

Call - 599  
PAP-17

Government of the Peoples Republic of Bangladesh  
Flood Action Plan

# FAP 17

Fisheries Studies  
and  
Pilot Project

(5)



## FINAL REPORT

(Draft)

JUNE 1994



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Supporting Volume  
No. 4



### FISHERIES STUDY

### PABNA IRRIGATION AND RURAL DEVELOPMENT PROJECT

## ODA

Overseas Development Administration, U.K.

**FAP 17**  
**FINAL REPORT**

**SUPPORTING VOLUME NO. 4**

**\*\* Draft \*\***

**FISHERIES STUDY**

**Pabna Irrigation and Rural  
Development Project**



**FAP 17**  
**FISHERIES STUDIES**  
**AND PILOT PROJECT**

**June, 1994**

**Funded by ODA in conjunction with the Government of Bangladesh**



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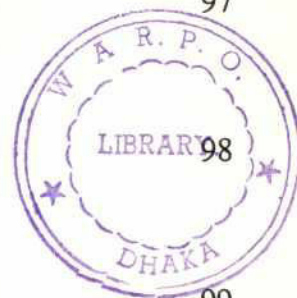
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## PREFACE

The Fisheries Studies and Pilot Project (FAP 17) was funded by the British Overseas Development Administration (ODA) in conjunction with the Government of Bangladesh. The national implementing agency for the Fisheries Studies was the Department of Fisheries of the Ministry of Fisheries and Livestock. FAP 17 also reported to the Flood Plan Coordination Organisation of the Ministry of Water Resources. The project was one of a number of supporting studies of a broader programme known as the Flood Action Plan (FAP) of Bangladesh. The FAP consisted of a series of eleven major engineering studies, five of which comprised separate regional studies which aimed to identify feasible large-scale flood control and drainage projects through which it would be possible to regulate the extent of flooding during the monsoon. The engineering components were supported by a range of complementary studies several of which were designed to address various social and environmental impacts which were anticipated to result from large-scale flood control.

FAP 17 was designed to address issues relating to fisheries and aimed to collect, analyse and interpret information on which to make predictions of the impacts of the planned flood control action upon the inland capture fisheries of Bangladesh. To do this, quantitative baseline fisheries and socioeconomic data were collected from inside and outside a range of different types of flood control projects in four regions of the country.

A total of eight FCD/I projects was studied and the results of each study were documented in a series of Supporting Volumes (Fisheries Studies) of the project Draft Final Report (see list of reports on page xv). Three further fisheries studies were completed one of which described the fisheries of the main rivers Jamuna and Padma (Supporting Volume No. 10) and the other two investigated the movements of a) adult and juvenile fish and b) fish hatchlings in regulated and unregulated rivers and assessed the impact of regulators on these movements (Supporting Volume Nos. 5 and 11). A parallel set of socioeconomic studies was carried out and the results documented in seven village study reports (Supporting Volumes 12-18). In addition to the fisheries and village studies, several special studies, mainly desk studies, were completed during the course of the project. These provided background information on fish, the environment and socioeconomics (Supporting Volumes No. 19-28). Several of these studies have been documented previously as annexes to the FAP 17 Interim Report. However, to ensure wider circulation they were also included as part of the Draft Final Report.

One extremely important output from the FAP 17 study was the establishment of a detailed and comprehensive fisheries database which provides quantitative baseline information on inland fish resources and fisheries in Bangladesh. Fisheries and socioeconomic databases were submitted to the Government of Bangladesh through the Flood Plan Co-ordination Organisation of the Ministry of Water Resources and the Department of Fisheries in the Ministry of Fisheries and Livestock. Documentation of each database was included as Appendices 1 and 2 of the Draft Final Report.



The present report is one of a series of eight fisheries studies which form part of the Supporting Volumes to the Draft Final Report. The principal objectives of the supporting studies are listed below.

- 1) Evaluation of the effects of different flood control measures on the production of fisheries.
- 2) Evaluation of the effects of different flood control measures on the movements and populations of fish.
- 3) Assessment of the feasibility of technical and developmental measures to compensate for or reduce potential losses to fisheries due to flood control.

Descriptions of the methods employed for field data collection, laboratory studies and analyses of data are provided in the FAP 17 Inception and Interim Reports and are presented again with some additions in Appendix 3 of the Draft Final Report.

Two taxonomic guides were used for the identification of fish found during this study. The first was Rahman, A. K. A. 1989, *Freshwater Fishes of Bangladesh*, published by the Zoological Society of Bangladesh. The second was Talwar, P. K. and Jhingran, A. G. 1991, *Inland Fishes of India and Adjacent Countries*, Vols. 1 and 2, published by Oxford and IBM Publishing Co. Ltd. The more recent guide was used to provide a systematic listing of the scientific names of fish. However, the guide by Rahman was used more widely by fisheries biologists and all Bengali names of fish used in the present report were derived from this guide. The FAP 17 database also provides comprehensive lists of local names of fish collected in each region studied.

The term "species diversity" was used in this report in its simplest sense to denote the total number of different species of fish recorded at each site. The numbers of species recorded were dependent on the sampling effort deployed. No doubt more species would have been recorded had more sites or gear units been sampled more often using larger sub-samples of catches. All species recorded were divided into three categories of habitat preference: riverine, migratory and floodplain residents based on distributions identified using the complete FAP 17 database. The categorisations should be regarded as provisional only. As more knowledge is gained of the ecology and behaviour of individual fish and prawn species in Bangladesh more accurate revisions to the list will be needed.

Local names of gears were used throughout the report despite considerable geographical differences in names used in Bangladesh. A list of all gears recorded by FAP 17, with local and English names and a brief description of each is provided as an appendix to this report.

The source of all tables and figures presented in this report, unless otherwise stated, is from data collected by FAP 17 fisheries surveys.

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This report is based on the concerted efforts of a large number of people whose responsibilities covered field data collection, administrative support, entry of data into computers, management of databases, analyses and interpretation of results and report preparation.

Under the guidance of a senior fisheries supervisor, fisheries biologists, directly recruited by the project or provided through temporary employment by the Department of Fisheries, were responsible for the collection of fisheries, hydrological and limnological data. Field survey schedules required the team to monitor fishing activities from dawn to dusk, 12 hours each day with additional surveys carried out before dawn to monitor night fishing. That the team accomplished its objectives despite arduous working conditions and long, unsocial hours of work warrants the highest recognition and is a credit to both the team and the senior fisheries supervisors, Drs Islam and Wahab, who were responsible for maintaining not only discipline and high quality survey work but also team morale. The achievements of the FAP 17 fisheries survey teams demonstrated that it is possible in Bangladesh to obtain detailed quantitative fisheries appraisals based on the direct monitoring of fishermen's activities on water.

Administrative support staff and computer operators both in the field station and in Dhaka headquarters were responsible for the smooth running of the field programme and ensured that data were entered into the database promptly and accurately.

Mr. Asaf Hussain, senior computer programmer, was responsible for database management and programming and worked closely with Drs. James Scullion and Bernadette McCarton on data analyses. Fisheries resource assessment specialists, Professor John Beddington and Dr. Geoffrey Kirkwood of the Marine Resource Assessment Group, Imperial College, London, UK advised on the statistical methods for the analysis of catch rates of gears which formed the basis of comparisons of fish catches inside and outside the flood control project.

Mr. Goutam Chandra Dhar, computer specialist, together with a small team in Dhaka were responsible for the preparation of the report.



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## ABBREVIATIONS AND ACRONYMS

<i>b. aman</i>	Broadcast <i>aman</i>
BRE	Brahmaputra Right Embankment
BWDB	Bangladesh Water Development Board
°C	Degree Centigrade
cm	centimetre
CPUA	Catch Per Unit Area
CPUE	Catch Per Unit Effort
DO	Dissolved Oxygen
DoF	Department of Fisheries
FAP 17	Flood Action Plan Study No. 17 (Fisheries Studies and Pilot Project)
FCD	Flood Control and Drainage
FCD/I	Flood Control and Drainage with or without Irrigation
FRI	Fisheries Research Institute
ha	hectare
hr	hour
HYV	High Yield Varieties
kg	kilogram
km	kilometre
m	metre
mg/l	milligram per litre
MIKE11	A microcomputer based modelling system for rivers and channels
MPO	Master Plan Organisation
NCR	North Central Region
NWR	North West Region
PIRDP	Pabna Irrigation and Rural Development Project
PWD	Public Works Datum (water level)
pH	Measure of acidity and alkalinity of water (log of hydrogen ion concentration)
SWR	South West Region
SWMC	Surface Water Modelling Centre
t	tonne
<i>t. aman</i>	Transplanted <i>aman</i>
WARPO	Water Resources Planning Organisation (previously MPO, Master Plan Organisation)
μS	Measurement of conductivity of water (micro Siemens)

## SUMMARY

1. The Pabna Irrigation and Rural Development Project (PIRDP) is a large flood control drainage and irrigation (FCDI) project covering about 184,000 ha in the North West Region of Bangladesh. The project contains 160 km of embankments along its boundary rivers, the Jamuna, Padma and Baral/Atrai. The area has a population of about 1.5 million people.
2. Between October 1992 and February 1994, fisheries catch assessment surveys were carried out at fortnightly intervals on rivers, canals and floodplains/beel inside the PIRDP and in control areas outside it in both the North West and North Central Regions. The North Central Region was surveyed since free-flooding floodplains comparable to those in the PIRDP prior to embankment no longer exist in the North West Region because of flood control embankments along the Jamuna and Padma rivers. The control area selected in the North West Region was flooded by the Baral/Atrai through a large breach in an embankment.

### Flooding patterns

3. Despite the fact that the PIRDP was structurally secure and was capable of preventing flooding by its boundary rivers, extensive flooding still occurred in both dry and wet years of 1992 and 1993. There were two reasons for this flooding. First, the scheme could not prevent internal rainfall flooding by gravity drainage. Secondly, local farmers dictated the operations of sluice gates to permit entry of external river waters for the production of deepwater rice. The operational practices of flood control differed from the original design objectives of the project which anticipated full protection from external river flooding with a consequent expansion of HYV *t. aman* on increased areas of drier land and a reduction in deepwater rice.
4. Controlled flooding for the benefit of deepwater rice cultivation in the PIRDP resulted in the following impacts on flooding patterns.
  - i) External river flooding was reduced inside the PIRDP, therefore a greater proportion of the monsoon flood was derived from rainfall.
  - ii) Despite intermittent sluice gate closures in June, the timing of the first extensive flooding on land of comparable heights was the same (mid-June) inside and outside the scheme.





- iii) During the monsoon, sluice gates were operated to provide a gradual, progressive increase in flood levels of about 3 m reaching a peak in September. In doing so, rapid rates of increase in flooding and frequent seasonal fluctuations in water levels ranging from 0.5 m to 1.0 m, which were recorded outside the scheme, were avoided.
  - iv) Peak flooding inside the PIRDP was reduced by between 0.5 m and 1.8 m compared with areas outside it. This resulted in reductions in flood extent which varied between different drainage basins within the scheme. The latter were not quantified in this or previous studies.
  - v) The duration of the flood season was increased by one month within the PIRDP because of drainage congestion at sluice gates during the flood drawdown.
  - vi) Inter-annual variations in flood magnitude, extent and duration were substantially reduced compared with those on unregulated floodplains.
5. In the North Central Region, flooding patterns were similar to those found outside the PIRDP in the North West Region. Most floodplains were flooded by rainfall in May in small areas immediately surrounding depressions. During the last fortnight of June river waters entered and completely inundated most floodplains. Water levels increased through the monsoon with fluctuations following the Dhaleswari-Jamuna system, reaching a peak in September. The drawdown started in mid-September about two weeks earlier than on unregulated floodplains of the north west. Peak flood levels in the North Central Region were about 1 metre lower than those in the north west on land of apparently equal elevations. The difference was attributed to drainage congestion of the Hurasagar at its confluence with the Jamuna in the North West Region.

### Water quality

6. Seasonal variations in water temperature, pH, dissolved oxygen concentration, total dissolved solids and transparency were monitored in rivers, canals and floodplains inside and outside the PIRDP. With the exception of water transparency, no major differences in water quality were detected inside and outside the scheme. Waters on floodplains inside the scheme carried less silt than those outside it in the North West Region. This was attributed to sluice gates acting as bottlenecks to river flow, reducing water velocities and increasing the deposition of most silt before reaching floodplains.



## Total catch

7. In the North West Region, the annual catch per unit area (CPUA) from low elevation (F2-F4) floodplains inside the PIRDP was 65% higher than that outside (84 kg/ha) at Potajia (Table 1). However, statistical analyses indicated that fish densities were lower inside the PIRDP and that the higher catches resulted from increased fishing effort and a longer flood season (see paras 4.v and 17). Most of the increased effort was derived from the greater use of subsistence fishing gears, *doiar* traps and *thella jal* in shallow shoreline waters where they accounted for 41% of the annual catches inside the PIRDP and only 3% outside it. The increased use of these gears inside the PIRDP was attributed principally to the more stable hydrological environment resulting from controlled flooding for the production of deepwater rice. That the flood season was increased by at least one month inside the PIRDP compared to that outside also resulted in higher catches possibly through increased fish growth together with an increased opportunity to fish. In consequence, a greater share of the annual catch was taken during the winter (December - February) inside (40%) compared with outside (20%) the scheme.
8. The annual CPUA from low elevations floodplains in the North Central Region (42% kg/ha) was 70% and 50% lower than those from floodplain inside and outside the PIRDP in the North West Region. The lower yields from the North Central Region could be attributed to a combination of a shorter flood season and lower flood magnitude, lower fish densities and lower fishing effort but other factors, as yet unidentified, are likely to be involved since major differences in species diversity and catch composition were also found between regions (see paras 23 and 26).
9. The annual catch from high elevation floodplains inside the PIRDP (14 kg/ha) was 84% lower than that from comparable elevations on unregulated floodplains of the North Central Region (90 kg/ha). Lower yields inside the PIRDP could be attributed to shorter and lower floods and disconnection of floodplains from river systems.
10. The annual CPUA from canals inside the PIRDP (186 kg/ha) was 65% and 64% lower than catches from unregulated canals in the north west (529 kg/ha) and north central (511 kg/ha).

Table 1 Summary of quantitative impacts of PIRDP on fish

Habitat	In/out PIRDP	Annual catch (kg/ha)	Density of fish (significant difference $p < 0.05$ )	Diversity (Annual number of fish species)				Catch composition (% by weight)		
				Riverine	Migratory	Floodplain Resident	Total	Riverine	Migratory	Floodplain Resident
Low floodplain (F2-F4)	In	139 (143)	NW/NW Significant: Out > In	10	16	38	64	0.4	10	63
	Out	84 (94)	NW/NC Significant: In > Out	25	23	43	91	8	27	50
	Out	42		4	11	40	55	<0.1	6	74
High floodplain (F1-F0)	In	14	NW/NC Not tested	3	2	33	38	0.9	<0.1	87
	Out	90		7	16	38	61	0.5	12	64
Canal	In	186	NW/NW Not significant	8	11	37	56	<0.1	9	81
	Out	529	NW/NC Not significant	10	14	39	63	2	13	67
	Out	511		9	14	40	63	0.9	12	78
River	In	191-1631	Not tested	17	16	40	73	4	23	60
	Out	485		34	20	34	88	15	34	36
	Out	74-568		19	18	40	77	7	27	56

Notes: 1. Annual integrated catch values based on the combined catches from low elevation floodplains, canals and rivers inside and outside the PIRDP are given in parentheses

2. Categories of fish

**Riverine:** Species which are usually confined to rivers and estuaries (or sea in the case of *tilish*) throughout their life cycle with no dependence on the floodplain, although some species can occasionally be found on more extensive floodplains, particularly in the North East Region.

**Migratory:** Species which move between river and floodplain during different stages of their life cycle.

**Floodplain resident:** Species which are capable of surviving in perennial waters of the floodplain throughout the year and are largely dependent upon them for growth and reproduction. Many of these species inhabit a variety of freshwater habitats, including large rivers.



11. The annual CPUA from rivers inside the PIRDP ranged from 191 to 1631 kg/ha. The large variation between rivers could be partly attributed to differences in the degree of regulation of flow. The most highly regulated and canalized river, the Ichamati, supported the lowest catches. However, major differences in the degree of regulation between the other rivers studied, the Badai, Kageswari and Chiknai, were not detected. Catch differences between these rivers were related to differences in catchment area and connections to larger rivers. Rivers with larger catchments supported highest catches but direct connection to the Jamuna also increased catches of riverine and migratory species in the Badai.
12. Annual CPUA from unregulated rivers in the North West (485 kg/ha) and North Central Regions (74-568 kg/ha) were generally lower than those from regulated rivers inside the PIRDP.
13. Extrapolation of floodplain catch data to the total area of the PIRDP and the outside control area in the North West Region and addition of these to total canal and river catches resulted in an estimated total annual of 11,827 tonnes from the PIRDP. The combined catches from floodplains, rivers and canals provided an integrated estimate of CPUA from low elevation (F2-F4) floodplains inside the PIRDP of 143 kg/ha which was 52% higher than that outside (94 kg/ha).
14. Proposals for pumped drainage from Bera and Koitala pump stations under PIRDP Phase I and II would result in an estimated loss of 30,748 ha of low floodplains (F2-F4) and a loss of 4,729 tonnes of fish with an on-site value of 118 million taka. This amount of fish is equivalent to the annual consumption of about 0.5 million people which is one third of the population of the PIRDP.
15. Survey periods of 17 and 19 months in the North West and North Central Regions enabled comparison to be made of catches taken during two flood recessions and winters in years in which the depth, duration and extent of flooding differed considerably. In 1992 there was a serious drought while in 1993 there were substantially greater floods. Catches from low elevation floodplains were lower at all sites during the drier year of 1992 and this was attributed to reduced flooding. However, the degree to which catches were reduced in the dry year was lower inside the PIRDP (38% reduction) compared with outside in the North West (67%) and North Central Region (57%). The difference was attributed to the greater reduction in flooding on unregulated flooding during the drought year compared with the more regulated flooding.



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stable controlled flooding for deepwater rice production inside the PIRDP (see para 4. vi). The results also indicated a differential impact of inter-annual changes in flood magnitude and extent on fish and prawn populations from different habitats. Reductions in catch during the dry year were greatest on floodplains and usually lowest in rivers. This was due to the varying proportions of riverine, migratory and floodplain resident species comprising the catch from each habitat. Floodplain catches consisted of a higher proportion of floodplain residents and these fish were more dependent on inter-annual variations in the size of floods than were riverine species.

### Fish Densities

16. Statistical analyses of seasonally pooled catch rates of gears used inside and outside the PIRDP were carried out separately for each habitat type. Separate comparisons were made for sites inside and outside the PIRDP in the North West Region and for sites inside the PIRDP and sites in the North Central Region. Statistical comparisons were also attempted separately for low and high elevation floodplains. The underlying assumption of the method was that once differences in catchabilities between gears were accounted for then any further differences in catches rates inside and outside the PIRDP were due solely to differences in fish densities.
17. Statistical comparison of several dominant gears, excluding *katha* and *kua*, revealed significantly higher fish densities on low elevation floodplains immediately outside the PIRDP compared with those inside it. However, poor fit of the statistical model meant that this was not demonstrated conclusively. Total catches inside the PIRDP were substantially higher than those outside but this was due to the higher levels of fishing effort expended inside the scheme. Total standardised effort of dominant gears, measured in *current jal* hours per hectare, was 3694 compared with 1923 on outside floodplains. A major part of fishing effort expended inside the PIRDP was derived from small-scale subsistence gears, *doi*ar traps and *thella jal*, used in shallow shoreline waters. These gears were used less intensively on unregulated floodplains (see para 7).
18. Statistical comparisons of catch rates of dominant gears used on low elevation floodplains in the North Central Region and the PIRDP revealed significantly higher densities ( $p < 0.01$ ) and catches ( $p < 0.05$ ) inside the scheme. Higher catches were also due to higher amounts of fishing effort. Total standardised effort by dominant gears,

measured in *thella jal* hours per hectare, was 154 inside the PIRDP compared with 82 on unregulated floodplains.

19. Statistical comparisons of catch rates of gears used on high elevation floodplains in the North Central Region and the PIRDP was not possible because gear usage between regions was quite different resulting in too few gears common to both regions upon which to base analyses.

*very hard  
justifying because of  
gear used for catching  
fishes in different*

20. Statistical comparisons of several dominant gears used in canals revealed no significant difference between fish densities inside the PIRDP and outside it in the North West Region. The higher catch recorded outside the scheme was due solely to the higher level of fishing effort expended. Total standardised fishing effort measured in *jhaki jal* hours per kilometre of canal was 2920 compared with 1339 inside the scheme. Comparisons between regions indicated again that there was no significant difference in fish densities inside the PIRDP and on unregulated canals in the North Central Region. The higher catch recorded outside the scheme was therefore due to higher fishing effort (4693 *jhaki jal* hours/km) compared to inside (1918).

21. Statistical comparisons of catch rates from rivers inside and outside the PIRDP were not possible because of insufficient numbers of dominant gears common to both areas and because of differences in the size of rivers which in turn could influence catches.

*statistical comparisons not possible*

### Diversity

22. A total annual number of fish species recorded from low elevation floodplains inside the scheme (64) was 30% lower than that outside it (91). Examination of the diversity of different groups of fish showed a major adverse impact on riverine and migratory species due to flood control. A total of 48 species in these groups was found on floodplains immediately outside the PIRDP compared with only 26 species inside it, a reduction of 46%. The same trend was observed on high elevation floodplains and in rivers and canals where the numbers of riverine and migratory species were reduced by 78%, 39% and 21% respectively inside the scheme compared with areas immediately outside it (see Table 1). The particularly high reduction in diversity of these fish on high land (F0-F1) was due to the total disconnection between floodplains and adjacent rivers whereas the reduction recorded in other habitats was the result of blockage to migrations by regulators on rivers (see para 29). In contrast, the diversity of floodplain resident species was reduced to a lesser degree on both high (13%) and

*reduction  
of fish diversity  
due to  
regulation*



low floodplains (12%) and in canals (5%) while in rivers diversity of these fish increased (18%) inside the PIRDP.

23. In the North Central Region, the diversity of riverine and migratory species on low floodplains was 69% lower than that outside the PIRDP in the North West Region. The diversity of riverine species was also 44% lower in the rivers of the North Central Region but numbers of migratory species in rivers and canals were similar between regions. Reasons for inter-regional differences in diversity of these groups of fish remain unclear and further studies on fish movements through the North Central Region are needed.

### Catch Composition

24. Riverine and migratory species comprised 35% of the annual catch from low floodplains immediately outside the PIRDP compared with only 10% inside. These included the larger and higher value species such as *rui*, *catla*, *mrigel* and *boal*. Concomitantly, lower-value floodplain resident species and prawns totalled 90% of the PIRDP catch compared with 65% on outside floodplains. The differential impact of flood control on different categories of fish could also be seen clearly by examination of values of CPUA of each group. The catch of riverine and migratory species inside the scheme (14 kg/ha) was 53% lower than that outside it (30 kg/ha) while the catch of floodplain residents (88 kg/ha) and prawns (38 kg/ha) were 110% and 192% higher than those outside (42 kg and 13 kg respectively).
25. On higher ground inside the PIRDP which had lost connections with rivers, migratory and riverine species made a negligible contribution (< 1%) to the annual catch while on unregulated high floodplains in the North Central Region, these species accounted for 13% of the catch.
26. Riverine and migratory species accounted for 10% of the annual catch from canals inside the PIRDP compared with 15% outside it. In rivers, these groups contributed 27% of the inside catch compared with 49% outside the scheme. In the North Central Region, riverine and migratory species were relatively less abundant on floodplains and rivers than in the North West Region outside the PIRDP (Table 1).



## Fish Movements

27. Reductions in diversity and relative abundance of riverine and migratory species inside the PIRDP were caused by blockage or hindrance to their seasonal movements between rivers and floodplains. Flood control structures reduced fish migrations in two ways. First, by lowering the number of entry points on to floodplains and thereby concentrating fish in fewer channels where they were more susceptible to capture. Secondly, by closing the gates of regulators for extended periods during the pre-monsoon and monsoon.

*fishing needs open the regulator gates frequently*

28. Riverine and migratory fish commenced lateral migrations from rivers to unregulated floodplains in the North West Region in mid-June coinciding with the first ingress of river floodwaters and migrations continued through July and August. Riverine species such as *ilish* entered as juvenile *jatka* and made up 28% of the monthly floodplain catch in August. Other riverine species such as *kachki* and *kajuli* entered as adults in breeding condition. Major carps entered as small juveniles in July probably by upstream migration along the Baral/Atrai from the Jamuna River. Most riverine species moved off the floodplains and returned to rivers during the flood drawdown in November but several migratory species stayed in perennial *beel* until captured by *katha*.

29. Seasonal movements of individual fish species in regulated rivers and associated floodplains inside the PIRDP varied between rivers. However, several trends were common to all. A few riverine species, notably *kachki*, *kajuli*, *piali* and *gang tengra* entered the PIRDP in low numbers in May when sluice gates were open to drain rainfall runoff. In June, movements were blocked by gate closures but a small number of riverine and migratory species entered on the few days when gates opened. When gates opened for longer periods between late July and early to mid-August to allow entry of river water for deepwater rice, many more of these groups of species also entered. These included species such as *ayre*, *guizza*, *kalabata*, *khorsula* and *bacha*. Major carps appeared at this time but may have entered earlier as hatchlings during restricted periods of gate opening. Compared to unregulated sites in the North West Region, migrations of fish from external rivers to rivers inside the PIRDP were delayed up to one to two months by intermittent sluice gate closures. There was also a lower dispersal of riverine and migratory species, notably *ilish*, *kabashi*, *boal*, *kajuli*, *ghaura*, *phasa*, *shillong*, *chital*, *ru* and *raik* on to regulated floodplains compared with that on unregulated floodplains outside the scheme.

*depends on opening of gates*



30. Independent but closely related FAP 17 studies on the downstream movements of fish hatchlings in the Jamuna River and its distributaries showed that their passive drift on river currents was blocked by closures of sluice gates at Talimnagar and Koitala. Blockage to movement was particularly harmful during the first large rises in river levels in June when concentrations and supply rates of major carp hatchlings were high. Other studies demonstrated that even when gates were open, densities and supply rates of hatchlings were significantly reduced in regulated rivers and that these reductions were directly related to water level differences across regulators (Draft Final Report, Supporting Volume No. 11).

### Mitigation Measures

31. The most effective mitigation measure to reduce losses to capture fisheries caused by flood control is to extend the recommendations of the North West Regional Study (FAP 2) for the lower Atrai basin into the area of the PIRDP. This would entail the continued provision of controlled river flooding on low floodplains for the production of deepwater rice rather than to attempt, as in the current PIRDP Phase II Project, to convert these seasonal wetlands into drier land by complete closure of regulators and the use of expensive and possibly unreliable pumped drainage for the production of HYV *t. aman*. The production of deepwater rice would not adversely affect the production of HYV winter rice since both this and deepwater rice were observed in different seasons on most floodplains studied by FAP 17 in the North West Region. The benefit to fisheries of growing deepwater rice rather than *t. aman* was estimated at 4,729 tonnes of fish per year. This is the amount that would be lost if pumped drainage and gate closures proved successful in preventing external river flooding. The catch had an on-site value of 118 million taka and was equivalent to the annual consumption of about 0.5 million people which was one third the total population of the PIRDP (see para 14).
32. A series of other mitigation measures was recommended to reduce the adverse impact of flood control on capture fisheries of the PIRDP. The measures included improved operation of regulators to increase fish and hatchling migrations on to floodplains, rehabilitation and protection of dry season habitats such as perennial *beel*, and conservation of fish populations during the dry season using *kua* or *beel* as fish sanctuaries. In addition, several measures were recommended which related to institutional improvements mainly within BWDB. The most important of these was



the need to establish an effective multidisciplinary technical assessment unit in BWDB or WARPO comprising expertise from fisheries, agriculture, environment, hydrology and hydraulic engineering. The unit should be responsible for the re-evaluation of operating procedures of major existing structures and for the examination of future proposed flood control projects. Proposals for major new road or rail links which may affect flooding and drainage patterns should also be assessed by the unit.

### Future Research

33. Several topics which require further research work were identified, most of which follow on from the baseline data provided by the FAP 17 study. The topics cover a mix of basic and adaptive research. Emphasis was placed on the need for detailed long-term studies running for at least five years to obtain an understanding of the functioning of complex floodplain fisheries in relation to biological, environmental and socioeconomic factors which influence fish populations. The ultimate purpose of the research work is to provide not only a more detailed understanding of the precise mechanisms by which flood control affects different fish stocks but also to collect sufficient information on fisheries and flooding regimes upon which to base the development of a quantitative floodplain fisheries model. This can then be used as a predictive tool to provide future advice on fisheries management and development in Bangladesh.

*data bank  
are more  
affected  
for the  
floodplain  
fisheries  
model in  
future.*



## PABNA IRRIGATION AND RURAL DEVELOPMENT PROJECT (PIRDP)

### 1 STUDY AREA: BACKGROUND

The Pabna Irrigation and Rural Development Project (PIRDP) is a large, flood control drainage and irrigation project covering an area of about 184,000 ha in the North West Region (Fig. 1.1). The area has a population of about 1.5 million people. Pabna district covers most of the scheme and the district headquarters, Pabna town, is located centrally.

The project area is bounded by the Baral/Atrai<sup>1</sup>, Jamuna and Padma rivers on the north, east and south sides where it is protected from flooding by the construction of 160 km embankment. In the west and north west, the project is bordered by the Paksey-Adbulpur railway embankment and the Baral River, a distributary of the Padma River. Following the construction of a regulator in 1983 at the offtake of the Baral River at Charghat, flooding in the Baral basin was greatly reduced obviating the need to construct further flood protection embankments along its length.

Planning of the PIRDP started in 1970 when the first feasibility study was completed. This was followed in 1978 by a further feasibility study which resulted in the start of Phase I of the project. Construction work began in 1979 and Phase I was completed in 1992 with embankments in place, irrigation distribution networks covering 21800 ha established and pumped drainage facilities installed at Bera and Koitala on the Ichamati and Kageswari rivers.

From its inception, the main aim of the PIRDP, in addition of providing flood protection for people and infrastructure, was to increase agricultural production, principally rice production. It was accepted at feasibility stage in 1970 that there would be a loss in capture fisheries but the first attempts to quantify these losses were made much later, in 1991 as part of a feasibility study to formulate proposals for a second phase of the PIRDP. The previous estimate of fish loss is discussed in more detail later in this report when comparisons are made with the results of the present study (see Section 8.2).

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<sup>1</sup> The Atrai River is known as the Baral in part its lower reaches. In this report it is referred to as the Baral/Atrai to distinguish it from the Baral, a distributary of the Padma.

The feasibility study for the second phase of the PIRDP proposed to expand the irrigated area by 13,000 ha and improve the efficiency of the irrigation system which was expected to result in a predicted increase of 96,000 t of rice. The proposal also included a small-pond aquacultural development programme using irrigation water to compensate for previous capture fisheries losses resulting from flood control.

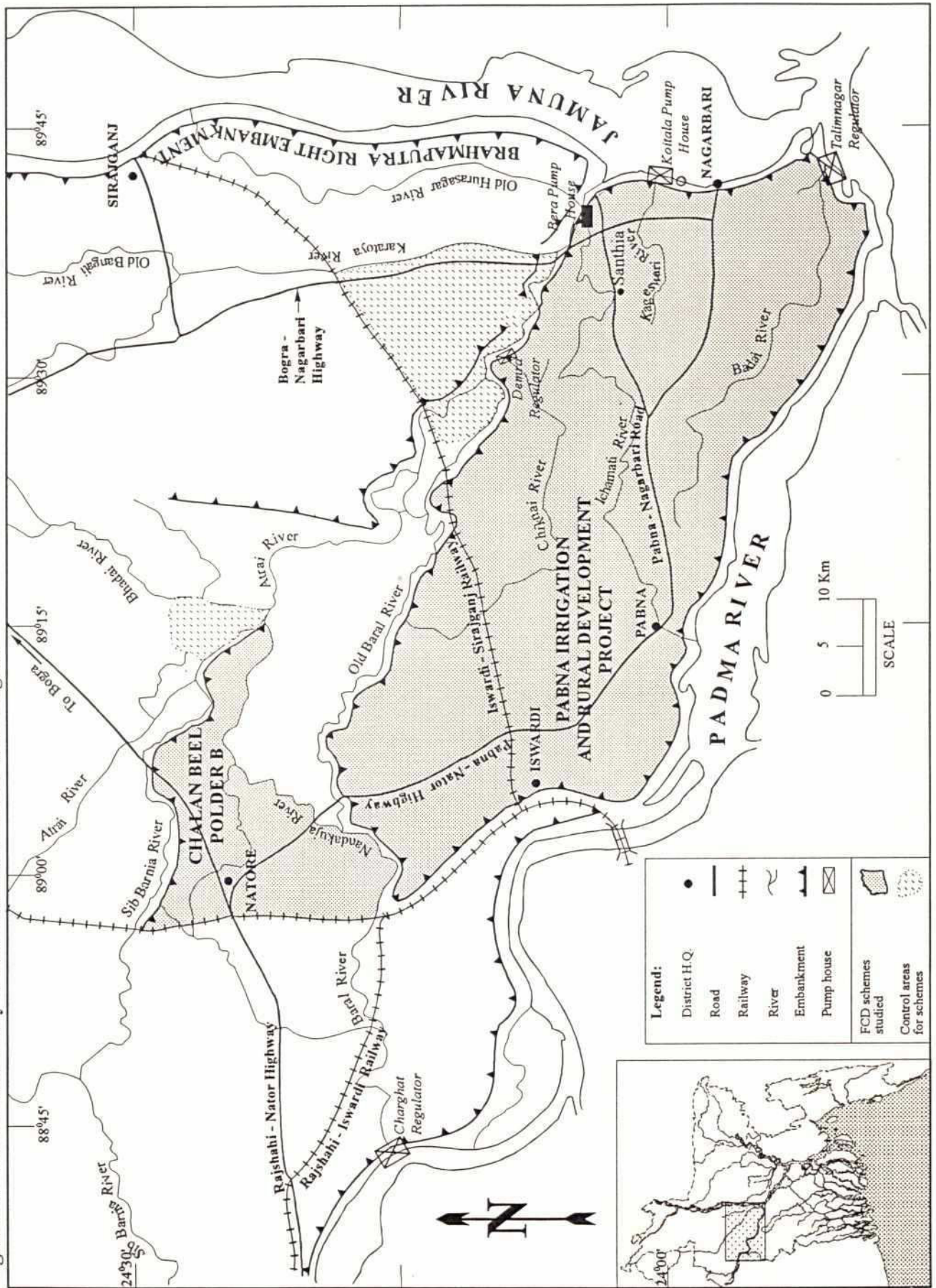
Economic analyses undertaken during the feasibility study assumed that pumping facilities at Bera and Koitala operated at design levels and that these would have no impact on capture fisheries. The first assumption was over-optimistic and the second was incorrect. The pump stations have not yet succeeded in operating to design levels for a single full flood season. If they did so, considerable reductions in capture fisheries would follow. These are detailed in Section 9 of this report.

On the basis of the 1991 feasibility study, proposals have been submitted for a second phase of the PIRDP funded by the Asian Development Bank. If accepted, the project should commence in about mid-1995.

In view of the large area of the PIRDP, FAP 17 selected several sites inside the scheme covering a range of drainage basins, agro-ecological units, land heights and habitat types. In this way, it was possible to investigate a range of impacts of flood control on flooding patterns and fisheries within the scheme. The identification of comparable free-flooding control areas outside the scheme was difficult since the region is protected effectively from flooding by the Brahmaputra Right Embankment and embankments on the left bank of the Padma River. Two areas were selected, one immediately north of the PIRDP on the left bank on the Baral River which flooded the selected area via a large breach in an embankment. This area was not considered as a free-flooded area since its was protected by the Brahmaputra Right Embankment. To find a free flooding area, sites were selected to the east of the Jamuna River in the North Central Region where various distributaries, notably the Dhaleswari River, carried Jamuna floodwaters on to low-lying floodplains.



Figure 1.1 Location of study areas within the North West Region





8

## 2 SAMPLING SITES

Rivers, canals, floodplains and *beel* were sampled inside and outside the PIRDP at fortnightly intervals for a total of 17 months from October 1992 to February 1994 inclusive. Site selection and fisheries data collection were carried out following procedures previously outlined in the FAP 17 Inception and Interim Reports.

### 2.1 Inside Sites

Previous feasibility studies divided the PIRDP into 6 drainage basins (Fig. 2.1). Sites were selected in 4 of the 6 basins (Fig. 2.2). Drainage basin No. 5 covering the northwestern part of the scheme was not sampled mainly because of logistical problems of long travel times for survey teams. A small basin (No. 3) in the northeast was also omitted but this basin was similar to sampled areas in basins No. 2 and 4. A total of 7 floodplain sites was selected covering a combined area of 2,009 ha which represented approximately 2% of the net cultivable area of the 4 sampled drainage basins (103,553 ha). Two sites (NW22 and NW23) were selected in areas of relatively higher land which received only shallow rainfall flooding while all others were located in lower-lying extensively flooded areas (Table 2.1).

Table 2.1 Description of sampling sites on floodplains/*beel*

OUTSIDE FCD			INSIDE FCD		
Site code	Site name	Area (ha)	Site code	Site name	Area (ha)
<i>Low Elevation</i>					
NW17+NW18	Potajia	769	NW04+NW05	Gandahasti	825
NC23	Hazipur	241	NW09+NW10	Gangbhanga	414
NC27+NC28	Char Ghior	215	NW12	Alnar	355
NC31	Gala/Alamdi	354			
<i>High Elevation</i>					
NC04	Gazaria	123	NW22	Kanaider	280
NC08+NC09	Anahula	92	NW23	Someshpur	135
NC18+NC19	Mailjani	137			

Figure 2.1 Location of drainage basins in the PIRDP

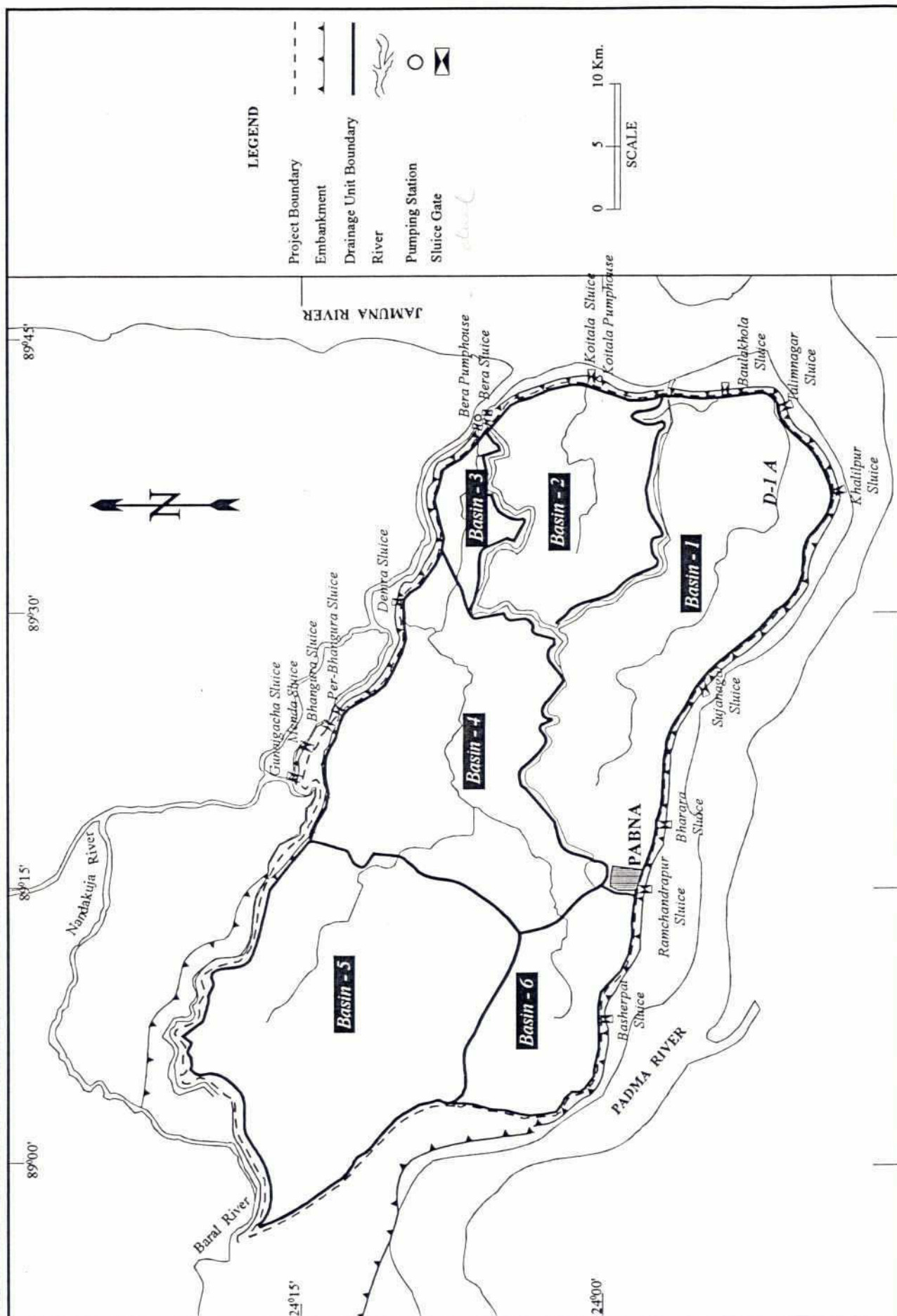
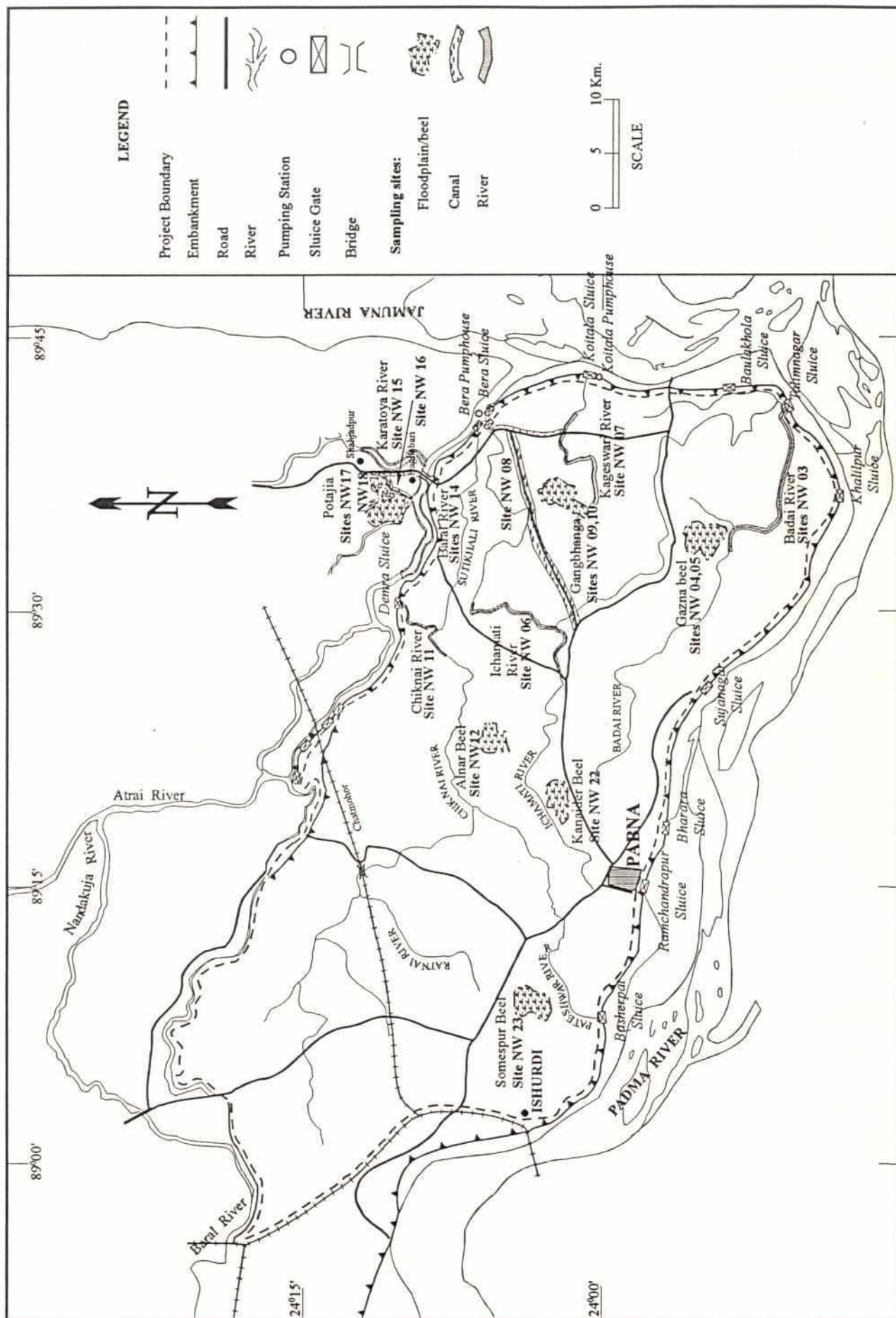




Figure 2.2 Location of sampling sites inside and outside the PIRDP



These low elevation sites were selected as contiguous paired sites, one of each pair containing either a perennial *beel* or a greater proportion of lower land. At Gandahasti floodplain in the Badai basin (No. 1), there was little difference between the two sites (NW04 and NW05). At Gangbhangra floodplain, one site NW10 contained the small perennial Gangbhangra *beel* and part of the surrounding floodplain while its partner (NW09) covered slightly higher floodplain immediately to the north. In the Chiknai basin (No. 4), the sampled floodplain surrounded the small perennial Alnar *beel*. The *beel* and the floodplain were surveyed by two teams throughout the study but data were amalgamated into one site (NW12). Low elevation sites were drained directly by a single river in each basin. The Badai, Kageswari and Chiknai rivers drained basins 1, 2 and 4 respectively. Each of these rivers was sampled together with the Ichamati River which was converted into the main irrigation channel of the scheme and therefore was subject to the greatest degree of regulation (Table 2.2). To obtain an estimate of fish yields from the extensive irrigation canal system within the scheme, typical roadside canals in drainage basin 2 (site NW08), were selected as representative examples of this network (Table 2.2). The two high elevation sites had no direct connection to canal or river and therefore there was no need to sample these habitats in relation to the floodplains.

**Table 2.2** Description of sampling sites on rivers and canals

OUTSIDE FCD				INSIDE FCD			
Site code	Site name	Length (km)	Area (ha)	Site Code	Site name	Length (km)	Area (ha)
<b>RIVERS</b>							
NW14	Baral/Atrai	14.00	177.10	NW03	Badai	7.80	39.00
NW15	Karatoya	6.50	53.62	NW06	Ichamati	14.15	95.51
NC21	Gazikhali	13.60	61.20	NW07	Kageswari	8.50	31.88
NC25	Kaliganga	15.62	209.89	NW11	Chiknai	7.50	28.13
NC29	Ichamati	12.00	45.00				
<b>CANALS</b>							
NW16	Potajia	7.60	12.77	NW08	Santia	13.60	31.82
NC22	Chandrakhali	3.63	6.28				
NC26	Mailagi	15.12	50.50				
NC30	Sakini	4.70	6.91				



## 2.2 Outside Sites

Immediately to the north of the PIRDP, across the Baral River, two low elevation sites were selected at Potajia (NW17 and NW18). Flood levels at these sites were determined by Baral River which overspilled on to them through a large breach in an embankment located 2 km upstream from Baghabari. Area elevation curves were constructed for each sampled area inside and outside the scheme using topographical maps and electronic planimetry (Fig. 2.3). The range of land elevations at outside sites was within those of inside sites and average site elevations (50% level) were almost identical at all sites except, Gandahasti floodplains (NW04/05) which were slightly lower.

One canal site (NW16) was selected which linked floodplain and *beel* sites with the Karatoya River. This river was also surveyed although it was not regarded as a totally unregulated system since it had lost periodic connections of its upper reaches with Jamuna overflows following the construction of the Brahmaputra Right Embankment. The Karatoya flowed into the larger Baral/Atrai River which was also surveyed. Of the two rivers selected for study outside the scheme, the Karatoya was more comparable in terms of size to the rivers inside the PIRDP. The larger Baral/Atrai was monitored to identify movements or blockage to movement of fish into the regulated Chiknai basin and Ichamati River inside the scheme and on to the more free-flooding areas of Potajia.

In the North Central Region, two sets of floodplain sites were selected. One on relatively high elevations around Tangail and the other, to the south where elevations were lower (Fig 2.4 and Table 2.1). In both areas floodplains were free-flooding, receiving waters from the Jamuna River via a series of distributaries running southeastwards through the region. Three pairs of sites were selected on low elevation floodplains for comparison with low elevation sites inside the PIRDP. Two of these sites NC31 and NC24 were treated as single sites but they each received two survey teams on each sampling day and data from each team were amalgamated. These two sites were of similar land elevations to Gandahasti floodplain, the lowest-lying site in the PIRDP (Fig. 2.5). The third site at Ghior was on slightly higher land equivalent to the regulated Alnar and Gangbhangha floodplains. At each floodplain site, a connecting canal and river was also sampled (Table 2.2).

Three pairs of high elevation sites were selected for comparison with sites NW22 and NW23 inside the PIRDP. One of the three sites received two survey teams throughout the study but data were amalgamated into one site (NC04). The average and range of land elevations at inside and outside sites were similar (Figs 2.6 and 2.7).

Figure 2.3 Area elevation curves of low elevation sites inside and outside the PIRDP

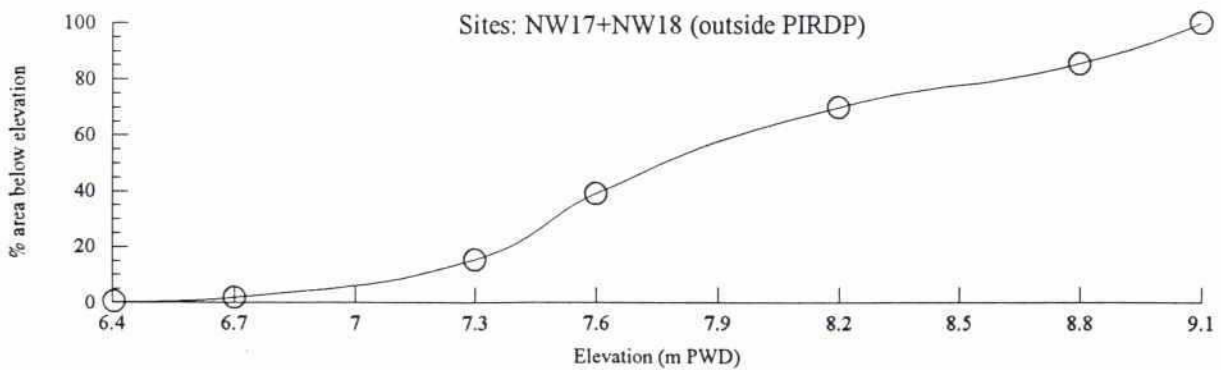
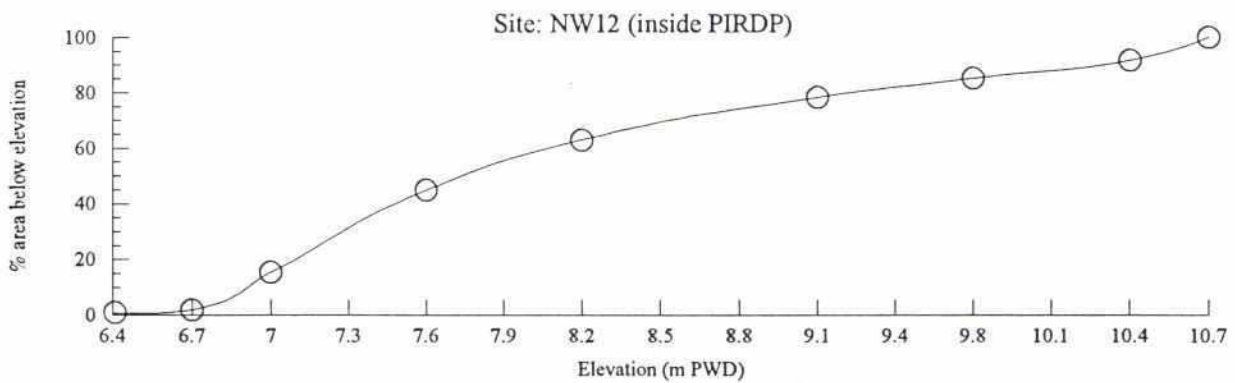
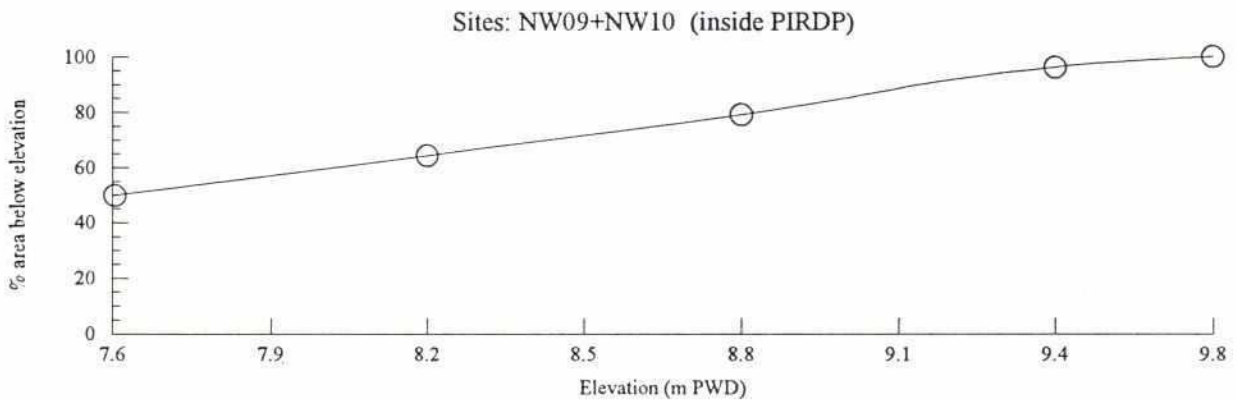
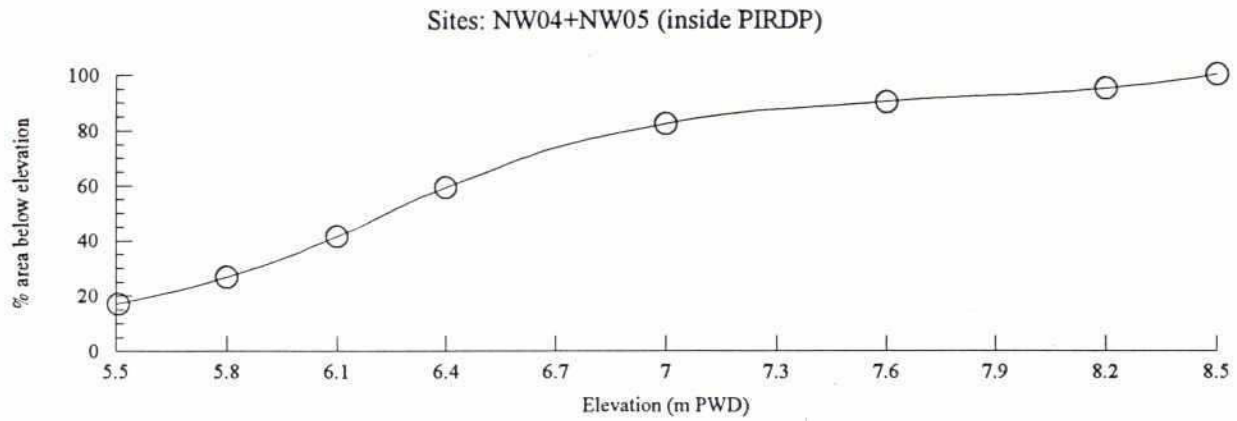




Figure 2.4 Location of sampling sites in the North Central Region

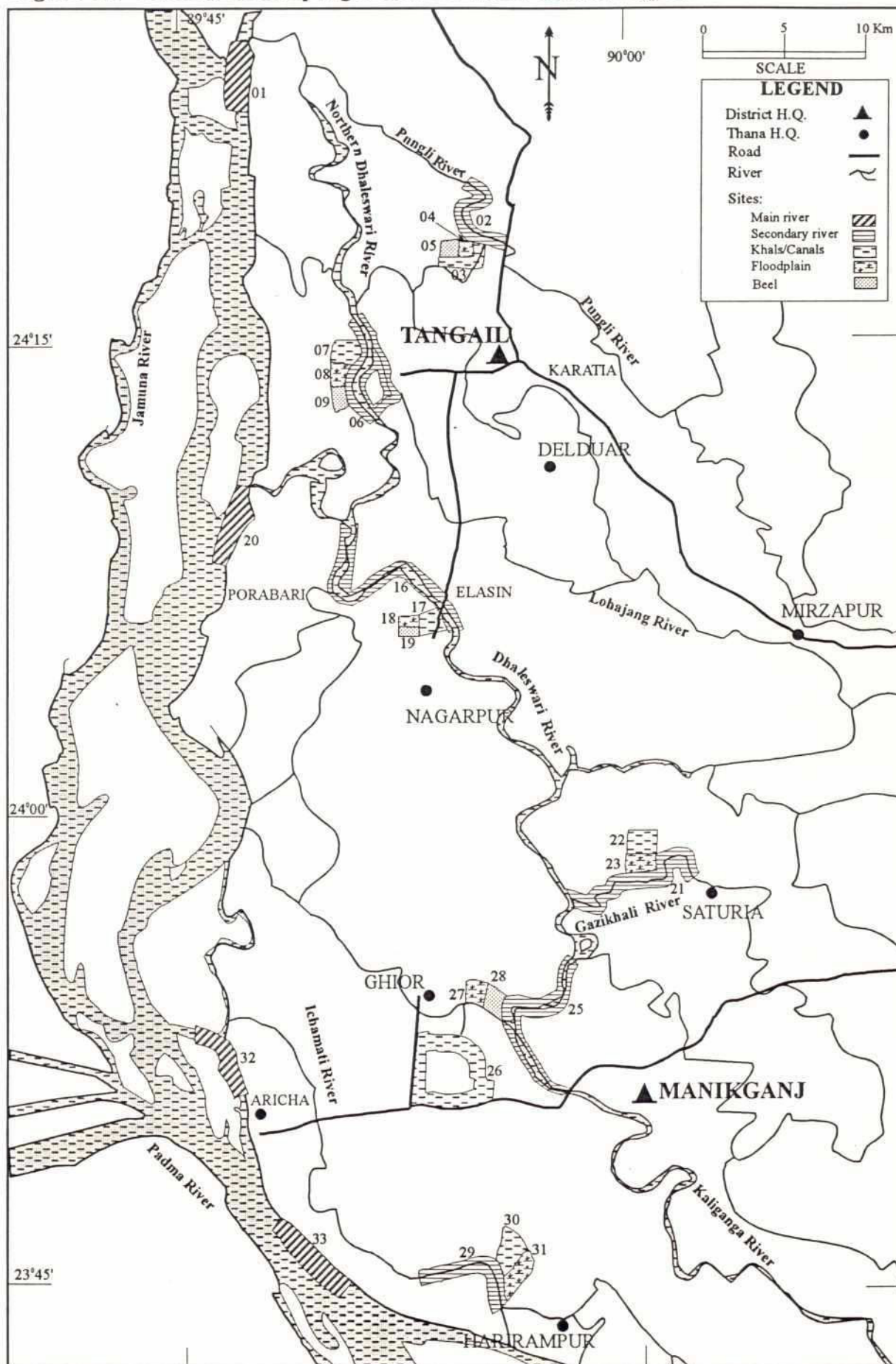


Figure 2.5 Area elevation curves of low elevation sites in the North Central Region

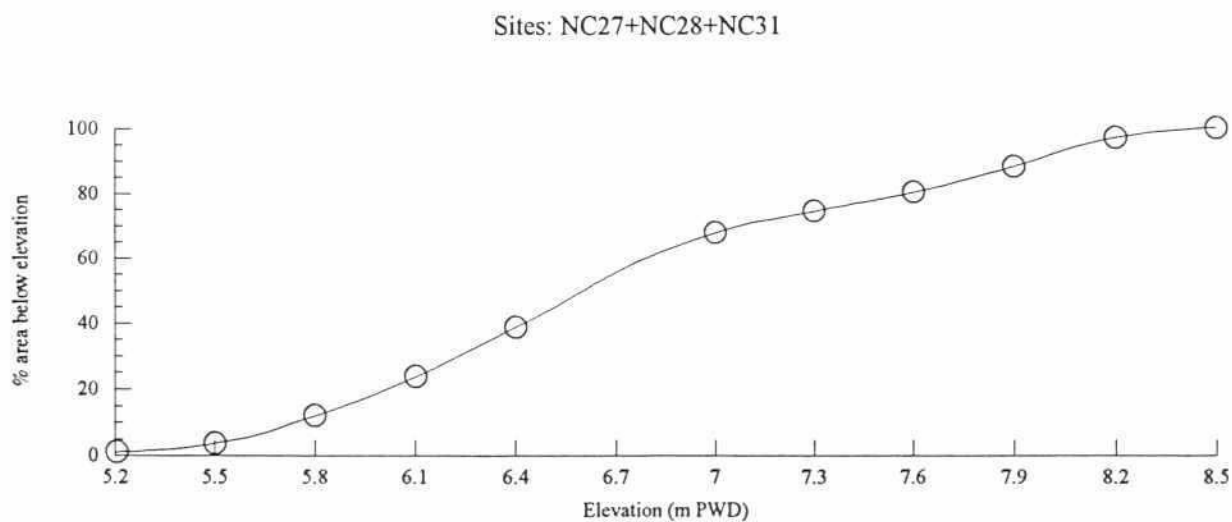
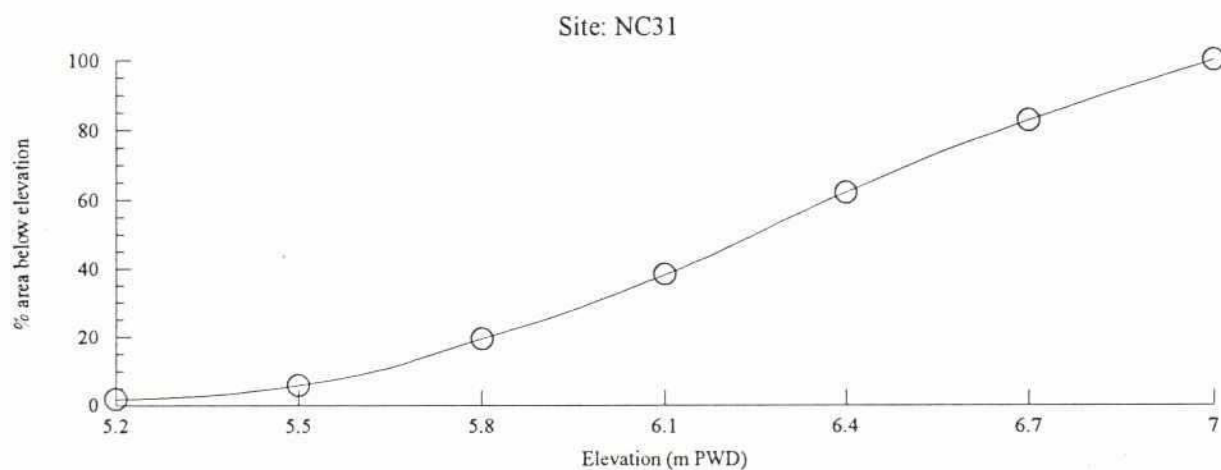
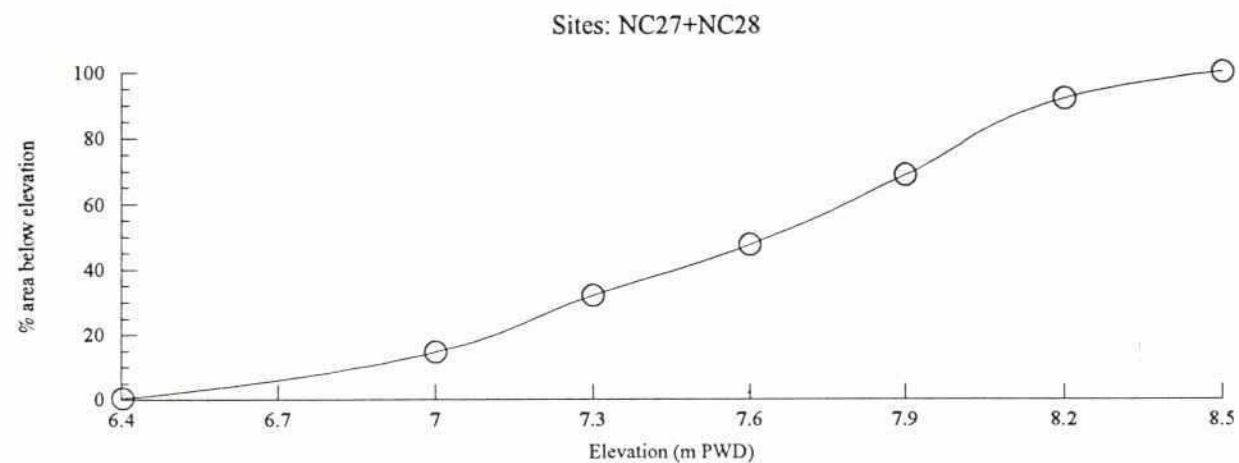
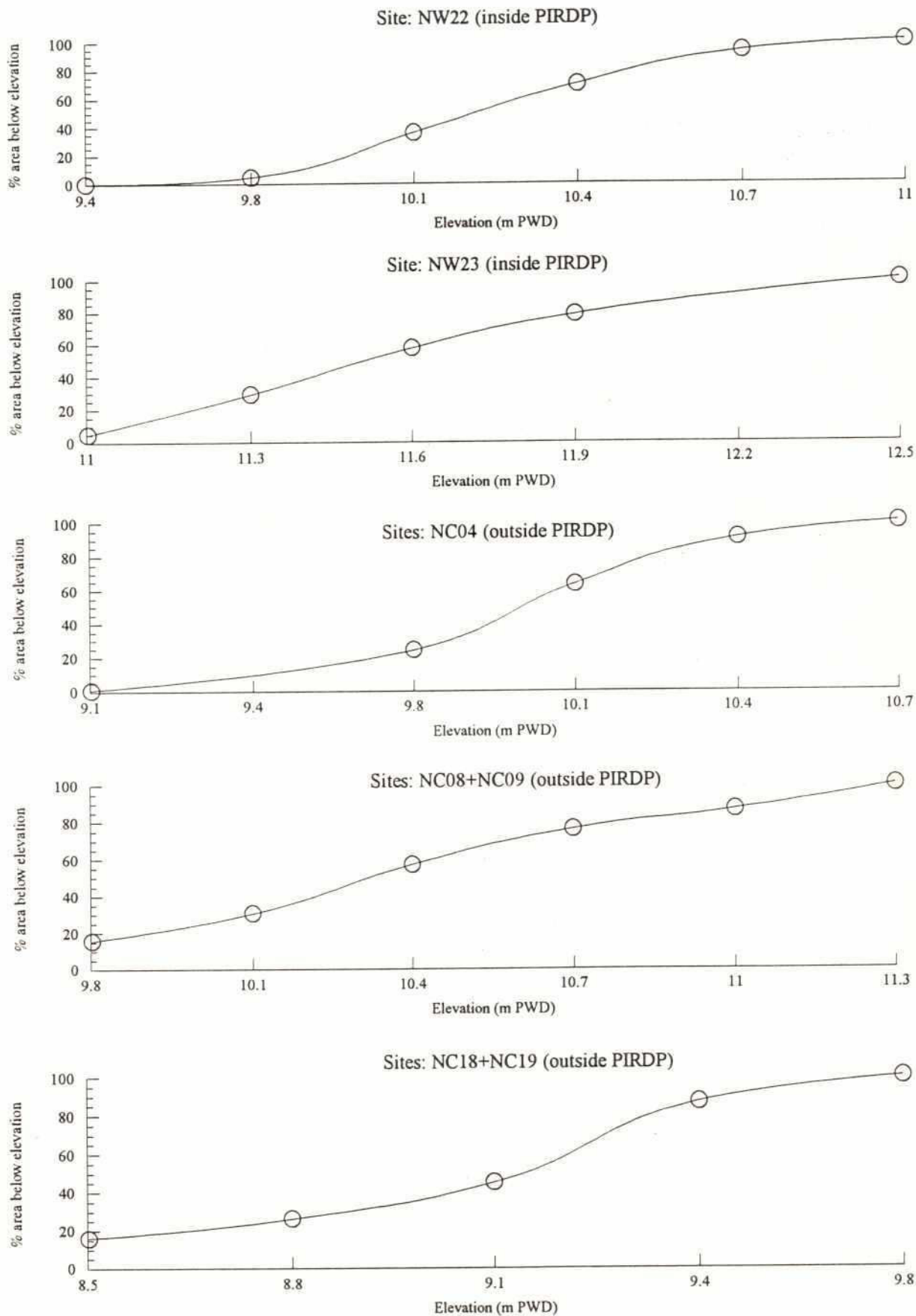
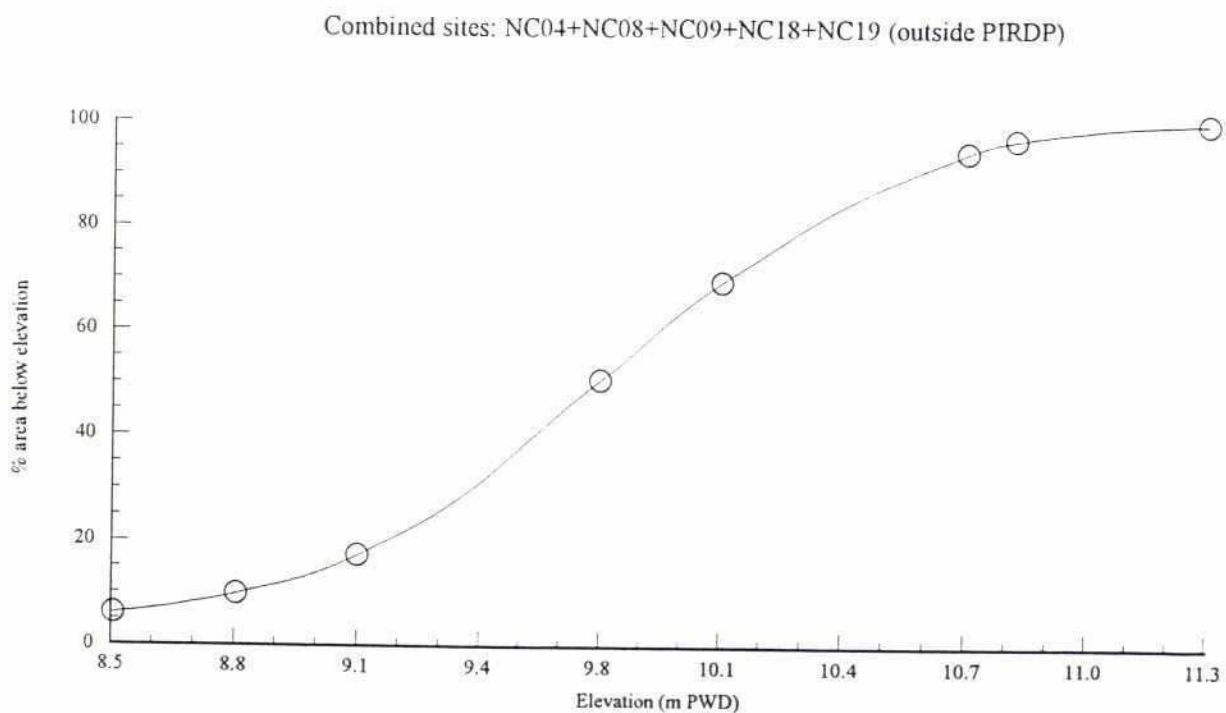
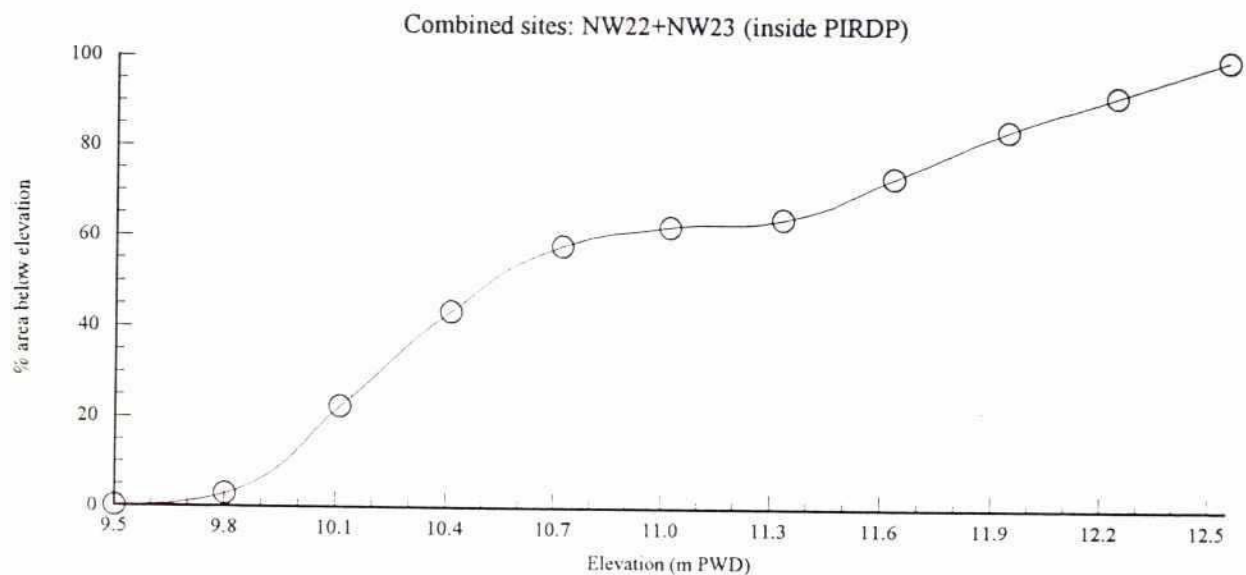




Figure 2.6 Area elevation curves of high elevation sites inside and outside the PIRDP



**Figure 2.7 Area elevation curves of combined high elevation sites inside and outside the PIRDP**





### 3 HYDROLOGY

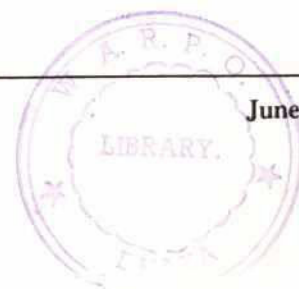
Three sources of data were used to provide a quantitative and qualitative description of flooding patterns inside and outside the PIRDP. The first was data collected directly during fisheries surveys. At each floodplain/*beel* site water depths were measured every two weeks at fixed points on different land heights. At the same time, the extent of the flood was recorded on sketch maps and points of entry or exit of floodwaters were noted together with directions of flow in associated canals.

The second and third sources of data applied mainly to sites inside the PIRDP. Daily water level data inside and outside sluice gates of Koitala and Talimnagar were provided by BWDB for the period June to October 1993 and for July to August 1993 at Demra regulator in the Chiknai basin. The third source of data was commissioned from the Surface Water Modelling Centre (SWMC) which carried out a hydrodynamic modelling analysis using MIKE11 for the period October 1992 to November 1993. The analysis produced simulated flooding patterns inside the PIRDP for 1993 conditions for before and after embankment construction.

#### 3.1 Inside PIRDP

##### 3.1.1 Previous studies

Previous feasibility studies divided the PIRDP into 6 drainage basins (Fig. 2.1). Recent estimates suggest that 80% of the cultivable land floods to varying depths during the monsoon season with land areas approximately equally divided between F0 to F3 and a smaller portion in F4 (Table 3.1). The area contains six major drainage channels which form three hydraulically independent drainage systems: the Chiknai-Tarapasha-Ratnai-Sutikhali system, the Kageswari system and the Badai system (Fig. 2.2). Prior to the construction of embankments flooding was caused by local rainfall and from the bordering rivers Padma, Jamuna and Baral/Atrai. The 1970 feasibility study reported that flooding was mainly from the Jamuna River with some overland flooding in the northwest. This study concluded that embankments would only slightly reduce flooding in a "normal" year and have even less effect in a 1 in 10 year flood. It therefore recommended pumped drainage facilities at each main drainage outlet. Two were eventually constructed at Bera and Koitala despite the prevailing policy of the National Water Plan which considered pumped drainage to be an economically unviable development option in Bangladesh. The Bera pump station serves as



both an irrigation and drainage facility whereas Koitala is used only to supplement gravity drainage.

**Table 3.1 Percentage distribution of different flood phases in each drainage basin of the PIRDP**

Flood Phase	Drainage Basin						Total Area
	1	2	3	4	5	6	
F0	24	3	<1	6	33	45	20
F1	23	19	28	13	25	24	21
F2	19	27	34	20	14	7	19
F3	12	20	14	19	9	6	13
F4	3	10	5	19	0	0	7
Non- cultivated land	19	21	19	23	19	19	20
Total area (ha)	45598	21984	6599	45274	52470	12462	184387

Source: Second Pabna Irrigation and Rural Development Project, Feasibility Study, Final Report 1991

Notes: 1. Flood phase based on definition of MPO.

2. Flood depth (cm)

F0 = 0 - 30

F1 = 30 - 90

F2 = 90 - 180

F3 = 180 - 270

F4 = > 270

Gravity drainage structures also occur at Talimnagar on the Badai River and Demra on the Chiknai. These are of a standard design commonly used in Bangladesh having a series multi-vented vertical lift gates. Flow through these is "undershot" i.e. water passes across the structure under gates when they are mechanically raised. The structures are designed to drain pre-monsoon rainfall runoff into main rivers, are closed to prevent inflow of water when levels in outside rivers rise and are reopened during the flood drawdown when outside river levels begin to fall, usually in September and October.

Prior to embankment construction, the Badai River connected with the Padma River and much of the flooding in its upper reaches was caused by inflows from the Padma. After embankment construction, this connection was cut completely. Two drainage regulators were installed at Bharara and Sujanagar but these allowed little or no entry of Padma floodwaters (Fig. 2.2). The Ichamati River also connected with the Padma but this too was disconnected



by embankments. It was further disconnected by a permanent cross dam located at western end of site NW06 (Fig. 2.2) and the eastern section then served as the main irrigation channel for the scheme.

The 1991 feasibility study of a second phase project reported that flooding inside the PIRDP had been much reduced following the construction of embankments. However, this conclusion was based solely on the reports of local people and no quantitative empirical evidence from the field or from flood modelling techniques was presented to support it. The study re-examined the potential performance of additional pump stations and concluded that these could not cope adequately with variable local rainstorm events and therefore recommended that no more should be constructed in the PIRDP. At the time of study, the pumping stations of Bera and Koitala were still not operational. A strong recommendation was made for a detailed case-study on Koitala to assess its viability in lowering flood levels and to assess both farmers reactions to pumped drainage and its impact of agriculture.

As part of the 1991 feasibility study, an assessment was made of the impact of the project on capture fisheries (see Section 8.2). It was reported that between 1984 and 1990 the floodplain area had been reduced by 47% (11,707 ha to 6,208 ha) by flood control. The data were provided by the District Department of Fisheries and were used without question by the consultant in an assessment of fish losses despite the fact that estimates of floodplain area for 1990 given elsewhere in the report were an order of magnitude higher: F1-F4 land = 110,318 ha; F2-F4=71,415 ha.

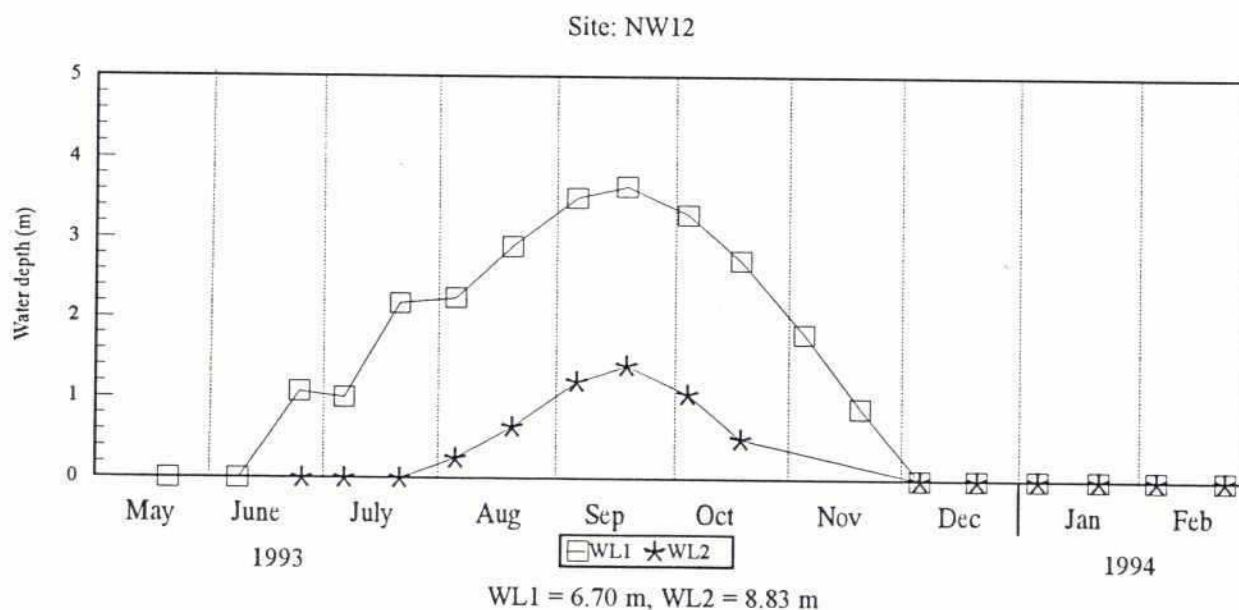
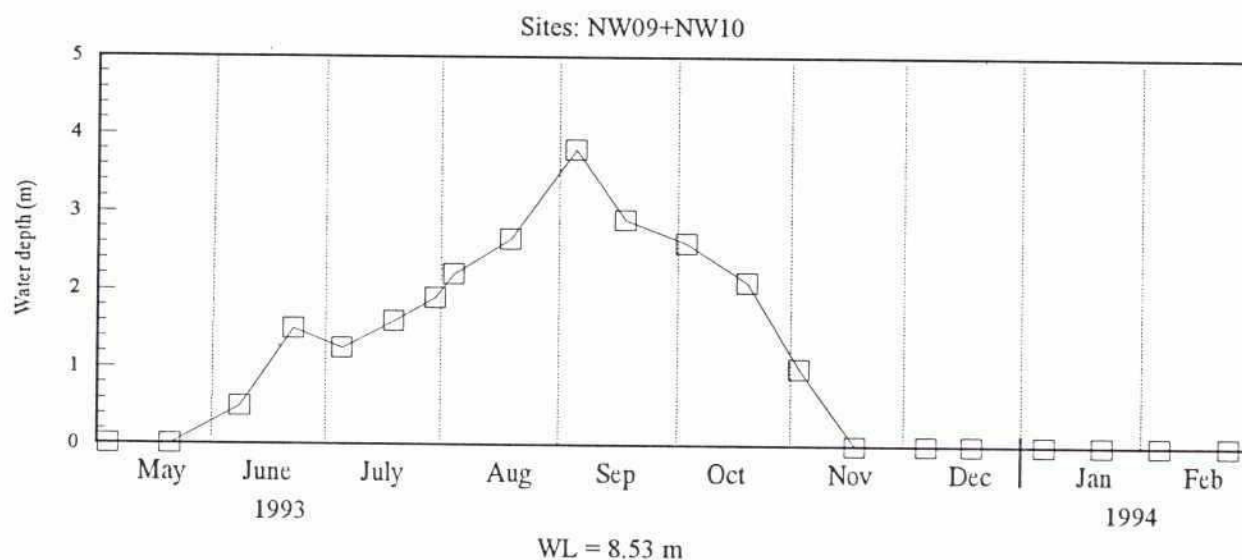
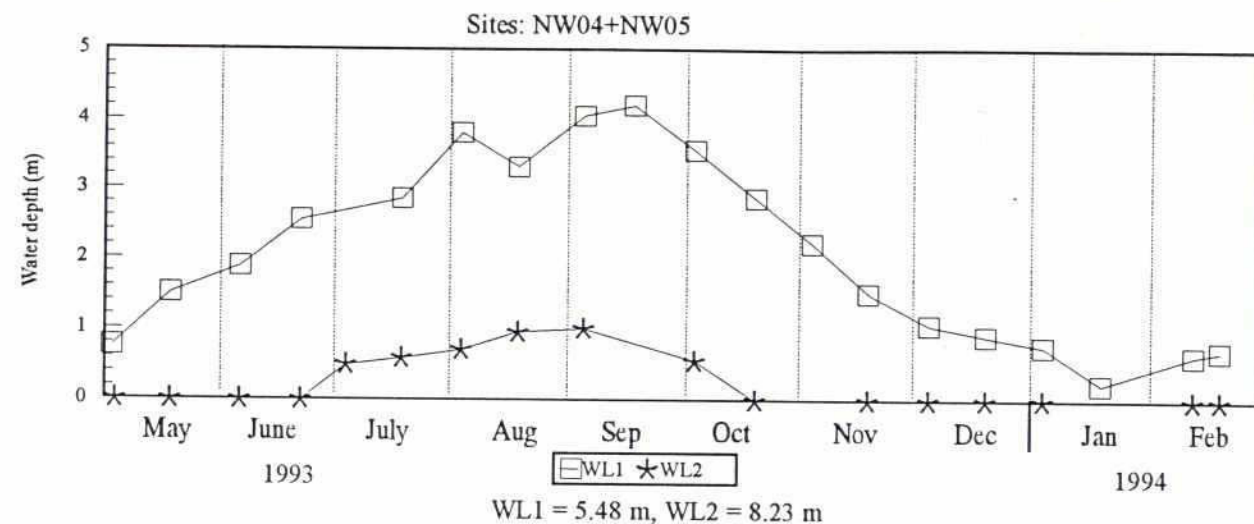
### 3.1.2 Present studies

#### *Water levels*

Rainfall flooding of Gandahasti floodplains (NW04+NW05) in the Badai basin began in April and increased in May 1993 (Fig. 3.1). During this period runoff drained into the Jamuna via the Badai River to the south of the sites. Talimnagar sluice gates were open at this time to allow gravity drainage but closed towards the end of May when outside river levels rose sharply (Fig. 3.2b). Gates remained closed as river levels subsided and gradually increased again in early June. For a short period around mid-June (7-12) when outside river levels begin to rise more rapidly, the gates appear to have been opened since water levels inside also rose sharply. Unfortunately, no records were kept by BWDB on gate operations during this period which is a very important time for fisheries and, to a lesser extent, agriculture since it coincides with possible late harvesting of winter rice and the recruitment

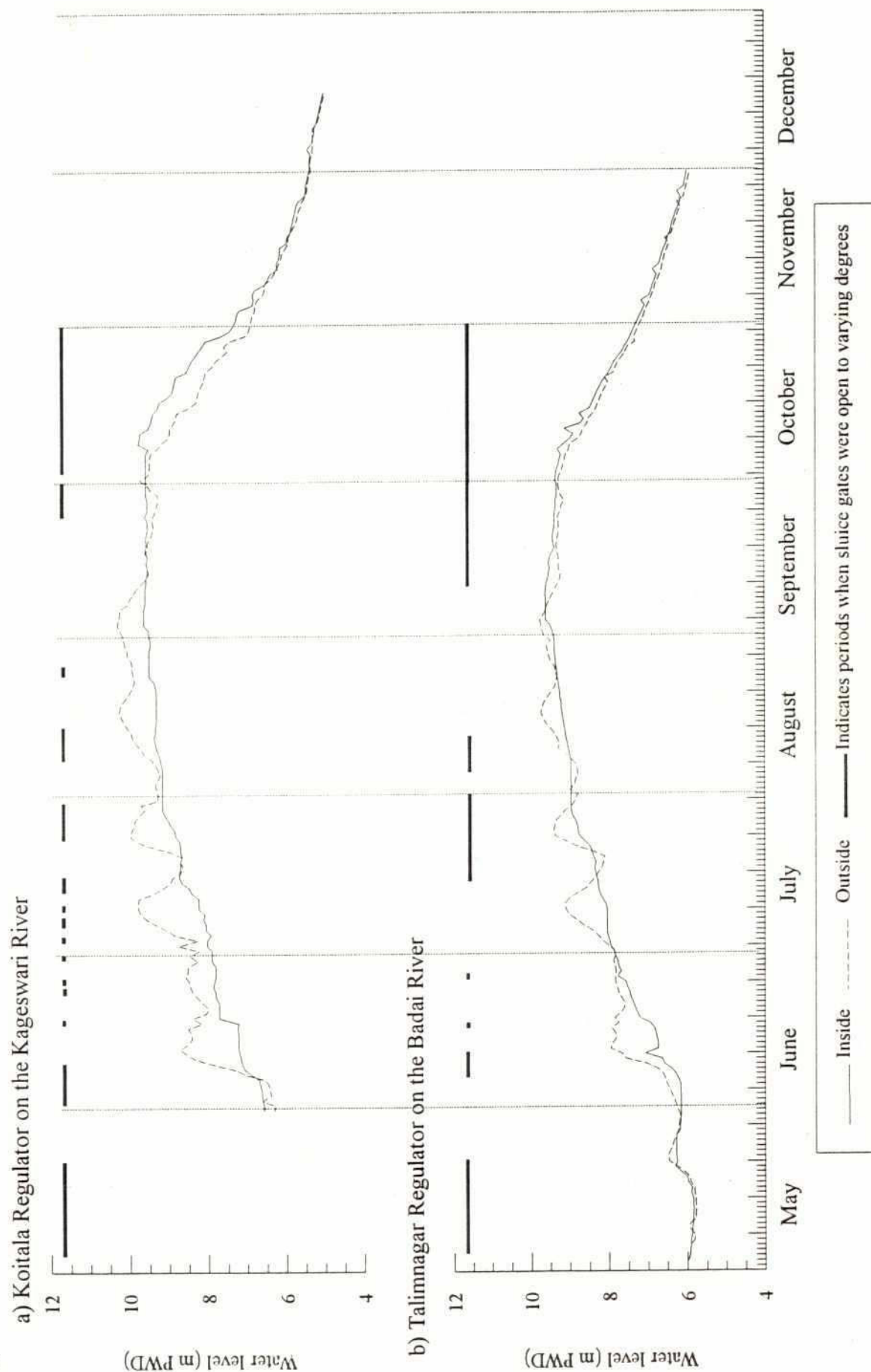


Figure 3.1 Seasonal variation in water depths on low elevation floodplains inside the PIRDP, May 1993 - February 1994



WL = Land elevations (m PWD) at positions of depth measurements

**Figure 3.2 Seasonal variations in water levels inside and outside Koitala and Talimnagar regulators in the PIRDP, May - December, 1993**



of young fish, especially major carps, on to the floodplains by passive drift in floodwaters. Direct observations during fisheries surveys revealed that the gates were partially open on the 17 and 18 June but no data were available for the rest of June. Water levels inside the sluice gate rose at this time suggesting that the gates remained partially open. Alternatively, continued rainfall flooding may have resulted in the same rise while the gates were shut. During the first half of July when Jamuna levels again increased sharply, gates were closed. As levels subsided in mid-July, water levels inside became higher than those outside, gates were then partially opened for the remainder of the month coinciding with a further rapid rise in the Jamuna levels which caused a more gradual rise in levels inside the scheme. In August, gates were at first closed, then opened for about a week before closing again until the second week in September after which they were opened for the remainder of the season to drain the floodplains. The sluice gate operating schedule resulted in a smooth progressive increase in water levels to a predetermined maximum level (approx 9.5 m PWD) to meet the requirements for the production of deepwater rice (*aman*). The overall effect was to dampen the natural oscillations of flood levels thereby avoiding rapid rates of rise which might damage the rice crop. In general, there was good agreement between seasonal variations in water levels recorded at floodplain sites and river levels recorded inside Talimnagar sluice gates.

At Koitala sluice gate on the Kageswari River, the same seasonal trends in flooding inside and outside the PIRDP were seen (Figs 3.1 and 3.2). However, manipulation of gates differed somewhat to that at Talimnagar but resulted in the same overall objective of producing a smoothly rising, controlled flood suited to deepwater rice production. The gates were open in early June when Talimnagar was closed. However, at this time water levels in the Kageswari were higher than the Jamuna and therefore rainfall flooding drained out of the scheme. As the Jamuna began to rise rapidly, the gates remained open for about two days before closing in the second week. For the remainder of June, water level data suggested that gates were opened intermittently usually only for one day at a time. This pattern continued through the first half of July to produce a stepped rise in inside river levels. In the second half of the month gates were opened for only one week compared to two weeks at Talimnagar. Gate operations during August and September were similar at both regulators. Greater head differences between inside and outside water levels at Koitala during October indicated greater drainage congestion in this basin than that in the Badai.

There was generally good agreement between seasonal changes in flooding recorded at the Koitala sluice gate and those on the floodplains at Gangbhangra. The particularly high peak



flood level recorded at Gangbhanga in early September was not confirmed by inside river levels and therefore may have been due to an aberrant reading. Rainfall in April and May which caused extensive shallow flooding in the Badai basin, had very little impact on Gangbhanga floodplain except to flood a small area surrounding the *beel* while the rest of the floodplain remained relatively dry until mid-June.

The drawdown on the floodplain commenced in early October and the first dry land appeared in early November. By the first week in December, most of the floodplain was dry leaving water only in *beel* such as Gangbhanga. Water was retained in this relatively deep (3-5 m) *beel* throughout the winter and pre-monsoon periods.

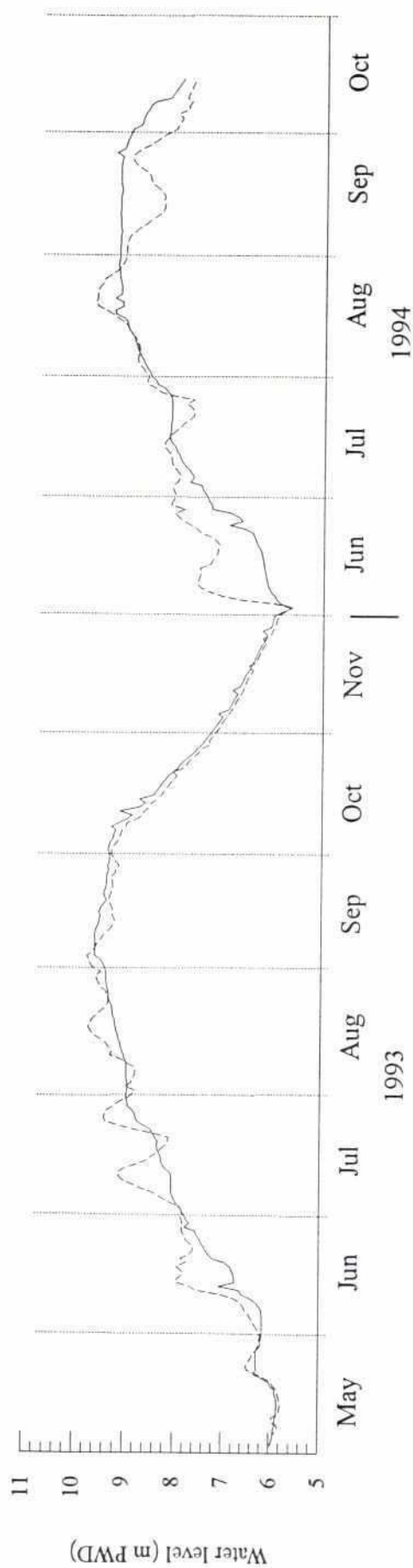
A comparison of water levels inside and outside Koitala and Talimnagar regulators between different years is made in Fig. 3.3. Unfortunately, data were not available for the drought year of 1992 but there were sufficiently large differences in Jamuna levels between 1993 and 1994 to make a useful comparison. The water level data indicated that during the drier year of 1994, both sluice gates were opened for longer periods from late July to late August to meet the required water depths inside the PIRDP for deepwater rice growth. In addition, as outside levels decreased earlier (September) in the dry year, gates were closed to maintain inside levels. The overall effect was to reduce the magnitude of inter-annual differences in flooding inside the scheme compared with those outside it. This obviously has important implications for annual changes in fish production inside and outside areas of flood control (see Section 7.1.3).

In the Chiknai basin, water level data inside and outside the main drainage sluice at Demra were available only for July and August in 1993 but a longer time series was obtained for 1992 (Fig. 3.4). Water level records suggest that in 1993, gates were opened and closed frequently for short periods to produce a progressive, slightly stepped increase in water levels inside the scheme following the same pattern as those in other basins. The gates appeared to open for slightly longer during July and August at Demra compared to Koitala and Talimnagar. Data for 1992 indicated that Demra sluice gates were opened for longer periods during this dry year to obtain the required water depths for deepwater rice production inside the scheme.

Water levels recorded at floodplain sites followed the same pattern as that recorded inside the sluice gate. As in the Kageswari basin, rainfall in April and May flooded only the lower land immediately surrounding *beel* but had little effect on the rest of the floodplains which

Figure 3.3 Seasonal variation in water levels inside and outside Koitala and Talimnagar regulators during 1993 and 1994

a) Talimnagar Regulator on the Badai River



b) Koitala Regulator on the Kageswari River

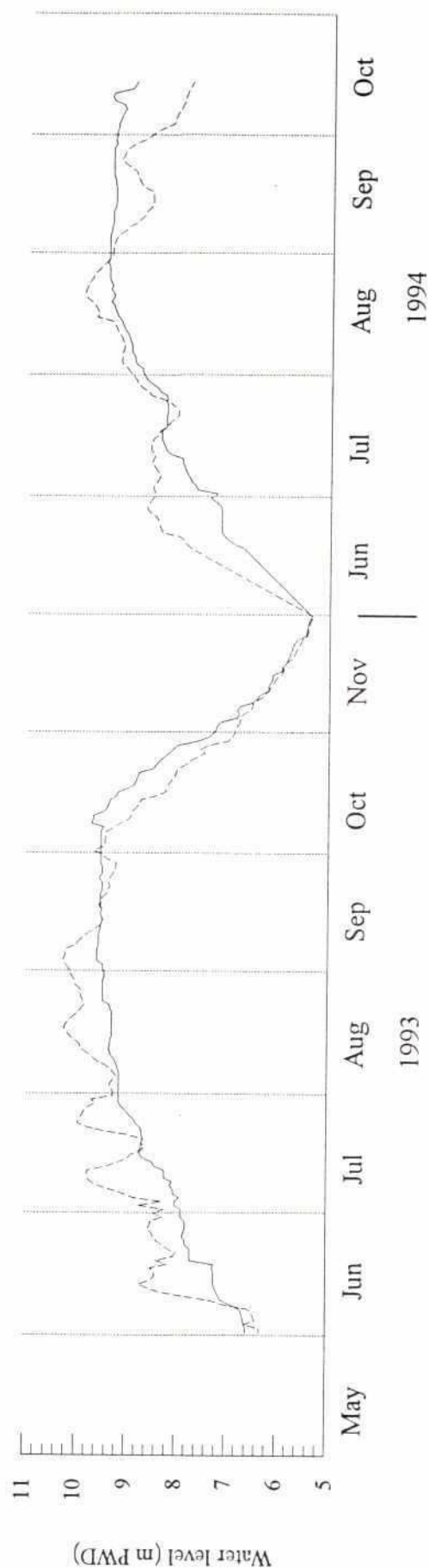
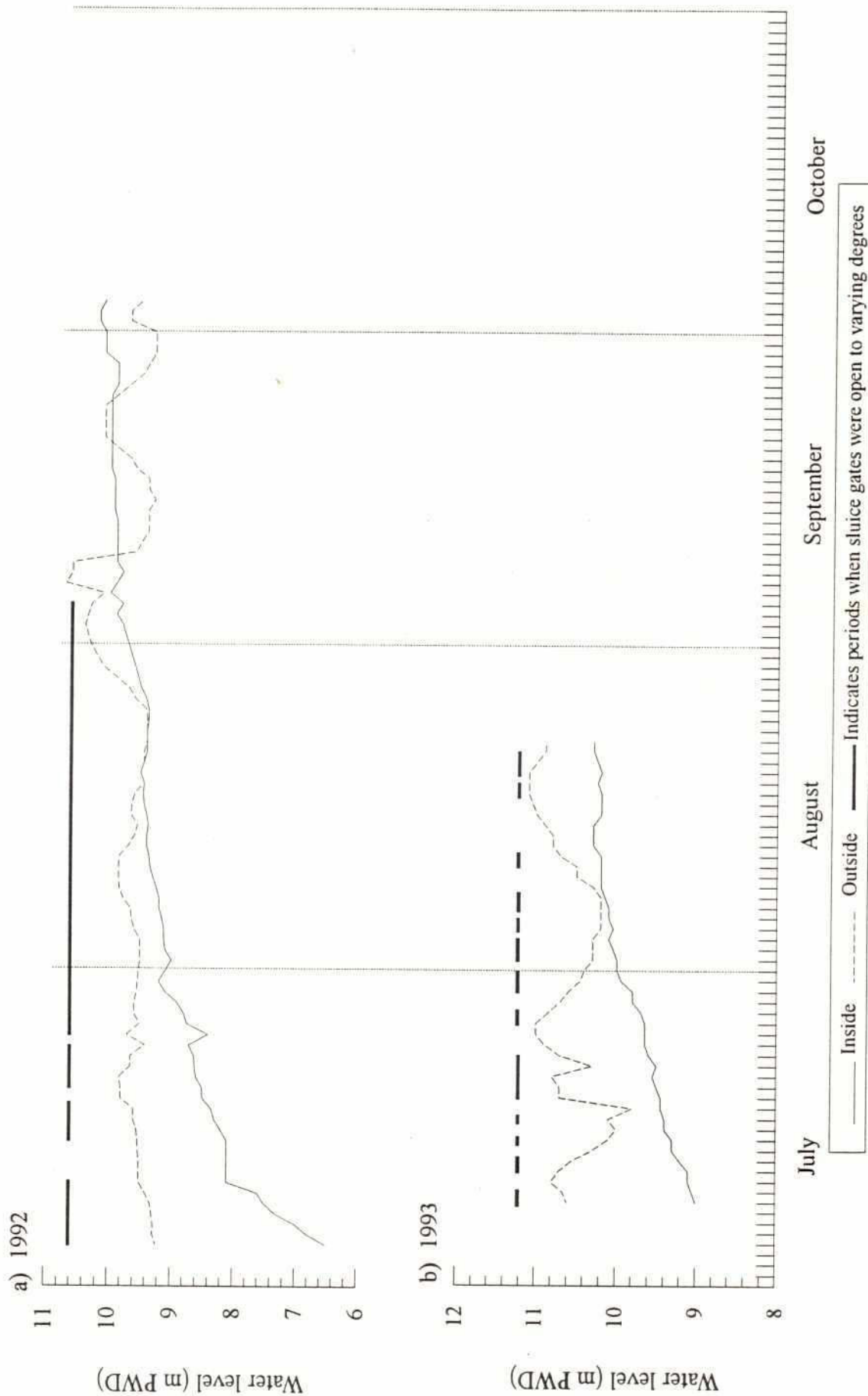


Figure 3.4 Seasonal variations in water levels inside and outside Demra regulator in the PIRDP, 1992 and 1993





flooded in mid June. Flood levels gradually increased to reach a peak in September and then receded at a steady rate during October and November (Fig. 3.1).

In early December most of the extensive open floodplains of this basin were dry leaving water only in the scattered small *beels* such as the one sampled at Alnar. Hydrologically, the basin was very similar to the Kageswari basin, both of which flooded later and drained more rapidly than the southerly, lower-lying Badai basin.

Water levels were not recorded at the high elevation floodplain sites inside the PIRDP (NW22 and NW23). However, since these sites were disconnected from their original feeder rivers, the Padma and the Badai, it seems probable that water levels remained below 1 metre throughout the monsoon.

#### *Flood modelling*

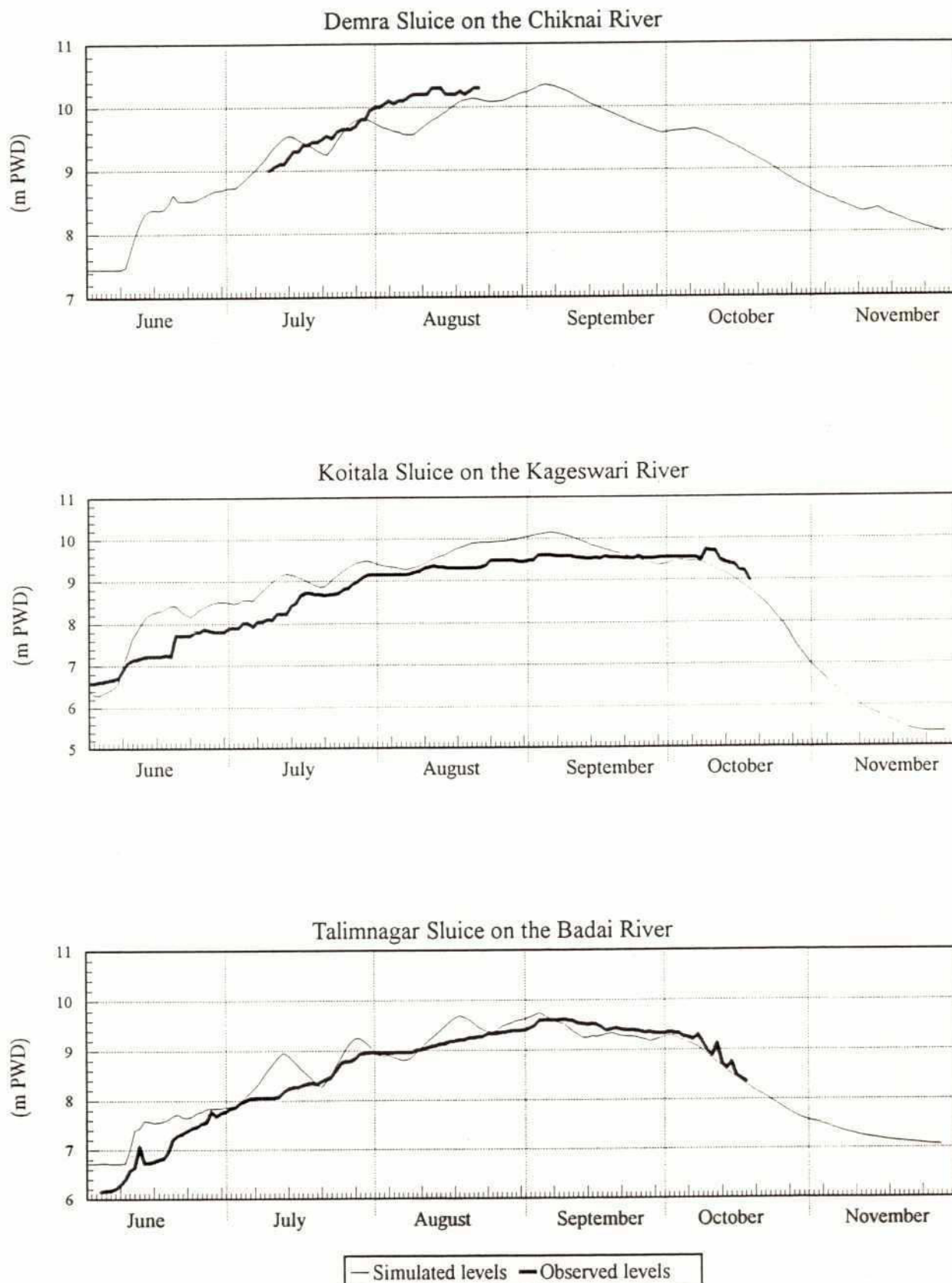
The MIKE11 one-dimensional hydrodynamic modelling system was used by the Surface Water Modelling Centre (SWMC) to simulate flooding patterns inside the PIRDP in pre- and post embankment conditions using hydrological data from 1993. A total of 14 flood cells covering an area of 758 km<sup>2</sup> in six drainage basins was modelled. The study focused attention on three cells which included the low elevation sites of FAP 17 in the Badai, Kageswari and Chiknai drainage basins.

Since exact gate operations were not known the model was run initially assuming gates served as drainage sluices only and that no water entered from outside rivers. This resulted in simulated water levels on the project side of sluice gates being far below observed levels. The analysis was therefore repeated assuming gates remained open throughout 1993. This produced slight over-estimates of inside flooding levels during periods of peak flooding in outside rivers (Fig. 3.5).

For the areas studied the following main impacts were identified.

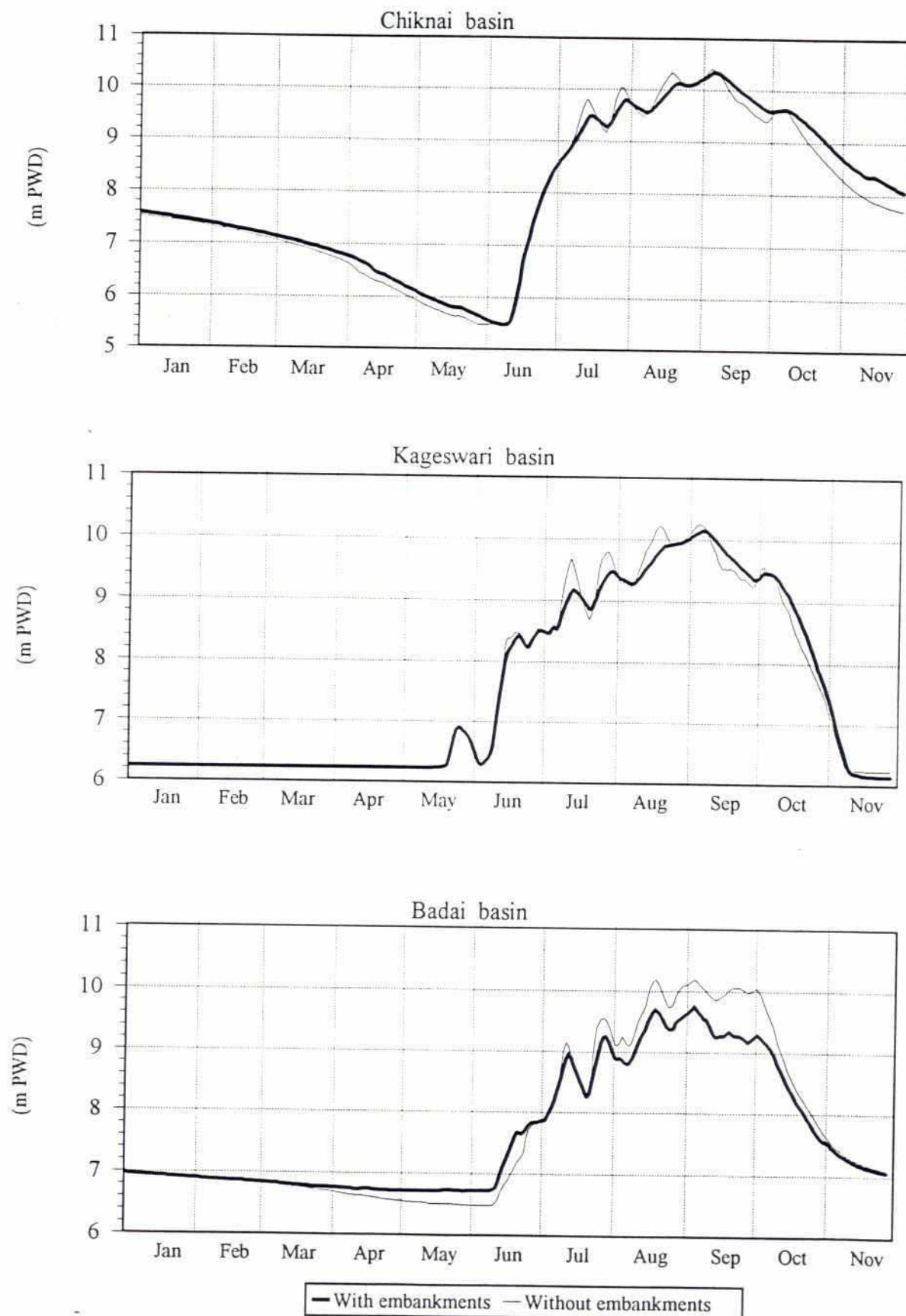
- i) In the Chiknai and Kageswari basins in the pre-project condition, the effect of connecting these basins to outside rivers was not major. Peak water levels in post-project condition were only slightly reduced but, in the Chiknai basin, water remained longer due to drainage congestion caused by embankment structures (Fig. 3.6).

Figure 3.5 Comparison of simulated and observed water levels inside regulators of the PIRDP, June - November 1993



Source: SWMC Report on PIRDP, March 1994

Figure 3.6 Seasonal variation in simulated water levels in different drainage basins of the PIRDP before and after embankment using conditions of 1993





- ii) In the Badai Basin in pre-project condition, peak water levels were 0.5-1.0 m higher than in the post-project condition because of the effect of reconnecting the Badai at its upstream end to the Padma River. This resulted in a substantial estimated reduction in inundated area under post-project conditions (Table 3.2). Actual reductions must have been even greater than those shown in Table 3.2 since the modelling assumptions resulted in overestimates of peak post-project flood depths.

Maximum areas inundated to different depths before and after embankment are shown in Table 3.3. The results indicate only slight post-embankment reductions in flooded areas at all sites. Again actual reductions were greater than these for reasons given above. Also, these results apply to 1993 conditions only, in years of higher river flooding such as in 1987 and 1988, flood levels inside the scheme would be considerably reduced compared to outside levels.

**Table 3.2 Seasonal variation in flooded areas in the Badai basin of the PIRDP before and after embankment**

Project Condition	Area Inundated (km <sup>2</sup> )		
	15 JUNE	31 AUGUST	31 OCTOBER
Pre-Project	12.83	121.26	26.77
Post-Project	20.15	93.28	26.52

**Table 3.3 Areas inundated to different depths at low elevation floodplain sites in the PIRDP before and after embankment**

Flood cell/ FAP 17 sites	Project condition	Area Inundated in peak flood (km <sup>2</sup> )	Area inundated by depth categories (km <sup>2</sup> )				
			F0	F1	F2	F3	F4
U1C1: NW04+NW05	Pre-Project	39.21	1.35	2.63	3.58	2.56	29.09
	Post-Project	37.23	1.36	2.39	3.19	2.35	27.94
U2U3: NW09+NW10	Pre-Project	24.59	3.37	7.82	5.76	3.06	4.58
	Post-Project	23.65	3.83	7.82	4.80	2.74	4.46
U4C3: NW10	Pre-Project	41.55	6.36	4.20	8.81	7.95	14.23
	Post-Project	40.07	6.17	3.28	9.04	7.99	13.59

Note: Flood depth (m)

Source: SWMC 1994

F0 = <0.3  
F1 = 0.3 - 0.9  
F2 = 0.9 - 1.8  
F3 = 1.8 - 2.7  
F4 = >2.7

### 3.2 Outside Sites

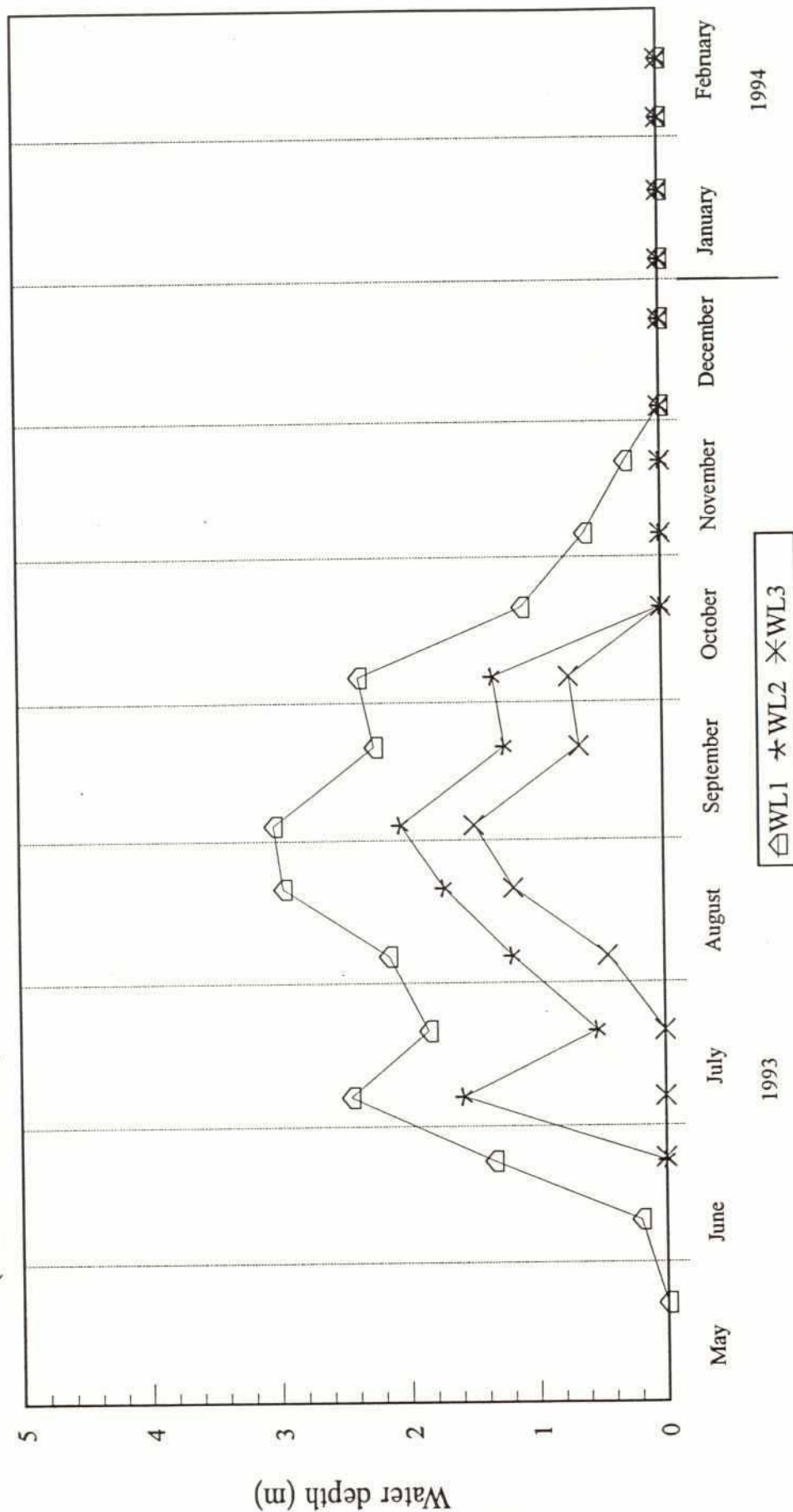
Readings of water levels taken from floodplain sites at Potajia indicated that there were wider and more frequent fluctuations in flood levels than at sites inside the PIRDP (Fig. 3.7). The fluctuations in floodplain water levels followed closely the seasonal variations recorded in the adjacent feeder river, the Baral/Atrai (Fig. 3.8). Rainfall in April and May expanded small *beel* areas slightly but had no effect on most of the floodplain. These areas first flooded in mid-June caused by the accumulation of rainfall and the entry of waters from the Baral/Atrai and Karatoya rivers. During peak floods, water level readings from comparable land elevations inside the scheme (NW12) and outside at Potajia indicated that floods outside were approximately 0.5 m greater than inside. However, water levels inside and outside Demra sluice gate suggested a greater difference with levels outside between 1.3 to 1.8 m higher than inside. It can therefore be concluded that peak flood levels outside were somewhere between 0.5 and 1.8 m higher than those inside.

Flood levels decreased rapidly between late September and early October and the first dry land appeared on sites towards the end of October. Two weeks later, in early November, the floodplains were dry apart from areas immediately adjacent to *beels*. Compared to sites inside the PIRDP, the flood drawdown outside was considerably more rapid, shortening the flood season by about one month compared to inside the scheme.

Another very important difference between sites inside and outside the scheme was that inter-annual variations in flooding patterns was substantially reduced inside the PIRDP compared with outside it (Figs 3.4a and 3.8). This has important implications for fisheries which are dependent on the magnitude and extent of floodplain flooding.

In the North Central Region, flooding patterns were similar to those found outside the PIRDP in the North West Region (Fig. 3.9). Most floodplains were dry until mid-June after which flooding increased with fluctuations following those in the Dhaleswari-Jamuna system reaching peak levels in September. The drawdown started in mid-September, about two weeks earlier than in the North West Region, and continued through October leaving most areas dry in early November. Compared to the North West Region, peak flood levels in the North Central Region were about 1 metre lower on land of apparently equal elevations (note: a recent correction factor in PWD between regions was not applied). Regional differences may be explained by the bottleneck to drainage in the North West Region near the confluence of the Hurasagar and Jamuna and the presence of embankments along the right bank of the Atrai, both of which probably increased flooding on the left bank of the Baral/Atrai system.

Figure 3.7 Seasonal variation in water depths on low elevation floodplains/beel in the NWR outside the PIRDP (sites NW17+NW18)



WL1=7.92 m, WL2=8.83 m, WL3=9.45 m  
 WL= Land elevations (m PWD) at positions of depth measurements



Figure 3.8 Seasonal variation in water levels in the Baral/Atrai River at Baghabari, April 1992 - October 1993

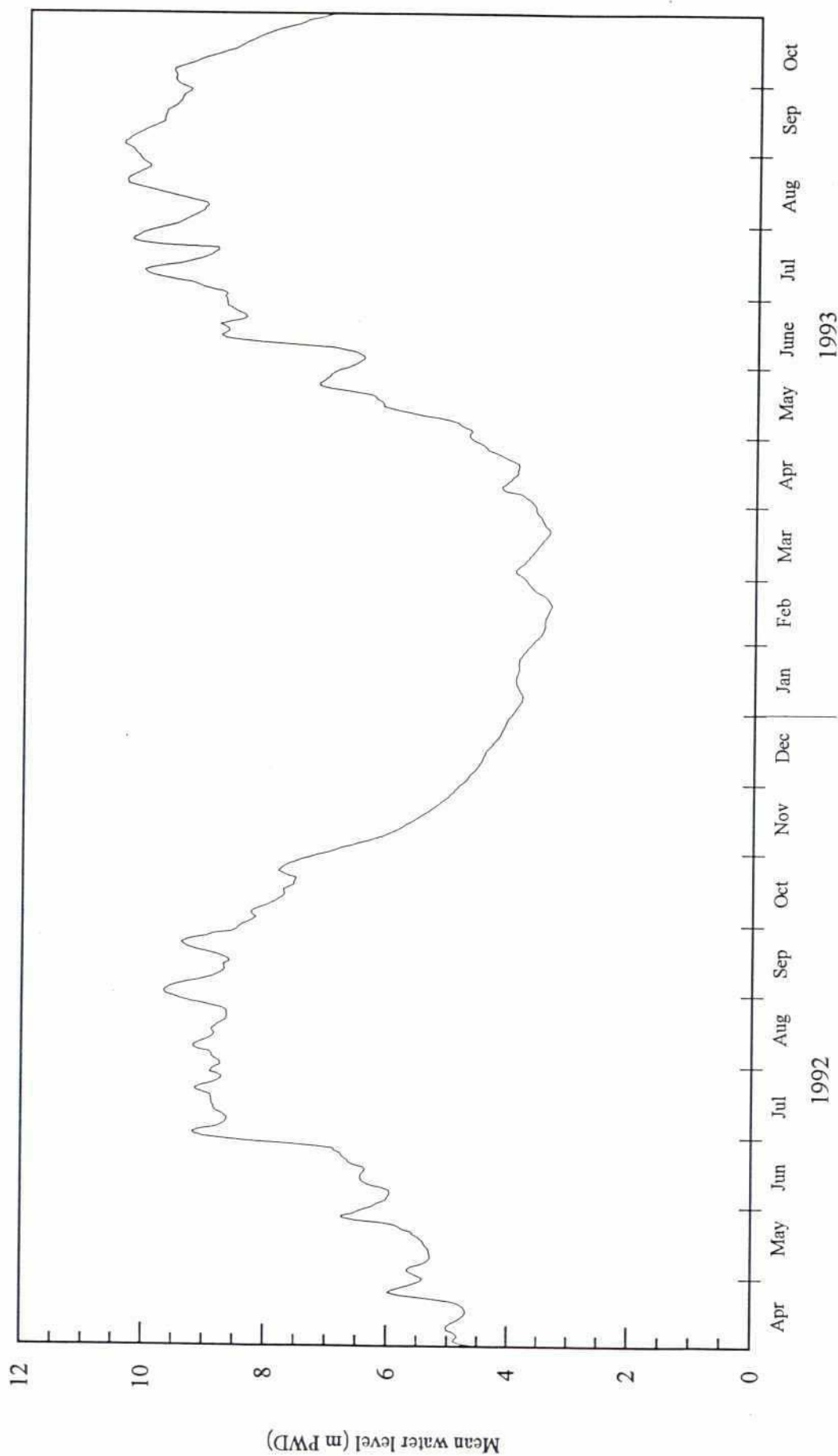
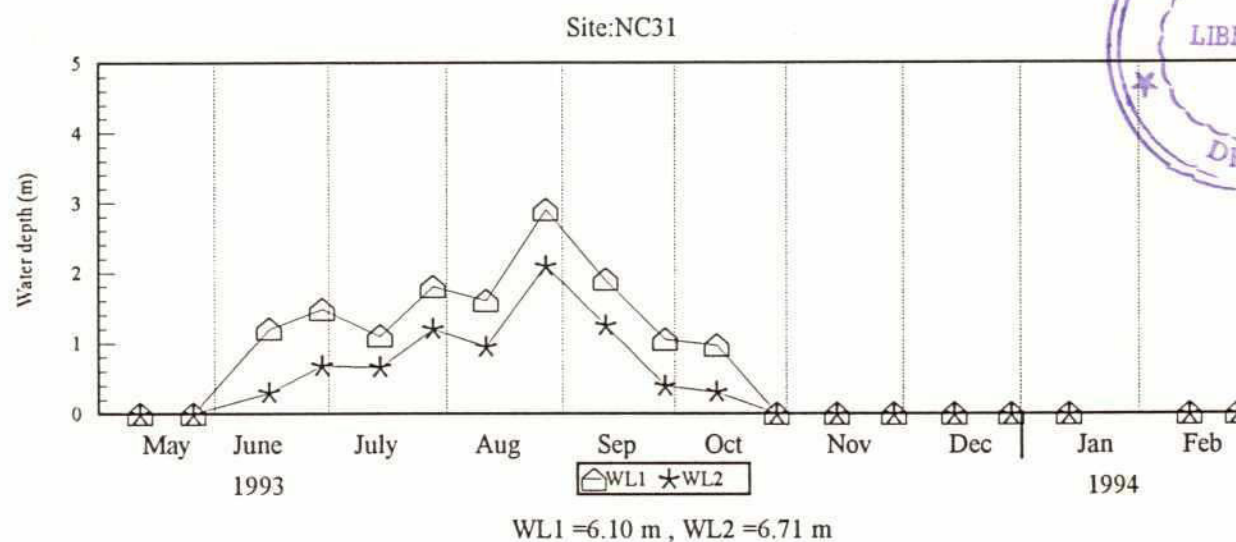
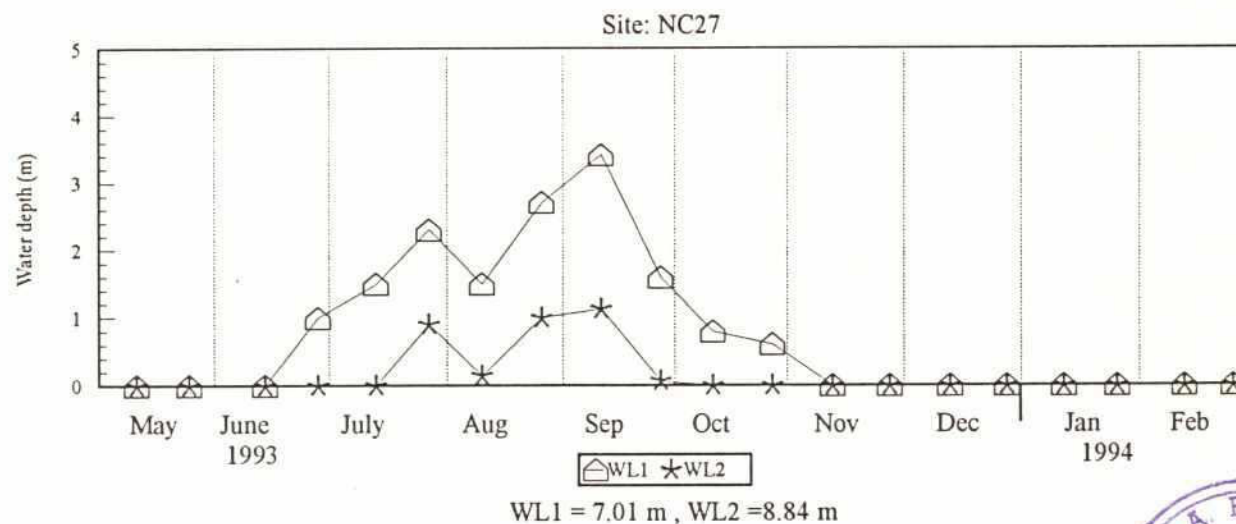
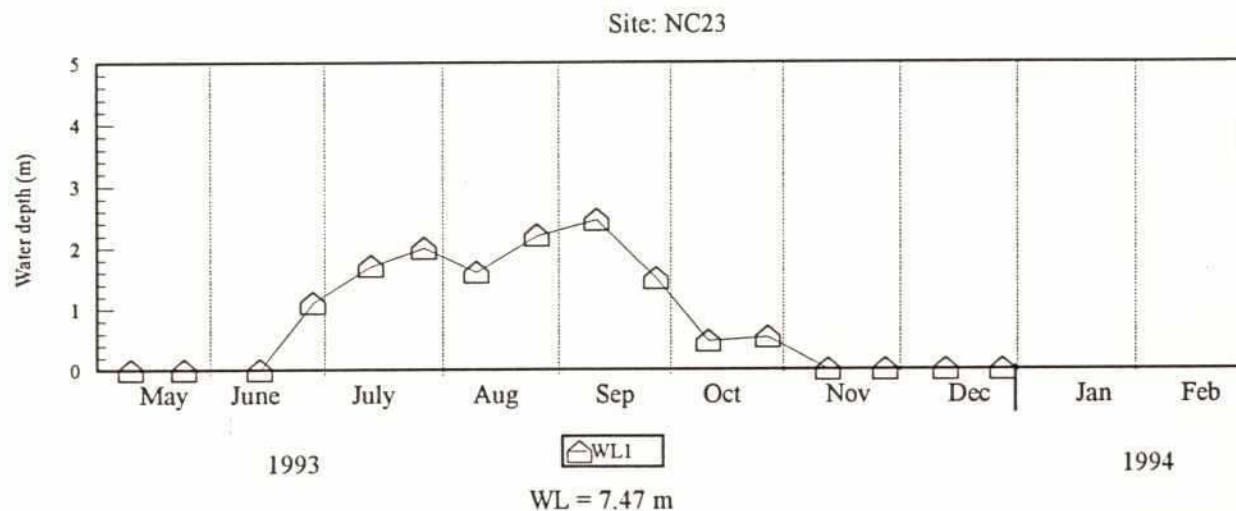


Figure 3.9 Seasonal variation in water depths on low elevation floodplains/beel in the NCR



WL = Land elevations (m PWD) at positions of depth measurements





### 3.3 Impact of PIRDP on Flooding Patterns

#### 3.3.1 Flood source

Since river flooding was reduced inside the PIRDP a greater proportion of the monsoon flood resulted from rainfall flooding compared with that on floodplains outside it.

#### 3.3.2 Flood timing and duration

On floodplains of comparable elevations inside and outside the scheme, rainfall flooding first accumulated in mid-June. At about the same time the first river floodwaters reached the floodplains resulting in a rapid rise in levels outside but a more gradual rise inside because of sluice gate closures which reduced and at times prevented entry of external river waters. The flood recession was more rapid and occurred one month earlier at outside sites than at those inside. The duration of the flood season was therefore extended by one month at inside sites due to drainage congestion.

#### 3.3.3 Flood magnitude and extent

Peak flood levels on floodplains inside the PIRDP were reduced by between 0.5 m and 1.8 m compared with levels outside it and rapid seasonal fluctuations in water levels which could damage deepwater rice were avoided. Reductions in flooding were not uniform throughout the scheme, being greatest in the Badai basin due to the disconnection of its western intake from the Padma River. Since peak water levels were reduced, then the extent of peak flooding was also reduced inside the scheme. In areas surrounding sampling sites in the Badai, Kageswari and Chiknai basins, the reductions in peak inundated areas was small (3-5%) but when areas of greatest impact in the western part of the Badai were taken into account, reductions in peak flooded areas were larger (23%).

### 3.4 Conclusions

The main conclusions drawn from the analyses are listed below.

- i) The project could not prevent extensive rainfall flooding by gravity drainage because of high levels in external boundary rivers.



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- ii) The project was capable of the prevention of river flooding in most years. However, local farmers dictated the operations of sluice gates to permit the entry of river waters to create controlled progressive flooding to a depth of 3 metres for the production of deepwater rice (*b. aman*).
  - iii) Operational practices of the project deviated from the original design objectives which anticipated not only the expansion of high yield varieties (HYV) of winter rice but the reduction and replacement of *b. aman* with HYV *t. aman* grown on increased areas of drier land. In practice, flooding levels inside the project were determined by the requirements of deepwater rice growth from July to September.
  - iv) Operational practices of the project resulted in the restricted entry of river waters, reduced peak floods, reduced seasonal and inter-annual fluctuations in flood levels, slightly reduced flood extent and a longer flood season in areas of drainage congestion.

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## 4 WATER QUALITY

Surface water measurements of temperature, pH, dissolved oxygen (DO), conductivity and total dissolved solids were made at sites on rivers, canals, floodplains and *beel* at fortnightly intervals using electronic metering techniques. Seasonal variations in each of these parameters are presented for representative sites inside and outside the scheme and for one feeder river the Baral/Atrai (Fig. 4.1-4.6). Given that temperature, pH and DO levels on floodplains generally depend on the time of day, attempts were made to standardise times when measurements were taken. However, this was not always achieved and whilst most readings were taken between 08.00-12.00, some were outside this range. Therefore the data presented in Figures 4.1 to 4.5 also reflect diurnal changes as well as seasonal variations.

Dissolved oxygen concentrations in floodplain open waters ranged from 1-11 mg/l at sites inside and outside the PIRDP with most readings within a narrower range of 4-6 mg/l. No major differences were apparent between inside and outside sites and fluctuations in DO level at individual sites were due to diurnal rather than seasonal variations. Previous more detailed studies carried out in Bangladesh showed that oxygen levels ranged over a 24 hr period from a completely anoxic (zero oxygen) condition near dawn to supersaturation in mid-afternoon in both open flooded fallow land and in deepwater rice fields<sup>2, 3</sup>. The studies also revealed considerable vertical stratification in oxygen levels in rice fields with lowest concentrations (near zero) in the bottom layer whilst surface layers remained near saturation. The effects of stratification were found to be more pronounced towards the end of the flood season when amounts of decomposing macrophytic vegetation increased in decreasing volumes of water.

No seasonal trends in pH levels were detected at any site. All values were within the range 6.0 to 8.5 which posed no danger to fish health or survival. Conductivities were generally lowest in the monsoon season and highest in the winter and pre-monsoon seasons when ionically-rich tubewell waters were pumped to the surface for rice field irrigation and mixed with surface waters in *beel*, canals and small rivers. Values of transparency (Secchi disc) increased at all floodplain/*beel* sites inside the PIRDP during the monsoon season largely due to the increase in water levels at this time of year rather than to an increase in the clarity of

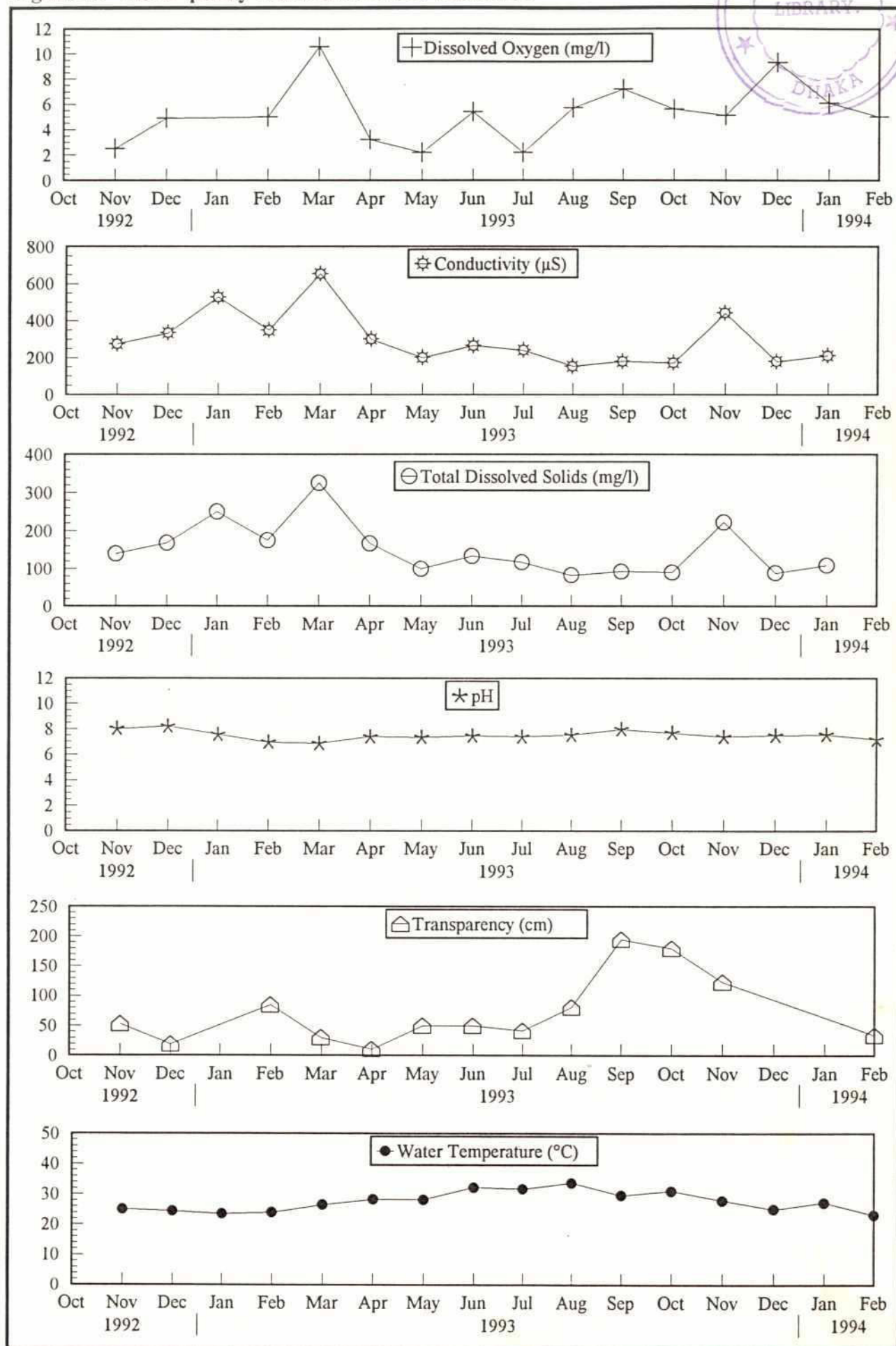
<sup>2</sup> ODA, 1984 Nitrogen fixation in deepwater rice fields of Bangladesh. Final Report 1981-1984 presented to the Overseas Development Administration, UK.

<sup>3</sup> ODA, 1988 Deepwater Rice Project, Phase Two. Annual Technical Report for 1987. Bangladesh Rice Research Institute and UK Overseas Development Administration.



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the water. The high values reveal that silts carried by incoming river water quickly settled before reaching floodplains. In contrast, at more free-flooded sites at Potajia (NW17 and NW18) transparencies decreased during August and September due to the ingress of silt-laden waters. The difference between sites was probably caused by sluice gates of the PIRDP acting as bottlenecks to flow, reducing velocities, damping water level fluctuations and resulting in the deposition of most silts before reaching the floodplains. This has implications for fisheries since reduced silt loads and increased clarity of water would be expected to lead to increased phytoplankton and zooplankton populations which serve as food for many young and some adult fish and thus result in increased fish production. An alternative perception reported repeatedly in other FAP studies is that a reduction in silts entering floodplains results in a loss of nutrient supply, the magnitude of which is dependent on both the nutrient-content of river silts and the quantity lost. This has been perceived as an apparent loss or disbenefit to agricultural, particularly rice, production.

Figure 4.1 Water quality inside the PIRDP: site NW05



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Figure 4.2 Water quality inside the PIRDP: site NW10

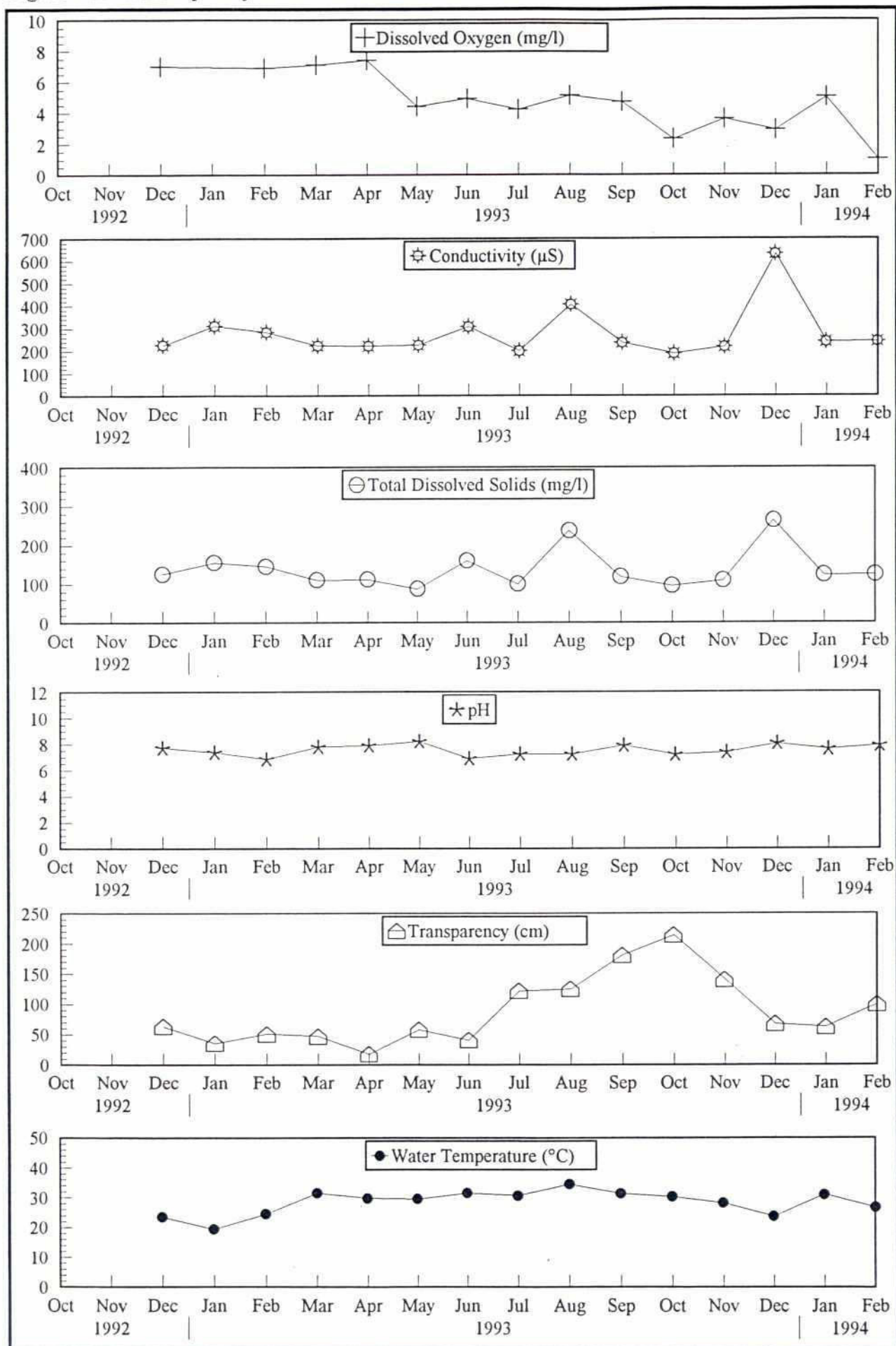




Figure 4.3 Water quality inside the PIRDP: site NW12

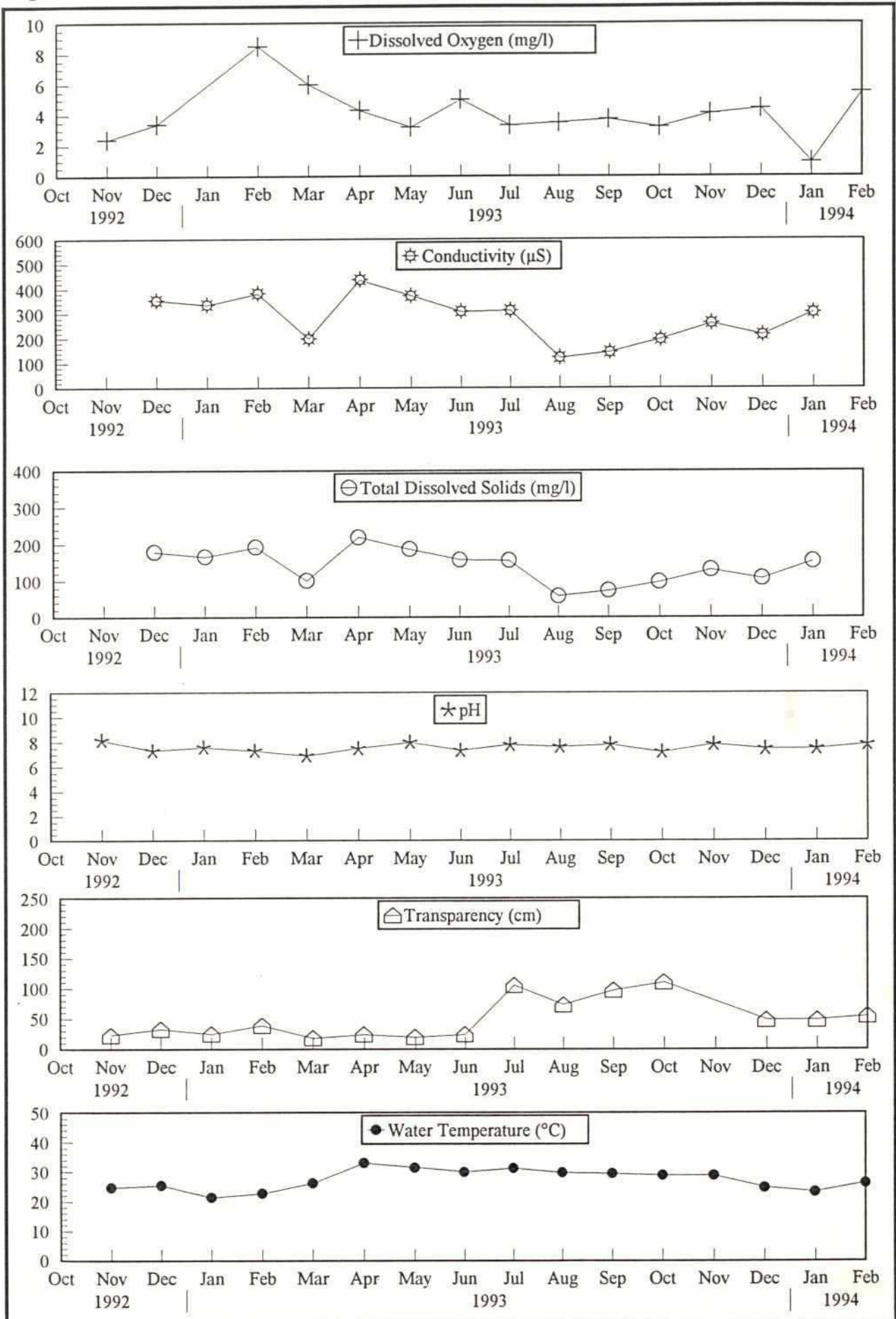


Figure 4.4 Water quality outside the PIRDP: site NW18

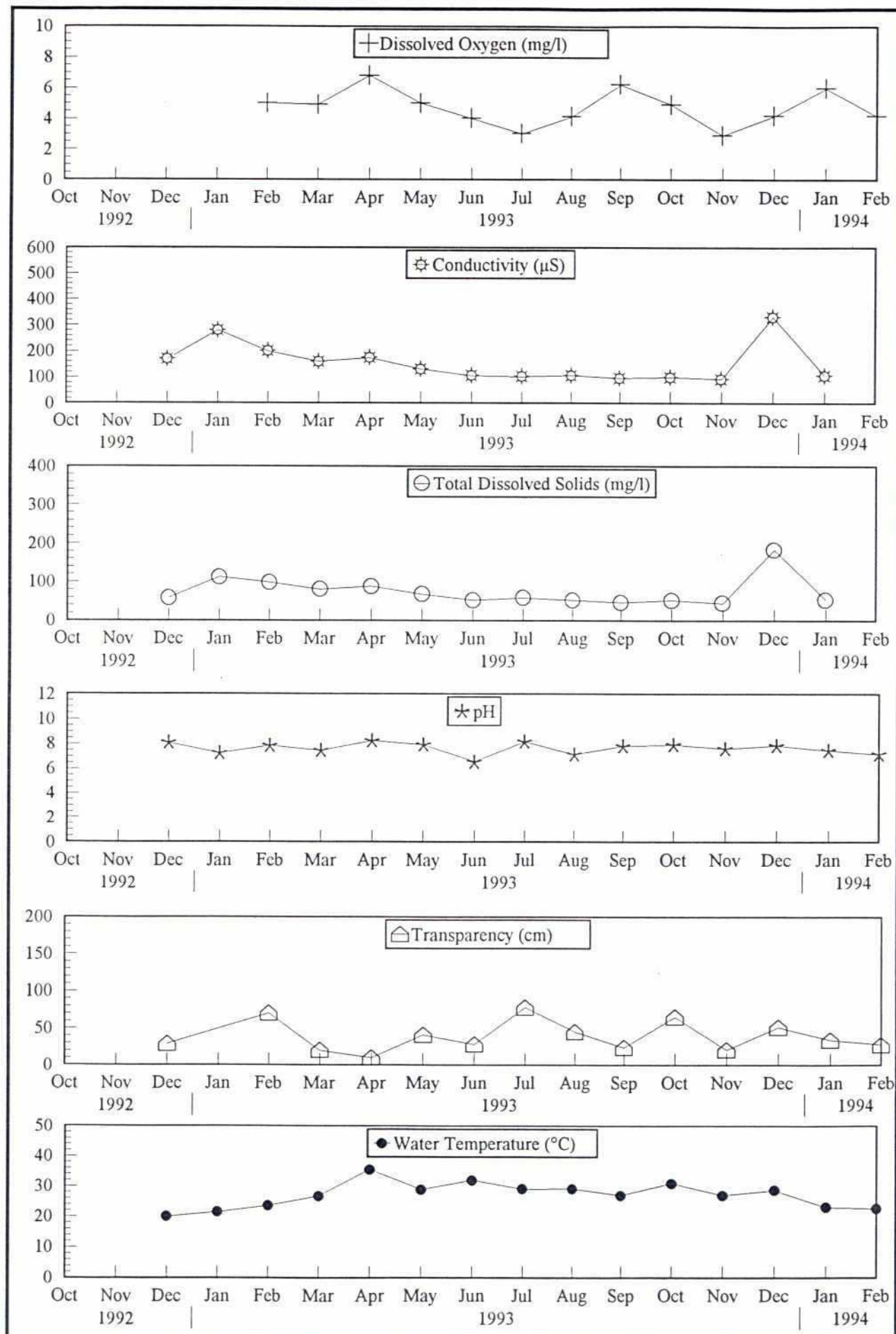
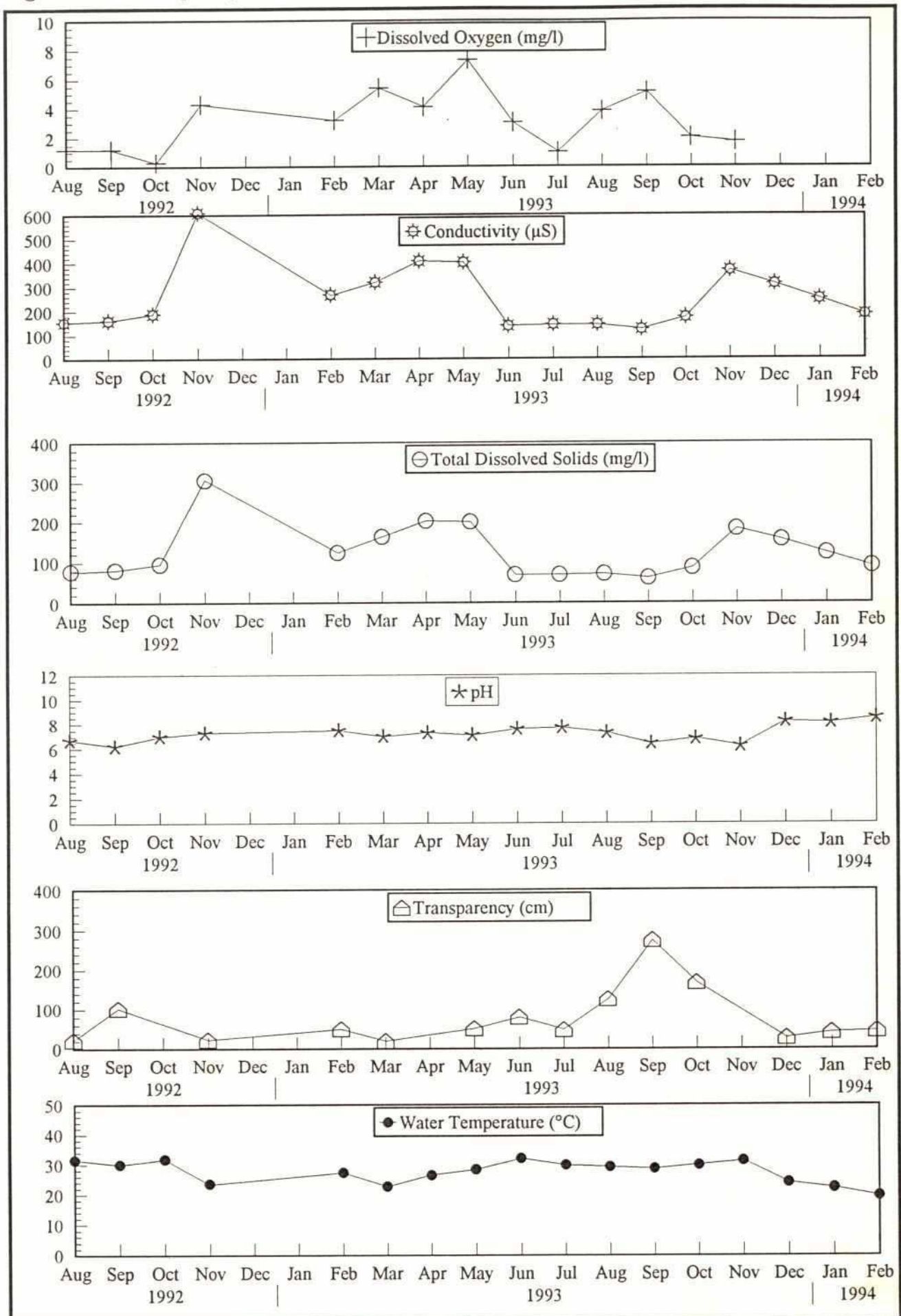


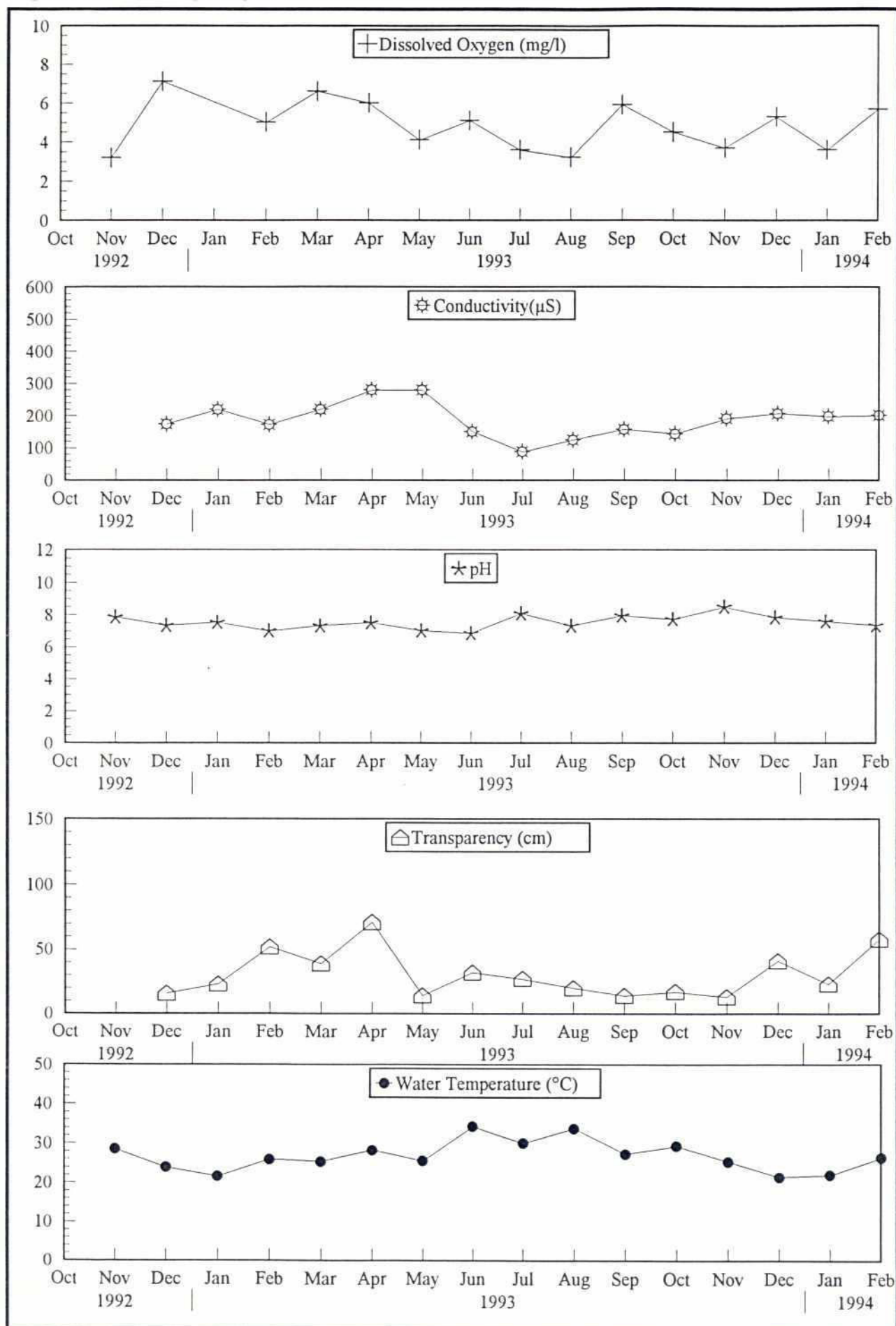
Figure 4.5 Water quality outside the PIRDP: site NC31





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Figure 4.6 Water quality of the Baral /Atrai River: site NW14



## 5 RIVER FISHERIES

### 5.1 Total Catch

#### 5.1.1 Pattern of catch

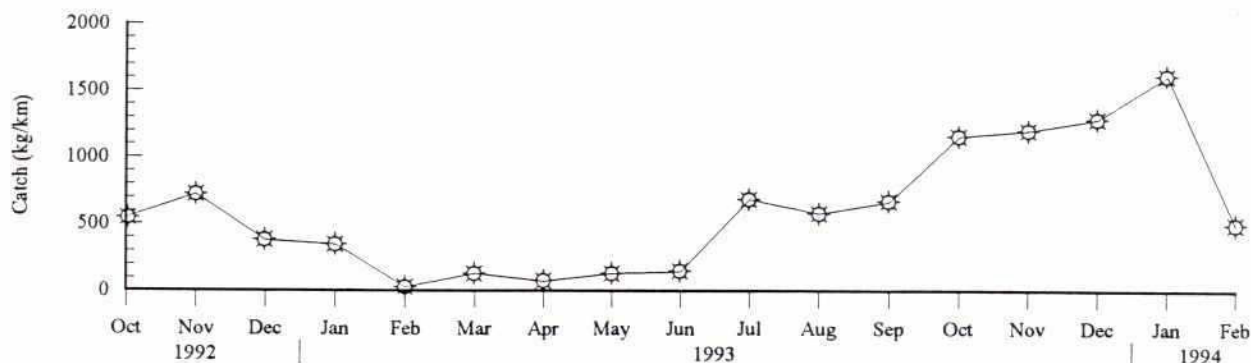
Collections of catch data were made from October 1992 to February 1994 in the North West Region and from August 1992 to February 1994 in the North Central Region following methods detailed previously in the FAP 17 Inception and Interim Reports.

Seasonal patterns of catch from four rivers inside the PIRDP are presented in Figure 5.1. In the Kageswari and Chiknai rivers, seasonal trends were similar with catches rising in September from a previous stable but low level followed by a precipitous rise in November coinciding with the flood drawdown when fish moved off the drying floodplains to seek shelter in rivers. In both rivers catches dropped sharply in December and continued to decline until the end of the study in February. In the Badai River, catches increased two months earlier, than in the Chiknai and Kageswari and stabilised until October when they again rose sharply during the peak flood recession then continued to rise until January after which the catch declined sharply. The difference in the pattern of catch between rivers could be attributed to the predominance of *katha* fisheries in the Badai during the winter months which in turn was related to a longer retention of deep water than in the other rivers. In January, the Badai lost its connection with the Jamuna outside Talimnagar regulator. The river channel inside the scheme thus served as a reservoir of water enabling gears like *katha* to harvest fish throughout the winter. In the fourth river studied, the Ichamati, the flow was highly regulated since it served as the principal irrigation channel of the PIRDP. As a result of this high degree of regulation, no clear seasonal catch trends were discernible. The channelised nature of this river with high embankments on both sides prevented fish migrating off adjacent floodplains into it during the drawdown.

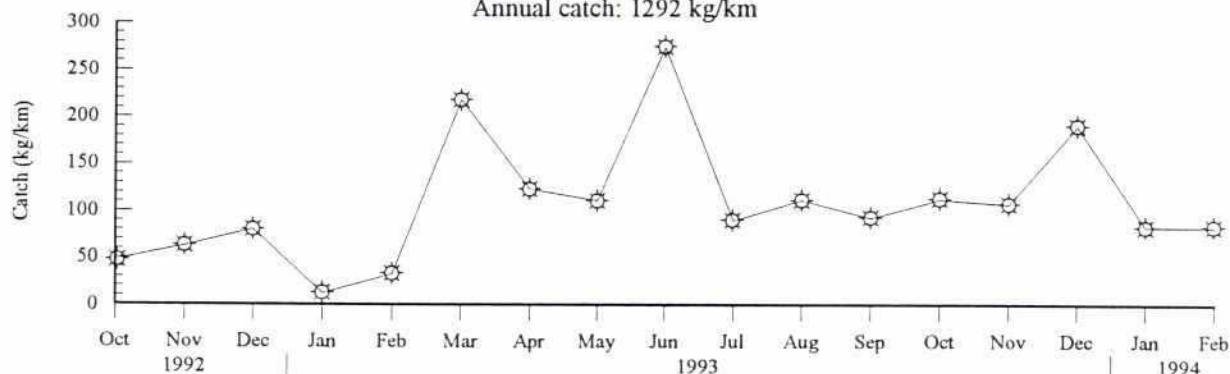
Of the two rivers surveyed outside the PIRDP, the smaller of the two, the Karatoya displayed similar seasonal catch trends as those observed in the Chiknai and Kageswari rivers although catches rose sharply one month earlier and declined more gradually during December 1993 and January 1994 (Fig. 5.2). Catches from the larger river, the Baral/Atrai, followed a slightly different pattern where catches increased gradually from March until May, then rose sharply in June with the onset of a drift net fishery targeting upstream migrating *ilish*. Catches then declined progressively until September before again rising sharply in October

**Figure 5.1 Seasonal variation in the catch (kg/km) of rivers inside the PIRDP, October 1992 - February 1994**

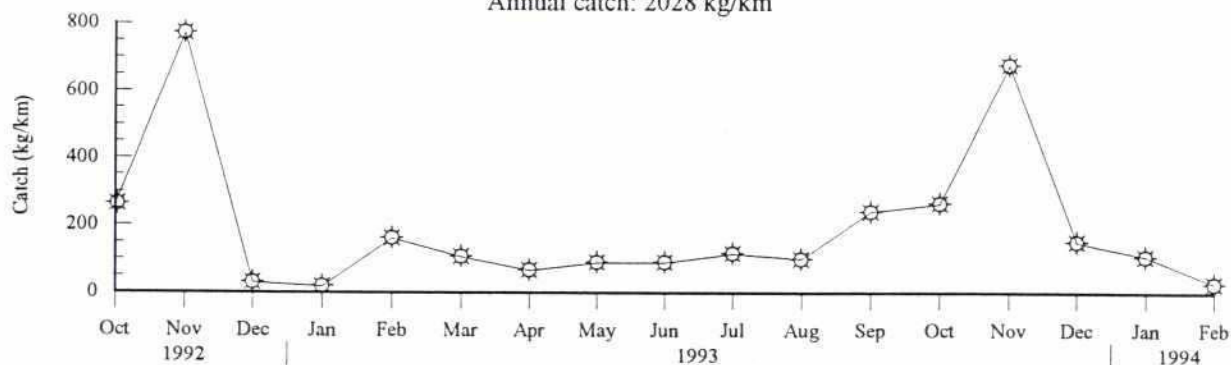
**Site NW03: Badai River**  
Annual catch: 8155 kg/km



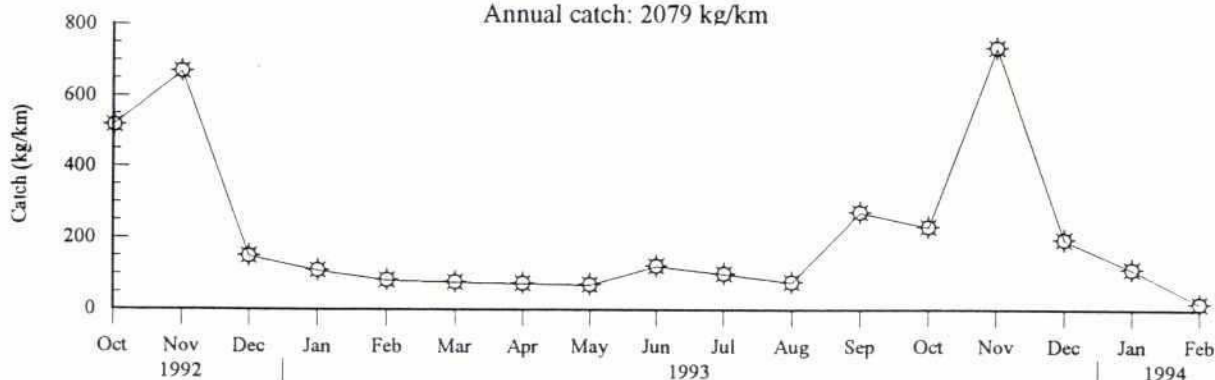
**Site NW06: Ichamati River**  
Annual catch: 1292 kg/km



**Site NW07: Kageswari River**  
Annual catch: 2028 kg/km

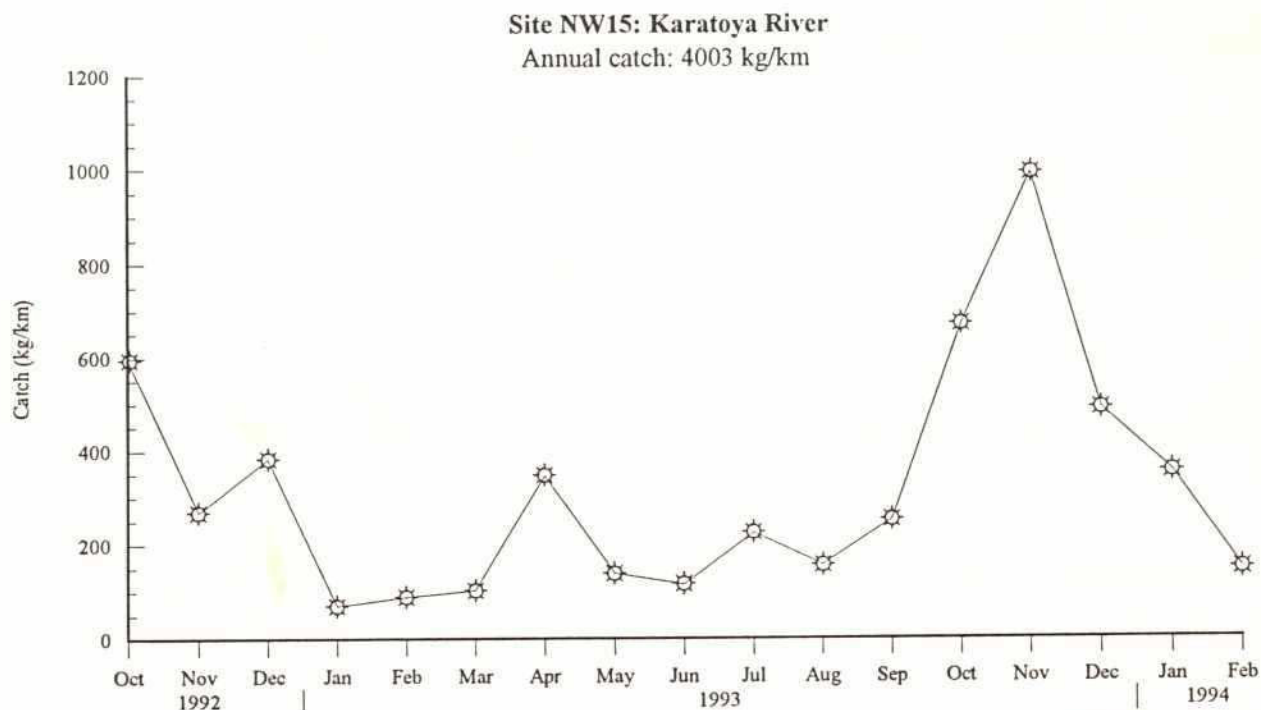
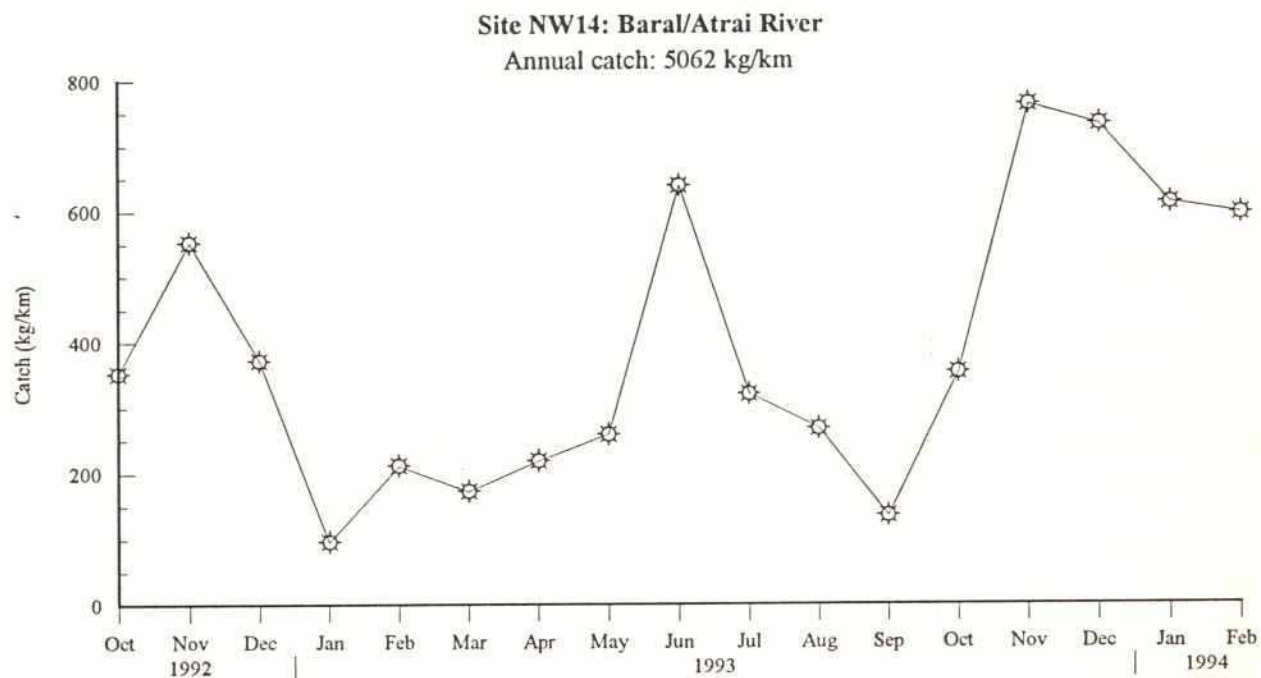


**Site NW11: Chiknai River**  
Annual catch: 2079 kg/km





**Figure 5.2 Seasonal variation in the catch (kg/km) of rivers outside the PIRDP, October 1992 - February 1994**



and November during the drawdown. Through the winter months until the end of the project, catches dropped slightly but still remained relatively high mainly due to the harvesting of *katha*.

In the North Central Region, all but one river showed abrupt rises in catch during October and November in one or both years sampled (Fig. 5.3). The exception to this fairly simple pattern was seen in the Gazikhali River, a highly seasonal river in which no significant catch increase occurred during the drawdown of 1992 but did so the following year preceded and followed by fluctuating catches which, for the winter period, were caused largely by variability in *katha* fishing.

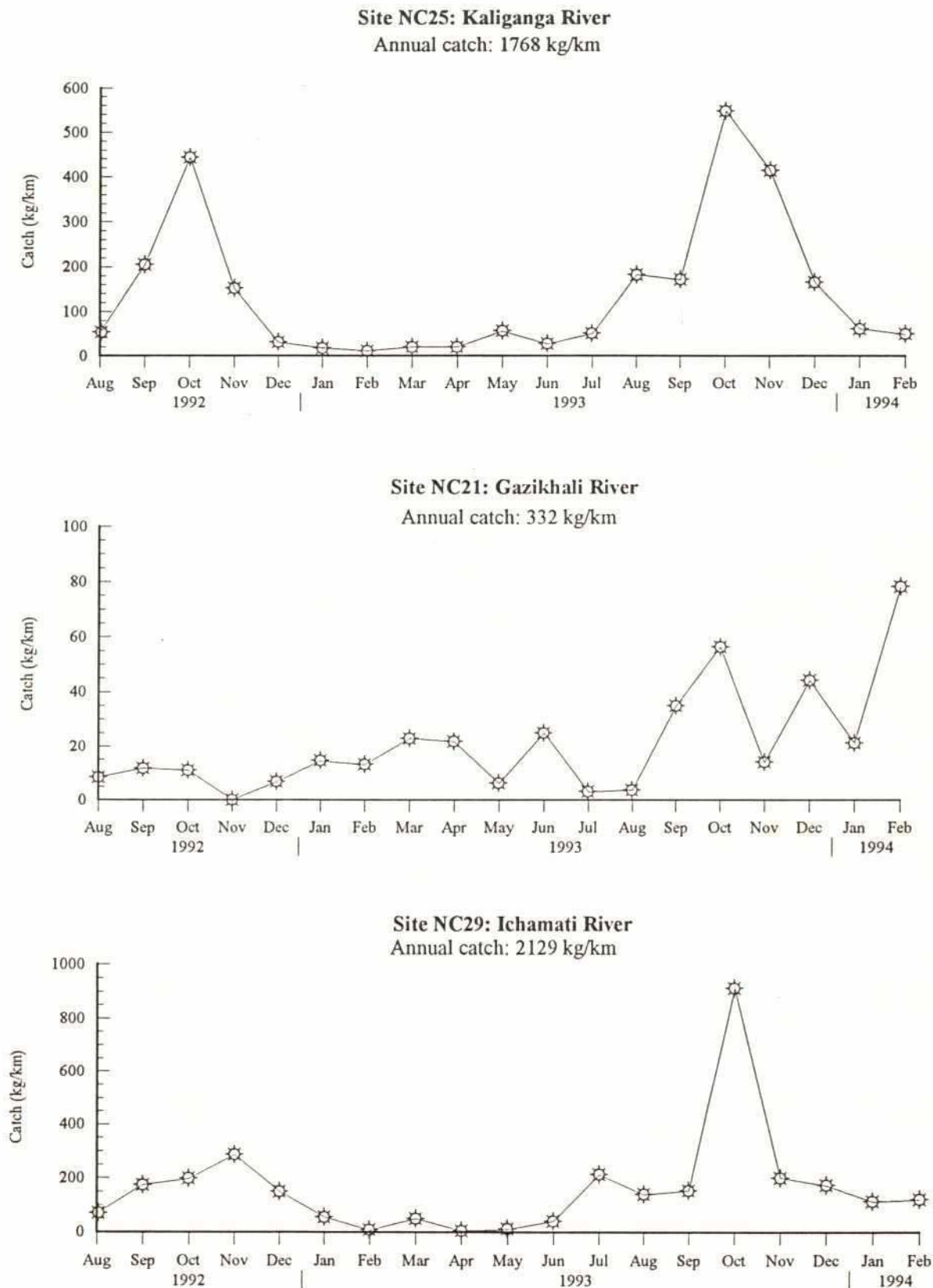
#### 5.1.2 Size of catch

The highest annual catch per unit length of river was recorded inside the PIRDP from the Badai which produced approximately 8.2 tonnes/km of fish and prawns (Table 5.1). This was the highest catch recorded from all 23 secondary rivers studied by FAP 17 throughout Bangladesh. The catch was also four or more times higher than those from the other three rivers sampled inside the PIRDP. Catches from two of these, the Chiknai and Kageswari were very similar (2.0, 2.1 tonnes/km) whereas the catch from the Ichamati River was lower (1.6 tonnes/km) and this included about 19% stocked major carps, *rui* and *mrigel*. When these were deducted, the annual catch of wild fish from the Ichamati dropped to 1.3 tonnes/km, six-times lower than the catch of the Badai.

The large variation in catch between rivers inside the PIRDP could be partly attributed to differences in the degree of regulation of flow. The most regulated and canalized river, the Ichamati, supported the lowest catches. However, major differences in the degree of regulation between the other three rivers studied could not be detected. The catch differences between these rivers were probably related to differences in catchment area (see Table 3.1) and connections to larger rivers. Rivers with the largest catchments supported highest catches but connection to the Jamuna also increased catches of riverine and migratory species in the Badai.

Outside the PIRDP, catches per kilometre from the Baral/Atrai and Karatoya rivers were higher than all those inside the scheme, with the exception of the Badai but values of CUPA were lower. Rivers outside the scheme, particularly the Baral/Atrai, were larger in terms of discharge and catchment area than those inside and therefore higher catches per unit length

**Figure 5.3 Seasonal variation in the catch (kg/km) of unregulated rivers in the North Central Region, August 1992 - February 1994**





of river might be expected since previous studies from other parts of the world have demonstrated that catches generally increase with increasing size or catchment area of rivers<sup>4</sup>.

**Table 5.1 Annual catch from rivers inside and outside the PIRDP, March 1993-February 1994**

Site code	Name	Inside/ Outside FCDI	Catch	
			(kg/km)	(kg/ha)
NW03	Badai	Inside	8155	1631
NW06	Ichamati	Inside	1292	236
NW07	Kageswari	Inside	2028	541
NW11	Chiknai	Inside	2080	555
NW14	Baral/Atrai	Outside	5062	400
NW15	Karatoya	Outside	4003	485
NC21	Gazikhali	Outside	332	74
NC25	Kaliganga	Outside	1767	132
NC29	Ichamati	Outside	2128	568

Note: Stocked major carps, *rui* and *mrigel* were omitted from catch of NW06

In the North Central Region, values of annual catch varied considerably between rivers. The highest catch was recorded from the Ichamati River (2.1 tonnes/km), which was hydrologically similar to the Badai River inside the PIRDP prior to its embankment when it too connected the Jamuna and Padma rivers. The second highest catch was recorded on the Dhaleswari/Kaliganga, the largest river in the region, comparable in size to the Baral/Atrai but different in that the latter is a tributary of the Jamuna whereas the Dhaleswari is an offtake or distributary. A very low catch was recorded from the Gazikhali River which is surprising from such a highly seasonal river since other seasonal rivers in the North Central and South West Regions produced substantially higher catches. Lower catches from unregulated rivers in the North Central compared to those from North West Region could

<sup>4</sup> Welcomme R L 1979. The Fisheries Ecology of floodplain Rivers. Longman, London. 317 pp

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be attributed, to a large extent, to lower productivities of their respective floodplains since more than 50% of riverine catches were provided by floodplain resident fish (see Sections 5.3.2 and 7.3). In the case of the Baral/Atrai River, higher catches here could also be attributed to the migration of *ilish* which provided 18% of the total annual catch in this river but *ilish* was rare in the North Central Region.

Statistical comparisons of catches and catch rates from rivers inside the PIRDP and from the Karatoya, the smaller of the two outside rivers in the North West Region, were not possible because of insufficient numbers of dominant of gears (excluding *katha*) common to both areas. For inter-regional comparisons more common gears existed but because of the differences in the size of the rivers (length, discharge, catchment areas) it would have been difficult to separate and attribute differences in catch or catch rate to the effects of flood control alone.

#### 5.1.3 Catch differences between years

Survey periods of 17 and 19 months in the North West and North Central Regions respectively provided an opportunity to examine inter-annual changes in catch through two flood recessions and winters. In the North West, total catches for the period October 1992 - February 1993 were compared with those for the same period in 1993/94. A similar comparison was made in the North Central Region for the months August to February 1992/93 and 1993/94 (Table 5.2). Catches from *katha* fishing were excluded from the analyses since these required more intensive sampling which was provided in 1993/94 but not at all sites in 1992/93. If this gear had been included it may have resulted in an overall underestimate of 1992/93 catch. One further exclusion of data was made at one site, NW06, the Ichamati River where major carps, *rui* and *mrigel* were stocked in 1993. These two species were therefore omitted from the analysis.

The scale of inter-annual differences varied considerably between rivers both inside and outside the PIRDP in the North West Region. In the North Central Region, where reductions in the 1992/93 catch were generally greater, there was closer similarity between sites even though these ranged from small seasonal rivers such as the Gazikhali to the much large perennial Kaliganga River.



**Table 5.2 Comparison of the total catch<sup>1</sup> from rivers inside and outside the PIRDP between different years**

Site code	River	Inside/ Outside FCDI	Catch (kg/km)		% Reduction in catch in 92/93
			1992-1993	1993-1994	
NW03	Badai	Inside	1330	3078	57
NW06 <sup>2</sup>	Ichamati	Inside	214	412	48
NW07	Kageswari	Inside	1095	1176	7
NW11	Chiknai	Inside	1509	1291	(increase) -17
NW14	Baral/Atrai	Outside	1554	1598	3
NW15	Karatoya	Outside	1124	2015	44
NC21	Gazikhali	Outside	65	132	51
NC25	Kaliganga	Outside	524	1366	62
NC29	Ichamati	Outside	734	1404	48
NCR all rivers <sup>3</sup>			464	757	39

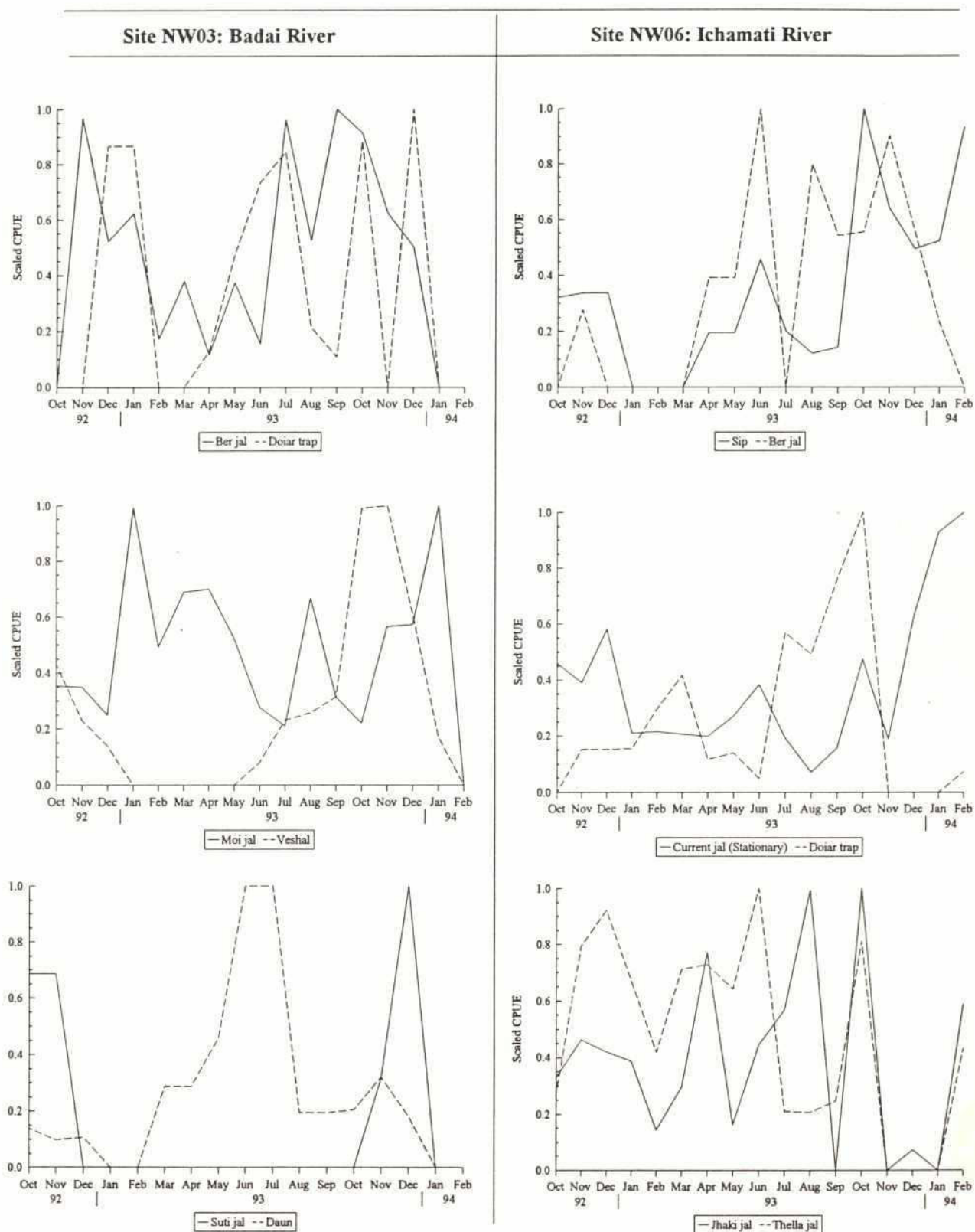
Notes: 1. *Katha* catches were excluded from the analyses (see text)  
 2. *Rui* and *mrigel* were excluded from the catch of site NW06 (see text)  
 3. Sampled rivers comprised Pungli (NC02), Northern Dhaleswari (NC06), Lohajang (NC12), Dhaleswari (NC16), Gazikhali (NC21), Kaliganga (NC25) and Ichamati (NC29).

Higher catches observed in 1993/94 in the North West and North Central Regions were largely a function of increased catch rates of dominant gears during periods of peak catch which implies higher fish densities during that year (Figs 5.4-5.7). This can be explained in hydrological terms since 1992/93 was a particularly dry year compared with the following year and, given the relationship between flood extent and floodplain fish production demonstrated elsewhere in the world (Welcomme and Hagborg, 1977)<sup>5</sup>, it is likely that such differences in magnitude, extent and duration of the flood between years was responsible for differences in the catch. This of course implies that riverine catches are heavily dependent on fish which breed and grow on floodplains. Evidence for this is provided by the seasonal peak in catches coinciding with the flood drawdown when fish move off the drying

<sup>5</sup> Welcomme R L and Hagborg 1977. Towards a model of a floodplain fish population and its fishery. Environ. Biol. Fish. 2, 7-24

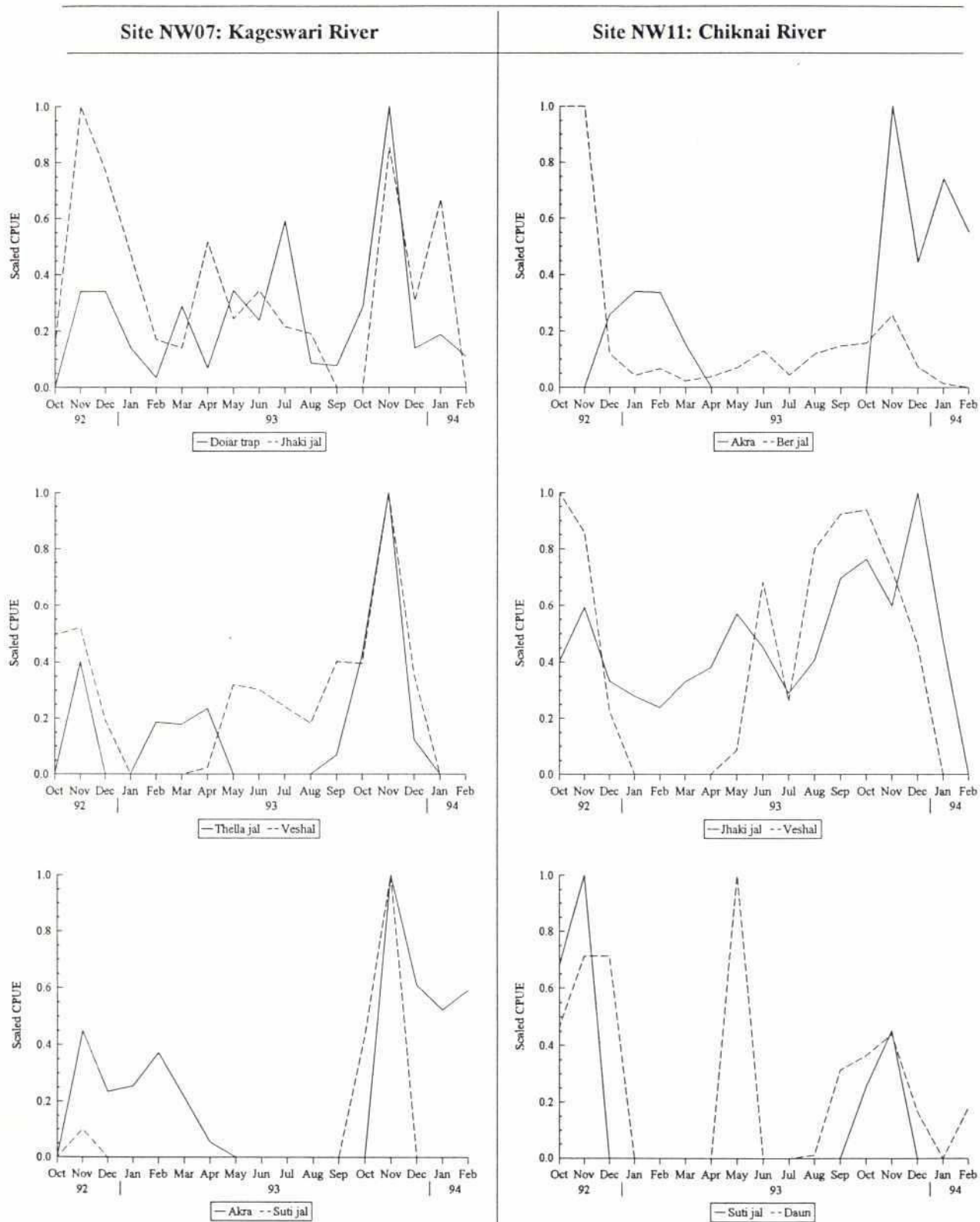


Figure 5.4 Scaled CPUE of dominant gears: sites NW03 and NW06 (inside PIRDP)



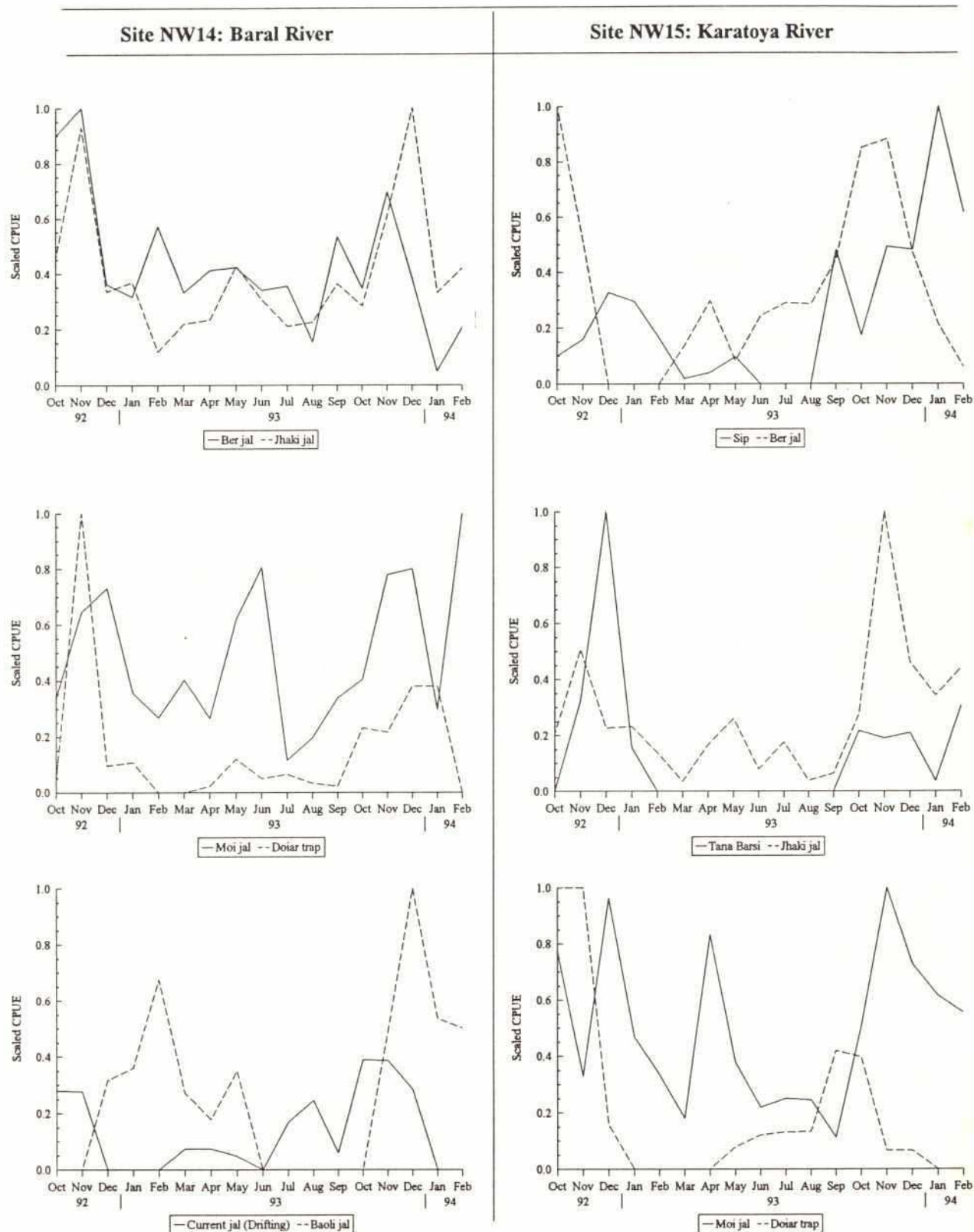
Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded.

Figure 5.5 Scaled CPUE of dominant gears: sites NW07 and NW11 (inside PIRDP)



Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded.

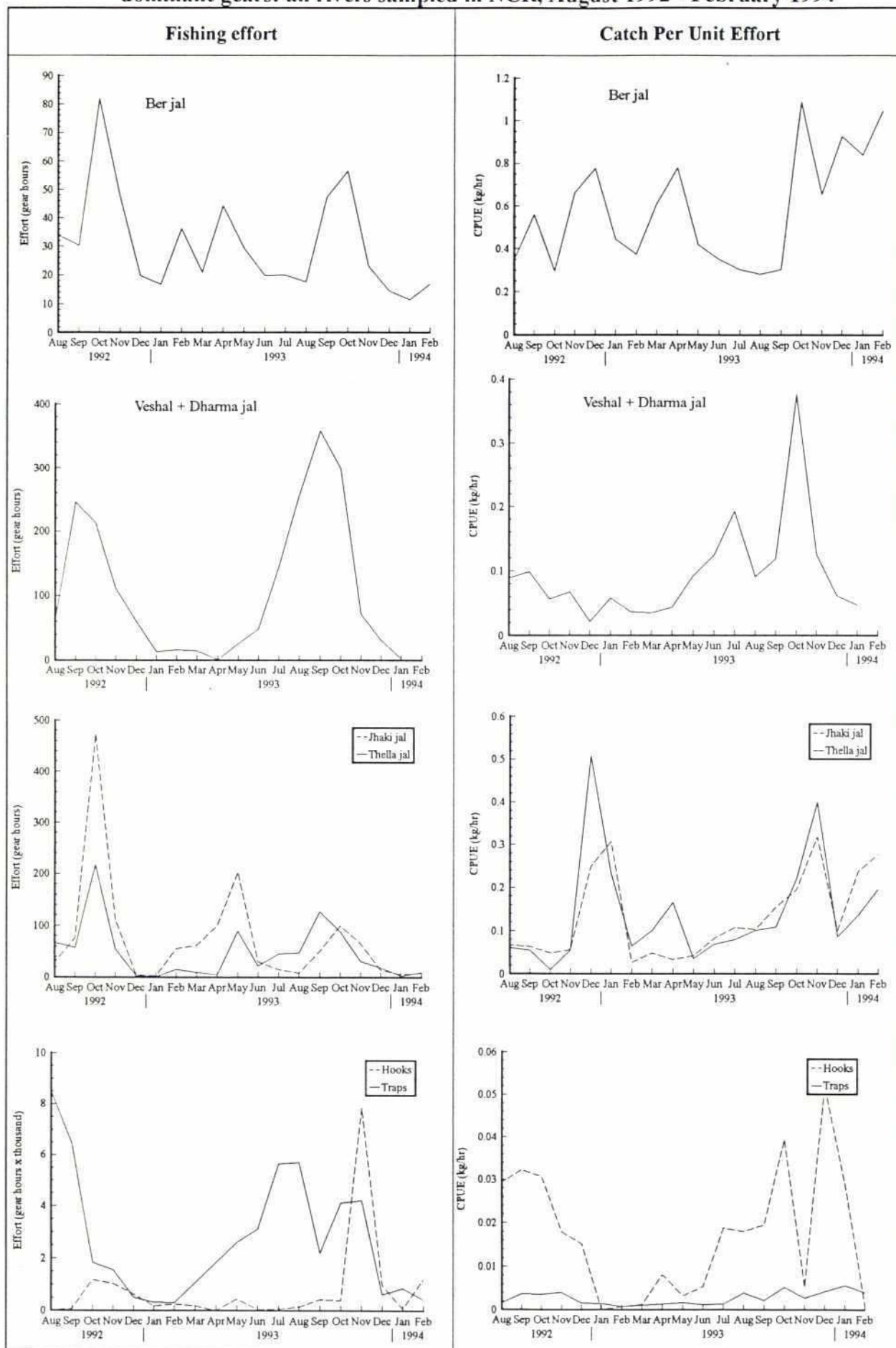
Figure 5.6 Scaled CPUE of dominant gears: sites NW14 and NW15 (outside PIRDP)



Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded.



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**Figure 5.7 Inter-annual variation in total monthly fishing effort and catch rate (CPUE) of dominant gears: all rivers sampled in NCR, August 1992 - February 1994**



floodplains and from catch compositions which reveal the dominance of floodplain resident species (see Section 5.3.2). It also might reasonably be expected that fish which are less dependent on floodplains should exhibit a less close relationship between inter-annual variations in catch and flood extent. This point is examined in Table 5.3 where catches between years were calculated separately for riverine, migratory and floodplain resident species (see Section 5.3.2 for definitions). In the North West Region there was a more consistent reduction in floodplain resident species than migratory or riverine species. In two rivers inside the PIRDP, the Kageswari and Chiknai and one outside, the Baral/Atrai migratory species were more abundant in the drier year of 1992. This may be because some species were not obligatory migrants but could successfully breed and grow in rivers as well as floodplains. The two rivers, Baral/Atrai and Chiknai, which showed the least change between years in the abundance of floodplain residents, were linked hydrologically with Chiknai being fed by the Baral/Atrai in the monsoon and draining into it during the drawdown and pre-monsoon periods. A survey of an upstream reach on the Atrai carried out as part of a separate study (Draft Final Report, Supporting volume No. 7), also recorded increased catches of floodplain resident and migratory species 1% of 55% respectively during the drier year of 1992. In this case, the increased catch of migratory species was due largely to higher catches of juvenile *boal* leaving the floodplains during the flood drawdown. In two of the three rivers in the North Central Region, riverine species exhibited a proportionately greater decline in the dry year compared with that of floodplain residents. However, absolute values of riverine CUPA were considerably lower than those of floodplain residents and therefore percentage values of change between years were more sensitive to small changes in catch.

A second factor which may have been influential in determining fish densities and thus catches between years was the occurrence of epizootic fish disease. This disease first appeared in Bangladesh in 1988 and outbreaks have occurred irregularly since then. The disease was much more severe in 1992 than in 1993 but since the first serious outbreak occurred in mid-November 1992 after the bulk of the catch (excluding *katha*) for the compared time periods had already been taken (North West inside: 78%, North West outside: 68%, North Central: 56%), it is unlikely to have had a major influence on catch comparisons between years.

Table 5.3 Comparisons of catches<sup>1</sup> (kg/km) of riverine, migratory and floodplain resident fish from rivers inside and outside the PIRDP between different years

Site code	River	Inside/ Outside FCDI	Riverine <sup>2</sup> CPUA			Migratory CPUA			Floodplain Resident CPUA		
			1992-1993	1993-1994	% change in 92/93	1992-1993	1993-1994	% change in 92/93	1992-1993	1993-1994	% change in 92/93
NW03	Badai	Inside	92.0	101.7	-10	508.5	1408.5	-64	704.0	1539.0	-54
NW06 <sup>3</sup>	Ichamati	Inside	1.2	1.6	-28	12.0	149.1	-92	127.0	204.4	-38
NW07	Kageswari	Inside	72.6	15.9	+357	169.4	66.4	+155	827.9	993.4	-17
NW11	Chiknai	Inside	69.0	7.5	+817	386.5	211.3	+83	941.3	983.2	-4
NW14	Baral/Atrai	Outside	266.5	400.6	-33	697.1	581.3	+20	452.1	438.7	+3
NW15	Karatoya	Outside	216.0	179.5	+20	337.9	768.7	-56	443.4	865.6	-49
NC21	Gazikhali	Outside	4.1	18.0	-77	20.3	15.6	+30	33.9	86.3	-61
NC25	Kaliganga	Outside	60.3	107.6	-44	161.1	446.1	-64	254.3	703.5	-64
NC29	Ichamati	Outside	22.4	72.0	-69	264.2	460.4	-43	307.9	647.2	-52

- Notes: 1. *Katla* catches were excluded from the analyses (see text: section 5.1.3)  
2. See text for definitions riverine, migratory and floodplain resident fish (Section 5.3.2)  
3. *Rui* and *mrigel* were excluded from the catch of site NW06 (see text: section 5.1.3)



## 5.2 Pattern of Fishing

### 5.2.1 Catch by gear

Percentage contributions made by dominant gears to the total annual catch from each river are presented in Table 5.4. More detailed information on percentage monthly and annual catches of all observed gears is given in Appendix 1, A-I.

Inside the PIRDP there were several clear differences in the patterns of fishing between rivers. On the Badai, *katha* captured the highest share (34%) of the catch most of which was taken between November and January. Other dominant gears included larger types such as *veshal* and *ber jal* used by professional fishermen which together accounted for a further 41% of the annual catch while smaller subsistence gears such as *thella jal* and *current jal* captured only a very small part of the catch (Appendix 1, A). On the Ichamati River, *katha* were not used at all even though regulated water levels during the winter could have supported this gear. The Ichamati differed from others inside the PIRDP in that it was stocked with major carps, *ruhi* and *mrigel* and fishing activities were greatly restricted by the leaseholders. This was reflected in substantially fewer gear types recorded on this river (14) compared to other rivers inside the PIRDP (20-22 gears). However, despite strong enforcement of gear restrictions by leaseholders, the "licensed" *ber jal* captured only 26% of the annual catch whilst small-scale subsistence gears such as *sip*, *thella jal*, *doiar traps* and *jhaki* took 58% of the catch, a proportion of which included stocked major carp.

On the Kageswari, *veshal* contributed the greatest share (44%) of the catch, most of which was taken during a short period during the flood drawdown. Small gears such as *jhaki jal*, *doiar* and *thella jal* accounted for a further 31% of the catch. *Ber jal* captured a surprisingly small part (3%) of the catch on this river. In contrast, on the Chiknai *ber jal* caught 26% of the catch and *suti jal* took the same. These two rivers were similar hydrologically and therefore differences in fishing patterns were probably related to differences in leaseholder arrangements.

Outside the PIRDP, fishing patterns on the Baral/Atrai and Karatoya Rivers were generally similar. However, the stronger currents in the larger river, the Baral/Atrai, attracted a breeding migration run of *ilish* which supported an important drifting gill net fishery during the monsoon. Fewer *ilish* migrated up the Karatoya and consequently drift net fishing was less important here. In this river hook and line fishing was more important, particularly

Table 5.4

Percentage contribution (by weight) to the total annual catch by dominant gears on rivers inside and outside the PIRDP, March 1993 – February 1994

Gear	North West Region						North Central Region		
	Inside FCDI				Outside FCDI		Outside FCDI		
	Badai	Ichamati	Kageswari	Chiknai	Baral	Karatoya	Gazikhali	Kaliganga	Ichamati
<i>Ber jal</i>	14.8	25.7	2.9	25.7	12.6	19.8	7.5	14.3	9.4
<i>Dhor jal</i>	—	—	—	—	—	—	12.1	3.5	—
<i>Horhori</i>	—	—	—	—	—	3.6	—	—	—
<i>Baoli jal</i>	—	—	—	—	6.3	—	—	—	—
<i>Moi jal</i>	3.1	—	—	2.2	7.2	8.5	—	—	3.1
<i>Current jal (Stationary)</i>	—	4.6	—	—	—	—	—	5.5	—
<i>Current jal (Drifting)</i>	—	—	—	—	19.2	2.5	—	—	—
<i>Kajuli jal</i>	—	—	—	—	—	2.0	—	—	—
<i>Veshal</i>	26.5	—	43.6	7.8	—	—	12.0	12.4	56.0
<i>Suti jal</i>	2.8	—	5.8	25.8	—	—	—	—	—
<i>Thaga</i>	—	—	—	—	—	2.9	—	—	—
<i>Thella jal</i>	—	14.5	7.4	—	—	1.9	—	6.7	—
<i>Jhaki jal</i>	—	10.9	14.5	13.8	4.4	6.1	14.3	7.8	2.7
<i>Sip</i>	—	21.7	—	2.1	3.9	10.7	4.6	—	—
<i>Tana Barsi</i>	—	—	—	—	—	7.1	—	—	—
<i>Daun</i>	6.3	—	—	9.5	—	—	—	2.8	—
<i>Doiar trap</i>	4.4	11.1	9.4	—	4.3	4.7	—	18.4	—
<i>Katha</i>	33.5	—	2.3	—	31.4	20.5	38.4	12.9	20.1
<i>Ucha</i>	—	3.7	—	—	—	—	—	—	—
<i>Akra</i>	—	—	3.8	4.2	—	—	—	—	—
Hand fishing	—	—	2.0	—	—	—	3.6	6.8	—
<i>Nimbaich</i>	—	—	—	—	3.3	—	—	—	—

Note: 1. Dominant gears are defined those gears which when ranked in order of abundance, comprised at least 90% of the annual catch



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during November and December when hand lines (*sip* and *tana barsi*) targeted catfish such as *tengra*, *golsha tengra* and *boal*. Large gears such as *katha* and *ber jal* were important in both rivers.

Comparisons between fishing patterns on the Karatoya and those on rivers inside the PIRDP were difficult because of the large variation in fishing activities between individual rivers within the scheme. In general, the Karatoya supported larger seine and drag net fisheries, larger hook and line fisheries and a larger *katha* fishery than most rivers inside the PIRDP whilst there was a greater prevalence of *suti jal* on regulated rivers. This gear would be favoured by the controlled drainage and reduced numbers of outlets which would be expected to concentrate fish to a greater degree than in unregulated rivers.

On the unregulated rivers of the North Central Region, *katha*, *ber jal* and *veshal* dominated the catches. *Veshal* were highly prolific on the Ichamati where they provided 56% of the annual catch. *Katha* provided the highest proportion of the annual catch in the seasonal Gazikhali River. This result is unexpected and not typical of results from other seasonal rivers studied by FAP 17. The small *katha* were constructed in a series of disconnected pools which were deep enough to support this gear until the end of the survey period in February 1994. Small subsistence gears were generally most prevalent in the largest of the three rivers, the Kaliganga.

### 5.3 Biodiversity and Catch Composition

#### 5.3.1 Species richness

The total annual number of species recorded from each river during the period March 1993 to February 1994 are presented in Table 5.5. The highest annual number of species (98) was found in the Baral/Atrai of the North West Region whilst slightly fewer species (88) were found on its tributary, the Karatoya River. The smaller of the two rivers, the Karatoya, was more similar in size to rivers of the PIRDP. Therefore this river was used as a reference against which to compare diversity in other rivers.



**Table 5.5** Total number of fish species recorded in rivers inside and outside the PIRDP

Site code	Name	In/Out FCDI	Number of species		% annual change compared with NW15
			Total survey: (Oct'92 - Feb'94)	Annual survey: (Mar'93-Feb'94)	
NW14	Baral/Atrai	Out	102	98	+11
NW15	Karatoya	Out	92	88	
Average			97	93	
NC21	Gazikhali	Out	77	72	-17
NC25	Kaliganga	Out	88	81	-7
NC29	Ichamati	Out	90	78	-11
Average			85	77	-11
NW03	Badai	In	101	94	+7
NW06	Ichamati	In	53	51	-41
NW07	Kageswari	In	74	70	-20
NW11	Chiknai	In	80	76	-14
Average			77	73	-17

Lower numbers of species were found in rivers of the North Central Region compared to the rivers in the North West outside the PIRDP. Lowest species diversity (72 species) occurred in the highly seasonal Gazikhali River, a distributary of the large Kaliganga River which supported a higher number of species. On average 11% fewer species were found in the rivers of the North Central Region compared with the North West Region (Table 5.5).

Inside the PIRDP, the impact of river regulation on species diversity varied considerably between rivers. The river subjected to the highest degree of regulation, the Ichamati, supported the lowest number of species (51) which when compared with the Karatoya represented a decrease of 41%. In contrast, the Badai supported a high diversity (94 species) which almost equalled that of the significantly larger Baral/Atrai River and exceeded that of the Karatoya. On the two other rivers inside the PIRDP, species diversity was between 14% and 20% lower than in the Karatoya River.

Seasonal variation in species richness varied between rivers outside the PIRDP. On the Baral/Atrai River, species numbers were lowest during the driest months of the pre-monsoon

period followed by a gradual increase through the monsoon reaching a peak during the drawdown and early winter (Fig. 5.8). High species diversity was maintained through the winter period of 1993/94 mainly due to the presence of a *katha* fishery. That this fishery was not sampled as intensively by FAP 17 in the 1992/93 season resulted in a lower number of recorded species. On the Karatoya River, a somewhat different seasonal pattern was observed. Here, species numbers remained fairly constant and low through the pre-monsoon and monsoon, followed by a sharp rise during September and October then declining again during the winter. The winter decline reflects the relatively smaller catches from the *katha* fishery compared with that in the Baral/Atrai River.

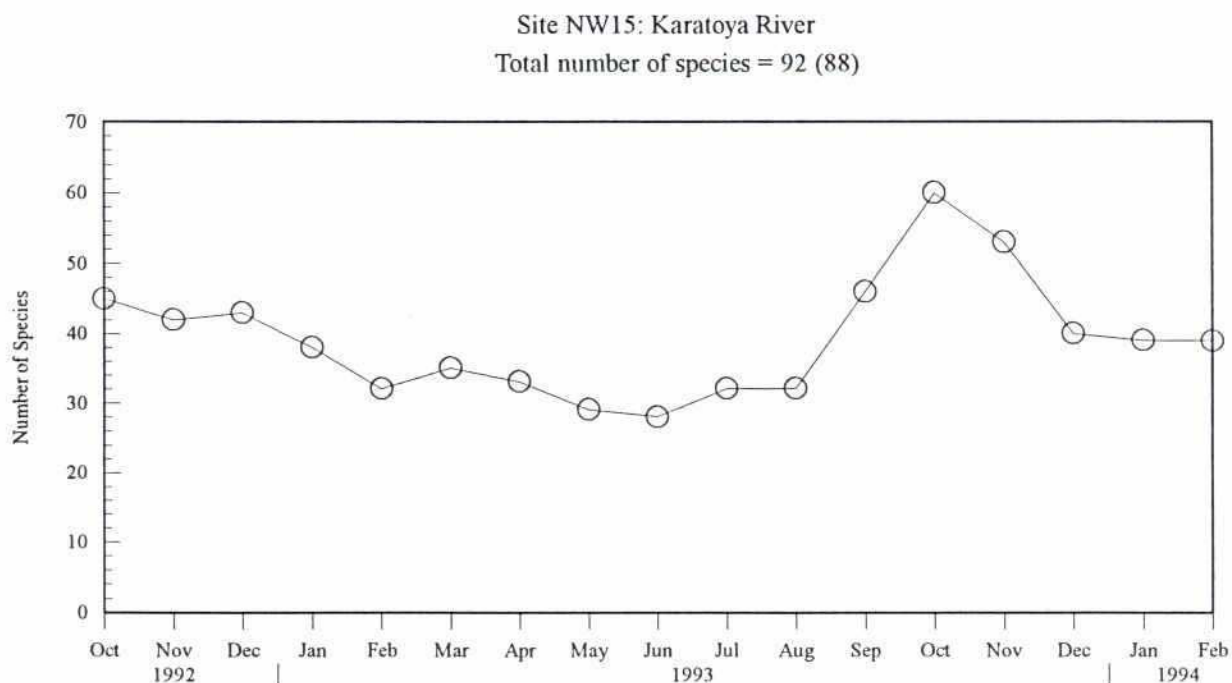
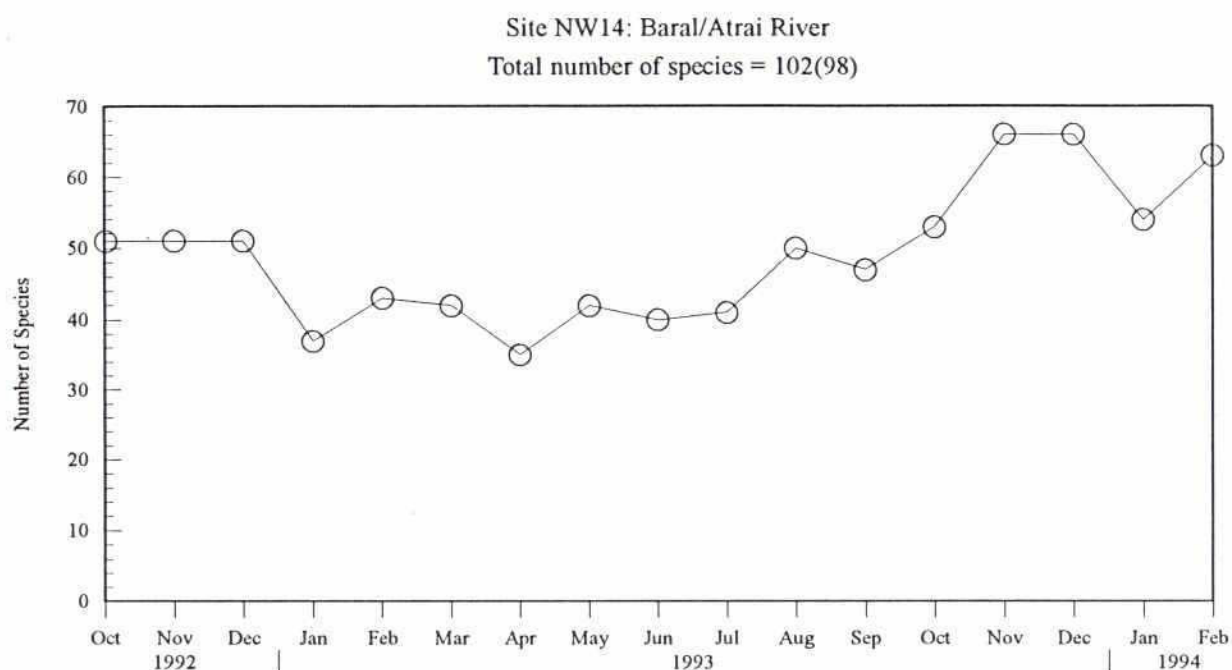
In the North Central Region, seasonal variation in species richness in the Kaliganga and Ichamati rivers was broadly similar to that seen in the Baral/Atrai (Fig. 5.9). The only difference being in the relatively higher number of species recorded from these rivers during the winter of 1992/93, when *katha* fisheries were sampled more intensively than in the Baral/Atrai. In the Gazikhali River, species numbers fluctuated widely and closely reflected temporal changes in catch during 1993. In both 1992 and 1993 increases in species diversity were observed during the flood drawdown.

Inside the PIRDP seasonal fluctuations in diversity were generally lower than those observed on unregulated rivers of the NCR (Fig. 5.10). This was particularly noticeable during drawdown periods when there was little discernible impact on species richness in all four rivers inside the PIRDP. The effects of varying degrees of flow regulation on seasonal variations in species richness could also be detected between these rivers. The most strongly regulated river, the Ichamati, displayed the most stable but very low species diversity whilst the Badai supported not only the most diverse fish fauna of regulated rivers but also displayed the greatest and most rapid seasonal change.

### 5.3.2 Catch composition

The percentage contributions to the total annual catch made by dominant species in each river are shown in Table 5.6. More detailed results of monthly catch compositions are given in Appendix 2 Table A-I. Species listed in these tables have been divided into three categories of habitat preference based on spatial distributions derived from the total FAP 17 database. The categories are defined below.

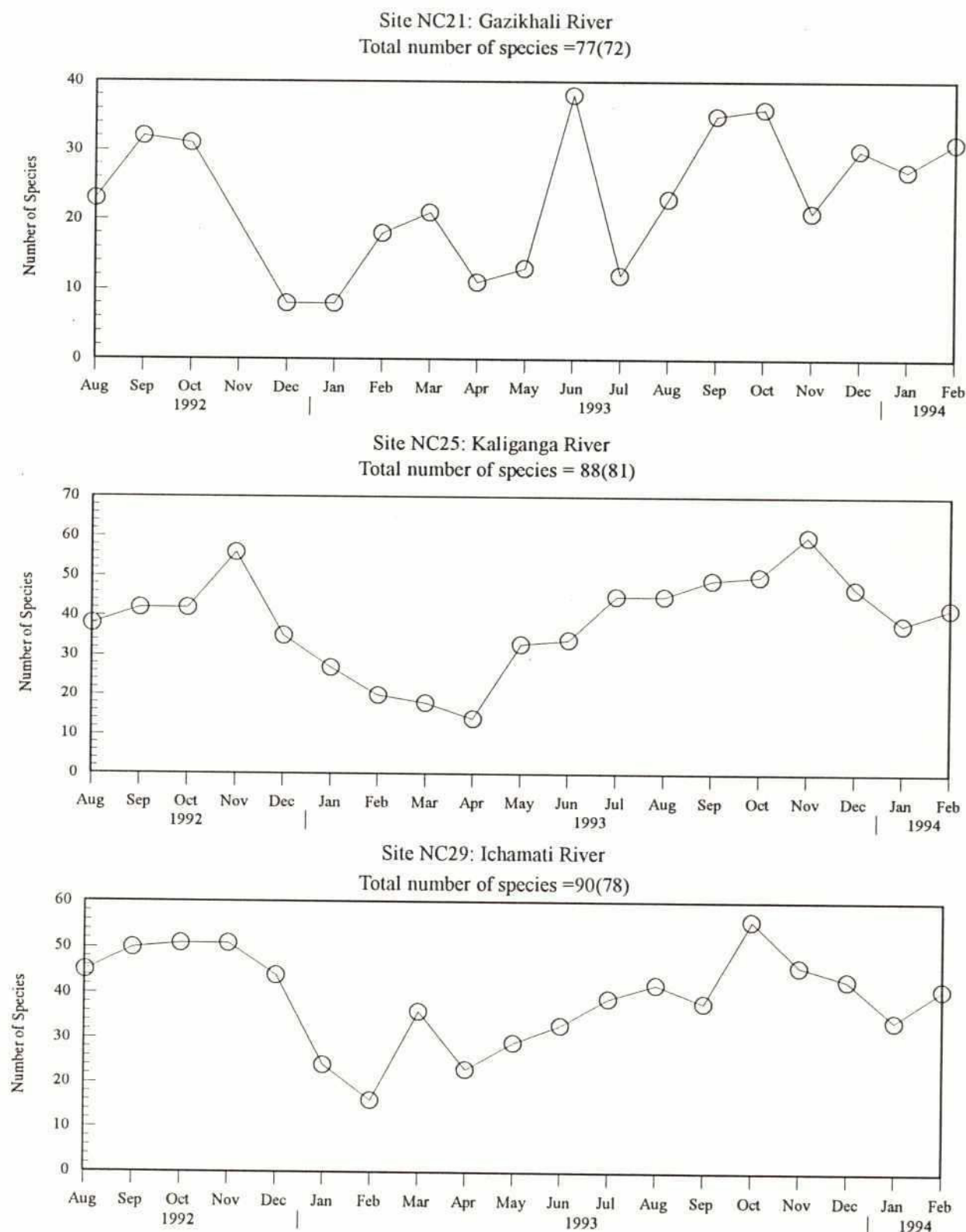
**Figure 5.8 Seasonal variation in the number of fish species recorded from rivers outside the PIRDP in North West Region**



Note: Annual total number of species recorded between March 1993 and February 1994 given in parentheses

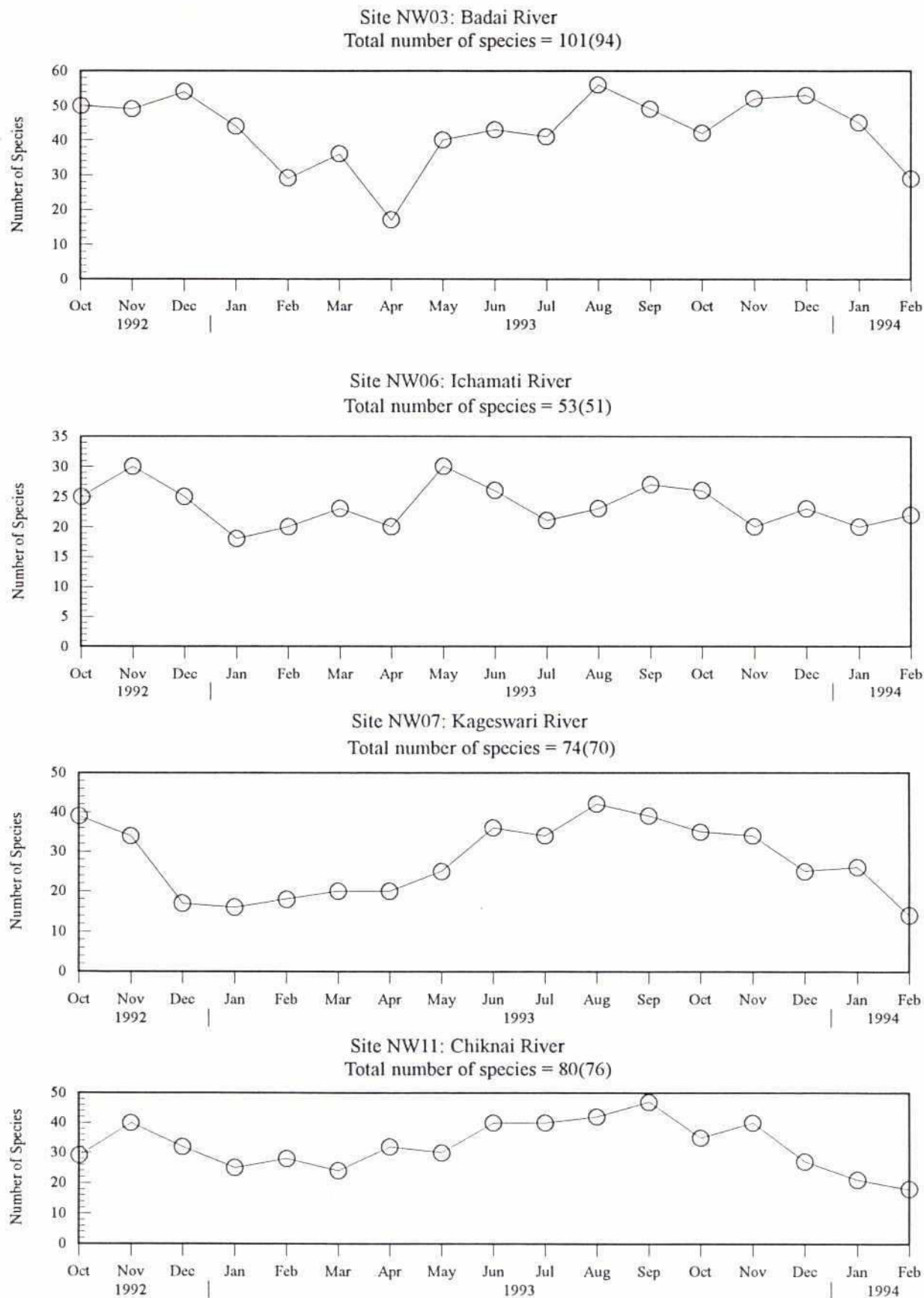


**Figure 5.9** Seasonal variation in the number of fish species recorded from rivers outside the PIRDP in North Central Region



Note: Annual total number of species recorded between March 1993 and February 1994 given in parentheses

**Figure 5.10 Seasonal variation in the number of fish species recorded from rivers inside the PIRDP in North West Region**



Note: Annual total number of species recorded between March 1993 and February 1994 given in parentheses

Table 5.6 Percentage contribution (by weight) to the total annual catch by dominant species from rivers inside and outside the PIRDP, March 1993 – February 1994

Habitat Preference	Species name		North West Region						North Central Region		
			Inside FCDI			Outside FCDI			Outside FCDI		
	Scientific	Bengali	Badai	Ichamati	Kageswari	Chiknai	Baral	Karatoya	Gazikhal	Kaliganga	Ichamati
Riverine	<i>Aspidoparia morar</i>	Piali								2.3	
	<i>Barilius barna</i>	Bani koksa									
	<i>Barilius evezardi</i>										
	<i>Botia dario</i>	Rani	1.2								
	<i>Hilsa ilisha</i>	Ilish	3.6		1.2		18.5	4.6			
	<i>Corica soborna</i>	Kachki						1.7			
	<i>Ailia coila</i>	Kajuli				1.7	2.5	3.2	1.2	1.4	
	<i>Clupisoma garua</i>	Ghaura					4.6	2.1	1.5	1.7	1.4
	<i>Silonia silondia</i>	Shillong							1.7		
	<i>Gagata cenia</i>	Kauwa									
	<i>Gagata youssoufi</i>	Gang tengra					1.4	1.0			
	<i>Johnius coitor</i>	Koitor					1.8				
Subtotal			4.8		1.2	1.7	28.8	12.6	4.5	5.4	1.4
Migratory	<i>Aorichthys aor</i>	Ayre	2.2					1.1		2.6	1.1
	<i>Mystus bleekeri</i>	Golsha tengra	1.5			4.6	5.9	4.3	4.0	1.8	3.3
	<i>Mystus cavasius</i>	Kabashi				1.7	11.4	9.3	1.2		
	<i>Catla catla</i>	Catla	1.2		1.1					3.2	3.4
	<i>Cirrhinus mrigala</i>	Mrigel				1.1				5.0	2.3
	<i>Cirrhinus reba</i>	Raik	13.6		2.4	2.3	1.1	1.2	1.5	4.9	7.2
	<i>Labeo calbasu</i>	Kalbasu	2.9				1.3	5.6	1.0	3.0	
	<i>Labeo rohita</i>	Rui	2.5				1.1		3.2	3.8	4.2
	<i>Salmostoma phulo</i>	Fulchela		4.8		4.6		1.7	1.3		2.1
	<i>Gudusia chapra</i>	Chapila	1.0	5.5	1.3		1.5				
	<i>Eutropiichthys vacha</i>	Bacha					1.5				
	<i>Pseudeutropius atherinoide</i>	Batasi					2.3				2.4
	<i>Wallagu attu</i>	Boal	2.9				5.8	6.0	3.9	3.7	2.2
Subtotal			27.8	10.3	4.8	14.3	31.9	29.2	16.1	28.0	28.2
Floodplain Resident	<i>Mystus vittatus</i>	Tengra	3.4	1.1	6.7	3.2	3.0	2.1	7.2	2.4	4.8
	<i>Colisa fasciatus</i>	Khalisha								1.1	1.2
	<i>Colisa sota</i>	Khalisha		1.4							
	<i>Xenentodon cancila</i>	Kaikka	5.0	1.6	10.5	4.7	1.3	1.9	2.0	3.5	3.0
	<i>Cyprinus carpio</i>	Karfu							4.7		
	<i>Puntius conchoniis</i>	Canchan puti	7.0	5.8	6.2	2.4		2.8	9.6	4.2	3.5
	<i>Puntius sophore</i>	Puti	7.0	6.4	17.6	14.2	2.0	3.6	11.2	8.2	8.2
	<i>Puntius ticto</i>	Tit puti									2.2
	<i>Danio devario</i>	Chebli									1.1
	<i>Esomus danricus</i>	Darkina							1.2		
	<i>Glossogobius giuris</i>	Bailla	4.1	9.7	5.6	4.4	5.0	5.7	8.3	7.9	5.8
	<i>Lepidocephalus guntea</i>	Gutum			2.1				3.1		1.4
	<i>Channa marulius</i>	Gajar	1.5			3.6					
	<i>Channa punctatus</i>	Taki	3.8	1.8	7.3	3.4		1.2	4.5	5.5	3.2
	<i>Channa striatus</i>	Shol	2.1								1.9
	<i>Macrognathus aculeatus</i>	Tara baim			2.4						
	<i>Macrognathus pancalus</i>	Guchi	2.6	6.4	5.9	5.6		2.4	3.6	1.6	3.8
	<i>Mastacembelus armatus</i>	Baral baim	4.2		3.2	12.1	3.5	8.6	5.9	8.3	1.8
	<i>Notopterus notopterus</i>	Foli							1.8	1.9	
	<i>Tetraodon cutcutia</i>	Potka									1.1
	<i>Chanda nama</i>	Nama chanda	2.3	5.4	2.3	3.0					1.1
	<i>Chanda ranga</i>	Lal chanda	1.4	1.2	1.6	2.0		1.6		1.3	
Subtotal			44.4	40.8	71.4	58.6	14.8	29.9	63.1	45.9	44.1
Others	<i>Macrobrachium rosenbergii</i>	Golda								1.2	1.3
	Prawn spp.	Chingri/Icha	10.5	22.0	9.8	10.8	11.6	15.8	7.6	8.6	12.2
Subtotal			10.5	22.0	9.8	10.8	11.6	15.8	7.6	9.8	13.5
Grand total			87.5	73.1	87.2	85.4	87.1	87.5	91.3	89.1	87.2

- Notes:
1. Dominant species are defined as those species which comprised 1% or more of the total annual catch
  2. Shaded values highlight the most abundant species (>4%)
  3. See text for definitions of habitat preference categories (Section 5.3.2)
  4. On the Ichamati River, inside the PIRDP, major carps mrigel and rui were stocked resulting in artificially high catches of 14.4% and 4.9% of the annual catch respectively. These have been excluded from the analysis.



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a) Riverine

Species which are usually confined to rivers and estuaries (or sea in the case of *ilish*) throughout their life cycle with no dependence on the floodplain, although some species can occasionally be found on more extensive floodplains, particularly in the North East Region.

b) Migratory

Species which move between river and floodplain during different stages of their life cycle.

c) Floodplain resident

Species which are capable of surviving in perennial waters of the floodplain throughout the year and are largely dependent upon them for growth and reproduction. Many of these species inhabit a variety of freshwater habitats, including large rivers.

The percentage contributions made by riverine, migratory and floodplain resident fish to annual catches inside and outside the PIRDP are summarised in Table 5.7. The results revealed that the average contribution to the catch made by riverine and migratory species inside the PIRDP was 44% lower than that in an outside river of comparable size, the Karatoya. However, there was large variation between rivers inside the PIRDP. The most regulated river, the Ichamati, supported the lowest relative catch of riverine and migratory fish, 76% lower than that in the Karatoya whereas in the Badai a substantially lower reduction (20%) was recorded. The higher relative catch in this river was due principally to the abundance of a single migratory species, *raik*. Percentage reductions in riverine and migratory species in the two other rivers, the Chiknai and Kageswari ranged between values recorded in the Ichamati and Badai. Similar trends were found in terms of number of species in different habitat preference categories (Table 5.8). Compared to the Karatoya, there was an average reduction of 39% in the total annual number of riverine and migratory species recorded from rivers in the PIRDP. Reductions were again greatest in the highly regulated Ichamati (66%) and least in the Badai (19%).

The results also indicated a differential impact of flood control on different individual categories of fish. In rivers inside the PIRDP, reductions in relative abundance and diversity were larger for riverine species (72% and 50% respectively) than for migratory species (42% and 20%) while floodplain residents increased in both abundance (69%) and diversity (18%) compared to the Karatoya.

**Table 5.7** Percentage contribution of riverine, migratory and floodplain resident fish to total annual catches from rivers inside and outside the PIRDP, March 1993 - February 1994

River	Site code	Inside/ Outside FCDI	% Total annual catch				% Reduction in Riverine + Migratory fish compared to average of NW15
			Riverine	Migratory	Riverine + Migratory	Floodplain resident	
Badai	NW03	In	7.8	31.0	38.8	50.6	20
Ichamati	NW06	In	0.7	10.9	11.6	47.1	76
Kageswari	NW07	In	4.3	11.4	15.7	77.3	68
Chiknai	NW11	In	4.0	19.5	23.5	65.7	52
Average			4.2	23.0	27.2	60.2	44
Baral/Atrai	NW14	Out	33.3	34.2	67.5	20.7	-
Karatoya	NW15	Out	15.0	33.5	48.5	35.6	-
Average			24.2	33.9	58.1	28.2	-
Gazikhali	NC21	Out	7.1	18.1	25.2	67.1	48
Kaliganga	NC25	Out	7.5	31.3	38.8	51.3	20
Ichamati	NC29	Out	5.4	30.6	36.0	50.5	26
Average			6.7	26.7	33.4	56.3	31

Note: On the Ichamati River (NW06), stocked major carps, *mrigel* and *rui* accounted for 19.3% of the annual catch. This percentage has been deducted from the analysis of annual catch composition

**Table 5.8** Total annual number of fish species, classified by habitat preference, recorded from rivers inside and outside the PIRDP, March 1993 - February 1994

River	Site Code	Site code	Number of species			Total	% reduction in numbers of riverine + migratory fish compared with NW15
			Riverine	Migratory	Floodplain resident		
Badai	NW03	In	24	20	50	94	19
Ichamati	NW06	In	7	11	33	51	66
Kageswari	NW07	In	18	17	35	70	35
Chiknai	NW11	In	19	17	40	76	33
Average			17	16	40	73	39
Baral/Atrai	NW14	Out	35	23	40	98	
Karatoya	NW15	Out	34	20	34	88	
Average			35	22	37	93	
Gazikhali	NC21	Out	16	16	40	72	40
Kaliganga	NC25	Out	24	19	38	81	19
Ichamati	NC29	Out	17	19	42	78	33
Average			19	18	40	77	31



The results shown in Tables 5.7 and 5.8 revealed important differences between the North Central and North West regions. The relative abundance and diversity of riverine species were substantially lower in rivers of the North Central Region than in the Karatoya or Baral/Atrai of the North West Region. This was true not only of the Ichamati River (NC29) which flows directly into the lower Padma River but also of the larger Kaliganga River which flows south eastwards to join the Buriganga south of Dhaka city. A possible explanation for this difference might be that the rivers of the North Central Region are distributaries of the Jamuna whereas the North West Region rivers are tributaries which possibly offer a stronger attraction for the riverine species which characteristically reside in larger rivers such as the Jamuna and Padma. An alternative explanation is that industrial and domestic pollution downstream of Dhaka deterred fish from using the Buriganga River as upstream migration route into the Dhaleswari system from the lower Padma and Meghna rivers. More detailed studies on fish movements in these rivers are needed to gain a better understanding of fish distributions and movements in the North Central Region.

Examination of the contributions made to annual catches by dominant species revealed several important differences between rivers inside and outside the PIRDP (Table 5.6). In the Baral/Atrai and Karatoya rivers, there were six dominant riverine species comprising 19% and 13% respectively of the annual catch whereas there were only three dominant riverine species recorded from four rivers inside the scheme comprising up to 5% of catches from individual rivers. Of the six species recorded in the two outside rivers, *ilish* predominated in both rivers, but was particularly abundant in the larger Baral/Atrai where it comprised 19% of the catch. *Ilish* was also the most important of the three dominant riverine species found inside the PIRDP. It occurred as a dominant species in two rivers, the Badai and the Kageswari and although percentage contributions were fairly similar, 3.6% and 2.0% respectively, because of the larger annual catch per kilometre from the Badai, the abundance of *ilish* in this river was about 7 times greater than that in the Kageswari. In the highly channelised and regulated Ichamati River, there were no dominant riverine species.

In the North Central Region, four dominant riverine species were recorded, *piali*, *kajuli*, *ghaura* and *shillong* which together comprised between 1% and 5% of catches. For reasons which remain unclear, *ilish* did not migrate upstream into the Dhaleswari system and was also unimportant in the Ichamati, a river which linked the Jamuna and Padma rivers.

Dominant migratory species comprised 32% and 29% of the catches from Baral/Atrai and the Karatoya. Of the 11 species recorded, 3 catfish, *golsha tengra*, *tengra* and *boal* were



common in both rivers while the carp, *kalbaus*, was relatively more abundant in the Karatoya. Two other carps, *ruí* and *raik* each formed just over 1% of the catch in one or both of the outside rivers.

Inside the PIRDP, dominant migratory species generally contributed substantially lower proportions to the annual catch compared with those in rivers outside the scheme. Only in the Badai was their share of catch (28%) comparable with those outside. In the other three rivers contributions ranged from 6% to 14% with the lowest value found in the Ichamati. Here only two dominant migratory species were recorded, *chapila* and *fulchela*. The catch of both species suddenly increased in December 1993 prior to which *fulchela* was recorded in low numbers in almost every month whilst *chapila* was recorded for the first time in October 1993. Since the Ichamati is the main irrigation canal of the scheme, and is therefore embanked and strongly regulated, access into it through sluice gates at Bera pump station is very restricted. During December 1993 water was pumped into the Ichamati from the Baral/Atrai, however this seems a unlikely source of supply of fish, even assuming they could physically pass through the pumping systems without being killed. An alternative explanation for the occurrence of these species is that they permanently reside and breed in the Ichamati. This explanation is supported by the fact that both species are found in river and floodplain sites inside the scheme throughout the year and in breeding condition at several floodplain sites. Two other migratory species, the major carps *ruí* and *mrigel*, together formed 19% of the annual catch of the Ichamati river. However, these were not wild fish but were stocked by the Department of Fisheries in 1993 and therefore excluded from the results presented in Table 5.6.

In the Chiknai, five dominant migratory species were recorded of which *golsha tengra* and *fulchela* were the most abundant in catches. In the Kageswari, only two dominant migrants were found, these were the carps *ruí* and *raik* which comprised 1% and 5% of the catch. In the Badai four carps, *catla*, *ruí*, *kalbaus* and *raik* accounted for 20% of the annual catch. The most common of these was *raik* forming about 14% of the catch. Evidence from data on average weight per individual fish in catches indicated that this species possibly spawned and preferred to reside in small secondary rivers such as the Badai. Three migratory catfish, *boal*, *ayre* and *golsha tengra* were also included in the list of dominant fish from the Badai together with the migratory clupeid, *chapila*.

In the North Central Region, 11 dominant migratory species contributed between 16% and 28% of the annual catch from each of the three rivers studied. The lower proportion was

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recorded on the seasonal Gazikhali River while compositions of dominant migrants on the Kaliganga and Ichamati were fairly similar despite substantial size differences between the two rivers.

Major carps accounted for 17% of the catch from the Ichamati and 20% from the Kaliganga but only 6% from the Gazikhali. Their relative abundance was considerably higher in these rivers than those in the North West Region outside the PIRDP. This is not surprising since the North Central Region rivers are distributaries of the Jamuna from which they receive a seasonal supply by downstream drift of hatchlings of *rui*, *catla* and *mrigel*. Since the North West Region rivers are tributaries of the Jamuna they do not receive the same supply through passive drift. Prior to the construction of the Brahmaputra right embankment (BRE) the Karatoya River would have received a similar supply of carp fry through various headwater connections to the Jamuna. These are now blocked by the BRE cutting off this important source of major carp spawn along the whole eastern border of the North West Region. Prior to construction of an embankment along the left bank of the Padma, the Baral/Atrai system would have received a supply of carp hatchlings spawned in the Padma and transported by distributaries such as the Baral-Nandakuja. This river is now regulated and the supply of hatchlings has consequently been reduced (see Draft Final Report, Supporting Volume Nos. 5 and 11).

The discussion so far has focused only on annual summary data from catch compositions, later in this report (Section 7.5) a closer examination is made of monthly data to identify seasonal movements of individual species between rivers and floodplains and to assess the impact of flood control on such movements.



## 6 CANAL FISHERIES

### 6.1 Total Catch

#### 6.1.1 Pattern of catch

One canal site inside the PIRDP (NW08) was compared with one site outside it to the north of the Baral/Atrai River (NW16) and three across the Jamuna River in the North Central Region (NC22, 26 and 30).

Seasonal variations in catch inside and outside the scheme were similar during 1993/94 with sharp rises in catch occurring in October reaching a peak in November at most sites (Figs 6.1 and 6.2). During these two months about half the total annual catch was taken inside the scheme (47%) and outside it at site NW16 (52%). In the North Central Region a greater proportion of the catch (69%) was taken from two (NC22, 26) of the three canals. The results demonstrate the considerable importance of the drawdown period to subsistence and commercial fisheries. Catches at other times of the year were low. However, since part of the canal system sampled inside the PIRDP was used for irrigation purposes, it retained more water than most canals outside the scheme during the winter period and consequently catches were relatively higher, particularly in January 1993.

During 1992, peak catches from unregulated canals were recorded about one month earlier than those in 1993 and this could be attributed to the generally lower flood and earlier drawdown in 1992. For reasons which remain unclear, no peak catch was observed during the drawdown inside the PIRDP during 1992.

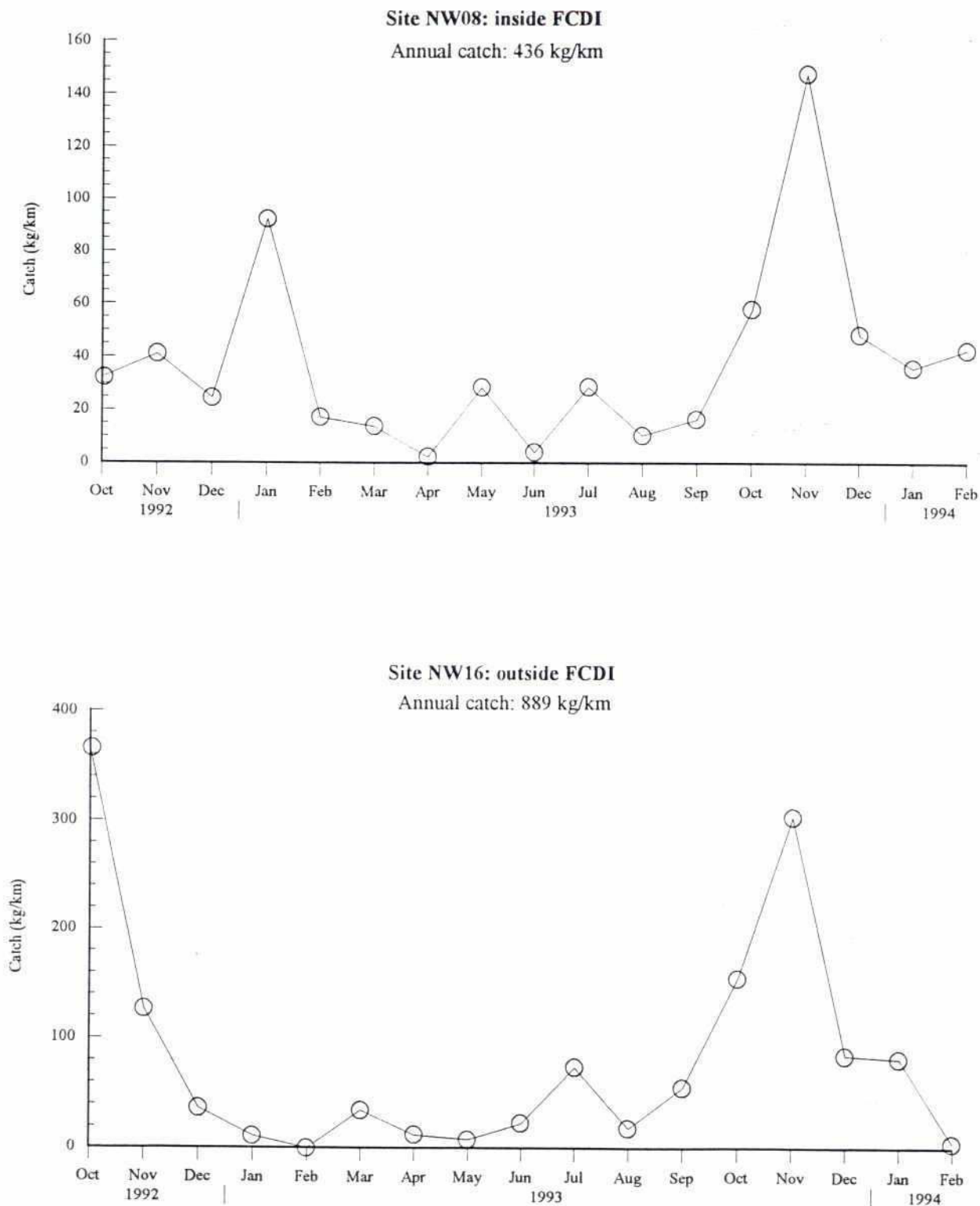
#### 6.1.2 Size of catch

The annual catch taken inside the PIRDP between March 1993 and February 1994 was substantially lower than catches from unregulated canals in the North West and North Central Regions (Table 6.1). Compared with Potajia canal outside the scheme, catches per km and per hectare inside the scheme were 51% and 65% lower respectively. Compared with average catches per km and per hectare from North Central Region canals, catches inside the scheme were 62% and 64% lower. However, statistical analyses revealed no significant difference in the underlying fish densities inside and outside the PIRDP so that catches differences were principally a result of differences in the amounts of fishing effort applied

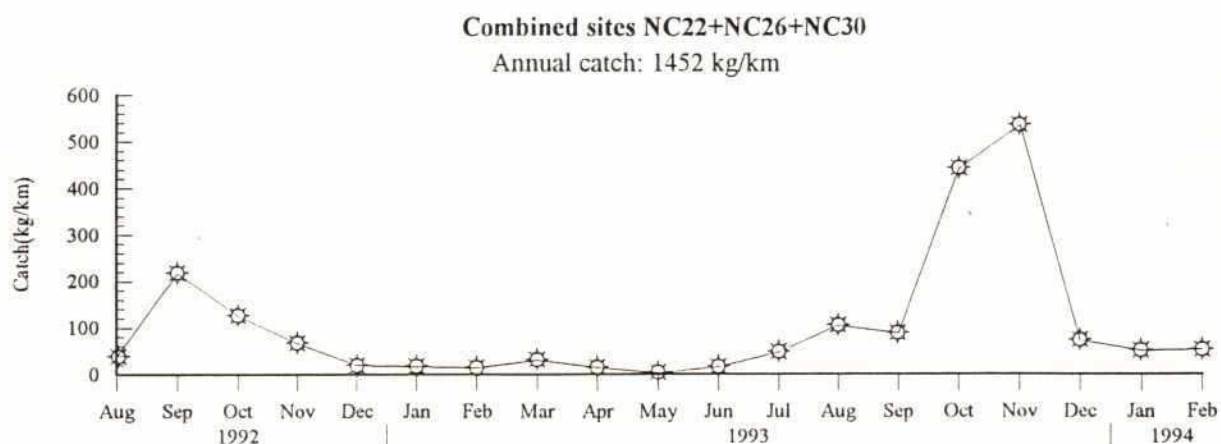
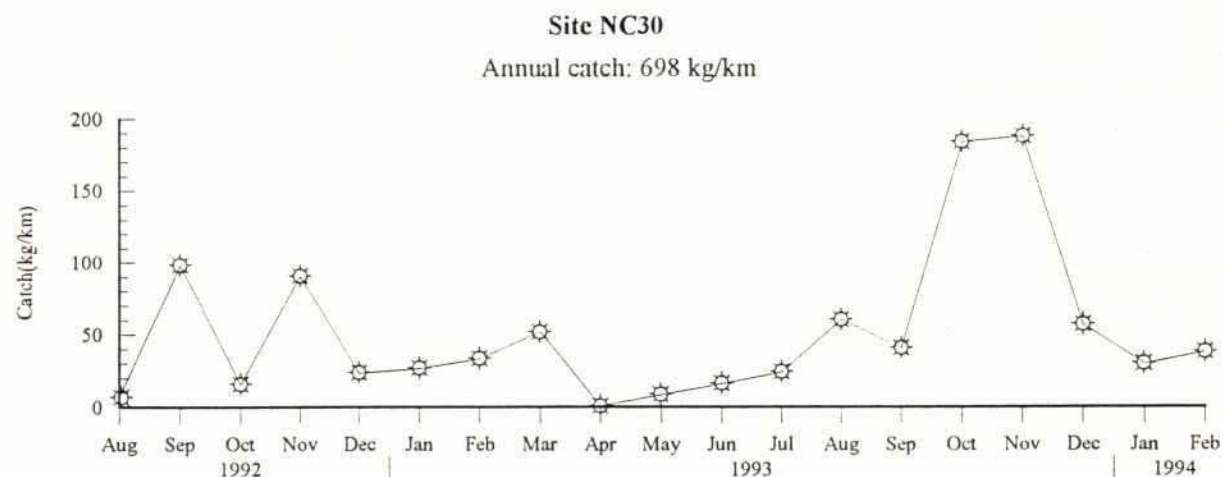
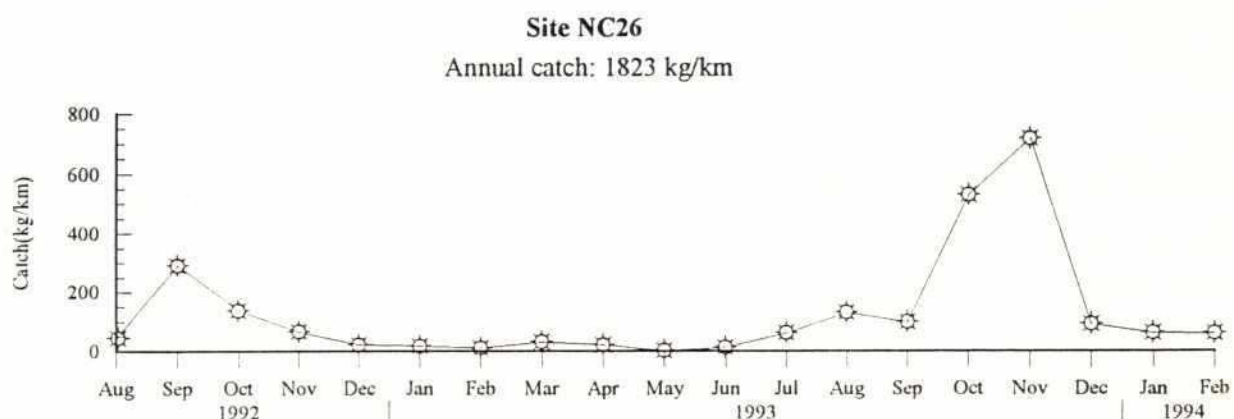
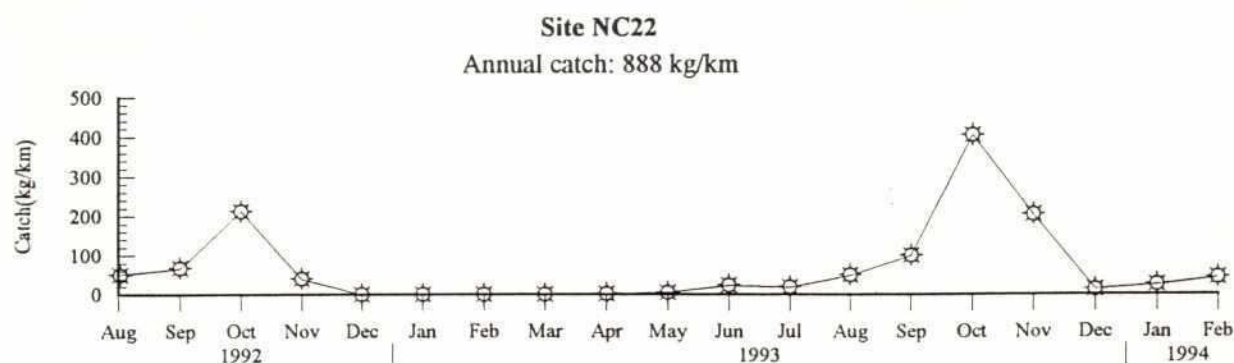




**Figure 6.1 Seasonal variation in the catch per unit length from canals inside and outside the PIRDP, October 1992 - February 1994**



**Figure 6.2 Seasonal variation in the catch per unit length from unregulated canals in the North Central Region, August 1992 - February 1994**



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Table 6.1 Annual catch from canals inside and outside the PIRDP, March 1993 - February 1994

Site code	Name	Inside/Outside FCDI	Annual catch	
			(kg/km)	(kg/ha)
NW08	Santia <i>khal</i>	Inside	436	186
NW16	Potajia <i>khal</i>	Outside	889	529
NC22	Chandrakhali <i>khal</i>	Outside	888	513
NC26	Mailagi <i>khal</i>	Outside	1823	546
NC30	Sakini <i>khal</i>	Outside	698	475
NC average		Outside	1136	511

(see Section 6.3 for further details). Catches per unit length of canals were similar in 3 of the 4 unregulated sites. The exception was Mailagi *khal* in the North Central Region where catches were substantially higher (1823 kg/km) than other sites. However, the catch per unit area from this site was similar to others which suggests that the difference in catch per unit length was related to the larger width of this canal, particularly along a stretch of the Dhaka-Aricha highway where *veshal* were particularly abundant and accounted for the largest share of the total annual catch.

#### 6.1.3 Comparison of catches between different years

In the North West Region, total catches for the period October 1992 to February 1993 were compared with those for the same period in 1993/94. A similar comparison was made in the North Central Region for a slightly longer period, August to February 1992/93 and 1993/94 (Table 6.2). Catches from *katha* fishing were excluded from the analyses since these required more intensive sampling which they received in 1993/94 but not at all sites in 1992/93.

Lower catches were recorded at all sites except NW16 in the relatively dry year 1992/93 compared with those in the following year when floods were greater. A similar trend was found in riverine catches and possible reasons for this have been discussed in Section 5.1.3. Since the bulk of canal catches was taken during the flood drawdown when fish moved off the drying floodplains, it seems probable that differences in flooding patterns between years was the principal factor determining differences in catch.



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**Table 6.2 Comparison of the total catch from canals inside and outside the PIRDP between different years**

Site code	Name	Inside/ Outside FCDI	Catch (kg/km)		% change in catch in 92/93
			1992-1993	1993-1994	
NW08	Santia <i>khal</i>	Inside	207	318	- 35
NW16	Potajia <i>khal</i>	Outside	533	529	+ 1
NC22	Chandrakhali <i>khal</i>	Outside	371	775	- 52
NC26	Mailagi <i>khal</i>	Outside	593	1513	- 61
NC30	Sakini <i>khal</i>	Outside	294	575	- 49
Total NC22, 26, 30		Outside	499	1211	- 59

- Notes: 1. *Katha* catches were excluded from analyses (see text for details)  
 2. + and - denote increase and decrease in catches respectively

The greatest inter-annual difference was observed in the North Central Region where the combined catch from three canals in 1992/93 was 59% lower than in 1993/94. A smaller reduction (35%) was found inside the PIRDP whilst little difference between years was observed in the canal outside the scheme. With the exception of this site, the results generally support those from rivers where reductions in catch of 48% to 62% were observed in the North Central Region during the dry year while more variable results were obtained from the North West Region (Section 5.1.3).

The higher catches observed in the higher flood year of 1993/94 were largely a function of increased catches rates of dominant gears (Figs 6.5, 6.8, 6.11), although fishing effort by the some of these gears also increased substantially particularly in the North Central Region (Fig. 6.10). Increased catch rates indicated higher fish densities 1993/94.

Examination of inter-annual differences in the catches of different groups of fish i.e. riverine, migratory and floodplain residents (see Section 5.3.2 for definitions) revealed differential impacts on different groups (Table 6.3). Reductions in catches of floodplain resident species were observed at all sites, even at site NW16 where little difference in the total catch of all species was detected. In contrast, catches of migratory species were generally higher at most sites during the drier year of 1992 indicating that the species in question were not totally

dependent on floodplains but could also breed and feed in rivers. Catches of riverine species were extremely low and therefore estimation of percentage changes between years was highly sensitive to small differences in catch values.

**Table 6.3 Comparison of the catch<sup>1</sup> of riverine, migratory and floodplain resident fish from canals inside and outside the PIRDP between different years**

Site code	Inside/ Outside FCDI	Riverine Fish (kg/km)			Migratory Fish (kg/km)			Floodplain Resident Fish (kg/km)		
		1992-1993	1993-1994	% change in 92/93	1992-1993	1993-1994	% change in 92/93	1992-1993	1993-1994	% change in 92/93
NW08	Inside	0.03	0.62	-95	13.93	12.76	+9	183.84	275.98	-33
NW16	Outside	0.33	3.24	-90	106.61	31.08	+243	353.54	409.68	-14
NC22	Outside	1.30	8.83	-85	47.88	69.68	-31	304.90	641.43	-52
NC26	Outside	6.24	10.22	-39	277.88	250.49	+11	293.80	1098.54	-73
NC30	Outside	0.15	1.47	-90	72.44	68.88	+5	214.61	462.21	-54

Note: 1. Prawns and *katha* catches were excluded from the analyses (see text for details)  
2. + and - denote increase and decrease in catches respectively

## 6.2 Pattern of Fishing

### 6.2.1 Catch by gear

Percentage contributions made by dominant gears to the total annual catch from each canal site are presented in Table 6.4. More detailed information on percentage monthly and annual catches of all gears recorded at these sites is given in Appendix 3, A-F.

A total of 17 different gear types was recorded on the canal inside the PIRDP. This is slightly lower than the number found on the outside canal site (21 gears) but falls within the range found in the North Central Region (14-26 gears).

Several differences in the patterns of fishing inside and outside the PIRDP were apparent. *Jhaki jal* and *veshal* together accounted for a substantial share of the catch at all sites. *Veshal* were more important in the North Central Region where they accounted for 19-44% of annual catches compared with 14% inside and outside the PIRDP in the North West Region. *Ber jal* captured 8% of the catch inside the PIRDP compared to only 3% outside it in Potajia



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*khal* (NW16) where small seines (*dhor jal*) and drag nets (*moi jal*) together accounted for 17% of the catch. In contrast, in the North Central Region seine and drag nets were relatively unimportant. Small-scale fishing methods such as fishing by hand or with *thella jal* were used at all sites. However, other small-scale methods such as fishing with *doiar* trap, *akra*, *sip* and *current jal* were more prevalent inside the PIRDP. *Katha* contributed a surprisingly low share of the catch at all sites, the highest being 15% outside the PIRDP in the North West Region compared with only 6% inside it. Since part of this site was used for irrigation purposes, restrictions may have been imposed on *katha* construction since they could impede water flow through the system.

**Table 6.4** Percentage contribution (by weight) to the total annual catch by dominant gears in canals inside and outside the PIRDP, March 1993 - February 1994

Gear	North West Region		North Central Region		
	Inside FCDI	Outside FCDI	Outside FCDI		
	NW08	NW16	NC22	NC26	NC30
<i>Jhaki jal</i>	23.7	18.1	10.2	6.3	30.6
<i>Doiar</i> trap	14.9	4.9	-	8.6	-
<i>Veshal</i>	13.5	14.0	36.3	43.8	18.8
<i>Ber jal</i>	8.4	3.0	-	-	-
<i>Akra</i>	6.5	-	-	-	-
<i>Katha</i>	6.0	15.2	7.2	9.8	3.1
Hand fishing	5.7	10.5	5.3	3.7	4.6
<i>Thella jal</i>	5.7	9.9	3.9	6.2	4.1
<i>Sip</i>	5.2	-	3.2	-	4.3
<i>Current jal</i> (Stationary)	4.1	-	-	-	3.4
<i>Moi jal</i>	-	14.3	-	-	-
<i>Dhor jal</i>	-	2.9	-	-	-
<i>Suti jal</i>	-	-	22.2	-	-
<i>Ucha</i>	-	-	-	4.1	16.5
<i>Kua</i>	-	-	-	6.0	-
<i>Uttar jal</i>	-	-	4.6	-	-
<i>Urani</i>	-	-	-	3.3	-
<i>Dharma jal</i>	-	-	-	-	5.6

Note: 1. Dominant gears are defined as those gears which when ranked in order of abundance, comprised at least 90% of the annual catch



### 6.2.2 Catch by gear by month

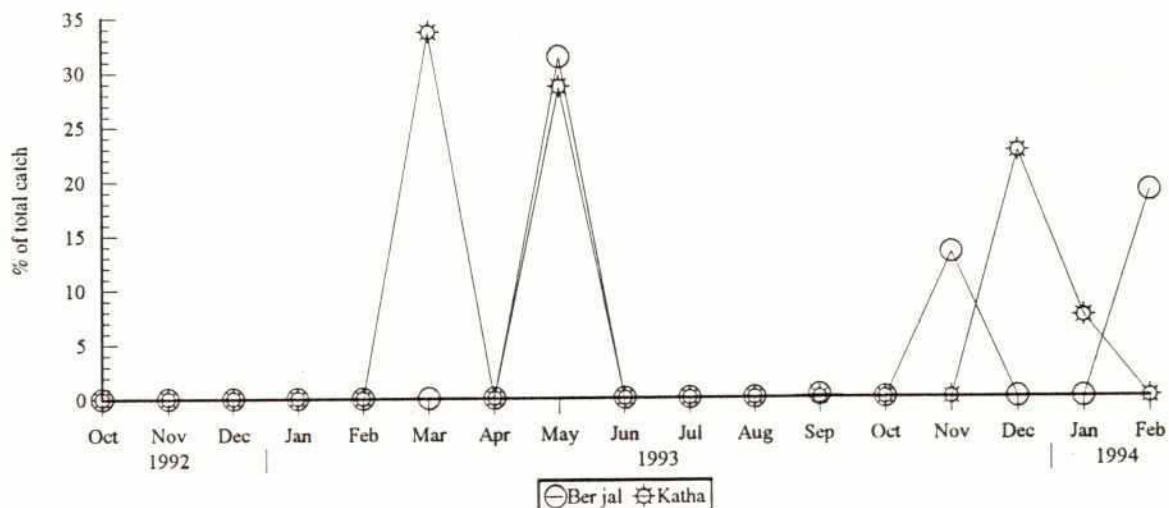
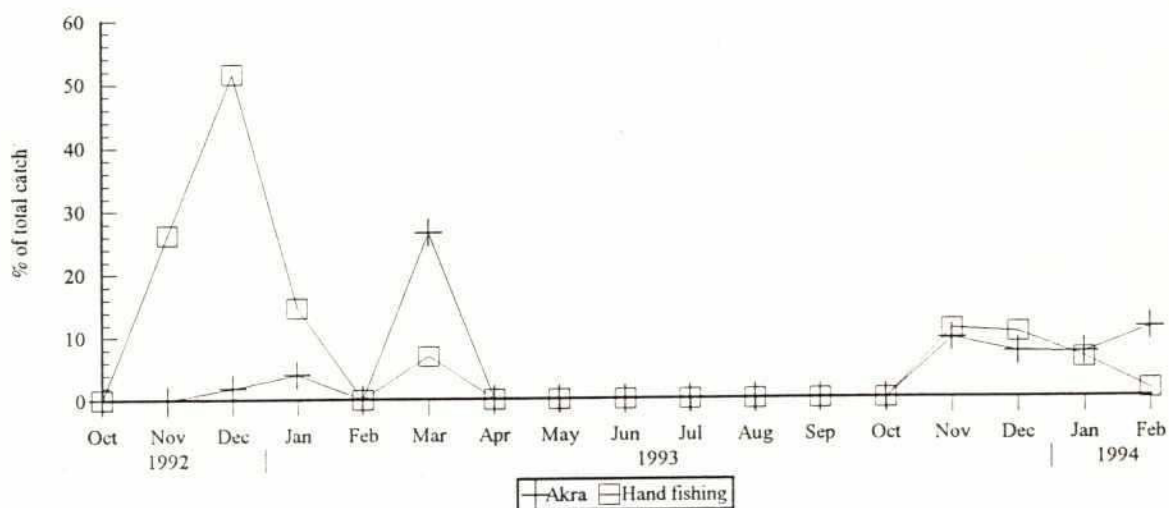
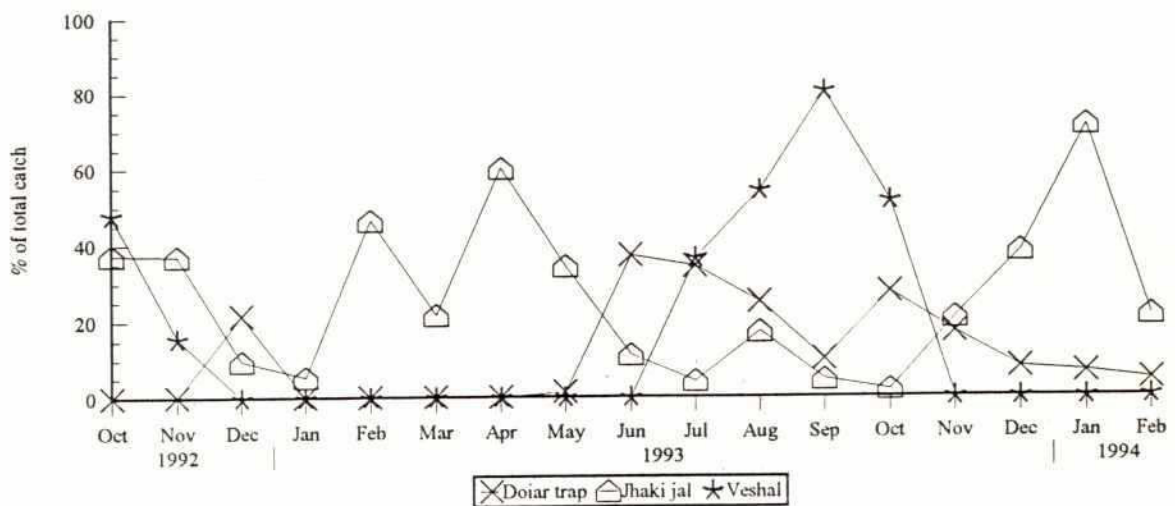
Inside the PIRDP, during the pre-monsoon months of March and April 1993, *jhaki jal*, *akra* and *katha* contributed most to the prevailing low catches (Fig. 6.3). During the rising flood phase of May and June, first *katha* and *ber jal* dominated catches followed by *veshal* and hooks in June. In the full flood period from July to September, *veshal*, *doiar* traps and, to a lesser extent, *jhaki jal* predominated. With the onset of the flood drawdown in October and November the number of different types of gears deployed increased and a more equitable catch distribution over a range of different gears was observed. Peak catches recorded in November 1993 were not related to changes in fishing effort (Fig. 6.4) but were largely due to increased catch rates of dominant gears, including small-scale gears such as *jhaki jal*, *doiar* traps, *akra* and hand fishing used by subsistence fisherman and the larger-scale *ber jal* used by professionals (Fig. 6.5). During the winter months, December 1993 to February 1994 when catches stabilised at a relatively low level, *jhaki jal*, *katha*, and *ber jal* predominated at different times.

In Potajia *khal* outside the PIRDP, *jhaki jal*, *thella jal* and hand fishing accounted for the bulk of the low pre-monsoon catches (Fig. 6.6). During the rising flood phase *jhaki jal* predominated in May and was joined by *veshal* and *ber jal* in June when river floodwaters first entered the canal. During peak floods from July to September, the small drag net, *moi jal*, and *veshal* predominated. Unlike the canal site inside the PIRDP, *doiar* traps and *jhaki jal* were unimportant in Potajia *khal* during peak floods. During the drawdown, peak catches of November were taken mainly by hand fishing, *thella jal*, *jhaki jal* and, to a lesser extent, *moi jal*. These high catches were caused by increased fishing effort of dominant gears such as hand fishing, *jhaki jal* and *thella jal* (Fig. 6.7) and peak catch rates of all dominant gears except *jhaki jal* whose catch rate remained high from October to December (Fig. 6.8). During the winter months, December 1993 to February 1994, *katha* provided an increasing share of the catch, reaching 78% and 93% in January and February respectively.

In the North Central Region, low pre-monsoon catches from three canal sites were provided mainly by *jhaki jal*. During the rising and full flood periods, *veshal* provided most of the catch but *doiar* traps were also important (Fig. 6.9). Peak catches were recorded over two months during the drawdown of October and November, when *veshal* again was the most important gear but *thella jal* and *ucha* also made significant contributions to catches in October as did *jhaki jal* and *doiar* traps in November. Peak catches were caused by peak

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**Figure 6.3 Percentage of total monthly catch taken by dominant gears:  
site NW08 (inside FCDI)**



**Figure 6.4** Total monthly fishing effort per kilometre of canal by dominant gears: site NW08 (inside FCDI)

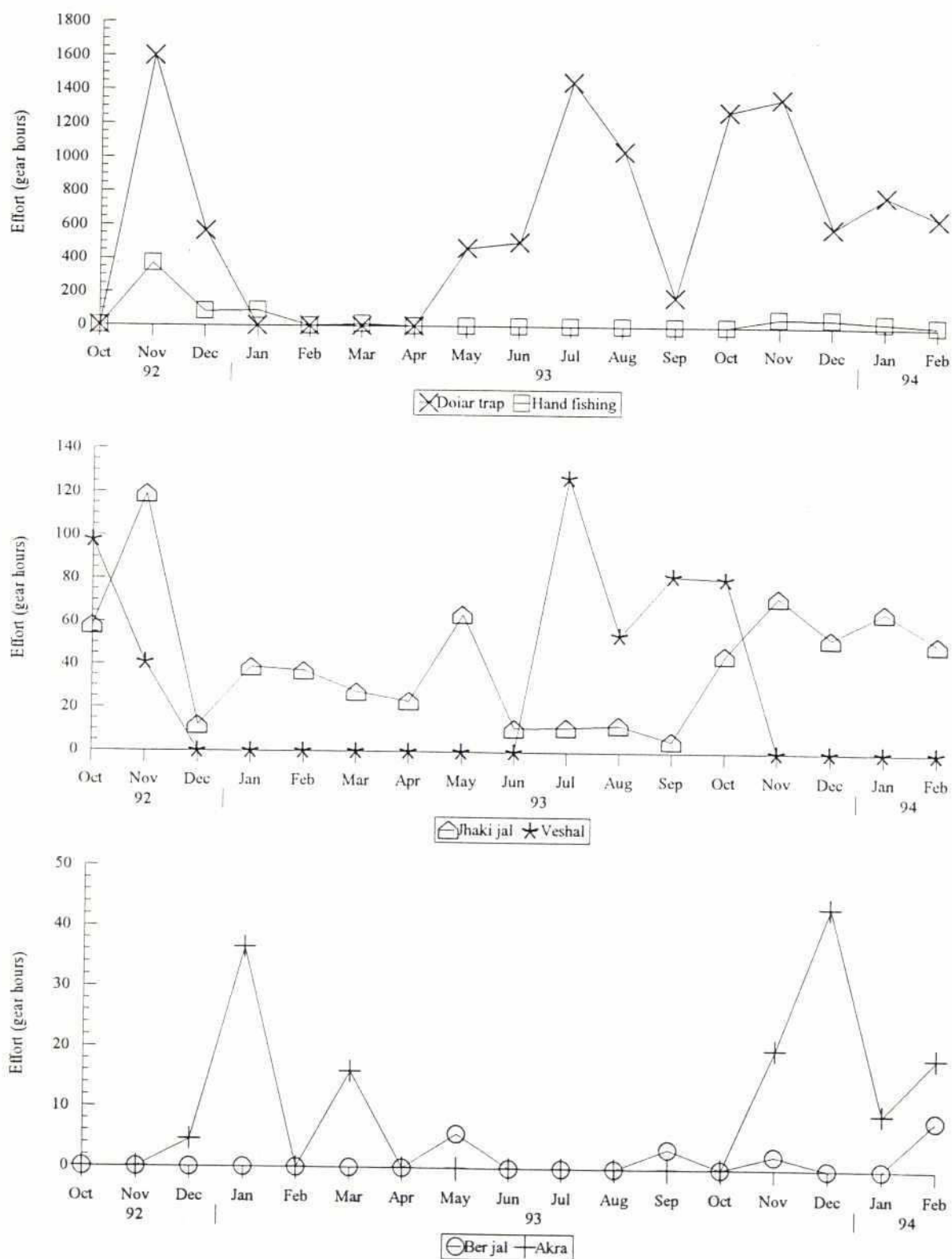
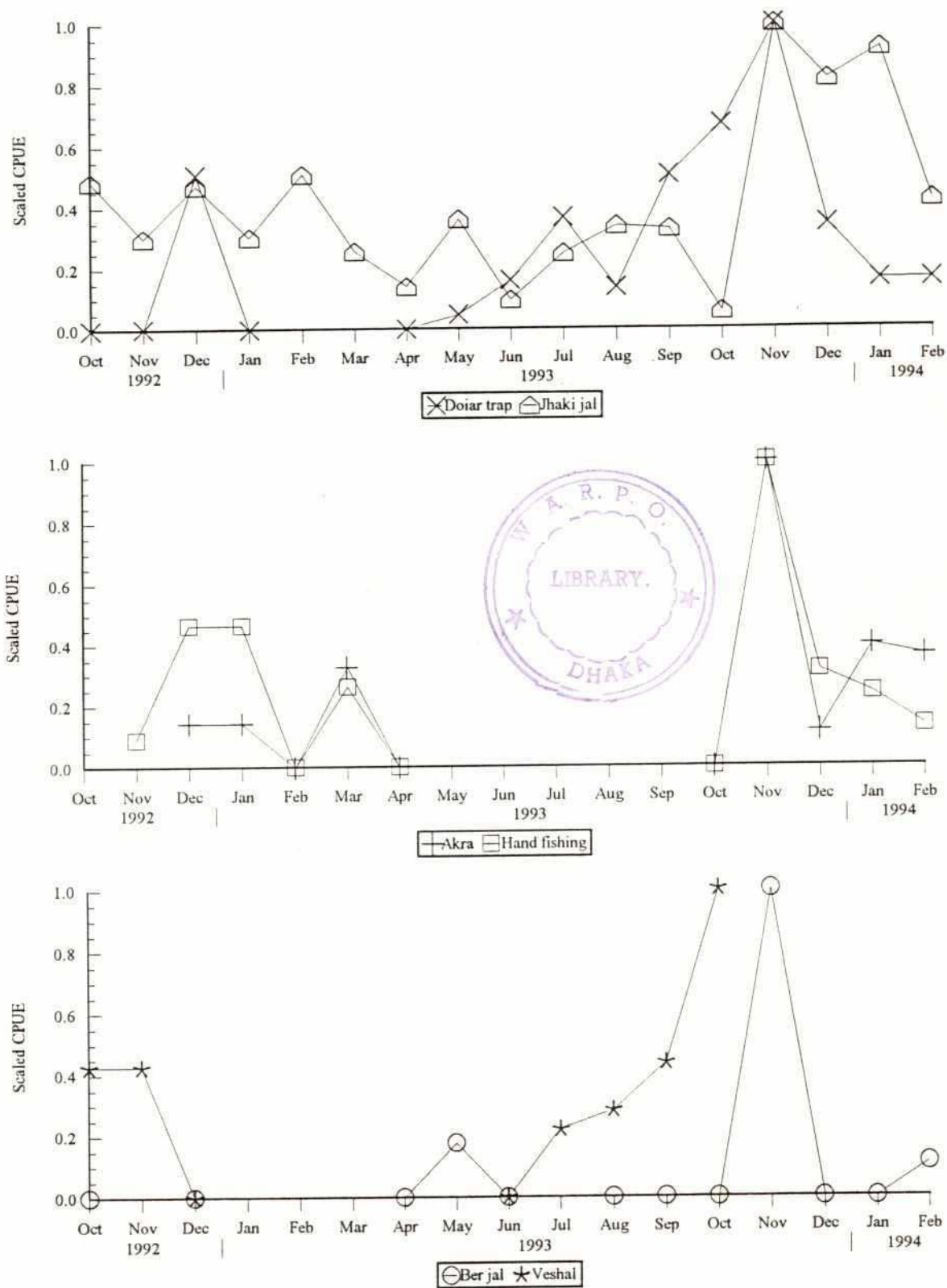


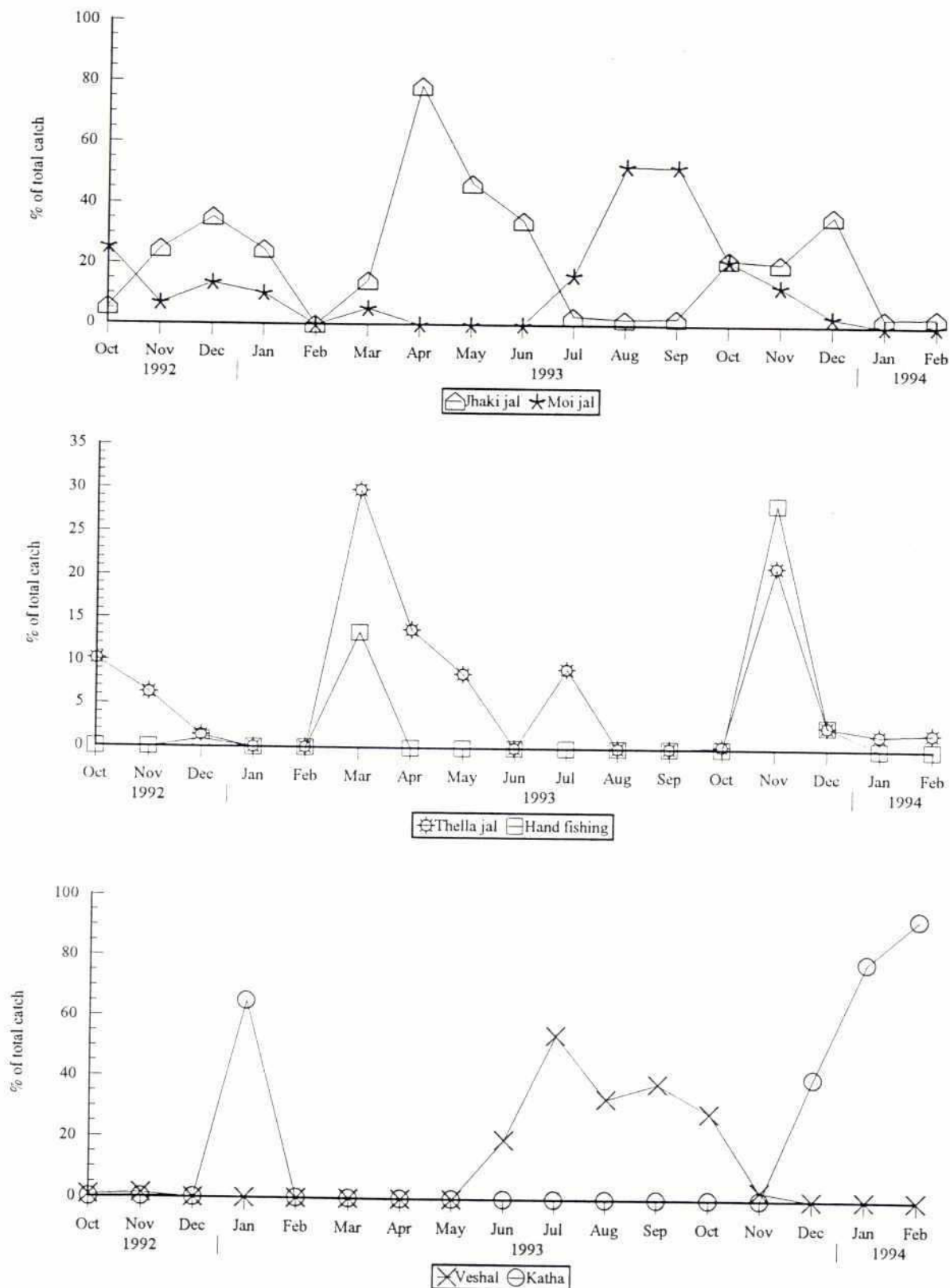


Figure 6.5 Scaled CPUE of dominant gears: site NW08 (inside FCDI)



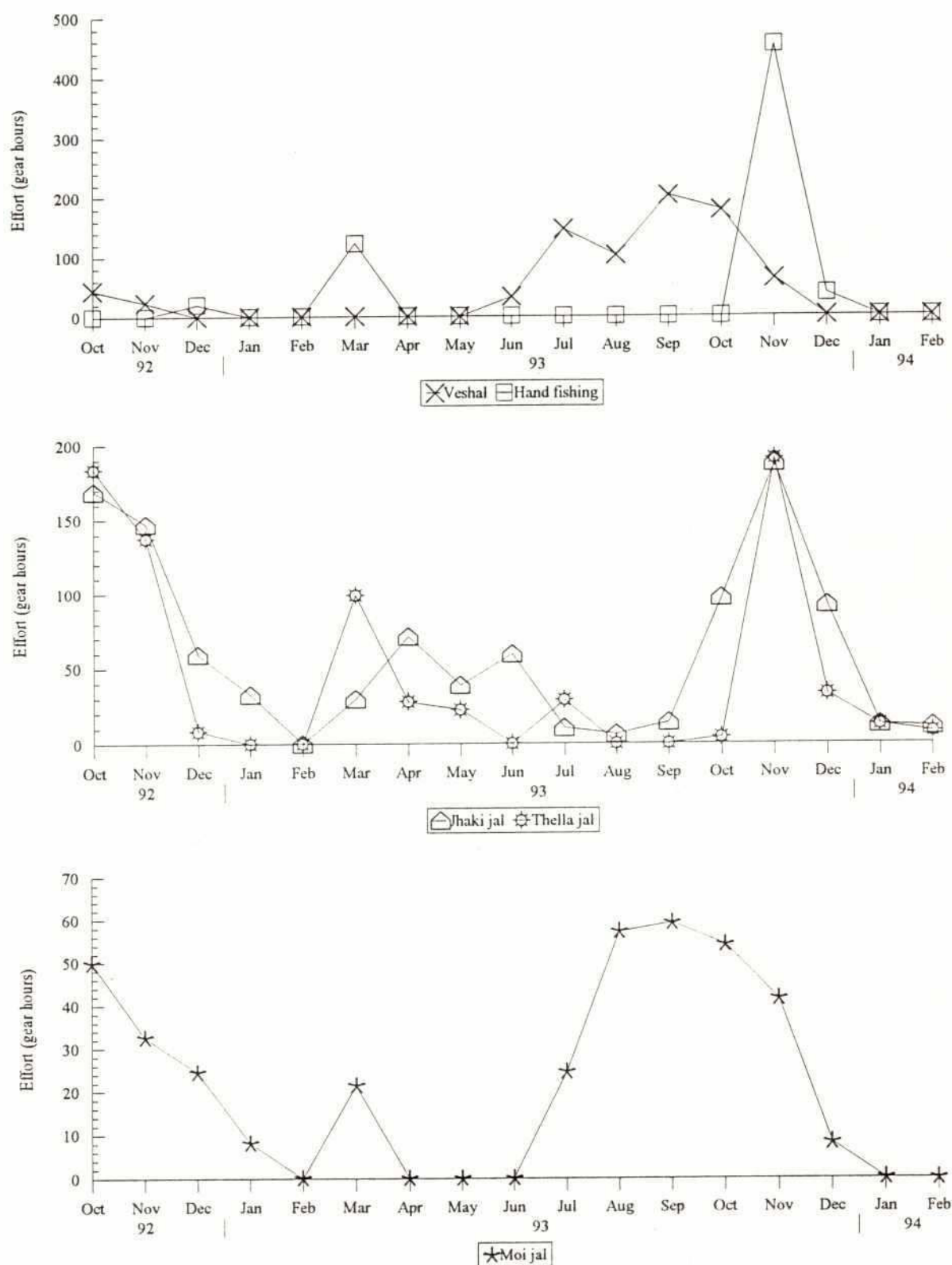
Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded.

Figure 6.6 Percentage of total monthly catch taken by dominant gears:  
site NW16 (outside FCID)



Note: No fishing observed during February 1993

**Figure 6.7 Total monthly fishing effort per kilometre of canal by dominant gears: site NW16 (outside FCDI)**

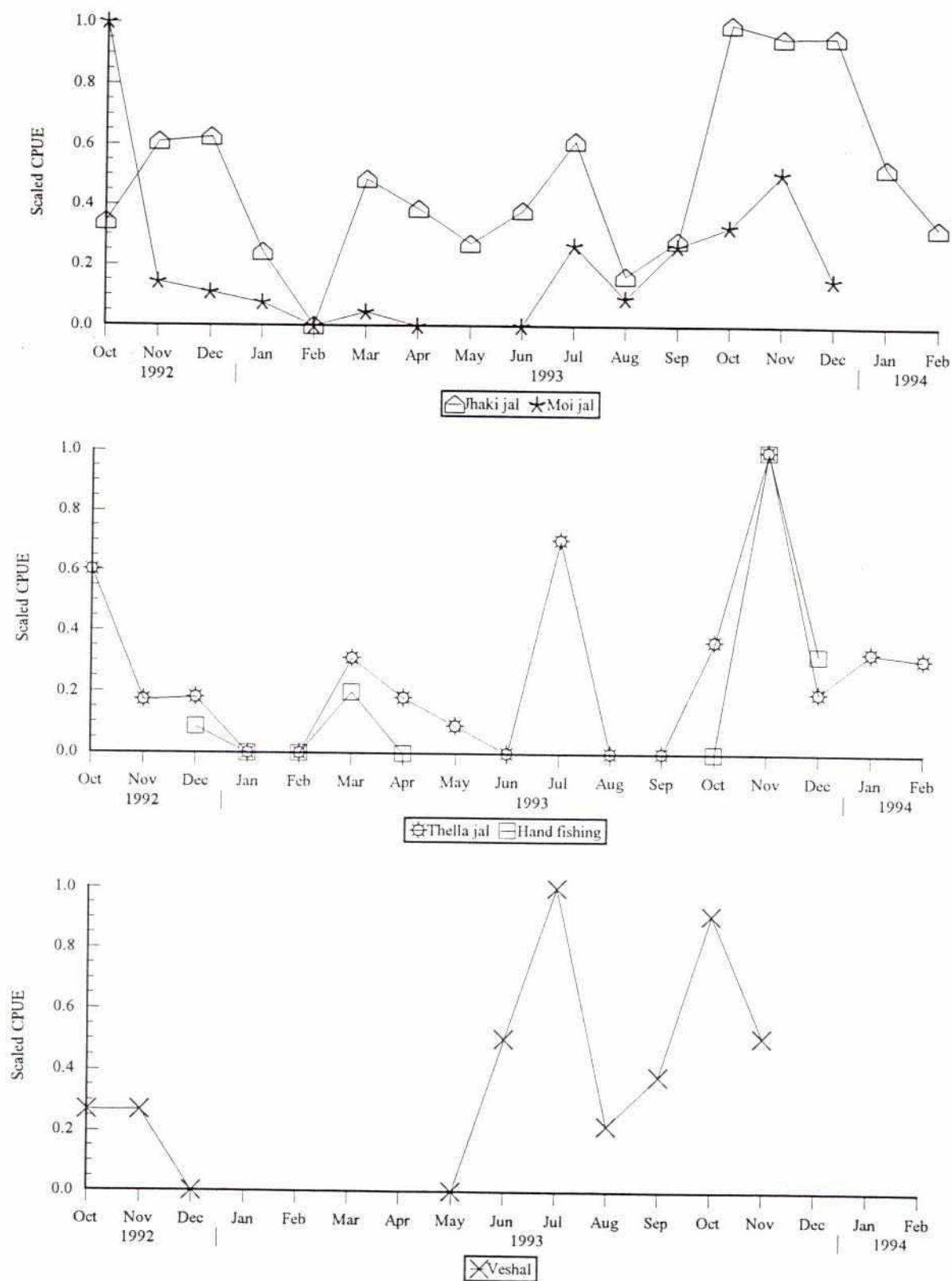


Note: No fishing observed during February 1993



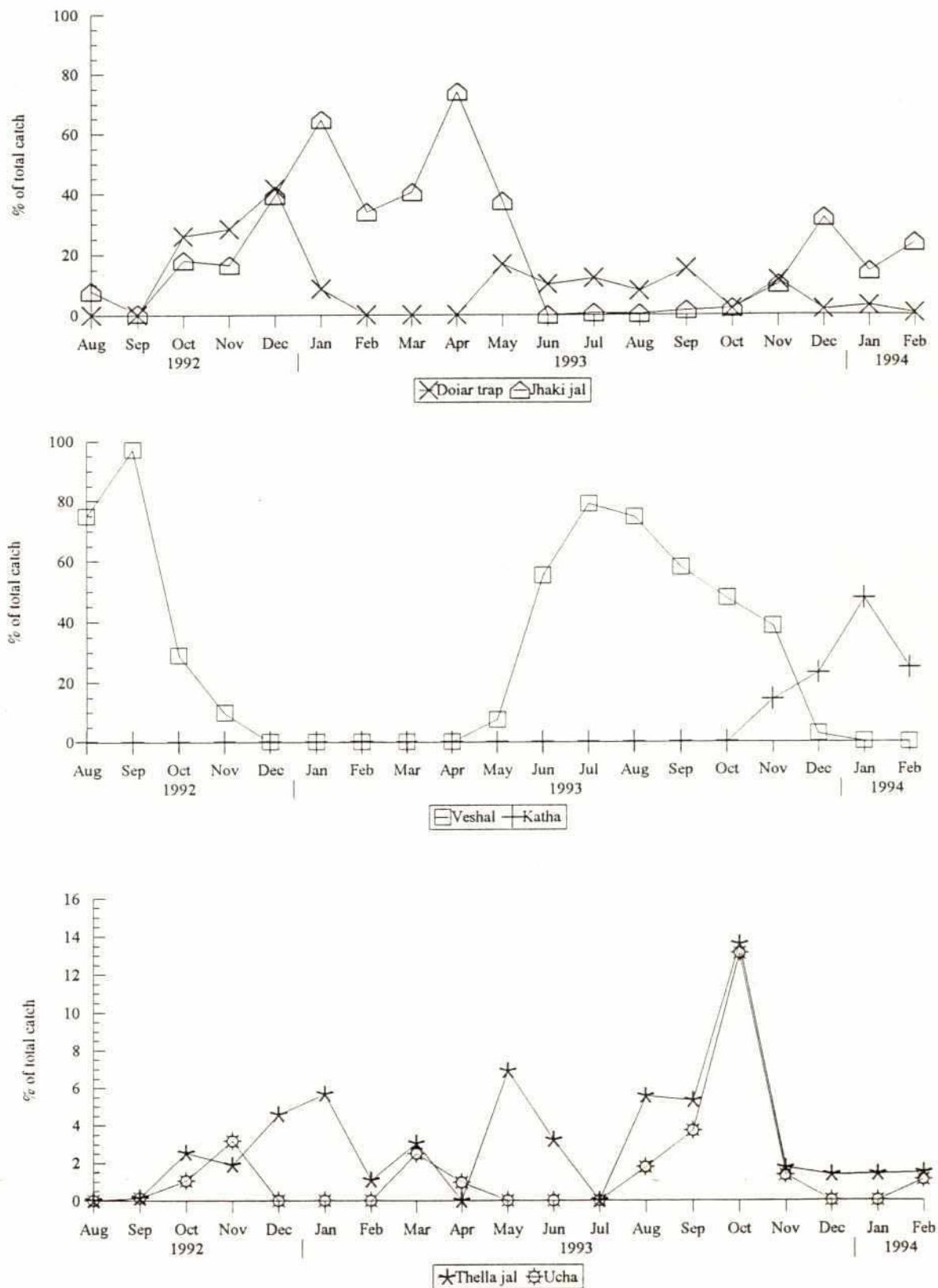
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**Figure 6.8 Scaled CPUE of dominant gears: site NW16 (outside FCDI)**



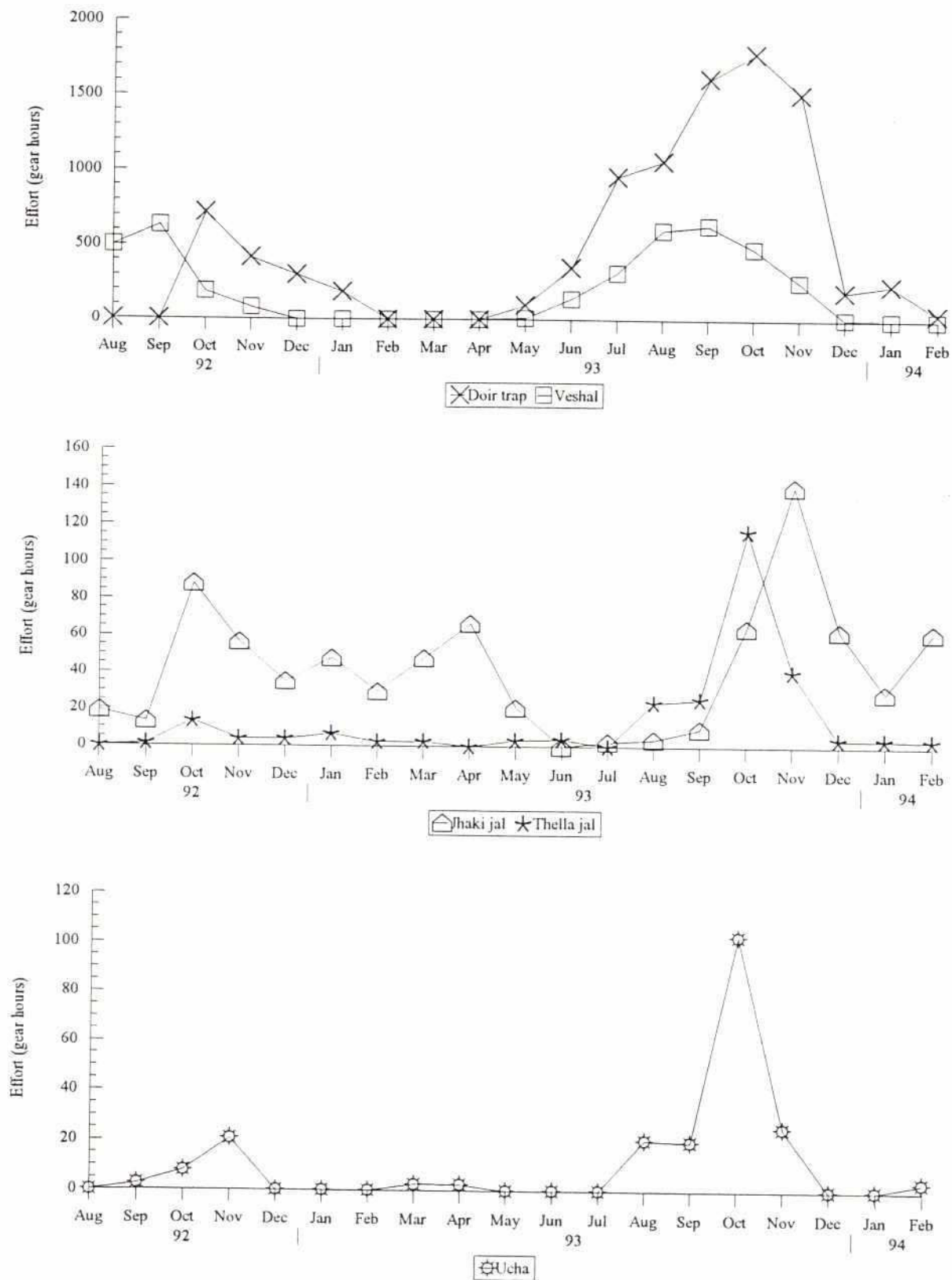
Notes: 1. Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded  
 2. No fishing observed during February 1993

Figure 6.9 Percentage of total monthly catch taken by dominant gears: sites NC22+NC26+NC30 (outside FCDI)



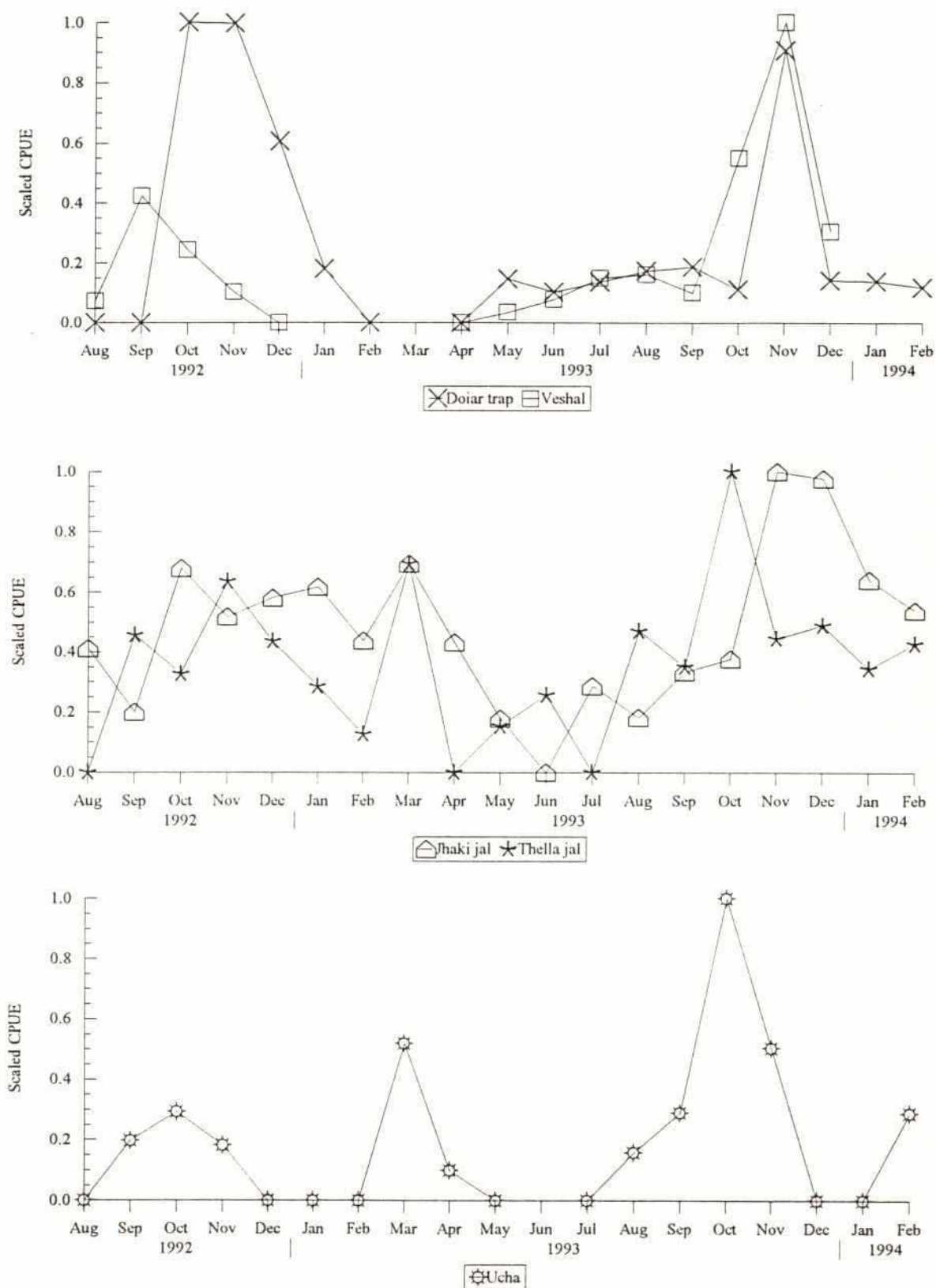
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**Figure 6.10** Total monthly fishing effort per kilometre of canals by dominant gears: sites NC22+NC26+NC30 (outside FCDI)





**Figure 6.11 Scaled CPUE of dominant gears: sites NC22+NC26+NC30 (outside FCDI)**



Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded

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fishing effort by some of these gears, *thella jal*, *ucha* and *jhaki jal* (Fig. 6.10) and by peak catch rates of all dominant gears (Fig. 6.11). Low winter catches between December 1993 and February 1994 were taken by *katha* and *jhaki jal*. The largest of the three canals, Mailagi *khal* (NC26) was sub-divided in places by small embankments to form *kua* which were fished during the winter.

### 6.3 Statistical Comparison of Catch Rates and Catches Inside and Outside the PIRDP

Statistical analyses of seasonally pooled catch rates of gears used inside and outside the PIRDP were carried out following the method described in the Draft Final Report, Appendix 3. The underlying assumption of this method is that once differences in catchabilities between gears are accounted for then any further differences in catch rates inside and outside the PIRDP are due solely to differences in fish densities.

Two separate statistical comparisons were made, one for inside and outside sites in the North West Region and the other for the inside site compared with outside sites of the North Central Region.

#### *Comparison of NW sites (inside/outside)*

At the inside site (NW08) over 88% of the total catch per kilometre for the period March 1993 to February 1994, excluding *katha*, was taken by 8 gears. At the outside site (NW16), over 88% of the total catch per kilometre over the same period was taken by 7 gears. In all 8 gears were used in the statistical analysis of catch rates, as listed in Table 6.5. Six gears appeared in both lists: *jhaki jal*, *veshal*, hand/dewatering, *thella jal*, *doiar* traps and *ber jal*. *Jhaki jal* took 25% of the catch per kilometre at the inside site, and 22% at the outside site. A total of 300 individual catch rate observations was used in this analysis. Mean monthly catch rates of dominant gears are presented in Figure 6.12.

Comparison of seasonally pooled catch rates by gear between inside and outside sites indicated that the main assumptions of the statistical analysis were reasonably satisfied, and there was generally good agreement between observed and predicated catch rates. With the exception of *thella jal* in season 4, all other discrepancies between observed and predicted catch rates could be traced to isolated single catch rate observations. Repeating the statistical analysis with these single observations removed resulted in almost no change in the parameter estimates or significance levels of the various tests, so the discrepancies did not bias the results.

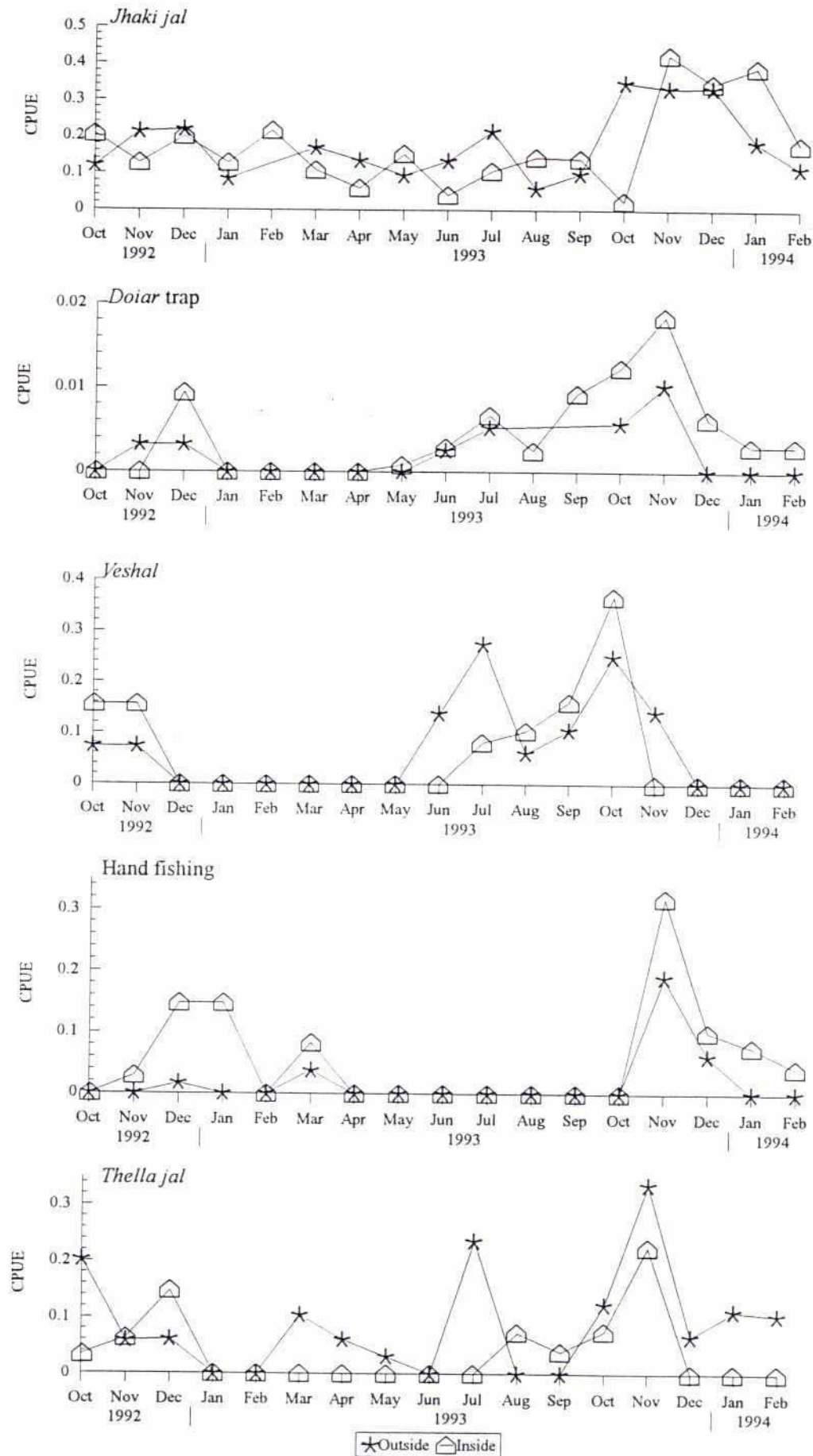
**Table 6.5 Comparison of the total catch (kg/km) by dominant gears used in canals outside and inside the PIRDP, March 1993 - February 1994**

		SEASON																	
		Mar-Apr			May-Jun			Jul-Sep			Oct-Nov			Dec-Nov					
		1			2			3			4			5					TOTAL
GEAR	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	
OUTSIDE	<i>Jhaki jal</i>	15.3	13.4		10.2	12.8		4.0	4.0		97.0	101.7		29.9	33.1		156.4	164.8	
	<i>Veshal</i>	0.0	0.0		4.5	4.5		73.2	61.2		50.5	66.1		0.0	0.0		128.2	131.8	
	Hand fishing	4.6	8.0		0.0	0.0		0.0	0.0		86.1	97.0		2.2	2.7		92.9	107.7	
	<i>Thella jal</i>	10.2	10.2		0.7	0.7		6.7	2.9		56.6	31.3		4.5	4.5		78.6	49.4	
	<i>Doiar trap</i>	0.0	0.0		0.2	0.2		10.7	12.6		33.2	44.7		0.0	0.0		44.1	57.4	
	<i>Ber jal</i>	0.0	0.0		7.9	7.5		0.0	0.0		18.7	20.7		0.0	0.0		26.6	28.2	
	<i>Moi jal</i>	1.8	1.8		0.0	0.0		55.0	55.0		66.3	66.3		2.3	2.3		125.4	125.4	
TOTAL		31.9	33.4		23.5	25.7		149.6	135.6		408.4	427.6		38.9	42.5		652.3	664.8	
STD ERR			4.2			8.6			16.1			42.7			6.1			47.1	
INSIDE	<i>Jhaki jal</i>	4.4	6.7	6.7	10.8	9.8	9.8	3.9	3.9	3.9	44.6	41.9	41.9	35.2	33.7	33.7	98.9	96.0	96.0
	<i>Veshal</i>	0.0	0.0	0.0	0.0	0.0	0.0	30.7	35.8	35.8	29.6	22.2	22.2	0.0	0.0	0.0	60.3	58.0	58.0
	Hand fishing	1.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	16.1	10.8	10.8	3.9	3.7	3.7	21.0	15.3	15.3
	<i>Thella jal</i>	0.0	0.0	0.0	0.0	0.0	0.0	1.2	2.1	2.1	18.8	27.5	27.5	0.0	0.0		20.0	29.7	29.7
	<i>Doiar trap</i>	0.0	0.0	0.0	2.2	2.3	2.3	17.3	16.3	16.3	35.2	26.4	26.4	12.6	12.6	12.6	67.3	57.6	57.6
	<i>Ber jal</i>	0.0	0.0	0.0	8.9	10.9	10.9	0.0	0.0	0.0	19.6	4.5	4.5	2.2	2.2	2.2	30.7	17.6	17.5
	<i>Sip</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.3	0.5	0.5	0.5	1.8	1.8	1.8
TOTAL		5.3	7.5	7.5	21.9	22.9	22.9	53.0	58.2	58.1	165.3	134.7	134.7	54.4	52.7	52.7	300.0	275.9	275.9
STD ERR			1.2	1.2		11.9	11.9		6.3	6.3		12.8	12.8		11.5			21.9	19.9

Note: Obs = observed; Pred = predicted



Figure 6.12 Comparison of mean catch rates (kg/hr) of dominant gears from canals inside and outside the PIRDP, October 1992 - February 1994



None of the parameter estimates measuring the seasonal differences in underlying density of fish at the inside and outside sites was significantly different from zero. Taken together, no significant difference was found in fish densities at inside and outside sites ( $p > 0.6$ ).

Total annual catches per kilometre by the 8 gears were very much higher outside the PIRDP than inside it (Table 6.5). However, given the lack of significant differences in fish densities between inside and outside sites detected by the statistical analysis, this was due solely to higher levels of fishing effort expended at the outside site. Estimates of standardised effort per kilometre, summed across all 8 gears and seasons, were derived from the statistical analysis. For the inside site, the total standardised effort (measured in *jhaki jal* hours per kilometre) was 1339, compared with 2920 for the outside sites. Observed and predicated catches per kilometre are shown in Table 6.5.

#### *Comparison of North West (inside)/North Central (outside)*

At the outside sites, over 82% of the total annual catch per kilometre was taken by 6 gears. In all, 8 gears were used in the statistical analysis of catch rates, as listed in Table 6.6. Five gears appeared in both lists: *veshal*, *jhaki jal*, *doiar* traps, *thella jal* and hand/dewatering. *Jhaki jal* took 25% of the catch per kilometre at the inside site and 10% at the outside sites, while *veshal* took 14% of the catch per kilometre at the inside site and 47% at the outside sites. A total of 558 individual catch rate observations was used in this analysis. Mean monthly catch rates of dominant gears are presented in Figure 6.13.

Comparison of seasonally pooled catch rates by gear between inside and outside sites indicated that the main assumptions of statistical analysis were reasonably satisfied. There was generally good agreement between observed and predicated catch rates, except for *doiar* traps in seasons 3 and 4 at the inside site, and for *thella jal* in season 4 at the inside site, where there were considerable discrepancies. Only a single catch rate observation was available for *thella jal* in season 4. Repeating the statistical analysis with this single observation removed resulted in almost no change in the parameter estimates or significance levels of the various tests, so the discrepancy did not bias the results. Similarly, only small numbers of catch rate observations were available for *doiar* traps in seasons 3 and 4 at the inside site.

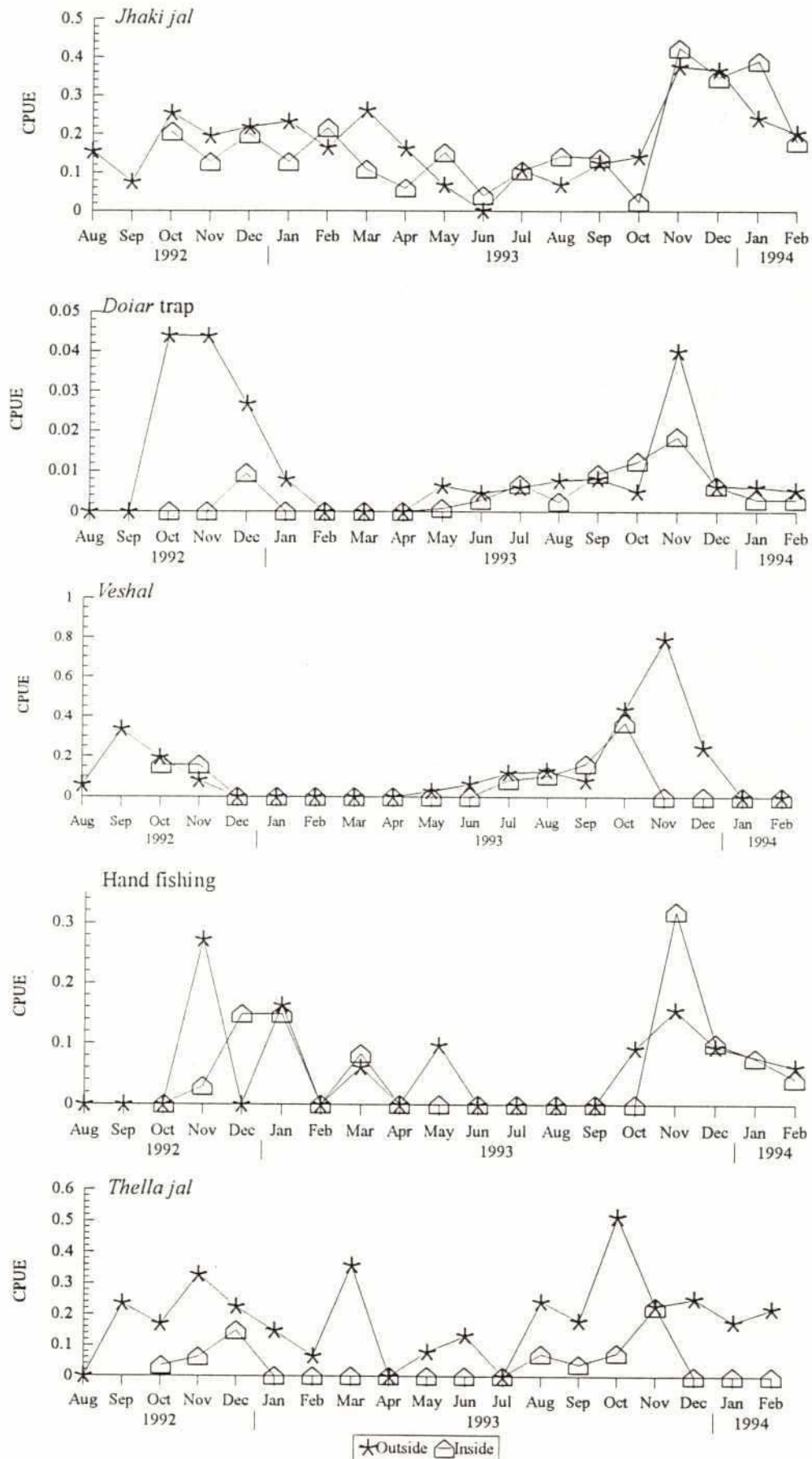
Table 6.6 Comparison of the total catch (kg/km) by dominant gears used in canals inside the PIRDP and in the North Central Region, March 1993 -February 1994

		SEASON																	
		Mar-Apr			May-June			July-Sept			Oct-Nov			Dec-Feb					
		1			2			3			4			5					
		Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out			
NCR	GEAR																		
	<i>Jhaki jal</i>	23.0	19.9		1.4	2.6		1.9	2.0		56.6	60.1		42.5	43.8		125.3	128.4	
	<i>Veshal</i>	0.0	0.0		8.9	8.9		171.9	173.8		420.8	393.3		2.0	2.0		603.6	578.0	
	<i>Doiar trap</i>	0.0	0.0		2.0	1.8		27.8	26.4		83.1	72.8		2.9	2.5		115.9	103.6	
	<i>Thella jal</i>	0.9	0.9		0.7	0.7		11.2	10.1		67.1	55.6		2.4	2.4		82.2	69.7	
TOTAL	Hand fishing	0.2	0.2		0.2	0.2		0.0	0.0		57.8	61.5		3.1	2.9		61.3	64.8	
	<i>Ucha</i>	1.1	1.1		0.0	0.0		5.4	5.4		72.9	72.9		0.6	0.6		80.0	80.0	
		25.2	22.2		13.2	14.2		218.1	217.6		758.3	716.3		53.5	54.2		1068.3	1024.5	
	STD ERR		3.6			2.0			15.0			55.2			6.9			57.8	
	PIRDP	<i>Jhaki jal</i>	4.4	8.8	8.8	10.8	9.2	9.2	3.9	3.6	3.6	44.6	34.3	34.3	35.2	33.2	33.2	98.9	89.1
<i>Veshal</i>		0.0	0.0	0.0	0.0	0.0	0.0	30.7	29.2	29.2	29.6	42.5	42.5	0.0	0.0	0.0	60.3	71.7	71.7
<i>Doiar trap</i>		0.0	0.0	0.0	2.2	3.9	3.9	17.3	19.3	19.3	35.2	58.2	58.2	12.6	14.1	14.1	67.3	95.6	95.6
<i>Thella jal</i>		0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.3	4.3	18.8	60.6	60.6	0.0	0.0	0.0	20.0	64.9	64.9
Hand fishing		1.0	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	16.1	7.7	7.7	3.9	4.2	4.2	21.0	12.8	12.8
TOTAL	<i>Ber jal</i>	0.0	0.0	0.0	8.9	8.9	8.9	0.0	0.0	0.0	19.6	19.6	19.6	2.2	2.2	2.2	30.7	30.7	30.7
	<i>Akra</i>	3.7	3.7	3.7	0.0	0.0	0.0	0.0	0.0	0.0	14.0	14.0	14.0	3.4	3.4	3.4	21.0	21.0	21.0
		9.0	13.3	13.3	21.9	22.0	22.0	53.0	56.5	56.5	178.0	236.8	236.8	57.4	57.1	112.3	319.2	385.8	385.8
	STD ERR		0.2	0.4		22.9	22.9		4.3	4.3		79.4	79.4		11.7	12.0		83.6	83.6

Note: Obs = observed; Pred = predicted



Figure 6.13 Comparison of mean catch rates (kg/hr) of dominant gears from canals inside the PIRDP and in the North Central Region, August 1992 - February 1994



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Parameter estimates measuring the seasonal differences in underlying density of fish at the inside and outside sites indicated slightly lower densities at the inside site in seasons 1, 3, 4 and 5, and slightly higher density at the inside site in season 2, but only the comparison for season 1 approached statistical significance at the 5% level when considered individually. Taken together, no significant difference was found in fish densities at inside and outside sites ( $p > 0.05$ ).

Total annual catches per kilometre by the 8 gears were very much higher at the outside sites than at the inside site (see Table 6.6). However, given the lack of significant differences in fish density between inside and outside sites detected by the statistical analysis, this was due solely to higher levels of fishing effort expended at the outside sites. Estimates of standardised effort per kilometre, summed across all 8 gears and seasons, were derived from the statistical analysis. For the inside site, the total standardised effort (measured in *jhaki jal* hours per kilometre) was 1918, compared with 4693 for the outside sites. Observed and predicted catches per kilometre are shown in Table 6.6.

#### 6.4 Biodiversity and Catch Composition

##### 6.4.1 Species richness

A total of 56 species of fish was recorded from Santia *khal* inside the PIRDP between March 1993 and February 1994. This was 11% fewer than that found in Potajia *khal* (63 species) immediately outside the scheme (Table 6.7). In the North Central Region, two of three sampled *khals* supported slightly lower numbers of species than Santia *khal* while one, Mailagi *khal* supported substantially more.

Seasonal variation in species diversity followed broadly similar patterns in North West Region sites inside and outside the PIRDP but with some important differences at critical times of the year (Fig. 6.14). Species numbers were generally lowest between January and April inside the scheme but rose slightly earlier, in April, at the outside site. A substantial increase in species number was recorded in May inside the PIRDP when sluice gates were open and rainfall flooding drained from canals to rivers. Surprisingly this coincided with a decrease in species number in the unregulated canal outside the scheme. As river floodwaters entered the floodplains in June, species number rose outside the PIRDP but declined inside it coinciding with the closure of sluice gates on the regulated Kageswari River which prevented or hindered the entry of many migratory species (see Section 5.3.2). At the outside

site, species numbers remained high throughout the full flood period and early part of the drawdown between July and October, with a temporary fall in August. Inside the PIRDP, species number rose sharply in July when gates were again partially opened allowing some access to migratory fish. Numbers remained high and generally steady throughout the full flood period and drawdown until winter when they declined somewhat. In contrast, at the outside site, species number declined earlier, in November, coinciding with peak catches then remained steady until February when they declined again.

**Table 6.7** Total number of fish species recorded in canals inside and outside the PIRDP

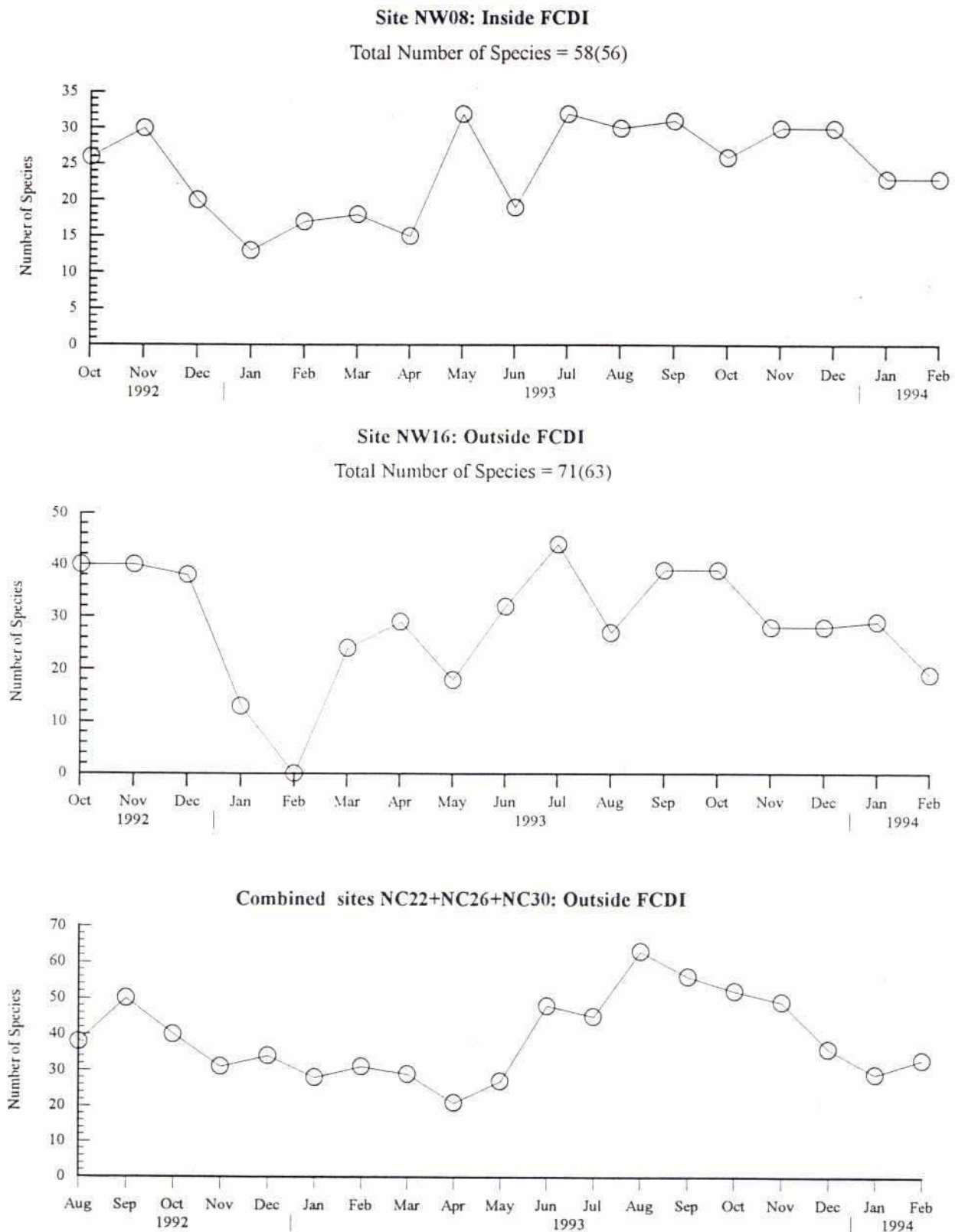
Site code	Name	Inside/ Outside FCDI	Number of species		% difference compared with annual number at NW16
			March 1993 - Feb 1994	Oct 1992 - Feb 1994	March 1993 - Feb 1994
NW08	Santia <i>khal</i>	Inside	56	58	-11
NW16	Potajia <i>khal</i>	Outside	63	71	-
NC22	Chandrakhali <i>khal</i>	Outside	58	61	-8
NC26	Mailagi <i>khal</i>	Outside	75	79	+19
NC30	Sakini <i>khal</i>	Outside	55	59	-13

Note: + and - denote increase and decrease in catches respectively

In the North Central Region, seasonal variations in species numbers followed a similar pattern in the three sampled canals, therefore data were pooled (Fig. 6.14). General trends were similar to those found in the North West Region. Lowest species diversity was observed in the winter and pre-monsoon with a slight rise in May and a more noticeable rise in June when river floodwaters entered canals. Peak species diversity was recorded during the full flood in August and declined gradually through the drawdown period of October and November followed by a more rapid decrease to low winter levels.



**Figure 6.14 Seasonal variation in the number of fish species recorded from canals inside and outside the PIRDP**



Notes: 1. Annual total number of species recorded between March 1993 and February 1994 given in parentheses  
2. No. fishing was observed in February 1993 at site NW16

#### 6.4.2 Catch composition

Detailed monthly catch compositions comprising all species recorded at each site are given in Appendix 4, A-F. In all tables, species are divided into three categories based on habitat preference: a) riverine b) migratory and c) floodplain resident (see Section 5.3.2 for definitions). Percentage contributions of the above categories to the total annual catch at each site are presented in Table 6.8.

**Table 6.8 Percentage contributions of riverine, migratory and floodplain resident fish to annual canal catches inside and outside the PIRDP, March 1993 - February 1994**

Name	Site code	Inside/ Outside FCDI	% Total annual catch		
			Riverine	Migratory	Floodplain resident
<i>Santia khal</i>	NW08	Inside	<0.1	8.7	81.1
<i>Potajia khal</i>	NW16	Outside	1.5	13.2	67.1
<i>Chandrakhali khal</i>	NC22	Outside	1.7	8.4	83.3
<i>Mailagi khal</i>	NC26	Outside	0.7	14.9	72.5
<i>Sakini khal</i>	NC30	Outside	0.3	11.5	78.8
Average NCR		Outside	0.9	11.6	78.2

Floodplain resident species dominated canal catches both inside and outside the PIRDP. This was also found in regulated and unregulated canals of the South West Region of Bangladesh (FAP 17 Draft Final Report, Supporting Volume No. 3). However, the degree to which these species dominated catches differed between sites inside and outside the PIRDP in the North West Region. In *Santia khal* inside the PIRDP, floodplain species formed 81% of the total annual catch whereas in *Potajia khal* outside the scheme, they formed only 67%. In the North Central Region, floodplain resident species comprised between 73% and 83% of the catch. Riverine and migratory species contributed less inside the scheme (9%) than outside (15%) in the North West Region. Examination of catches of each category of fish inside and outside the PIRDP revealed a 71% decrease in the catch of riverine and migratory species inside the scheme compared and a 41% decrease in the catch of floodplain resident fish. This

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differential impact on different groups of fish was also seen in terms of species diversity where there was a proportionately greater reduction in the numbers of riverine and migratory species (21 %) inside the scheme compared with floodplain resident species (5 %) (Table 6.9).

**Table 6.9 Total annual number of fish species, classified by habitat preference, recorded from canals inside and outside the PIRDP, March 1993 - February 1994**

Canal name	Site code	Inside/ Outside FCDI	Number of species			Total	% change in number of riverine + migratory compared with NW16
			Riverine	Migratory	Floodplain resident		
Santia <i>khal</i>	NW08	Inside	8	11	37	56	-21
Potajia <i>khal</i>	NW16	Outside	10	14	39	63	
Chandrakhali <i>khal</i>	NC22	Outside	9	10	39	58	-21
Mailagi <i>khal</i>	NC26	Outside	12	18	45	75	+25
Sakini <i>khal</i>	NC30	Outside	5	13	37	55	-25
Average NCR		Outside	9	14	40	63	

Note: + and - denote increase and decrease in species numbers respectively

Percentage contributions made to the total annual catch by dominant species are presented in Table 6.10. All riverine species found in canals inside and outside the PIRDP were uncommon and individually comprised less than 1% of annual catches. Three dominant migratory species were found in the canal inside the PIRDP, two of which were the major carps, *catla* and *rui* which were stocked in a leased section of the canal. The third species was the clupeid, *chapila* which was also found to be relatively abundant in the adjacent Ichamati River. In Potajia *khal*, outside the scheme, there were only two dominant migratory species, *rui* and *boal*. Of the two, *boal* was considerably more abundant (6.6% of annual catch) particularly in the *katha* catches of February 1994 when it made up 60% of the total monthly catch. Inside the scheme it comprised only 0.6% of the annual catch suggesting serious hindrance to migrations of adults from river to canals and floodplains probably in June when sluice gates were closed for some time on the connecting Kageswari River. The scarcity of *chapila* in the outside canal, while relatively common inside, can be linked to its general scarcity in the unregulated Karatoya River which connected with the sampled stretch of canal. In the North Central Region, dominant migratory species included four large carps,



Table 6.10 Percentage contribution (by weight) to the total annual canal catch by dominant species inside and outside the PIRDP, March 1993 – February 1994

Habitat Preference	Species name		North West Region		North Central Region		
			Inside FCDI NW08	Outside FCDI NW16	Outside FCDI		
					NC22	NC26	NC30
Migratory	<i>Catla catla</i>	<i>Catla</i>	1.0			2.8	3.2
	<i>Cirrhinus mrigala</i>	<i>Mrigel</i>			2.1	1.0	
	<i>Cirrhinus reba</i>	<i>Raik</i>				1.0	1.3
	<i>Labeo rohita</i>	<i>Rui</i>	3.3	2.1	3.3	5.4	4.0
	<i>Gudusia chapra</i>	<i>Chapila</i>	2.3				
	<i>Pseudeutropius atherinoides</i>	<i>Batasi</i>				1.6	
	<i>Wallagu attu</i>	<i>Boal</i>		6.6			
Subtotal			6.6	8.7	5.4	11.8	8.5
Floodplain	<i>Anabas testudineus</i>	<i>Koi</i>				1.8	2.6
Resident	<i>Mystus tengara</i>	<i>Bajari tengra</i>			4.3	1.1	
	<i>Mystus vittatus</i>	<i>Tengra</i>	1.8	4.8	6.5	1.7	4.2
	<i>Colisa fasciatus</i>	<i>Khalisha</i>	2.9	2.5	1.5	3.5	7.1
	<i>Colisa lalia</i>	<i>Lal khalisha</i>				1.1	
	<i>Colisa sota</i>	<i>Khalisha</i>	1.5				
	<i>Xenentodon cancila</i>	<i>Kaikka</i>		2.0	5.7	2.4	2.8
	<i>Cyprinus carpio</i>	<i>Karfu</i>		1.3		1.8	
	<i>Puntius conchoni</i>	<i>Canchan puti</i>	2.4	4.8	7.1	2.2	2.0
	<i>Puntius sophore</i>	<i>Puti</i>	22.0	19.0	23.4	19.6	19.5
	<i>Puntius ticto</i>	<i>Tit puti</i>			2.6	3.3	1.4
	<i>Danio devario</i>	<i>Chebli</i>					1.1
	<i>Esomus danricus</i>	<i>Darkina</i>	3.6				2.3
	<i>Glossogobius giurus</i>	<i>Bailla</i>	7.3	7.8	3.0	2.7	3.8
	<i>Lepidocephalus guntea</i>	<i>Gutum</i>	1.2	2.5	2.5	2.4	2.9
	<i>Channa marulius</i>	<i>Gajar</i>	1.5			1.8	
	<i>Channa orientalis</i>	<i>Cheng</i>	1.2				
	<i>Channa punctatus</i>	<i>Taki</i>	15.5	5.7	9.9	10.4	14.5
	<i>Channa striatus</i>	<i>Shol</i>			1.8	3.6	3.2
	<i>Heteropneustes fossilis</i>	<i>Shingi</i>	1.4			1.4	1.5
	<i>Macrognathus aculeatus</i>	<i>Tara baim</i>	5.1	1.4	2.4		
	<i>Macrognathus pancalus</i>	<i>Guchi</i>	3.5	5.1	4.8	3.0	2.3
	<i>Mastacembelus armatus</i>	<i>Baral baim</i>		1.9	1.8	1.1	1.5
	<i>Chanda nama</i>	<i>Nama chanda</i>	2.0	1.5			
	<i>Chanda ranga</i>	<i>Lal chanda</i>	3.4	1.6		1.3	
Subtotal			76.3	61.9	77.3	66.2	72.7
Other	Prawn spp.	<i>Chingri/Icha</i>	10.1	18.1	6.3	11.9	9.5
Subtotal			10.1	18.1	6.3	11.9	9.5
Grand total			93.0	88.7	89.0	89.9	90.7

- Notes: 1. Dominant species are defined as those species which comprised 1% or more of the total annual catch  
2. Shaded values highlight the most abundant species (>4%)  
3. See text for definitions of habitat preference categories (Section 5.3.2)

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*ru*, *catla*, *mrigel* and *raik* and one small catfish, *batasi*. The carps were relatively more abundant in canals of this region, (5-10% annual catch) than in the North West Region (2%). This was also found to be true of riverine catches of major carps and can be explained by the greater recruitment of carp hatchlings and fry resulting from their downstream drift in numerous distributaries of the Jamuna River which flow through the region. In the North West Region, the Brahmaputra Right Embankment (BRE) prevents such recruitment by passive drift. The consequences of this blockage to passive drift of hatchlings can be seen more clearly when the catch per unit area of these species are compared (Table 6.11). The same order of abundance between species was found in all canals, *ru* followed by *catla* then *mrigel* and *kalbaus*. When taken together, the catch of all four species of major carp was five-fold higher than that inside the PIRDP and 2.5 times higher than in Potajia *khal* outside it. These results provide the first quantitative indication of the benefits that might be gained by the introduction of mitigation measures to increase recruitment of carp hatchlings through the BRE and the PIRDP.

**Table 6.11 Annual catch per unit area (kg/ha) of major carps from canals inside and outside the PIRDP, March 1993 - February 1994**

Site	Inside/ Outside FCDI	<i>Catla</i>	<i>Mrigel</i>	<i>Kalbaus</i>	<i>Rui</i>	Total
NW08	Inside	1.92	1.08	0	6.08	9.08
NW16	Outside	3.76	1.48	1.80	10.84	17.88
NC combined sites NC22 + 26 + 30	Outside	13.29	5.72	1.18	25.75	45.94

At sites inside and outside the PIRDP, about 80% of annual catches were provided by about 15 to 20 fish species, most of which were floodplain residents. Of these, the most important species was *puti* (*Puntius sophore*) whose relative abundance was similar inside and outside sites the scheme, ranging from 19% to 23% of annual catches. Another important species whose relative abundance was the same at inside and outside sites in the North West Region, was *bailla* forming 7% of catch. This species was, however relatively less abundant in the North Central Region where it comprised 3-4% of catches. Important species which were relatively more abundant inside the scheme than outside included *taki*, *tara baim* and *darkina*



while *canchan puti* and *tengra* were relatively more common at the outside site in the North West Region.

Prawns were important at all sites but were relatively more abundant outside the scheme in the North West Region where they comprised 18% of the annual catch compared with 10% inside it and during the monsoon season comprised 25% to 60% of monthly catches. In the North Central Region, prawns formed 6-12% of annual canal catches.



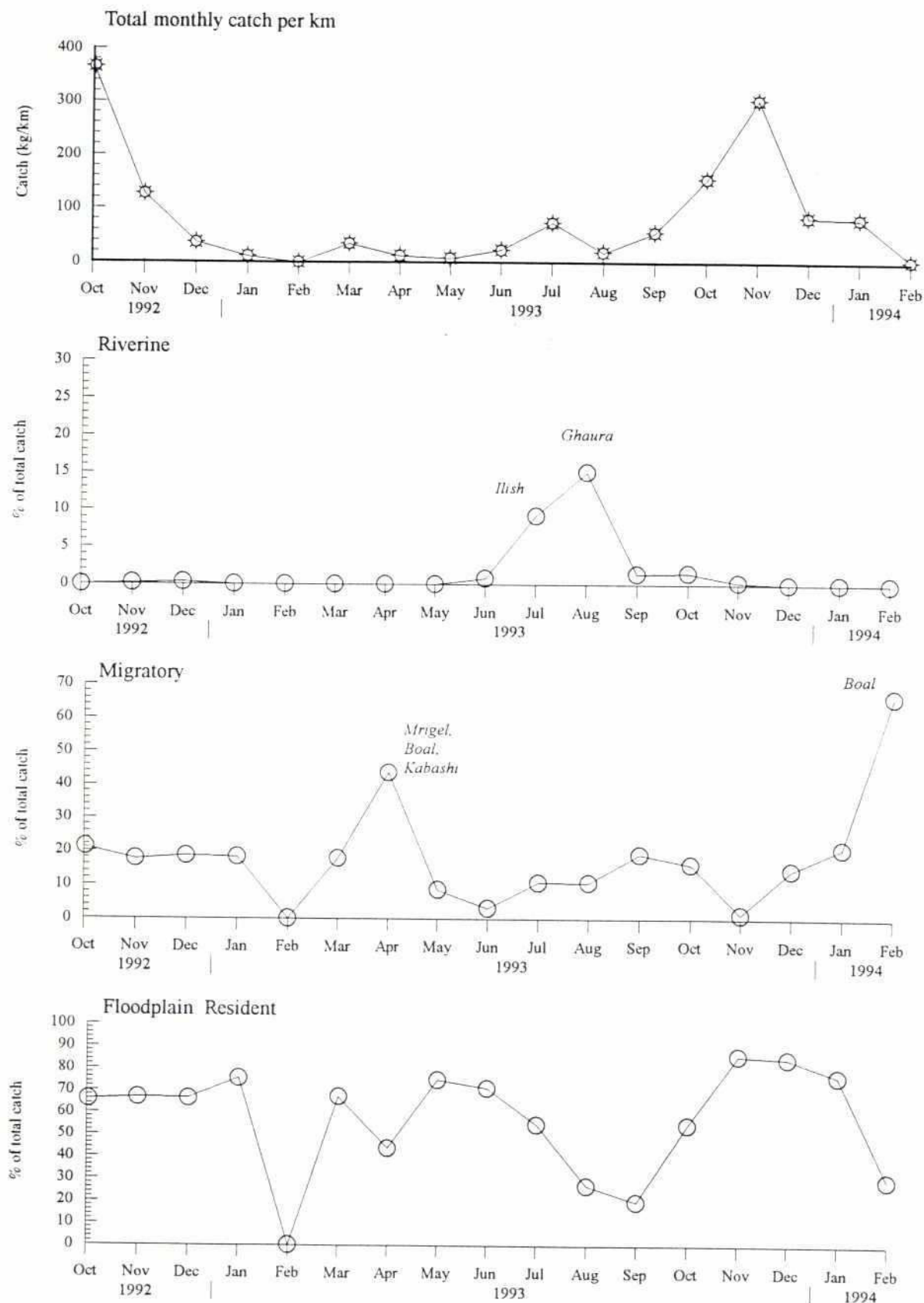
### 6.5 Fish Migrations

To examine more closely seasonal movements of fish through canals inside and outside the PIRDP in the North West Region, monthly percentage catch compositions and species numbers were calculated separately for riverine, migratory and floodplain resident species (Figs 6-15-6.17). In Potajia *khal*, riverine species first occurred in catches in June during the latter part of which river waters also entered canals. In July and August they made important contributions to the total catch, especially *ilish* in July and *ghaura* in August (Fig. 6.15). Total numbers of riverine species increased sharply in June and July and remained high during the drawdown in October but decreased markedly in November indicating an emigration from the system. The relative abundance and diversity of migratory species peaked temporarily in April 1993 when *mrigel*, *boal* and *kabashi* predominated. It seems likely that this peak was related to the capture of overwintering fish, especially in the case of *mrigel*, rather than the result of an influx migrant fish following rainfall runoff. Surprisingly, no further peak in relative abundance occurred despite sharp increases in the number of migratory species appearing in June and July. The sudden appearance of many of these species on the adjacent *beel* and floodplains (see Section 7.5) indicates that they probably moved rapidly from rivers through the canal in June and July without making a significant contribution to the canal catch. The rapid decline in species number in November indicated that many migratory fish moved out of the canal together with riverine species during the flood drawdown whilst many floodplain resident species remained behind.

Inside the PIRDP, riverine species made a negligible contribution to monthly catches (Fig. 6.16) and the number of species recorded each month was always very low. A peak of three riverine species occurred in May which coincided with the sudden appearance of eight migratory species. Since the sluice gates of the Koitala regulator on the connecting Kageswari River were open at this time to drain rainfall runoff from floodplains, migratory fish were

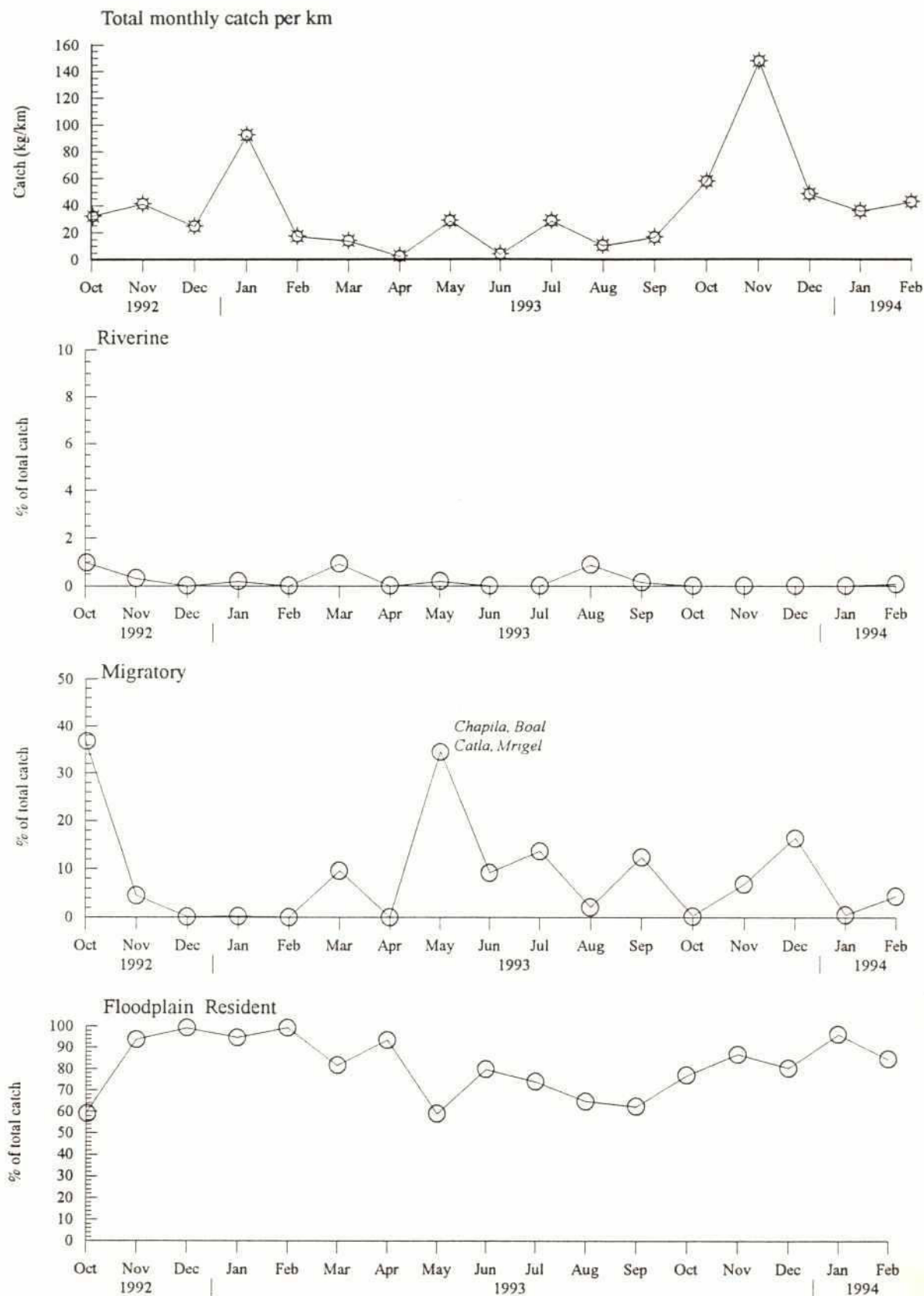


Figure 6.15 Percentage total monthly catch of riverine, migratory and floodplain resident fish from Potajia khal, (site NW16, outside FCDI)



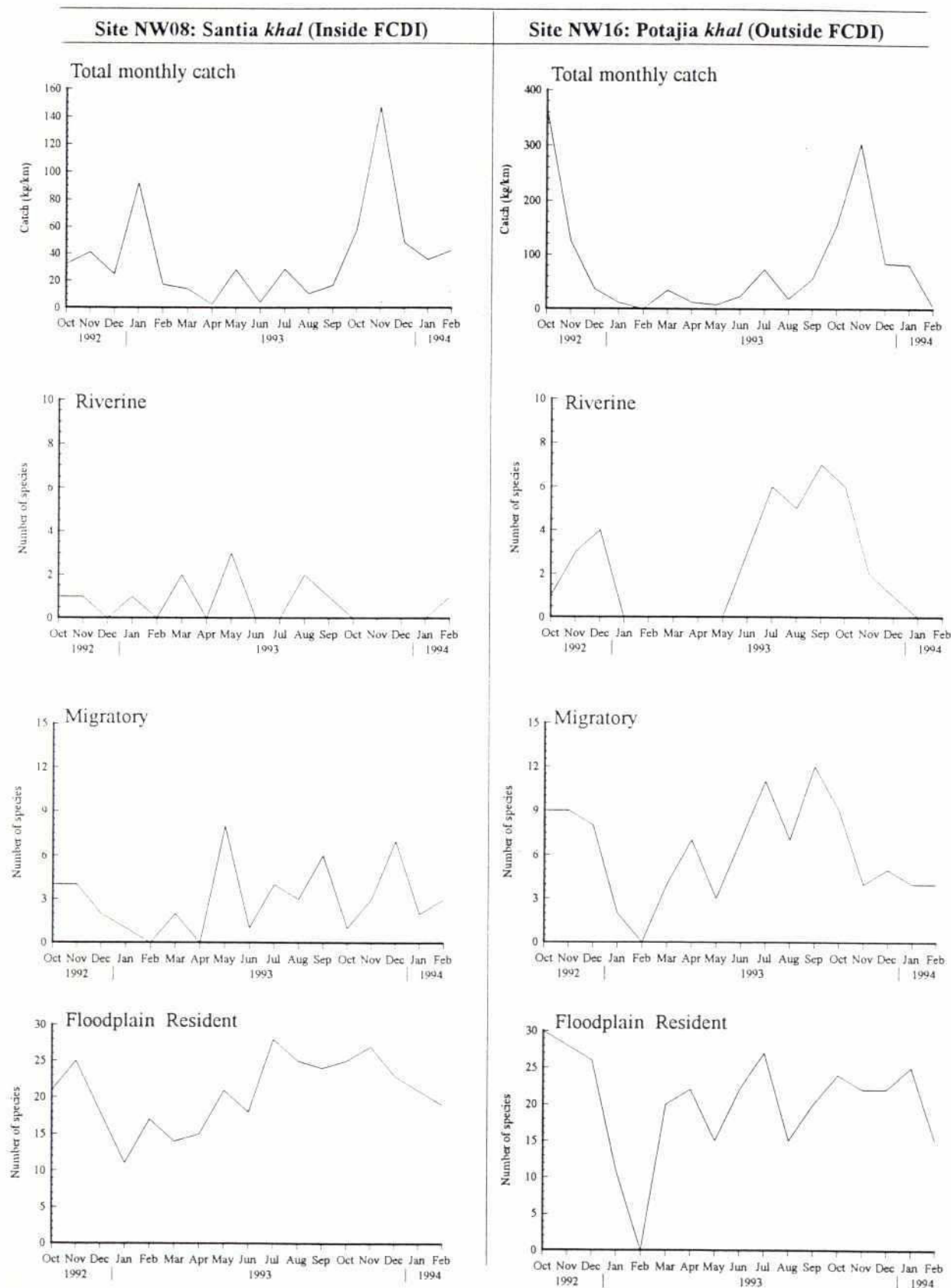
Notes: 1. See text for definition of different categories of fish based on habitat preference (Section 5.3.2)  
2. Dominant species are shown for peak relative abundances of riverine and migratory fish

**Figure 6.16** Percentage total monthly catch of riverine, migratory and floodplain resident fish from *Santia khal*, (site NW08, inside FCDI)



Notes: 1. See text for definition of different categories of fish based on habitat preference (Section 5.3.2)  
2. Dominant species are shown for peak relative abundances of riverine and migratory fish

**Figure 6.17 Seasonal variation in the number of riverine, migratory and floodplain resident fish species from canals inside and outside the PIRDP**

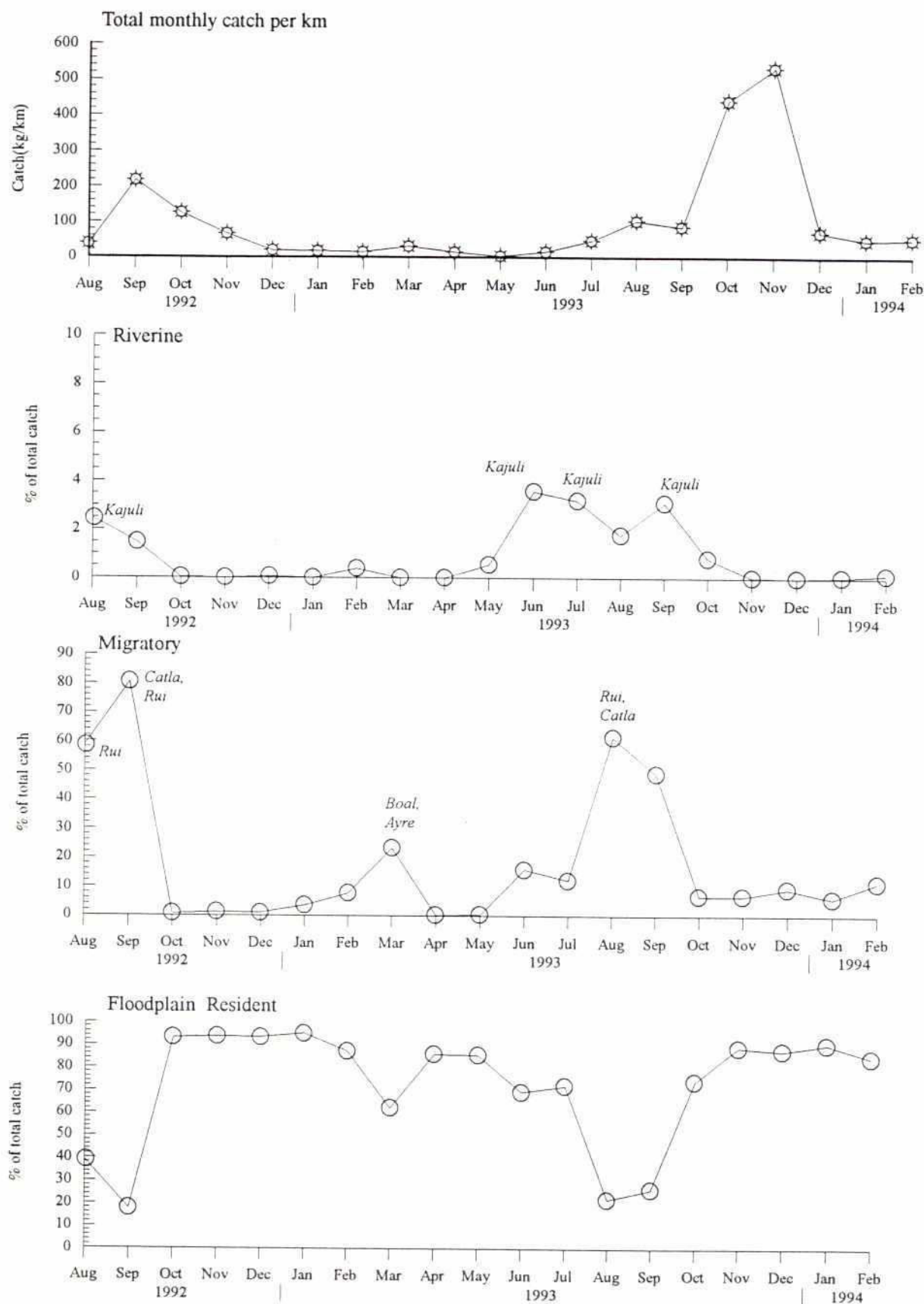




provided with an opportunity to move upstream against the current and enter the PIRDP from the Jamuna River. However, it is also possible that some species, particularly the major carps, *catla* and *mrigel*, overwintered in the canal and adjacent floodplains. Total or partial closure of the sluice gates in June and July blocked or hindered fish movements and this can be seen in a reduction in the numbers of migratory species appearing in canal catches during this time compared with those in the canal outside the PIRDP (Fig. 6.17). During the flood drawdown in October, the number of migratory species declined abruptly but unlike the unregulated Potajia *khal*, numbers again increased in December 1993. This may have been related to the opening and expansion of the winter irrigation canal system which involved increased water supply to one section of the sampling site this in turn may have been sufficient to attract fish other parts of the irrigation canal network.

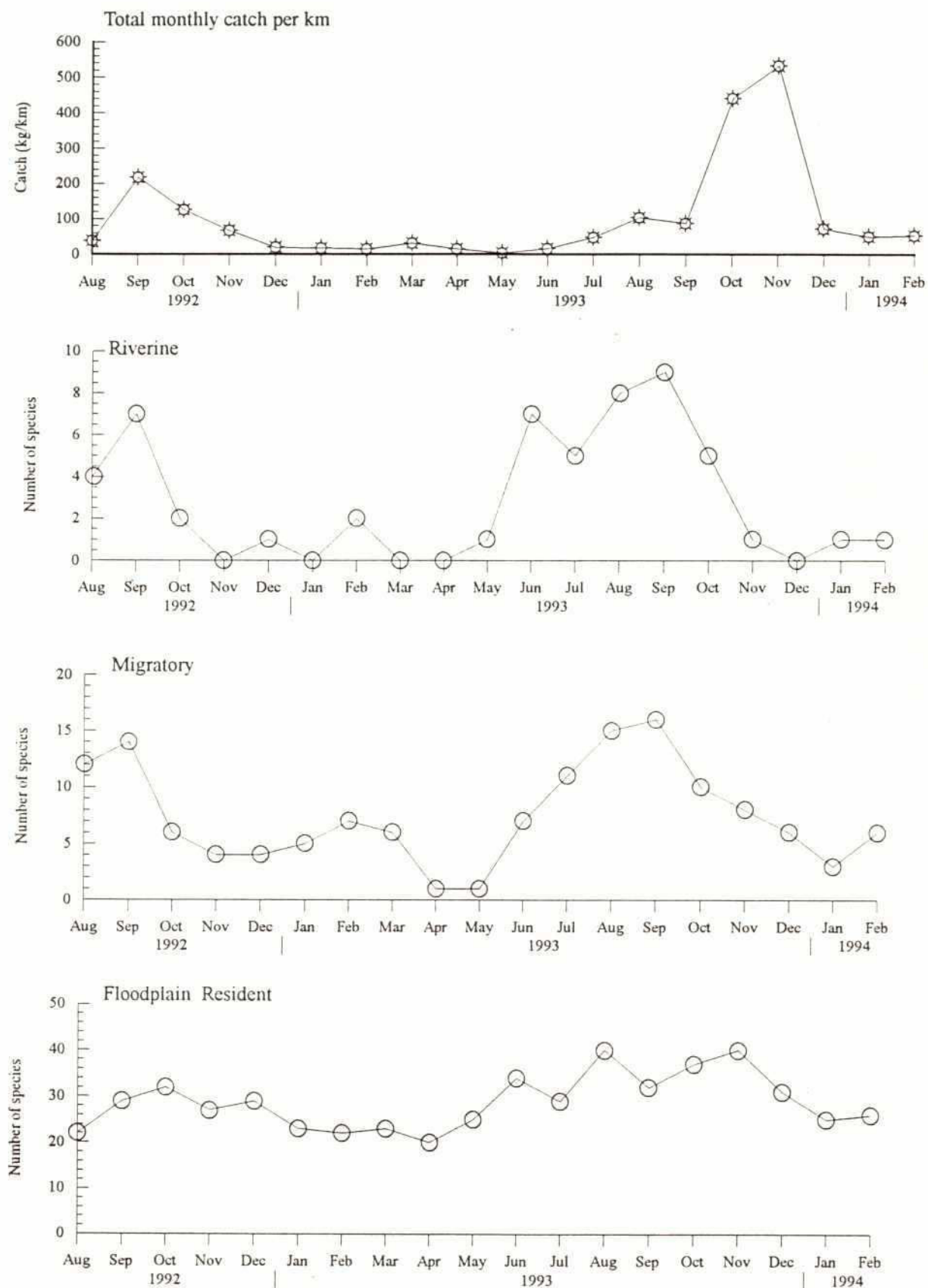
In the North Central Region, the relative abundance and diversity of riverine species increased between June and September (Figs 6.18 and 6.19). The first river floodwaters reaching the canal in mid-June brought with them most of the riverine species but these species contributed only a small part of the total monthly catches, the most important species being *kajuli*. As in the North West Region, riverine species migrated from canals during the flood drawdown in October and November. Abundance and diversity remained low throughout the winter and pre-monsoon months. The same was found for migratory species whose diversity increased progressively between June and September before decreasing again during the drawdown while a very sharp rise in relative abundance, principally of *rui* and *catla*, was recorded in August. The same pattern was seen in the previous, drier year of 1992/93.

**Figure 6.18** Percentage total monthly catch of riverine, migratory and floodplain resident fish from canals in the North Central Region



Notes: 1. See text for definition of different categories of fish based on habitat preference (Section 5.3.2)  
2. Dominant species are shown for peak relative abundances of riverine and migratory fish

**Figure 6.19 Seasonal variation in the number of riverine, migratory and floodplain resident fish species from canals in the North Central Region**



Note: See text for definition of different categories of fish based on habitat preference (Section 5.3.2)



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## 7 FLOODPLAIN FISHERIES

In the analyses of data and interpretations which follow, sites categorised as high or low elevation (see Table 2.1) are treated separately when making comparisons inside and outside the PIRDP.

### 7.1 Total Catch

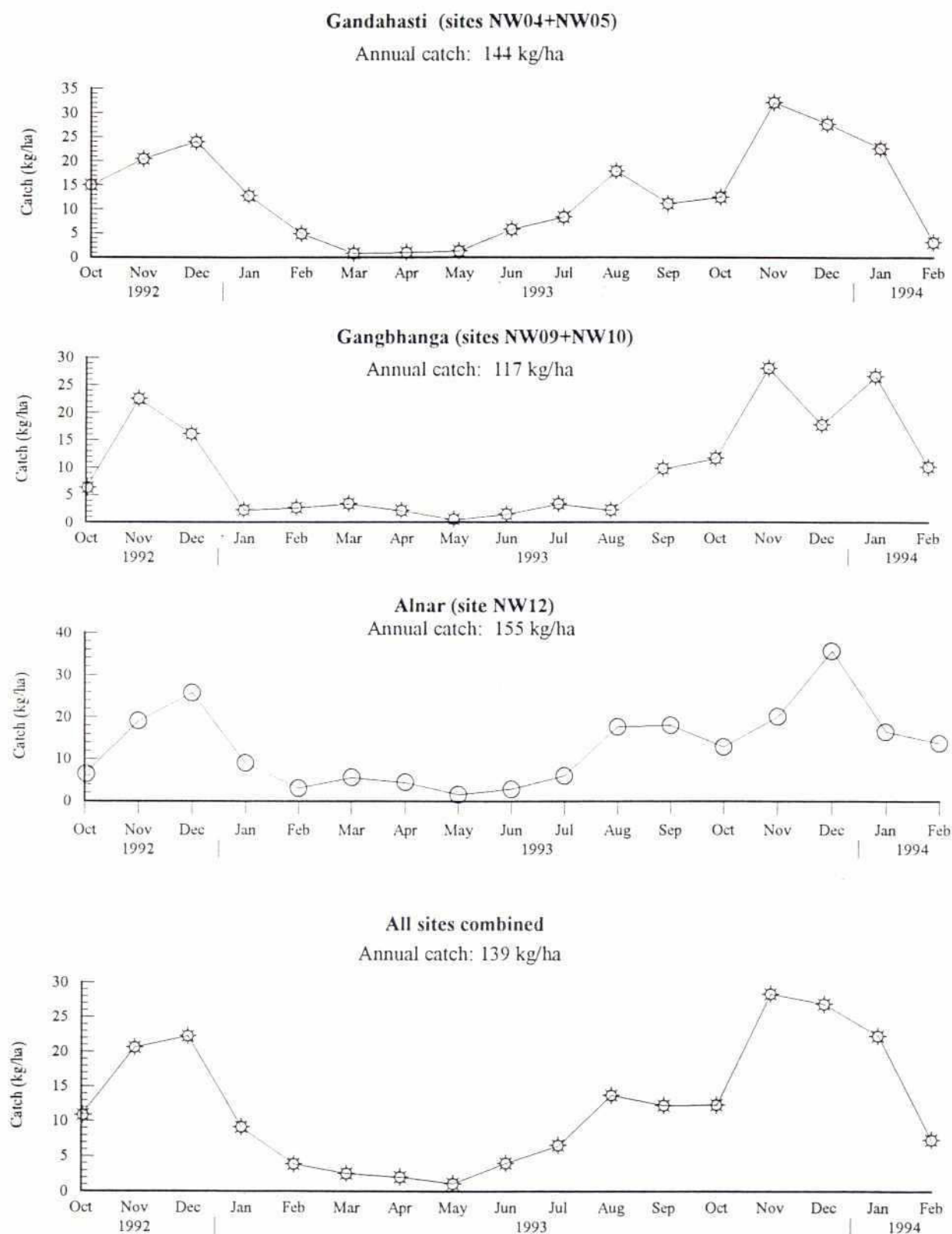
#### 7.1.1 Pattern of catch

Seasonal variations in catch per unit area (CPUA) of low elevation floodplains/beel in different drainage basins within the PIRDP were broadly similar (Fig. 7.1). Catches remained at their lowest at all sites from February to May despite pre-monsoon rainfall flooding on Gandahasti floodplain during April and May. Catches began to rise in June and July coinciding with sharp rises in flood depth and extent due to rainfall and restricted ingress of river waters through sluice gates. Catches increased more sharply in August, except at Gangbhanga (NW09+NW10) where they remained low possibly due to access restrictions in extensive areas of deepwater rice surrounding Gangbhanga beel. During the peak flood period and the start of the flood drawdown (August - October) combined catches from all sites generally remained fairly stable before rising sharply to a peak in November 1993, followed by a small but progressive decline until January with a sharper decline in February. Catches from Gandahasti (NW04+NW05) followed this general pattern fairly closely whereas other sites differed somewhat with a temporary decline noted in December at Gangbhanga whilst this was the time of peak catches at Alnar (NW12).

Similar seasonal catch trends were observed on low elevation sites outside the PIRDP at Potajia (NW17+18) but with one important difference: following a peak level in November the catch declined considerably in December and remained relatively low until February (Fig. 7.2). Thus, the contribution to the total annual catch made during winter (Dec-Feb) was substantially lower at sites outside the PIRDP (20%) compared with inside it (40%). The differences in pattern of catch were caused largely by differences in flooding pattern. The flood drawdown occurred about one month earlier at Potajia than at Alnar and Gangbhanga floodplains inside the scheme whilst drainage congestion was even more serious at Gandahasti as the Badai River disconnected with the Jamuna outside Talimnagar regulator in January 1994. As a consequence of this difference in winter catch shares, the share of the catch taken during the flood drawdown (October - November 1993) was higher outside the PIRDP (47%) than inside (29%).

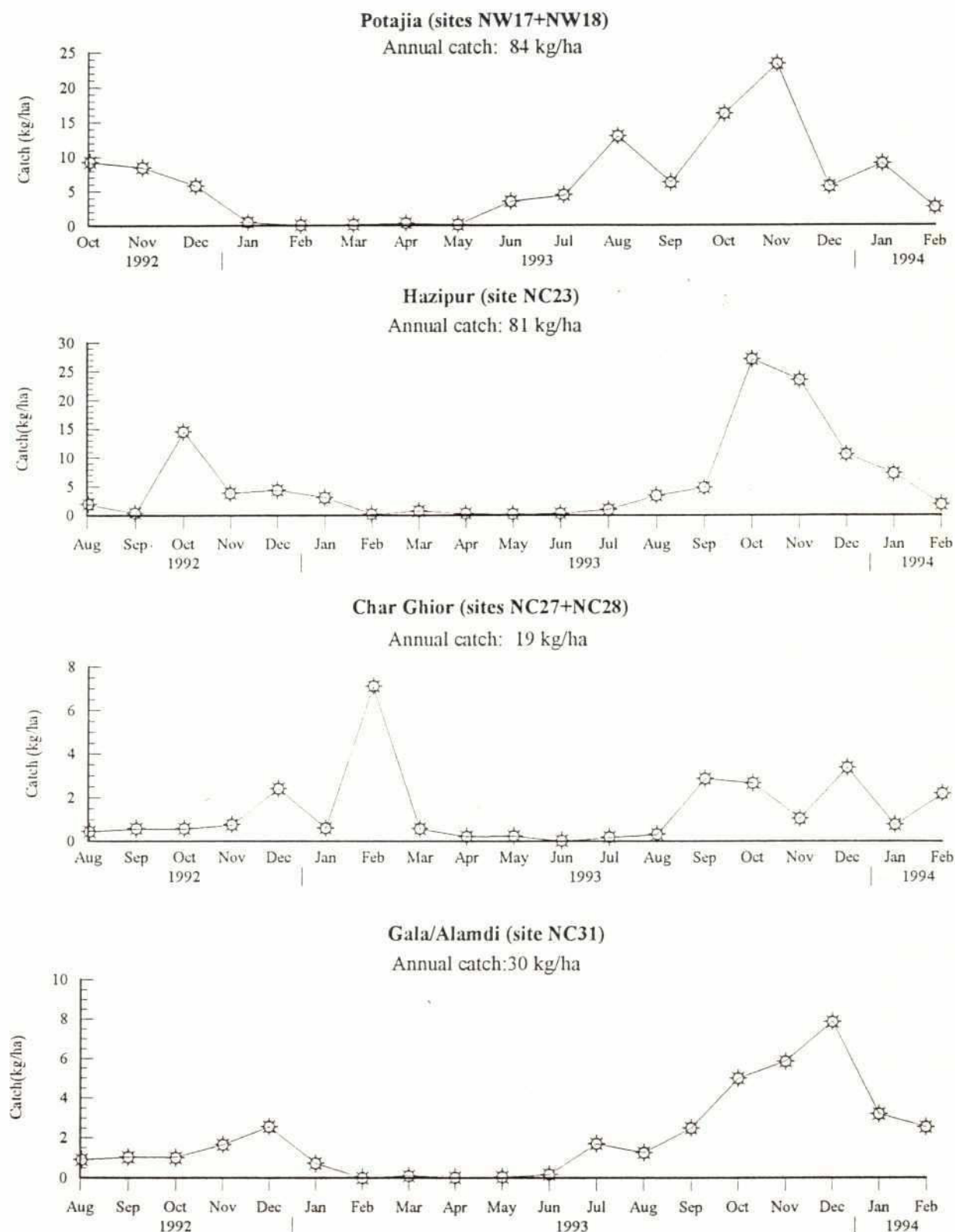


**Figure 7.1 Seasonal variation in the catch per unit area from low elevation floodplains/ beel inside the PIRDP, October 1992 - February 1994**





**Figure 7.2** Seasonal variation in the catch per unit area from low elevation floodplains/*beel* outside the PIRDP

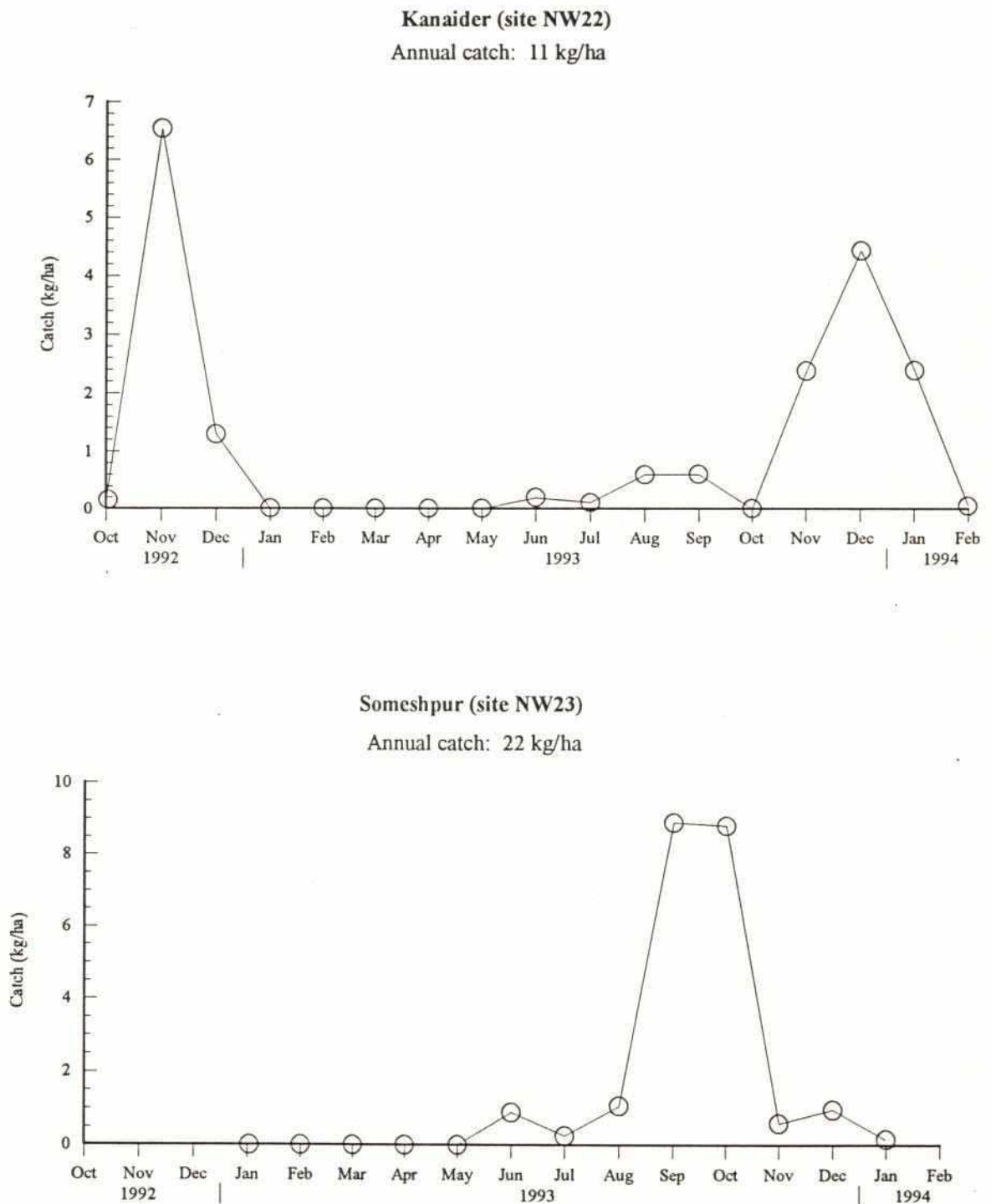


In the North Central Region, catches remained low from the pre-monsoon period until July and August. Thus, the first catch increases appeared one or two months later than in the North West Region despite the fact that flooding occurred at approximately the same time in both regions. At Hazipur (NC23), catches increased considerably during the drawdown in October then gradually declined until February 1994. In contrast, at Alamdi (NC31) catches progressively increased from August to December 1993 followed by a rapid decline in January. At both sites, *kua* equally dominated winter catches. At Char Ghior (NC27+NC28), a peak catch was recorded in February 1993 when the leased *baor*-like *beel* was fished out intensively by the leaseholder using *ber jal*. The same annual fishing operation was repeated in March 1994, outside the study period, therefore a survey period of February 1993 to January 1994 was used to provide a more accurate estimate of annual catch. No increase in catch occurred during the flood recession of 1993 when the adjacent floodplain (NC27) was flooded or in 1992 when it remained dry. From the combined annual catch from all North Central Region sites, 50% was captured during the drawdown months, October and November, and a further 33% was taken during the winter period, December to February. This pattern resembles that of the North West Region sites outside the PIRDP but with a slightly greater share of the catch taken in winter reflecting the greater abundance of *kua*.

At two high elevation sites in the PIRDP, peak catches were made just after the drawdown (November-January) at one, Kanaider *beel*, and just before and during the drawdown (September-October) at the other (Fig. 7.3). At other times of the year catches were insignificant. At high elevation sites in the North Central Region, catches generally started to rise in July reaching a peak in September or October (Fig. 7.4). One exception to this general pattern was seen at Anahula (NC08+NC09) where *ber jal* fishing both on the floodplain and *beel* resulted in a peak catch earlier in the season, in July. Catches at other times of the year (November-June) at most sites were very low. This contrasts with the pattern observed at lower elevation sites where proportionately greater catches were taken in November which reflects a more extended flood drawdown. The proportion of the combined annual catch from all sites in the North Central Region taken during winter (December-February) was 15% compared with 5% at Someshpur *beel* (NW23) and 64% at Kanaider *beel* (NW22) inside the PIRDP. The very high share of the catch from Kanaider is partly a result of an ingress of pumped tubewell irrigation water during December and January which artificially extended the period of fishing in the deepest part of the site.

With the exception of this site, patterns of catch from others reflected their higher and drier nature with less perennial water resulting in substantially lower relative winter catches

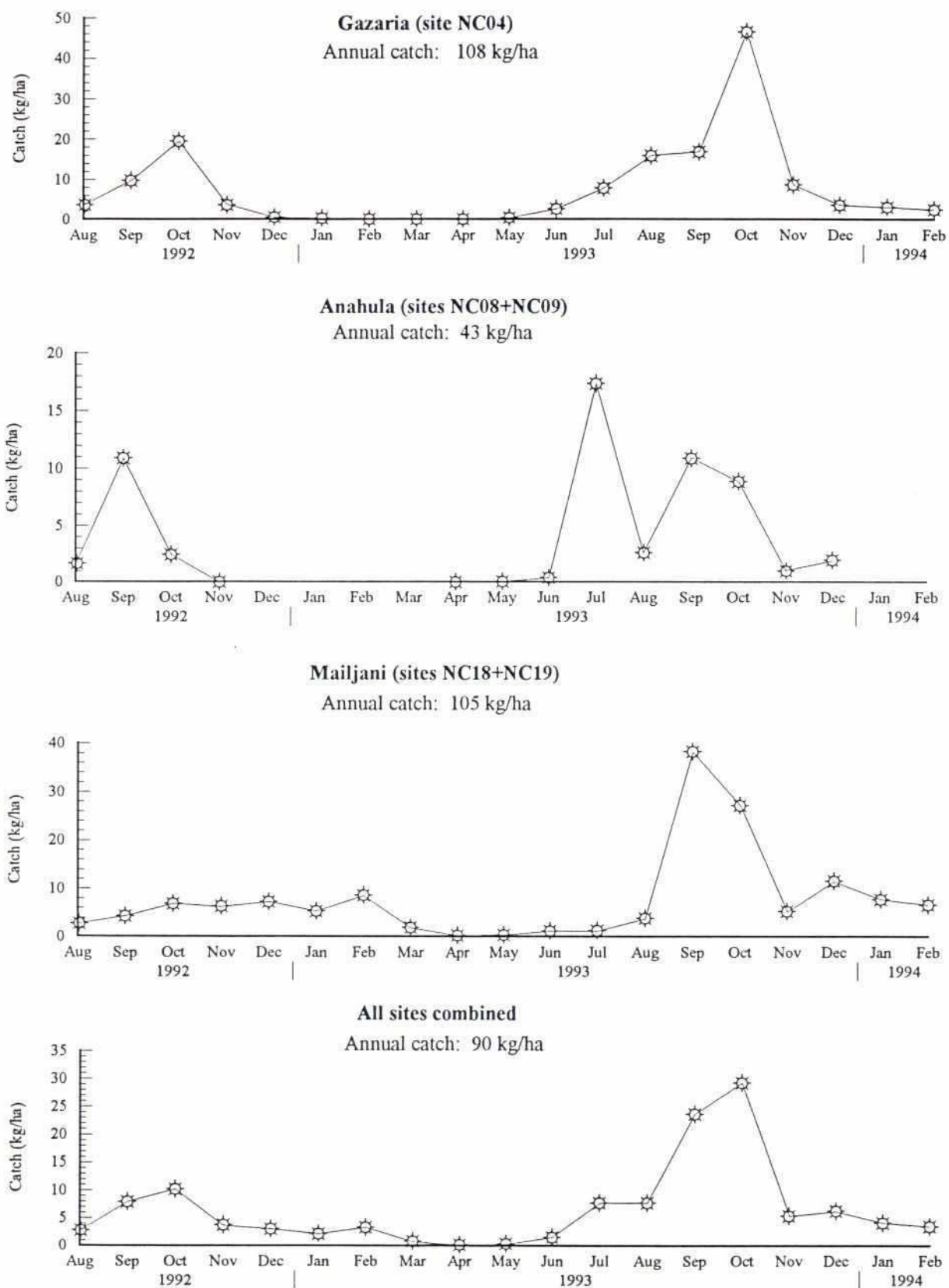
Figure 7.3 Seasonal variation in the catch per unit area from high elevation floodplains/beel inside the PIRDP, October 1992 - February 1994



Note: Catch rates not sampled at site NW23 between October 1992 and December 1992



Figure 7.4 Seasonal variation in the catch per unit area from high elevation floodplains in the North Central Region, August 1992 - February 1994



compared with those from lower elevation sites in the PIRDP and North Central Region. Similar seasonal differences in catch trends were observed in sites of different elevations in the South West Region of Bangladesh (Draft Final Report, Supporting Volume No. 3).

### 7.1.2 Size of catch

The combined annual catch from low elevation sites inside the PIRDP was considerably higher (65%) than that from North West Region sites outside it (Table 7.1). However, statistical analyses revealed that the higher catches inside the scheme were caused by higher levels of fishing effort and that fish densities (=abundance) were lower inside the PIRDP compared to those at North West Region sites outside it. More detailed discussion of differences in catch rates, fishing effort and catch per unit area is provided in Sections 7.2.2 and 7.3 together with results from statistical comparisons of sites inside and outside the PIRDP. That the flood season was extended by at least one month inside the PIRDP compared to that outside would also result in higher catches through increased growth of fish and increased opportunity to fish.

**Table 7.1 Annual catch from low elevation floodplains/beel inside and outside the PIRDP, March 1993 - February 1994**

Region	Site code	Name	Inside/Outside FCDI	Catch (kg/ha)
NW	NW04 + NW05	Gandahasti	Inside	144
	NW09 + NW10	Gangbhanga	Inside	117
	NW12	Alnar	Inside	155
		Combined sites	Inside	139
NW	NW17 + NW18	Potajia	Outside	84
NC	NC23	Hazipur	Outside	81
	NC27 + NC28 <sup>1</sup>	Char Ghior	Outside	19
	NC31	Gala/Alamdi	Outside	30
		Combined sites	Outside	42

Note: At site NC28, an annual "fish-out" by leaseholders occurred in February 1993 and March 1994 outside the study period. Therefore a survey period of February 1993 to January 1994 was used to obtain a more accurate estimate of annual catch.

Within the PIRDP, values of CPUA varied between sites with the lowest value observed at Gangbhanga (117 kg/ha) and the highest at Alnar floodplain/*beel* (155 kg/ha). The CPUA at Gandahasti (144 kg/ha) was slightly lower than at Alnar than despite the longer flood season due to drainage congestion. The lower catch from Gangbhanga could be explained by reduced fishing effort which was related to differences in fishing access to floodplains. At Gangbhanga (NW09) a considerably greater proportion of the sampled floodplain was used for the production of deepwater rice and within these rice fields, gears such as *ber jal* which could damage the crop, were prohibited by farmers. Only those gears which did not damage the crop e.g. *daun* or gears which could be set along the boundaries of flooded fields e.g. *current jal* and *doiar* traps provided most of the annual floodplain catch from Gangbhanga floodplain and levels of fishing effort by these gears were considerably lower those at other low-lying sites within the PIRDP (Table 7.2).

**Table 7.2** Comparison of annual fishing effort of selected gears on floodplain sites inside the PIRDP, March 1993 - February 1994

Gear	Effort (gear hours/ha)		
	NW09	NW04	NW12
<i>Current jal</i>	117	203	814
<i>Doiar trap</i>	1,427	5,498	4,287
<i>Daun</i>	35	61	40
% Total annual catch by above gears	85	50	33

Catches from the low elevation sites of the North Central Region were significantly less than those in the PIRDP. In this case, the difference could be attributed to both lower level of fishing effort and lower fish densities in the North Central Region (see Section 7.3 for details). Values of CPUA varied to a greater extent on the unregulated floodplains of the North Central Region compared with those in the PIRDP (Table 7.1). These variations were related to small differences in land elevations with sites containing greater proportions of higher land supporting lowest catches (Fig. 2.5).

Substantially higher catches (mean = 90 kg/ha) were recorded from higher elevation sites in the North Central Region compared with those from inside the PIRDP (mean = 14 kg/ha) (Table 7.3). However, because of large differences in the types of gears used inside and



outside the scheme, it was not possible to use statistical techniques to examine differences in fish densities nor evaluate the significance of catch differences between sites (see Section 7.3 for details). Surprisingly, catches from higher elevation sites in the North Central Region greatly exceeded those from lower-lying sites from the region.

**Table 7.3 Annual catch from high elevation floodplains/*beel* inside and outside the PIRDP, March 1993 - February 1994**

Site code	Name	Inside/Outside FCDI	Catch (kg/ha)
NW22	Kanaider	Inside	11
NW23	Someshpur	Inside	22
	Total	Inside	14
NC04	Gazaria	Outside	108
NC08+NC09	Anahula	Outside	43
NC18+NC19	Mailjani	Outside	105
	Total	Outside	90

### 7.1.3 Comparison of catches between different years

Comparisons of catch data from the North West Region and North Central Region were made following the procedure described in Sections 5.1.3 and 6.1.3. Catches from *katha* and *kua* were excluded from the analyses since these required more intensive sampling which they received in 1993/94 but not at all sites in 1992/93. Comparisons were again carried out separately for high and low elevation sites inside and outside the PIRDP.

Catches were lower at all low elevation sites during the drier year, 1992/93 compared with those of 1993/94 (Table 7.4). Within the PIRDP there was variation between sites with percentage reductions in 1992/93 ranging from 20 to 50%. The average percentage reduction (38%) from all sites inside the PIRDP was substantially less than that from sites outside it in the North West Region (67%) or from the North Central Region (57%). Given the direct positive relationship between the size of floodplain fish catches and the magnitude and extent of flooding established elsewhere in the world (see Section 5.1.3), then the results suggest that during the drier year of 1992/93 floods were more greatly reduced on unregulated floodplains outside the PIRDP than inside it. Evidence from hydrological studies (Section 3.2) confirms that this indeed was the case and that it resulted from the operation of sluice

gates to ensure an adequate supply of water for the production of deepwater rice between July and October.

**Table 7.4 Comparison of the total catch from low elevation floodplains inside and outside the PIRDP between different years**

Site code	Name	Inside/Outside FCDI	Catch (kg/ha)		% difference in catch in 92/93
			1992-1993	1993-1994	
NW04 + NW05	Gandahasti	Inside	54	90	-38
NW09 + NW10	Gangbhanga	Inside	50	62	-20
NW12	Alnar	Inside	40	82	-50
Total			50	81	-38
NW17 + NW18	Potajia	Outside	16	48	-67
NC23	Hazipur	Outside	22	58	-63
NC27 + NC28	Char Ghior	Outside	5	10	-50
NC31	Alamdi	Outside	7	19	-66
Total			12	28	-57

Notes: 1. *Katha* and *kua* catches are excluded from the analyses (see text: section 7.1.3)  
 2. At sites NC27 + 28 a survey period of August - January was used to exclude annual leaseholder fishing which was monitored in February 1993 but not in March 1994

Catches from all high elevation floodplains/*beel* were also lower in 1992/93 than in the following year (Table 7.5). Reductions in catch in 1992/93 were very similar (62%, 63%) at two of the three North Central Region sites while lower (41%) at the third. All however, were considerably greater than that recorded from Kanaider *beel* inside the PIRDP (14%). Thus the pattern of differential impact on catch between years from sites inside and outside the PIRDP was the same as that found on lower elevation sites. In the North Central Region, the percentage reductions in catch in 1992/93 were reasonably similar on high and low elevation sites whereas inside the PIRDP, reductions were greater at lower elevations. However, it should be noted that data were available for only one high elevation site and here catches in both years were very small and therefore values of percentage reduction were sensitive to very small changes in the estimated CPUA.



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The higher catches in the greater flood year of 1993/94 were a function of both increased fishing effort and increased catch rates of most dominant gears (see figures in section 6.2.2) at all sites. Increased catch rates indicate higher fish densities during the larger floods of 1993/94. A second factor which may have caused lower fish densities in the drier year of 1992/93 was the outbreak of epizootic ulcerative fish disease which was more serious in 1992/93 than in the following year. However, the disease did not cause large mortalities in the study areas until after November 1992 by which time the bulk of the catch (excluding *katha* and *kua*) for the compared time periods had already been taken (North West outside: 77%; North West Inside: 63-78%; North Central low elevation: 82%; North Central high elevation: 81%).

**Table 7.5 Comparison of the total catch (kg/ha) from high elevation floodplains inside and outside the PIRDP between different years**

Site code	Name	Inside/ Outside FCDI	Catch		% Reduction in catch in 92/93
			1992-1993	1993-1994	
NW22	Kanaider	Inside	8	9	14
NC04	Gazaria	Outside	37	95	62
NC08+NC09	Anahula	Outside	15	25	41
NC18+NC19	Mailjani	Outside	34	92	63
Combined			30	76	60

Note: *Katha* and *kua* catches are excluded from the analyses (see text: section 7.1.3)

Comparison of changes in the size of catch between years from floodplains/*beel*, canals and rivers revealed that inside the PIRDP greatest reductions were found in low elevation floodplains (38%) followed by canals (35%) then rivers (31%). A similar trend was found at outside sites in the North West Region but differences between habitats were greater: floodplains (67%), canals (1% increase) and rivers (18%) while differences in the North Central Region were slightly less: floodplains (60%), canals 59% and rivers 55%. Thus, the results indicate that there is a differential impact of inter-annual changes in flood magnitude and extent on fish populations from different habitats. The same trend was also found when catches from all sampling sites in the North Central Region were examined (Draft Final Report, Supporting Volume No. 1). The trend is in the direction expected given the fact that contributions to catches made by floodplain resident species increases from rivers to canals to floodplains. It is this group together with obligatory migratory species which would be



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expected to most be sensitive to changes in flooding patterns whilst riverine species and those migratory species which can breed successfully in rivers should be less affected by changes in flooding patterns.

Examination of inter-annual variations in catches of different groups of fish i.e. riverine, migratory and floodplain residents revealed differential impacts on these different groups from high and low elevation floodplains inside and outside the PIRDP (Tables 7.6 and 7.7). On all low elevation sites inside and the scheme catches of riverine and migratory species were higher during the drier year. Riverine catches were extremely, all under 1 kg/ha and one less than 0.1 kg/ha, therefore percentage differences between years were highly sensitive to small catches differences. Even so, the data show consistency between sites and with catches of migratory species which were somewhat larger but still less than 10 kg/ha. There is evidence from information on sluice gate operations in the PIRDP in 1992 and 1994, another relatively dry year that gates were opened more frequently in drier years to allow ingress of river floodwaters for the benefit of deepwater rice production. This would therefore provide increased opportunity for riverine and migratory fish to enter the PIRDP and reach its floodplains in drier years so long as there remained a hydrological connection between these habitats. Catches of floodplain resident species were between 31-48% lower during the dry year at two of the three sites in the PIRDP. At the third site however, Gangbhanga *beel*, catches were slightly higher in the dry year. That the total catch at this site was lower in the dry year was therefore due to a reduced catch of prawns. It is not known whether these were migratory or floodplain resident species since they were not identified.

At sites outside the PIRDP in the North West Region, catches of migratory and riverine species were considerably lower during the drier year. At two sites in the North Central Region, catches of riverine and migratory species were higher in this year but these were usually small (< 1 kg/ha) and therefore estimates of percentage change between years were sensitive to small changes in catch. Reduced catches on unregulated floodplains in the drier year is to be expected since not only was the size and extent of the flood reduced but also the timing of river floodwaters reaching the floodplain was delayed. Catches of floodplain resident species were also reduced at all sites but to a greater degree in the North Central Region than the North West Region. In the North Central Region, catches of floodplain species were also more reduced than migratory species but the reverse was found in the North West Region. At the higher elevation site inside the PIRDP for which catch data were available for two years, no riverine or migratory species were found in the dry year of 1992/93 but three species occurred in very low abundance in the following year.

Table 7.6 Comparison of the total fish catch<sup>1</sup> (kg/ha) from low elevation floodplains/*beel* inside and outside the PIRDP between different years

Site code	Floodplain/ <i>beel</i> name	Inside/ Outside FCDI	Riverine CPUA			Migratory CPUA			Floodplain Resident CPUA		
			1992- 1993	1993- 1994	% change in 92/93	1992- 1993	1993- 1994	% change in 92/93	1992- 1993	1993- 1994	% change in 92/93
NW04 + NW05	Gandahasti	Inside	0.57	0.24	+138	9.6	3.7	+161	36.5	52.7	-31
NW09 + NW10	Gangbhanga	Inside	0.17	0.02	-750	5.0	2.2	+125	40.7	36.7	+11
NW12	Alnar	Inside	0.26	0.09	+189	7.4	3.6	+109	28.8	55.8	-48
NW17 + NW18	Potajia	Outside	0.60	2.18	-72	3.3	13.2	-75	13.7	25.6	-46
NC23	Hazipur	Outside	0.024	.002	+1189	0.6	2.5	-76	22.1	37.3	-41
NC27 + NC28 <sup>3</sup>	Char Ghior	Outside	0	0.003	-	1.3	0.6	+117	1.9	4.9	-61
NC31	Alamdi	Outside	0.022	0.021	+10	1.0	0.6	+50	5.4	16.1	-67

Notes: 1. *Katha* and *kua* catches were excluded from the analyses (see text: section 7.1.3)

2. Prawns were excluded from the analyses

3. At sites NC27 + NC28 a survey period of August to January was used to exclude annual leaseholder fishing which was monitored in February 1993 but not in March 1994

Table 7.7 Comparison of the total fish catch<sup>1</sup> (kg/ha) from high elevation floodplains/*beel* inside and outside the PIRDP between different years

Site code	Floodplain/ <i>beel</i> name	Inside/ Outside FCDI	Riverine CPUA			Migratory CPUA			Floodplain Resident CPUA		
			1992-1993	1993-1994	% change in 92/93	1992-1993	1993-1994	% change in 92/93	1992-1993	1993-1994	% change in 92/93
NW22	Kanaider	Inside	0	0.10	-	0	.002	-	7.9	8.4	-6
NC04	Gazaria	Outside	0.101	0.244	-59	1.1	2.7	-59	31.6	69.4	-54
NC08 + NC09	Anahula	Outside	0.150	0.164	-9	5.0	4.2	+19	9.5	15.5	-39
NC18 + NC19	Mailjani	Outside	0.128	0.294	-56	8.1	17.2	-53	21.9	48.6	-55

Notes: 1. *Katha* and *kua* catches were excluded from the analyses (see text: section 7.1.3)  
2. Prawns were excluded from the analyses



Since there was no apparent hydrological connection between these sites and adjacent river systems even in the wet year of 1993/94, the source of these fish remains unclear. Catches of floodplain resident species were slightly lower in the drier year but in both years catches were low (<10 kg/ha). In the North Central Region, catches of riverine, migratory and floodplain resident species were reduced to about the same degree compared with those of 1993/94.

## 7.2 Pattern of Fishing

### 7.2.1 Catch by gear

Percentage contributions made by dominant gears to the annual catches from low and high elevation floodplains/*beel* are presented in Table 7.8 and 7.9. More detailed information on monthly catches from all observed gears is given in Appendix 5, A-P.

**Table 7.8 Percentage contribution (by weight) to the total annual catch by dominant gears from low elevation floodplains/*beel* inside and outside the PIRDP, March 1993 - February 1994**

Gear	North West Region					North Central Region			
	Inside FCDI				Outside FCDI	Outside FCDI			
	NW04+ NW05	NW09+ NW10	NW12	All sites	NW17+ NW18	NC23	NC27+ NC28	NC31	All sites
<i>Doiar trap</i>	29.3	6.9	17.5	21.5	2.4	-	4.8	2.9	-
<i>Thella jal</i>	19.2	18.2	19.8	19.1	-	31.2	5.5	15.8	23.9
<i>Daun</i>	18.9	8.4	-	12.9	5.4	-	-	6.3	2.0
<i>Ber jal</i>	13.6	20.5	22.8	17.4	32.7	3.4	-	6.1	4.0
<i>Current jal (Stationary)</i>	5.6	4.6	11.2	6.8	10.2	4.2	11.6	11.9	7.4
<i>Kua</i>	5.6	-	-	3.0	-	21.9	12.5	28.9	23.3
<i>Katha</i>	-	27.6	14.8	9.7	12.3	-	4.5	-	2.1
<i>Akra</i>	-	4.2	-	-	-	-	-	-	-
<i>Ucha</i>	-	-	-	-	-	-	39.6	9.7	7.4
<i>Tukri</i>	-	-	-	-	-	3.9	-	-	2.5
<i>Horhori</i>	-	-	-	-	7.3	-	-	-	-
<i>Veshal</i>	-	-	-	-	-	12.6	-	3.7	8.5
<i>Koi jal</i>	-	-	-	-	3.1	-	-	-	-
<i>Jhaki jal</i>	-	-	4.5	-	-	8.2	8.5	3.8	6.8
<i>Moi jal</i>	-	-	-	-	12.0	-	-	-	-
<i>Sip</i>	-	-	-	-	2.9	-	-	3.5	-
<i>Dhor jal</i>	-	-	-	-	-	-	6.7	-	-
<i>Hand fishing</i>	-	-	-	-	3.1	5.3	-	-	3.8

Note: Dominant gears are defined as those gears which when ranked in order of abundance, comprised at least 90% of the annual catch



**Table 7.9** Percentage contribution (by weight) to the total annual catch by dominant gears from high elevation floodplains/*beel* inside and outside the PIRDP, March 1993 - February 1994

Gear	North West Region			North Central Region			
	Inside FCDI			Outside FCDI			
	NW22	NW23	NW22 + NW23	NC04	NC08 + NC09	NC18 + NC19	All sites
<i>Polo</i>	30.9	-	15.7	-	-	-	-
<i>Doiar trap</i>	20.3	82.5	50.9	-	-	-	-
<i>Sip</i>	15.3	-	8.3	-	-	4.8	2.5
<i>Jhaki jal</i>	9.3	-	4.7	21.7	-	4.4	11.2
By hand/Dewatering	6.4	7.7	7.1	-	-	-	-
<i>Thella jal</i>	4.7	-	-	40.7	24.3	47.7	41.8
<i>Tukri</i>	3.6	-	-	-	-	-	-
<i>Kachitana</i>	-	-	-	4.0	-	-	-
<i>Nol barsi</i>	-	-	3.4	-	-	-	-
<i>Current jal (Stationary)</i>	-	-	-	6.0	-	-	3.4
<i>Dhor jal</i>	-	-	-	-	-	7.3	3.5
<i>Veshal</i>	-	-	-	2.7	-	-	-
<i>Akra</i>	-	-	-	4.1	-	-	-
<i>Dharma jal</i>	-	-	-	-	10.6	14.2	8.5
<i>Katha</i>	-	-	-	-	-	3.5	2.5
<i>Ber jal</i>	-	-	-	12.6	47.9	4.6	13.4
<i>Kua</i>	-	-	-	-	-	4.9	2.2
Hand fishing	-	-	-	-	8.8	-	3.1

Note: Dominant gears are defined as those gears which when ranked in order of abundance, comprised at least 90% of the annual catch

The total number of different types of gear used on sites inside the PIRDP (21-23) was similar to that used on the North West Region sites outside it (24). However, patterns of fishing differed markedly between sites inside and outside the PIRDP. At sites outside the scheme, catches were dominated by seine nets, *ber jal* (33%), *horhori* (7%) and drag nets, *moi jal* (12%) which together captured 52% of the catch whereas these gears accounted for only 19% of the catch from sites inside the scheme. Two other important gears, *current jal* and *katha*, contributed relatively higher catches outside the scheme. At the inside sites, the two most important gears were *doiar* traps and *thella jal* which provided 22% and 19% of the combined annual catch from all sites using an annual effort per hectare of 3932 and 25 gears hours respectively. In contrast, these gears were not important outside the scheme where they provided only 2% and 1% of the catch using an annual effort per hectare of 180 and 6 gears hours respectively.

The results indicate that most of the catch from outside sites was taken by gears which could exploit open-waters whilst characteristic shoreline gears such as *doiar* traps and *thella jal*



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were far less important. Inside the PIRDP, the contribution to the catch by these two shoreline gears was 38% higher than that outside. The large differences between inside and outside sites can be explained by a combination of contributory factors including topographical, hydrological and social factors. First, the outside sites possessed 10% less shoreline per hectare of floodplains (6.3 m per ha) than the inside sites (7.0 m per ha). This may have slightly reduced the shallow shoreline areas that are typically exploited by *thella jal* and *doiar*. A second, probably more important factor, was that outside sites were subject to more rapid fluctuations in water levels which followed the rise and fall of the Baral/Atrai and Jamuna systems whereas rapid fluctuations inside the scheme were prevented by control of sluice gates thereby providing a more stable environment for shallow water fishing. A third factor was that a Hindu village comprising many professional fishermen formed the southern boundary of the outside site. Since Hindu fishermen rarely use traps or *thella* in this region (Table 7.10) then lower effort by these gears might be expected on adjacent floodplains.

**Table 7.10 Percentage use by Hindu and Muslim fishermen of different types of fishing gears on low elevation floodplains/beel inside and outside the PIRDP**

Gear type	Inside PIRDP (sites NW04+05+09+10+12)			Outside PIRDP (sites NW17+18)		
	Number of fishing units sampled	Hindu	Muslim	Number of fishing units sampled	Hindu	Muslim
<i>Ber jal</i>	102	63	37	57	35	65
<i>Current jal</i>	323	1	99	77	5	95
<i>Thella jal</i>	144	2	98	25	0	100
<i>Doiar</i>	190	2	98	11	9	91
<i>Daun</i>	151	1	99	26	0	100

On the low elevation sites of the North Central Region, fewer gear types were employed (15-20) and the pattern of fishing differed from North West Region sites both inside and outside the PIRDP. In the North Central Region, *thella jal* contributed 24% of the catch while *doiar* traps provided only 1%. The second most important gear was *kua* which produced 23% of the annual catch but between 60% to 82% of monthly catches during winter. The predominance of this gear might explain why *ber jal* catches were lower in the North Central





Region possibly resulting from illegal access restrictions enforced by socially powerful landowners/farmers who also owned *kua* and restricted *ber jal* operations in adjacent waters in the hope of increasing their own *kua* catch. Inside the PIRDP, the site (NW04+NW05) with the greatest *kua* catch also showed the lowest *ber jal* catch. Other dominant gears which made relatively higher catch contributions in the North Central Region included *veshal* and *jhaki jal* while *current jal* provided about the same share of the annual catches in both regions.

On high elevation sites, the total number of gear types used inside the PIRDP (8-14) was lower than that outside in the North Central Region (12-20) and the patterns of fishing were completely different (Table 7.9). Inside the PIRDP, subsistence gears captured almost the whole catch with traps (*doiar* and *polo*) accounting for 67% of the catch, followed by hooks (12%) and hand fishing and/or dewatering (9%). In contrast, *thella jal* (42%), *ber jal* (13%) and *jhaki jal* (11%) predominated on the higher elevation floodplains/*beel* of the North Central Region reflecting the greater flooding at these sites.

#### 7.2.2 Catch by gear by month

In this section data from different sites are combined to provide generalised descriptions of seasonal patterns of fishing inside and outside the PIRDP. Where there are important differences at individual sites these are noted.

On low elevation sites inside the PIRDP, *katha*, *doiar* traps and *ber jal* predominated during the pre-monsoon, March - April, when catches were very low (Fig. 7.5). The rising floods of May and June, caused mainly by rainfall, stimulated the rapid expansion of a *doiar* trap fishery which provided 72-77% of the monthly catches. During the full flood period and into the initial drawdown (July - October), gear diversity increased and *ber jal*, *daun*, *thella jal* and *doiar* predominated. Peak catches were made during the later stages of the drawdown, in November and also in December when the number of different types of gears employed also peaked. Catches were taken principally by small-scale gears such as *thella jal* and *doiar* and, to a lesser extent, by the larger-scale *ber jal*. *Daun* also made an important contribution to the peak catch of November. Peak catches resulted not only from an increase in fishing effort of most dominant gears (Fig. 7.6) but also from an increase in their catch rates (Fig. 7.7) which indicated increased fish densities in decreasing areas of exploitable water. Catches fell sharply between January and February while the proportions of the catch taken by *katha* and *kua* increased.

**Figure 7.5** Percentage of total monthly catch taken by dominant gears from combined low elevation sites inside the PIRDP (NW04+05+09+10+12)

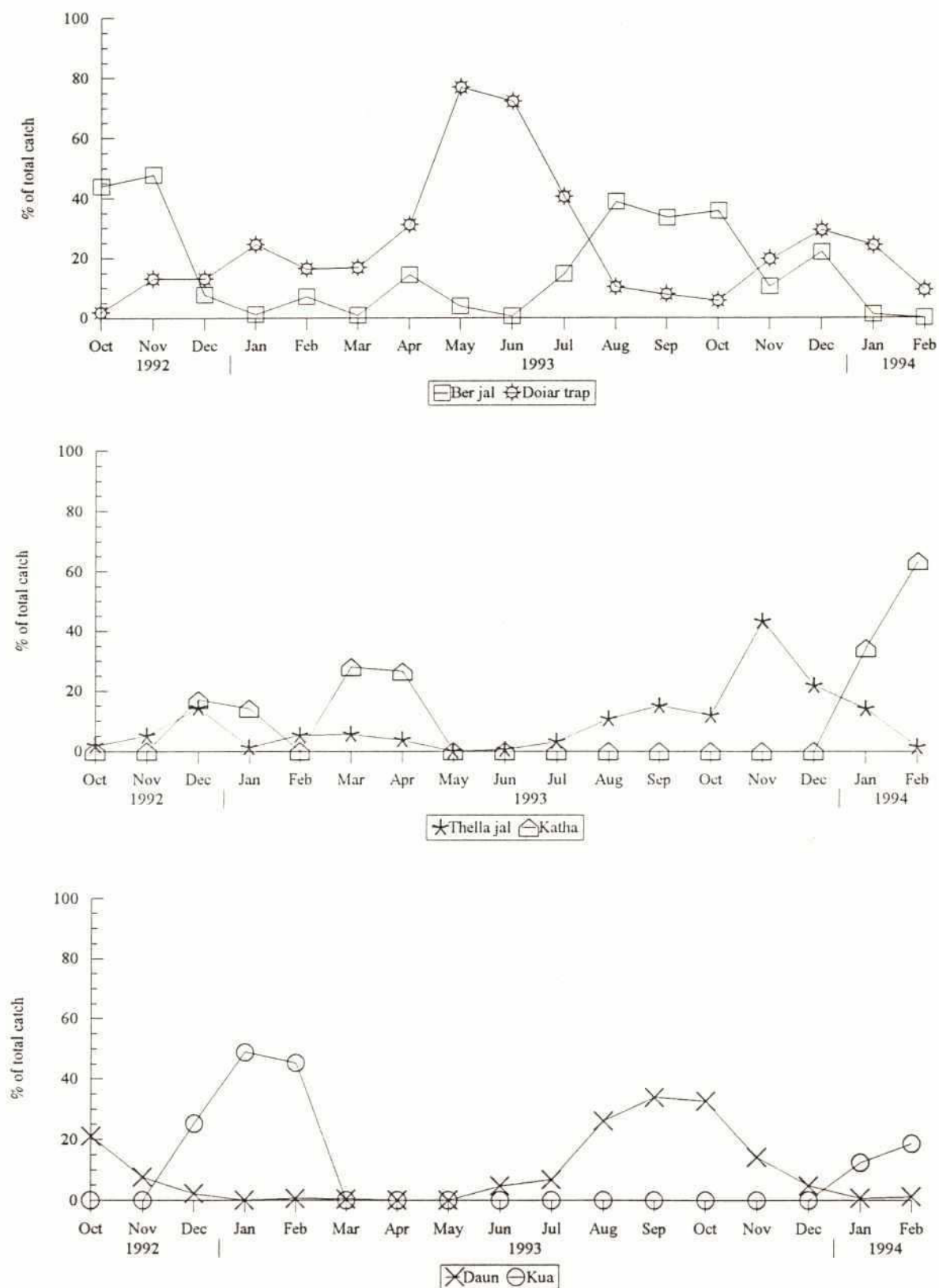
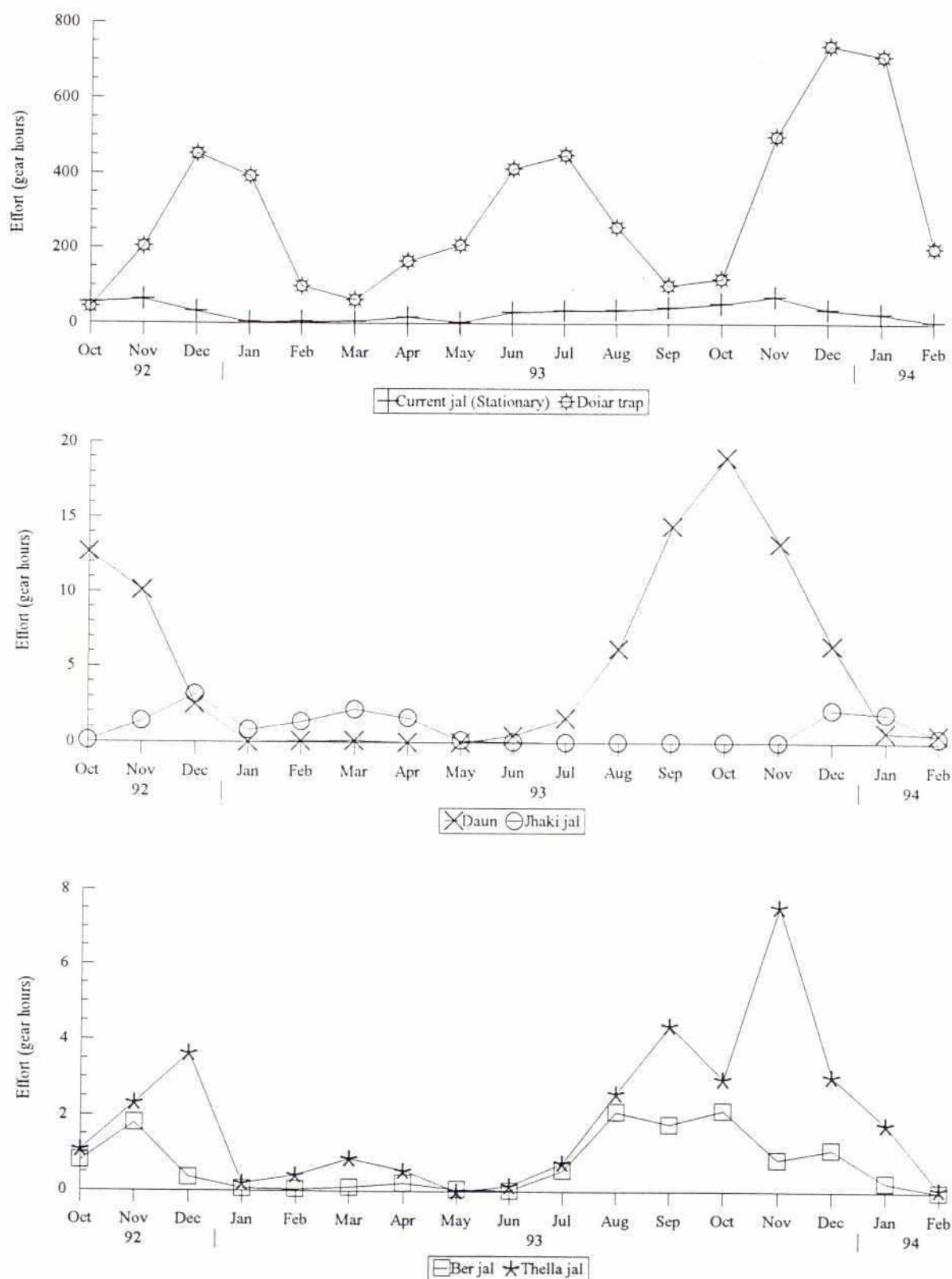


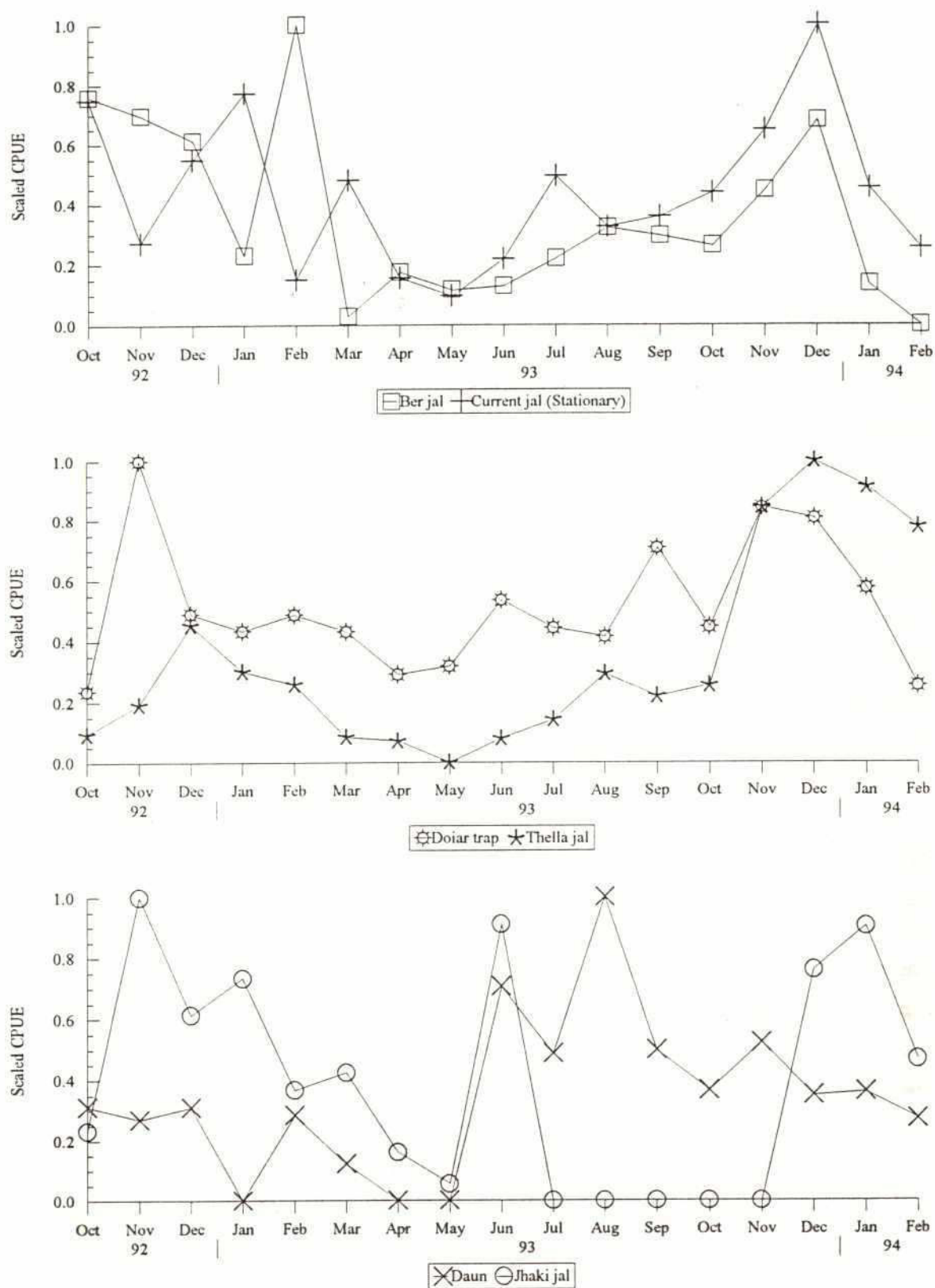
Figure 7.6 Total monthly fishing effort per hectare of low elevation floodplains/  
beel by dominant gears: combined sites inside the PIRDP  
(NW04+05+09+10+12)





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**Figure 7.7 Scaled CPUE of dominant gears used on combined low elevation sites inside the PIRDP (NW04+05+09 +10+12)**



Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded

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On comparable floodplains in North West Region outside the PIRDP, there was very little fishing activity between March to May and during this period most of the low catches were taken by non-dominant gears such as *hat panch*, *current jal*, *kua* and *kathi jal*. During the full flood period (July - September) catches increased and were taken principally by *ber jal* and *moi jal* (Fig. 7.8). Catches increased again during the flood drawdown reaching a peak in November. Predominant gears included *ber jal*, *current jal*, *koi jal* and *horhori* whilst the typical shoreline gears, *doiar* and *thella* were unimportant. Again peak catches resulted from both increased fishing effort by dominant gears (Fig. 7.9) and increased catch rates (Fig. 7.10). During the winter months when catches returned to low levels, *ber jal* and *katha* took most of the catch (87%) in January and *kua* provided 34% of the February catch together with *katha* (22%) and *akra* (17%) which was used specifically for raking *baim* out of muddy sediments.

On low elevation floodplains/beel of the North Central Region, catches remained very low from March to June during the pre-monsoon and rising flood periods. Low levels of fishing activity by *thella jal* and *jhaki jal* provided the bulk of the catch whilst *veshal* and *doiar* gained importance in the increasing floods of June (Figs 7.11 and 7.12). During the full flood period (July - September) catches progressively increased and most were captured by a mixture of *ber jal*, *thella jal*, *veshal*, *current jal* and *ucha*. The latter was particularly important in September at Char Ghior (sites NC27+NC28). Peak catches taken during the flood drawdown were a function of increased effort and higher catch rates of dominant gears comprising *thella jal*, *veshal*, *current jal*, *jhaki jal* and hand fishing (Figs 7.12 and 7.13). During the winter months, *kua* contributed most of the catch which decreased sharply to low levels in January and February.

On the higher elevation floodplains inside the PIRDP, seasonal fishing patterns were simplified by the lower diversity of gears, particularly dominant gears and the lower levels of fishing activity for much of the year. *Doiar* traps took most of the very small catch from June to August and again when catches increased in September and October at site NW23 (Fig. 7.14). During November and December when catches increased at site NW22, *sip* and *polo* traps took the bulk of the catch in respective months. Peak catches at both sites were a function of increased effort and catch rates of the dominant gears (Figs 7.15 and 7.16). During January, fishing continued in residual water bodies where water levels were enhanced by the ingress of pumped tubewell irrigation water and were fished by *doiar*, *polo* and *nol barsi*. As water levels decreased in February 1994, hand fishing and *akra* were the only gears used.

**Figure 7.8** Percentage of total monthly catch taken by dominant gears from combined low elevation sites outside the PIRDP (NW17+NW18)

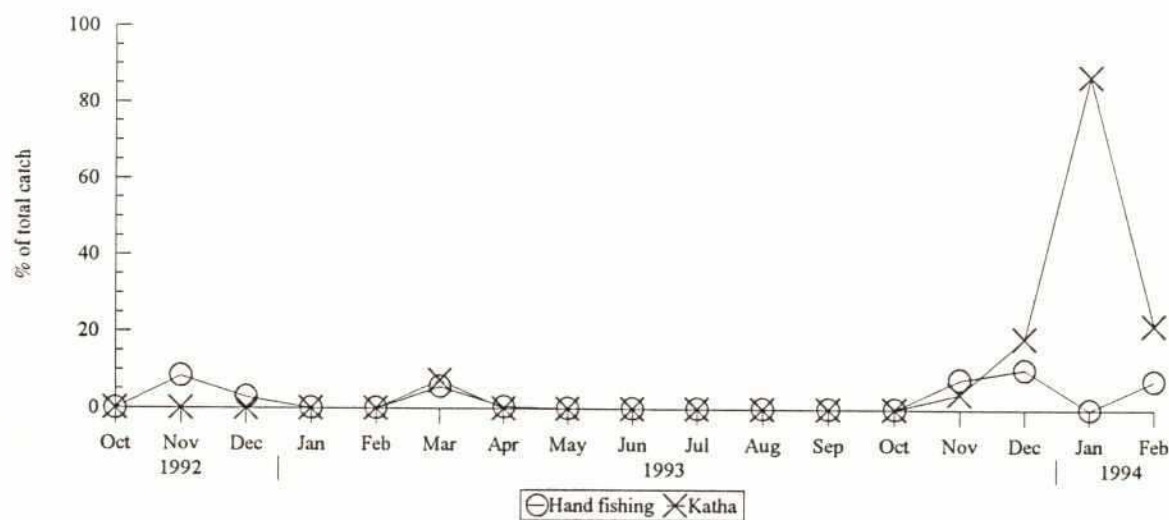
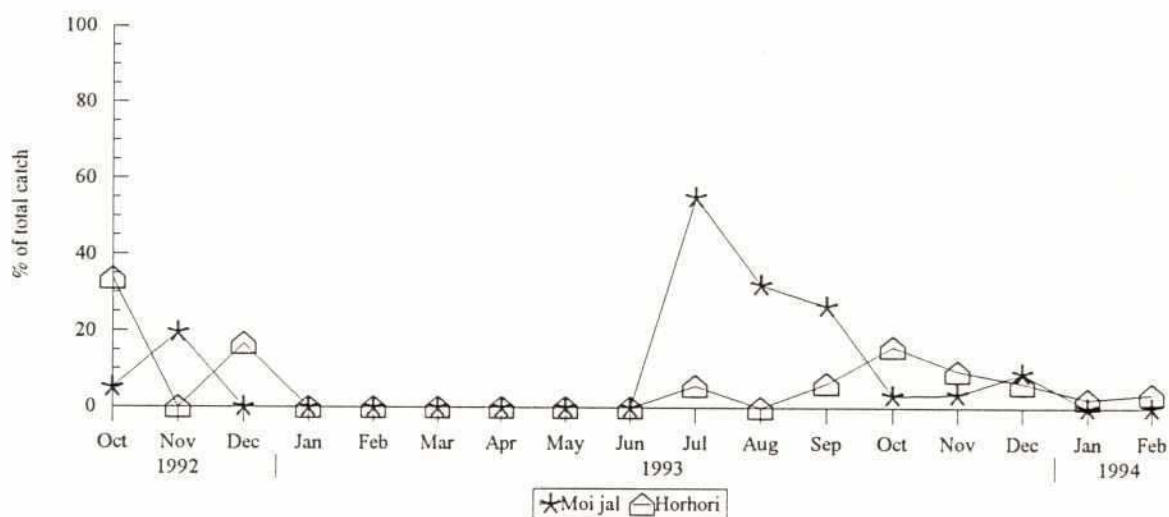
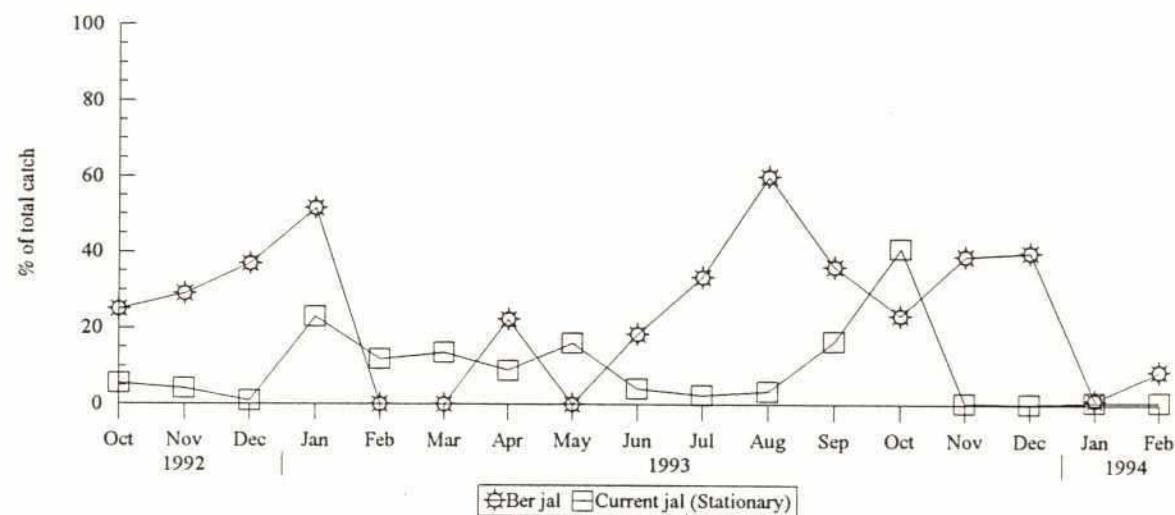
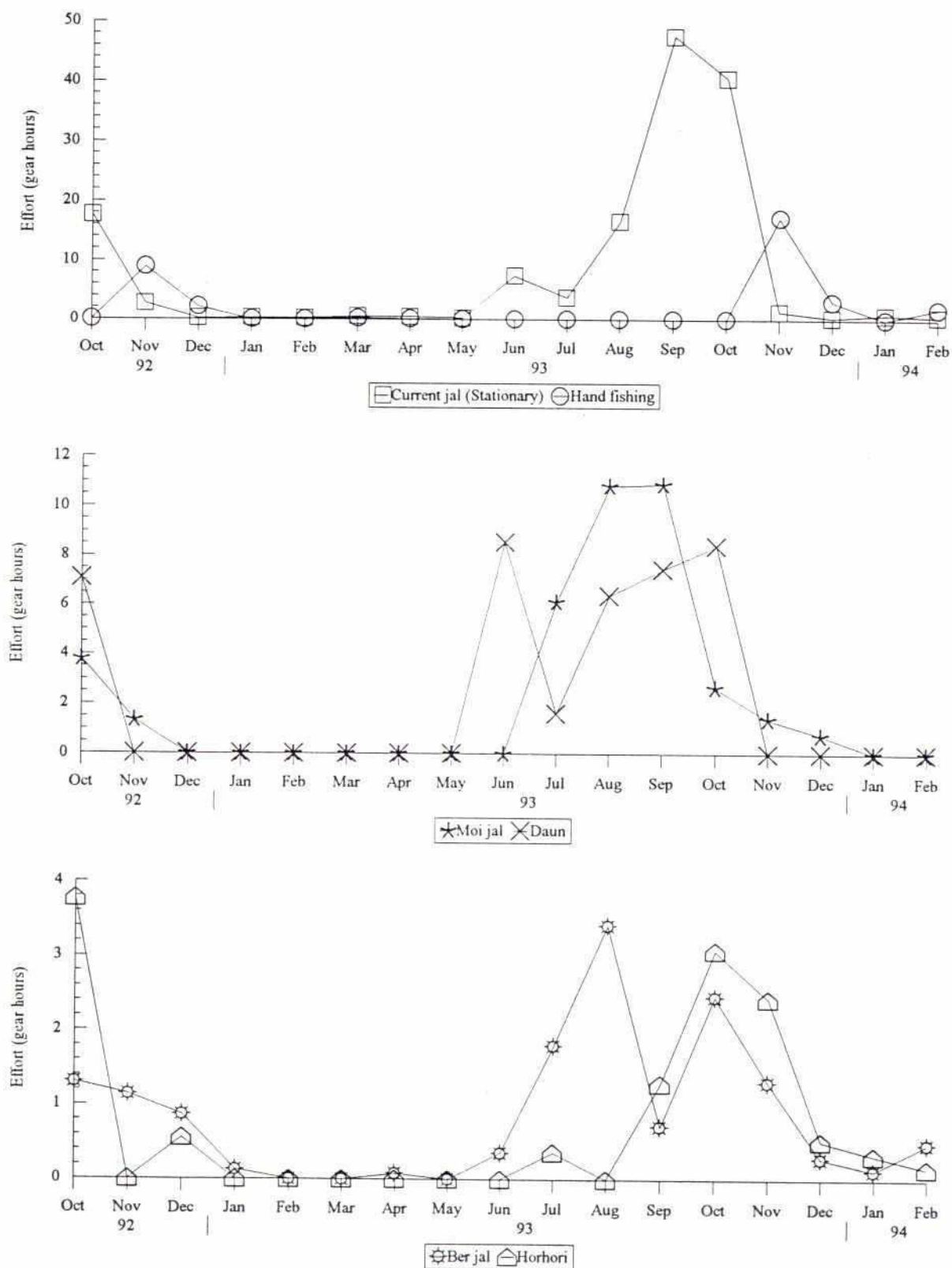
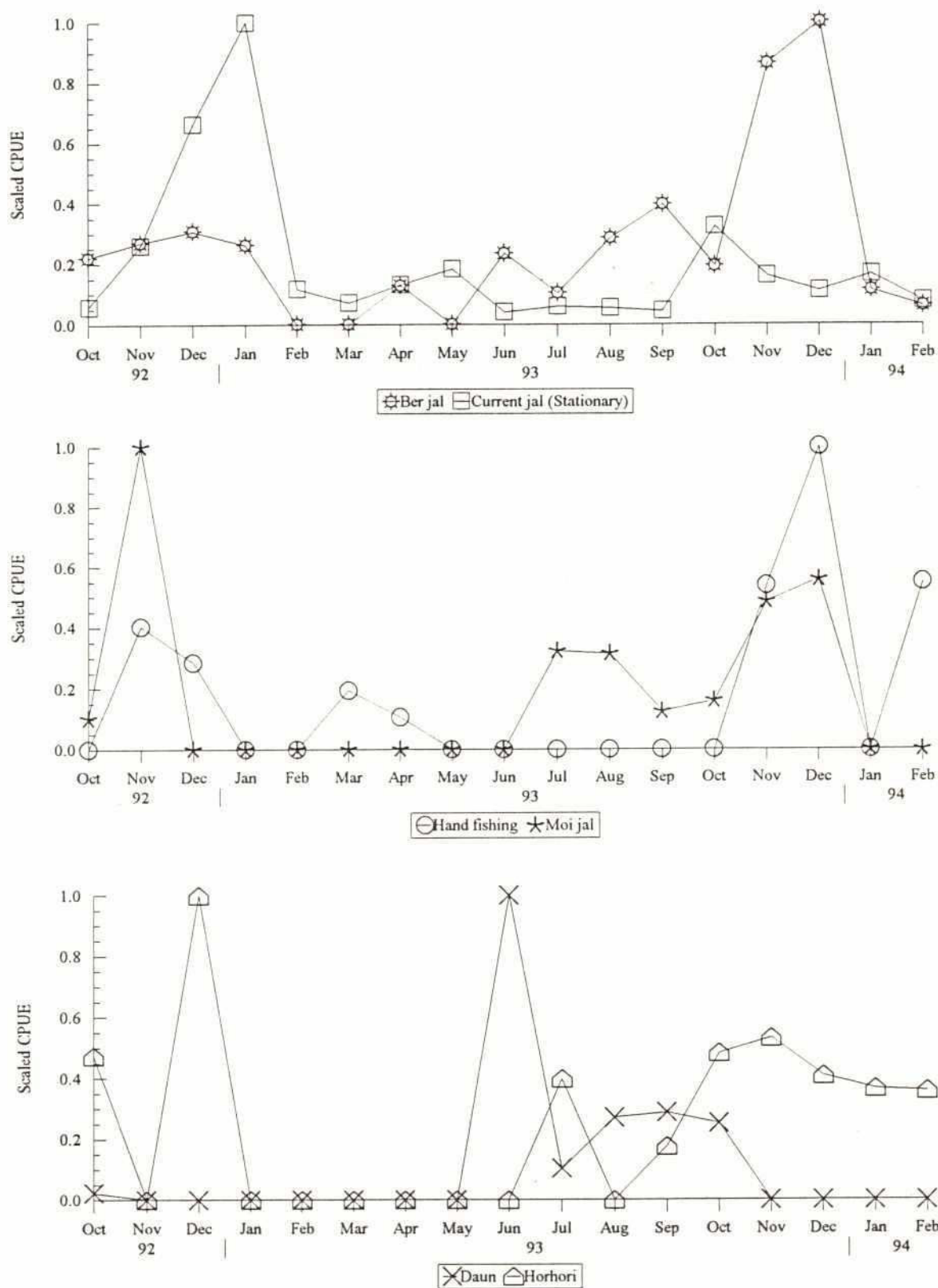




Figure 7.9 Total monthly fishing effort per hectare of low elevation floodplains/  
beel by dominant gears: sites outside the PIRDP (NW17+NW18)



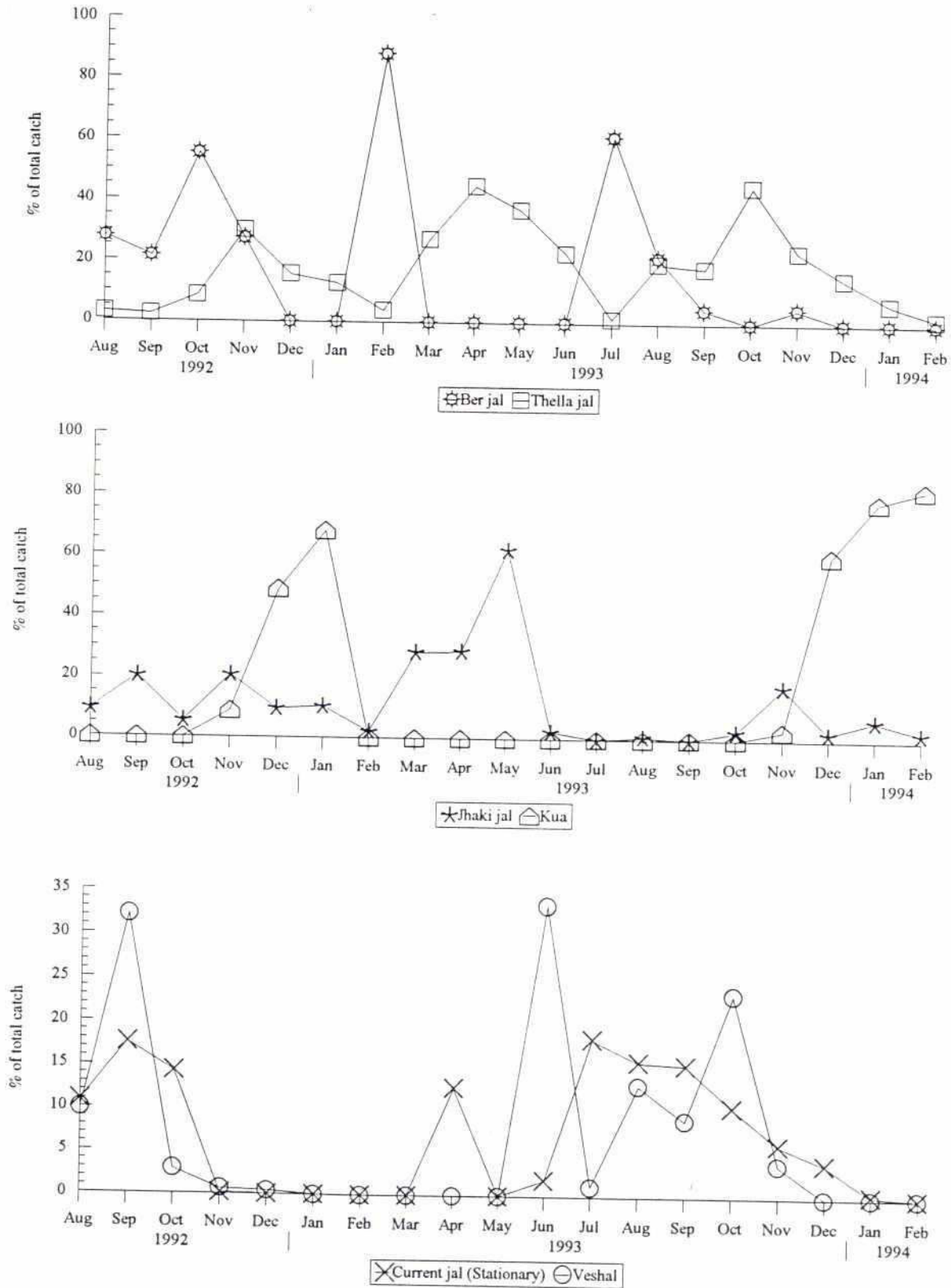
**Figure 7.10 Scaled CPUE of dominant gears: combined low elevation sites outside the PIRDP (NW17+NW18)**



Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded

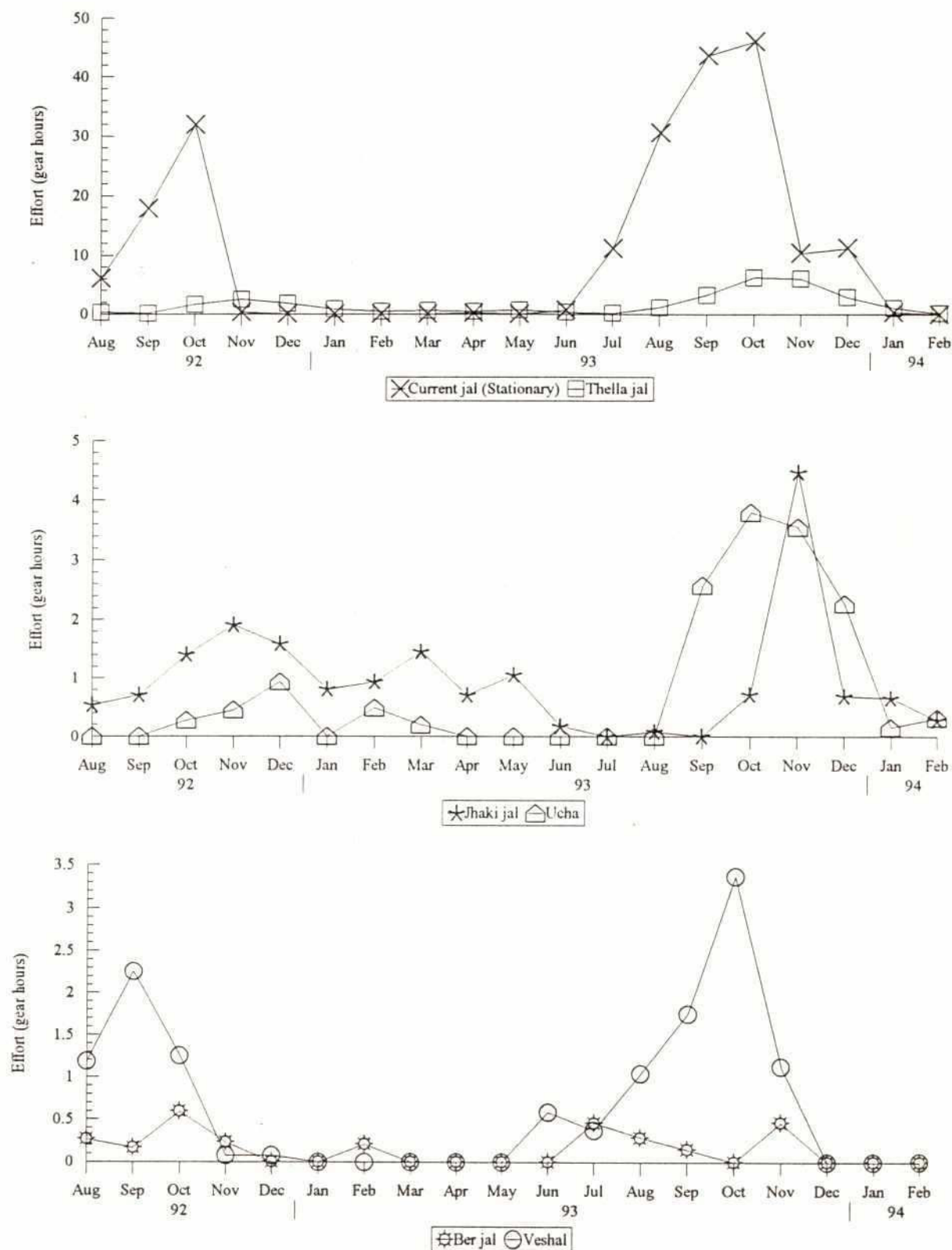
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**Figure 7.11 Percentage of total monthly catch taken by dominant gears from combined low elevation sites in the North Central Region (NC23+27+28+31)**

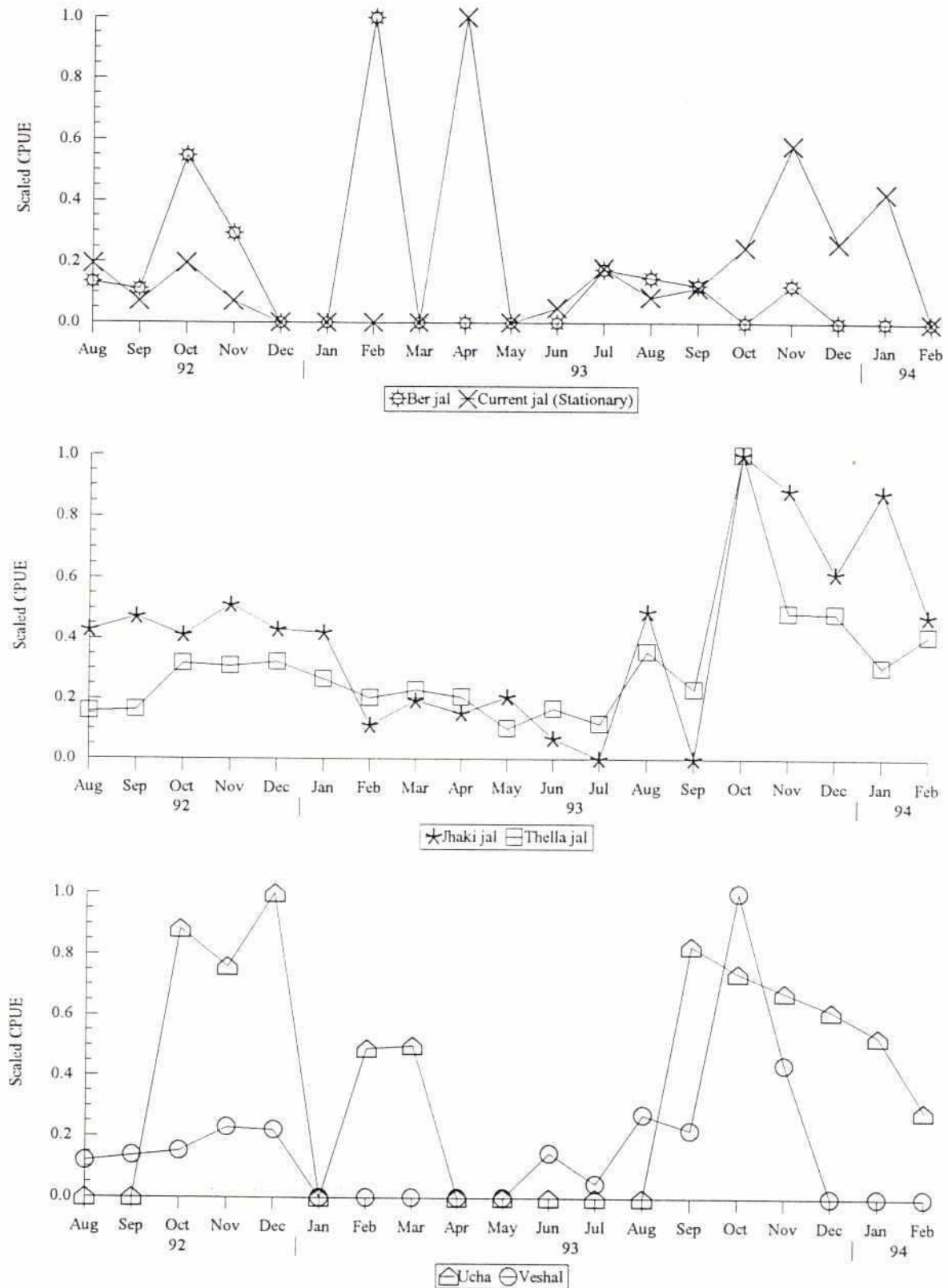




**Figure 7.12 Total monthly fishing effort per hectare of combined low elevation floodplains/beel by dominant gears in the North Central Region (NC23+27+28+31)**

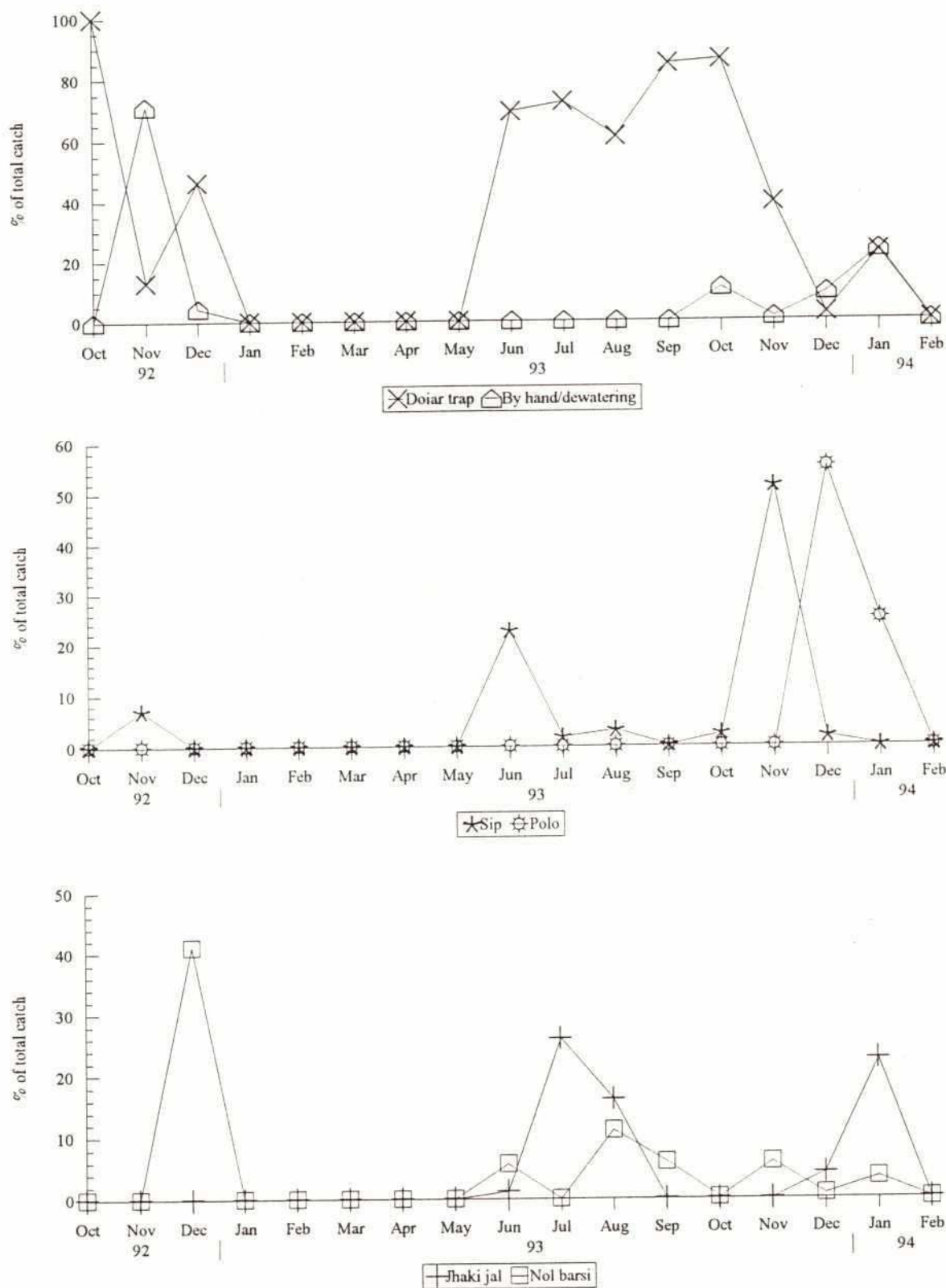


**Figure 7.13 Scaled CPUE of dominant gears: combined low elevation floodplains/ beel sites in the North Central Region (NC23+27+28+31)**



Notes: 1. Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded

**Figure 7.14** Percentage of total monthly catch taken by dominant gears from combined high elevation sites inside the PIRDP (NW22+NW23)





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**Figure 7.15** Total monthly fishing effort per hectare of high elevation floodplains/  
*beel* by dominant gears: combined sites inside the PIRDP (NW22+NW23)

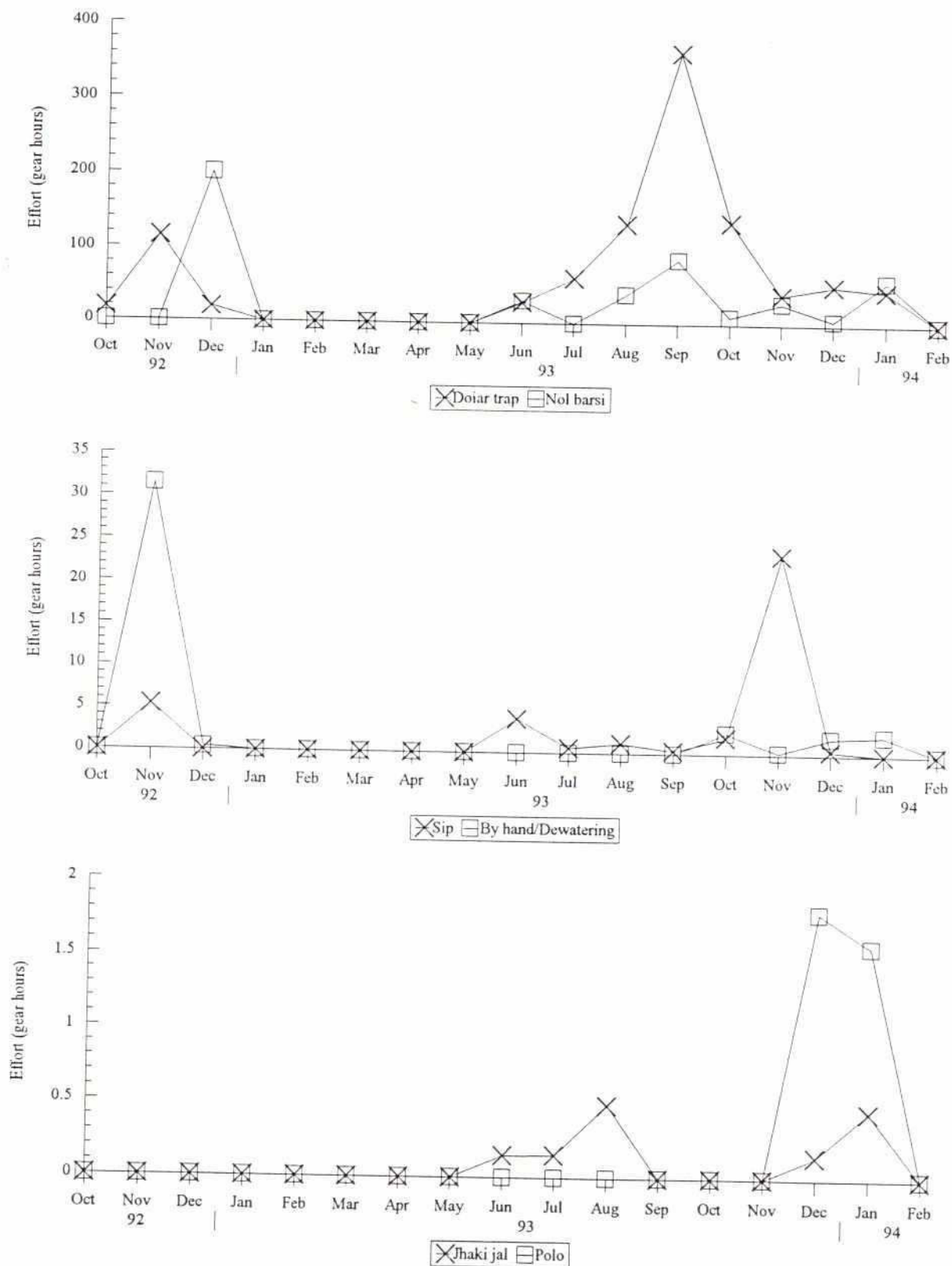
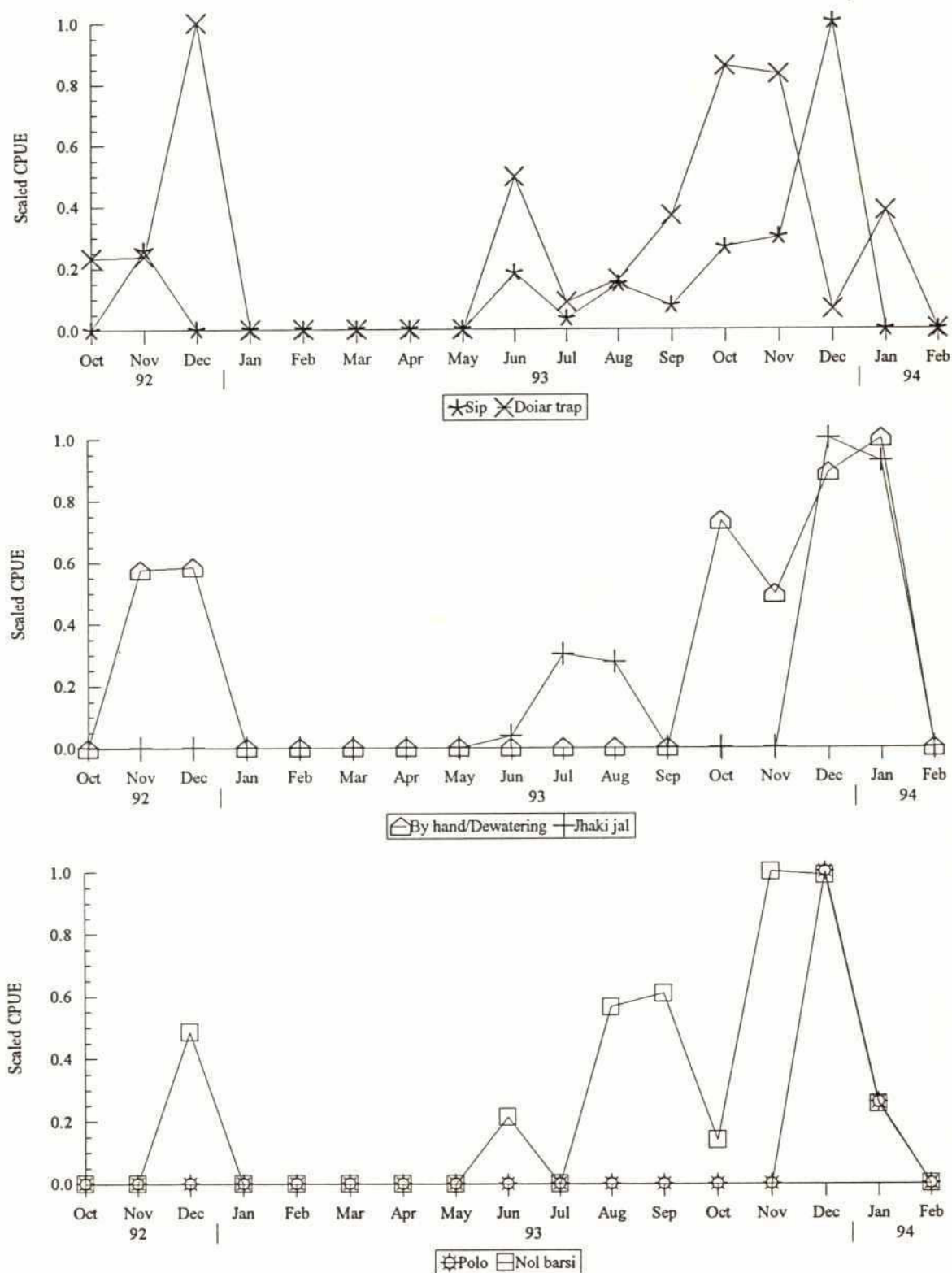


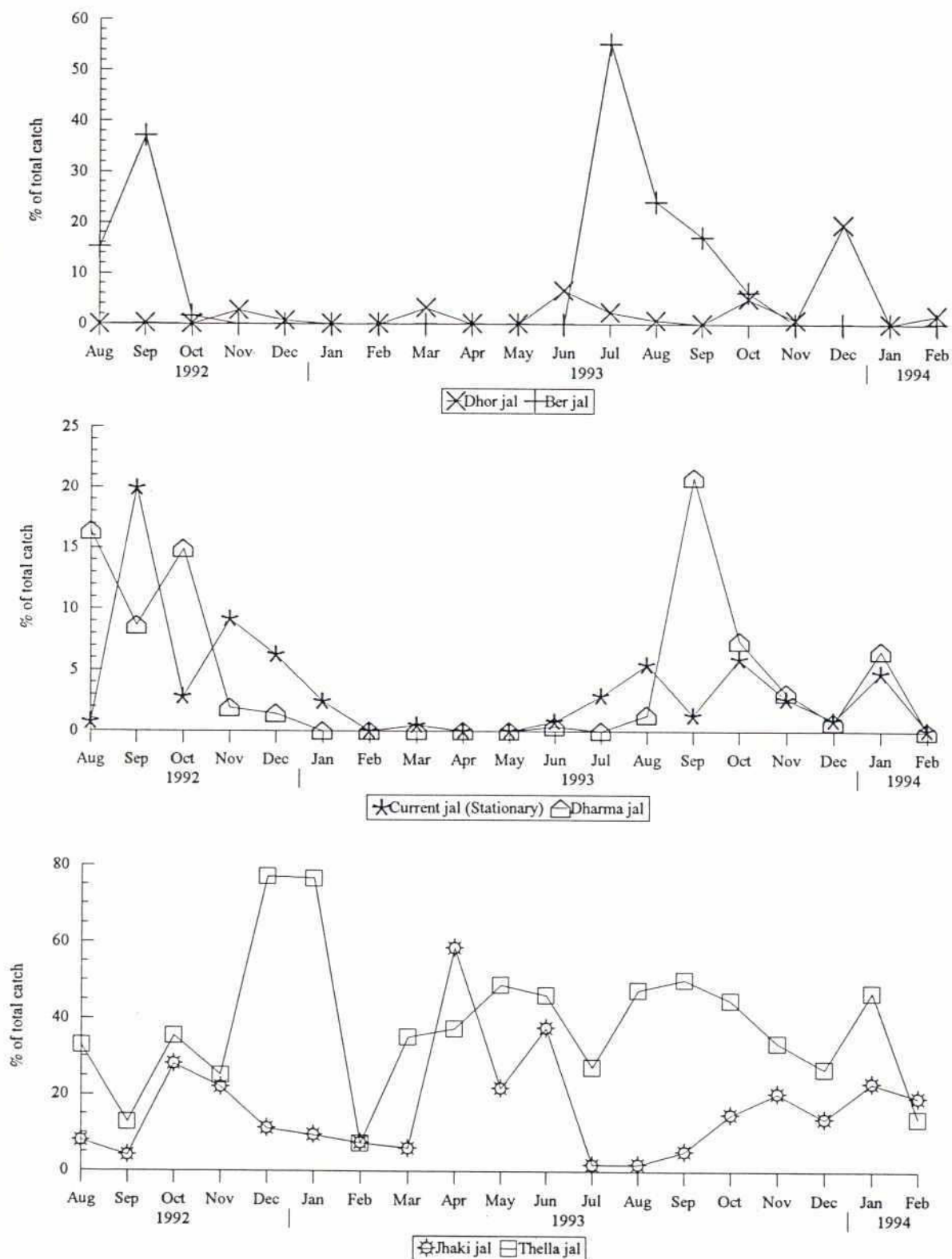
Figure 7.16 Scaled CPUE of dominant gears: combined high elevation floodplains/ *beel* sites inside the PIRDP (NW22+NW23)



Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded

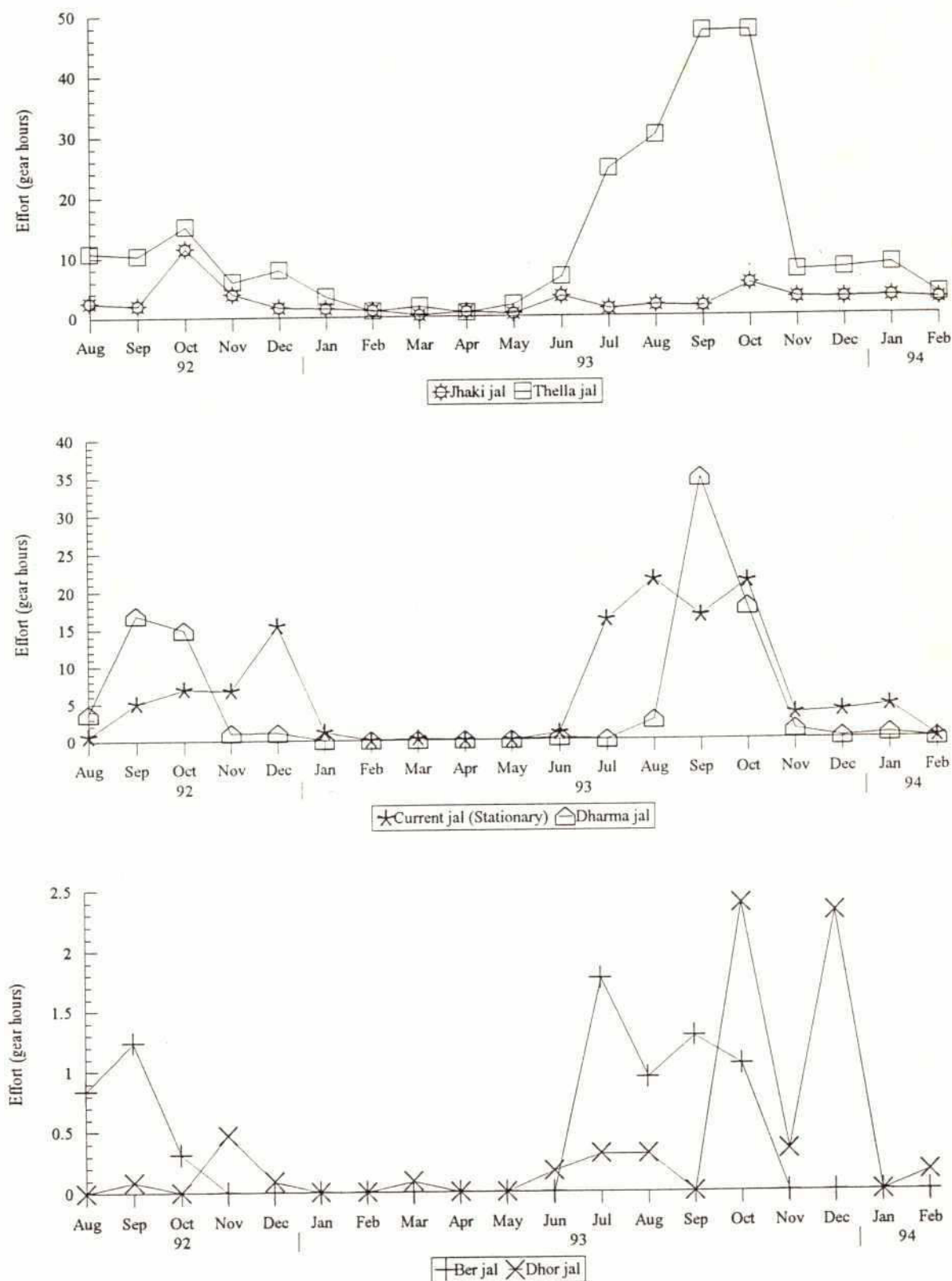
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**Figure 7.17** Percentage of total monthly catch taken by dominant gears: combined high elevation sites in the North Central Region (NC04+08+09+18+19)



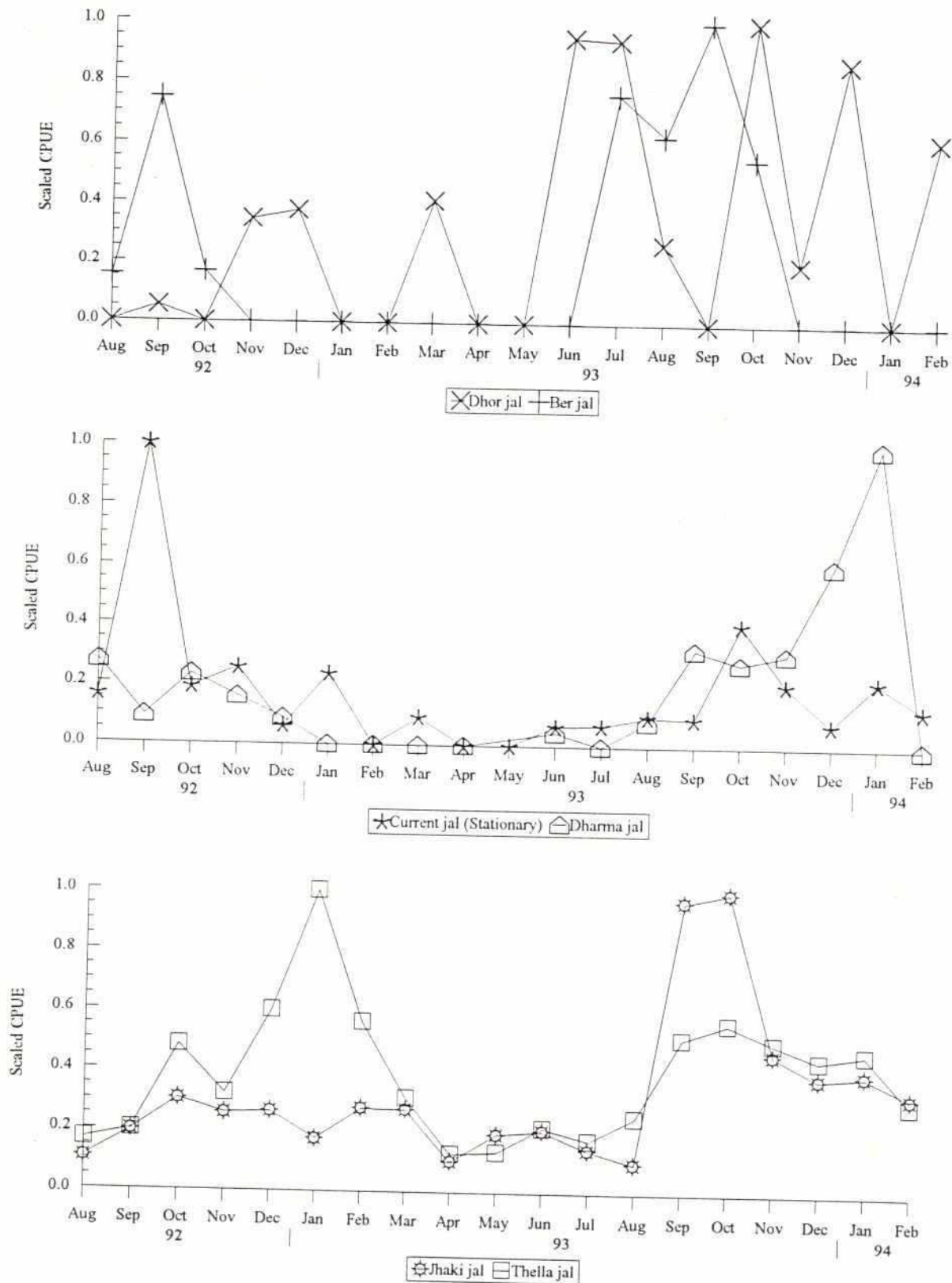


**Figure 7.18** Total monthly fishing effort per hectare of combined high elevation floodplains/beel by dominant gears in the North Central Region (NC04+08+09+18+19)



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**Figure 7.19 Scaled CPUE of dominant gears: combined high elevation floodplains/beel sites in the North Central Region (NC04+08+09+18+19)**



Note: Scaled CPUE are values of CPUE expressed as a proportion (decimal) of the maximum monthly value recorded

On the higher elevation sites of the North Central Region, catches remained very low from March to June when low levels of fishing effort by *thella jal* and *jhaki jal* provided most of the catch (Fig. 7.17). During the full flood period, *thella jal* continued to provide between 27-50% of the catch while *jhaki jal* declined in importance and *ber jal* increased. Catches rose sharply in September and October again being taken mainly by *thella jal*, *ber jal*, *jhaki jal* and *dharma jal*. Peak catches during this time resulted from increased fishing effort of the dominant gears (Fig. 7.18) and to their high catch rates (Fig. 7.19). Catches dropped rapidly in November and remained low throughout the winter. During this period, most of the catch was taken by *thella jal*, *jhaki jal*, *akra* and *hand* fishing.

### 7.3 Statistical Comparison of Catch Rates and Catches Inside and Outside the PIRDP

Statistical analyses of seasonally pooled catch rates of gears used inside and outside the PIRDP were carried out following the method described in the Draft Final Report, Appendix 3. The underlying assumption of this method is that once differences in catchabilities between gears are accounted for then any further differences in catch rates inside and outside the PIRDP are due solely to differences in fish densities.

Statistical comparisons were attempted separately for low and high elevations sites. Separate comparisons were also made for sites inside and outside PIRDP in the North West Region and for sites inside the PIRDP and sites in the North Central Region.

#### *Comparison of North West Region low elevation sites (inside/outside)*

At the inside sites, over 90% of the total catch per hectare for the period March 1993 to February 1994, excluding *katha* and *kua*, was taken by 6 gears. At the outside sites, over 86% of the total catch per hectare over the same period was taken by 8 dominant gears. In all, 9 gears were used in the statistical analysis of catch rates, as listed in Table 7.11. Three gears appeared in both lists: *current jal*, *ber jal* and *doiar* traps (Fig. 7.20). *Ber jal* took nearly 20% of the catch per hectare at the inside sites, and 40% at the outside sites. A total of 1057 individual catch rate observations were used in this analysis.

Even when isolated catch rate observations were omitted, there was evidence of failure of the assumptions underlying the statistical analysis. Comparison of observed and predicted catch rates indicated almost identical seasonal patterns in catch rates inside and outside for *ber jal*, but substantially higher catch rates outside in seasons 4 for both *current jal* and *doiar* traps, and also in seasons 1 and 5 for *current jal*. The usual response to such a finding is to

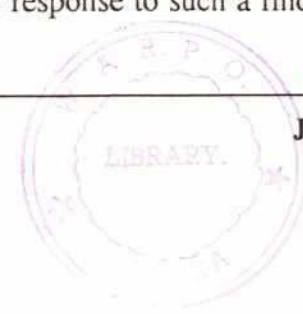




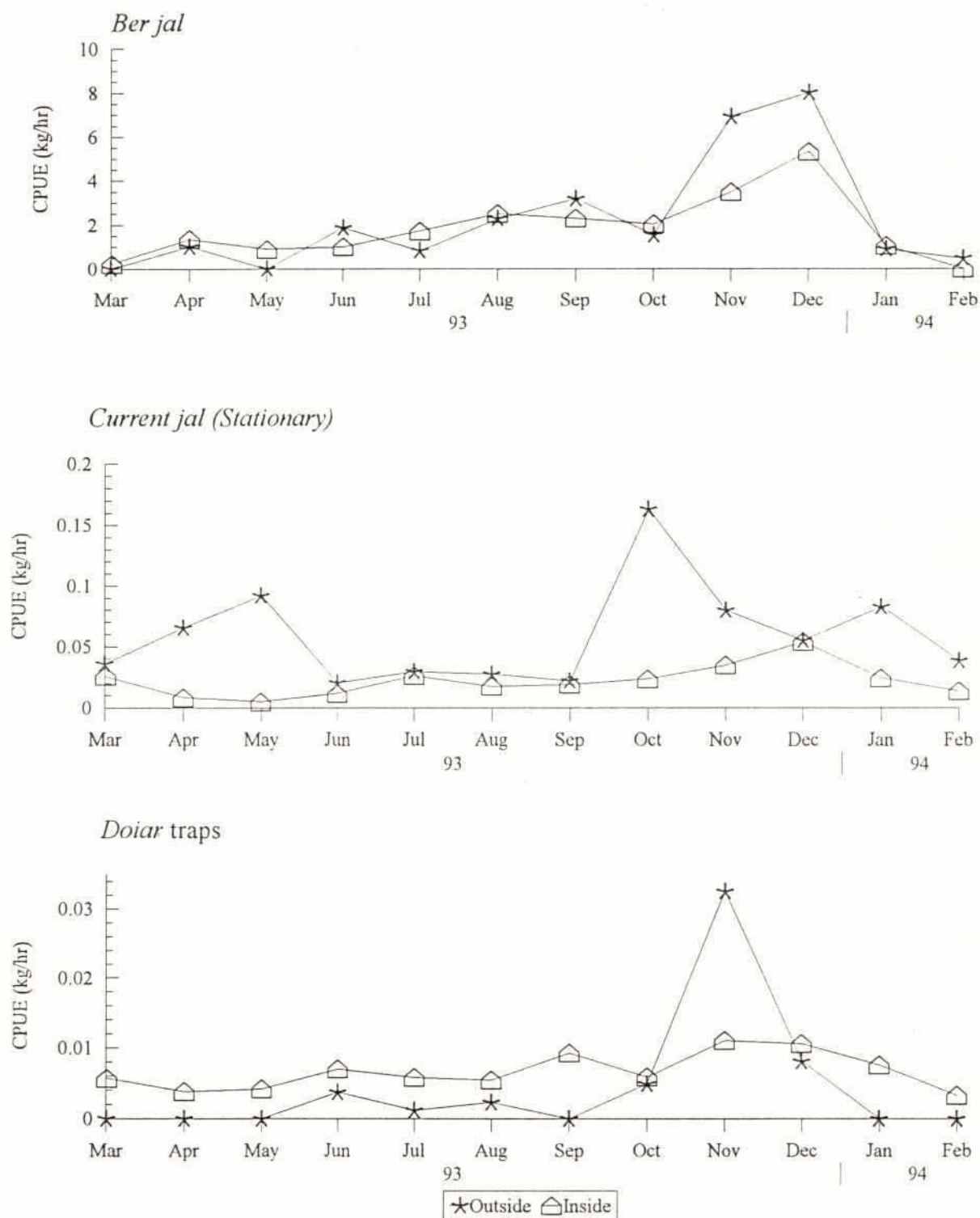
Table 7.11 Comparison of the total catch per hectare from low elevation floodplains/beel inside and outside the PIRDP, March 1993 - February 1994

		SEASON																
		Mar-Apr			May-Jun			Jul-Sep			Oct-Nov			Dec-Feb			Total	
GEAR		1			2			3			4			5				
		Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out		
OUTSIDE	Current jal (Stationary)	0.1	0.1		0.1	0.1		1.1	1.0		3.8	2.2		0.1	0.1		5.2	3.4
	Ber jal	0.1	0.3		0.7	0.6		9.5	10.4		20.0	28.5		3.3	4.9		33.5	44.6
	Doiar trap	0.0	0.0		0.1	0.1		0.1	0.3		1.4	1.2		0.1	0.2		1.7	1.8
	Horhori	0.0	0.0		0.0	0.0		0.3	0.3		4.9	4.9		0.7	0.7		6.0	6.0
	Moi jal	0.0	0.0		0.0	0.0		5.4	5.4		1.7	1.7		0.5	0.5		7.6	7.6
	Hand fishing	0.0	0.0		0.0	0.0		0.0	0.0		1.8	1.8		0.7	0.7		2.5	2.5
TOTAL	Koi jal	0.0	0.0		0.0	0.0		0.0	0.0		1.8	1.8		0.2	0.2		2.1	2.1
	Sip	0.0	0.0		0.0	0.0		0.0	0.0		1.6	1.6		0.7	0.7		2.3	2.3
		0.2	0.3		0.8	0.8		16.4	17.4		37.1	43.7		6.4	8.0		60.9	70.3
			0.2			0.2			2.4			6.0			1.6			6.7
		0.2	0.2	1.0	0.3	0.3	0.6	2.1	2.2	2.2	3.0	3.2	6.0	3.1	3.3	5.2	8.8	15.0
		0.3	0.2	1.1	0.1	0.1	0.1	10.2	9.7	9.9	14.0	11.2	21.0	11.2	9.8	15.2	35.7	31.0
INSIDE	Doiar trap	1.0	1.0	4.6	3.1	3.0	4.9	4.5	4.2	4.3	4.8	5.1	9.5	3.6	3.6	5.6	16.9	28.9
	Thella jal	0.2	0.2	0.9	0.0	0.0	0.0	3.4	3.4	3.5	11.3	11.3	21.2	17.7	17.7	27.7	32.7	53.3
		1.6	1.6	7.6	3.5	3.4	5.6	20.2	19.5	20.0	33.2	30.8	57.8	35.6	34.4	53.7	94.0	144.6
			0.4	3.3		1.1	2.2		1.0	7.2		1.4	8.1		1.5	9.3		2.6
STD ERR																		

Note: Obs = observed; Pred = predicted

Note: Obs = observed; Pred = predicted

**Figure 7.20** Comparison of mean catch rates of dominant gears from combined low elevation floodplains/beel inside and outside the PIRDP, March 1993 - February 1994



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repeat the analysis separately for *ber jal* and for *current jal* and *doiar* traps, but that would leave too few common gears on which to base the statistical comparisons. The effect on the statistical analysis is clear cut. The difference in predicted catch rates in the outside sites in seasons 1 and 4 and to a lesser extent in season 5 estimated in the analysis is intermediate between the almost zero difference seen for *ber jal* and the substantial difference seen for *current jal* and *doiar* traps.

Taken at face value, the parameter estimates measuring the seasonal differences in underlying density of fish at the inside and outside sites indicated lower densities at the inside sites in each season, but only for seasons 1 and 4 were they individually statistically significant. Taken together, there were highly significant ( $p < 0.01$ ) differences in densities between the inside and outside sites, with densities lower at the inside sites.

Total annual catches per hectare by the 8 dominant gears were substantially higher at the inside sites than at the outside sites (Table 7.11), however again this in part was due to higher levels of fishing effort expended at the inside sites. Estimates of standardised effort per hectare, summed across all 8 gears and seasons, were derived from the statistical analysis. For the inside sites, the total standardised effort (measured in *current jal* hours per hectare) was 3694, compared with 1923 for the outside sites.

To make allowance for this difference in effort, estimates of the total annual catch per hectare at inside sites, based on the observed effort pattern by gear at the inside sites, were calculated using both the predicated densities at inside and outside sites. The results are shown in Table 7.11. The predicted total catch per hectare using the inside densities was 89.7 kg per hectare (S.E. 2.6), while the corresponding figure predicted using the outside densities was 144.6 kg per hectare (S.E. 14.8). This difference is nominally highly significant statistically, suggesting that the outside sites were substantially more productive than the inside sites. However, this conclusion must be balanced against the lack of fit in the statistical model.

In summary, there is some evidence that higher catch rates can be taken at outside sites in some seasons using *current jal* and *doiar* traps, but no differences were seen in *ber jal* catch rates. Thus there may be higher fish densities in the outside sites, but this has not been demonstrated conclusively.



*Comparison of low elevation sites: NWR (inside)/NCR outside*

At the outside sites in the North Central Region, over 88% of the total catch per hectare for the period March 1993 to February 1994 was taken by 9 gears. In all, 10 gears were used in the statistical analysis of catch rates, as listed in Table 7.12. Four gears appeared in both lists: *thella jal*, *current jal*, *ber jal* and *daun*. In particular, *thella jal* took nearly 22% of the catch per hectare at the inside sites, and nearly 32% at the outside sites. A total of 1112 individual catch rate observations were used in this analysis.

Comparison of the seasonally pooled catch rates by gear between inside and outside sites indicated that the main assumptions of the statistical analysis were reasonably satisfied. There was generally good agreement between observed and predicted catch rates, except for *current jal* in season 1 at the outside sites, where there was considerable discrepancy. Investigation revealed that only a single catch rate observation was available for this gear and season. Repeating the statistical analysis with this single observation removed resulted in almost no change in the parameter estimates or significance levels of the various tests, so the discrepancy did not bias the results.

Parameter estimates measuring the seasonal differences in underlying density of fish at the inside and outside sites indicated a slightly lower density at the inside sites in seasons 1, but this was not statistically significant. In each of seasons 2, 3, 4 and 5, the estimated densities were significantly greater at the inside sites than at the outside sites (Fig. 7.21). Taken together, there are highly significant ( $p < 0.01$ ) differences in densities between the inside and outside sites.

Total annual catches per hectare by the 10 gears were very much higher at the inside sites than at the outside sites (Table 7.12), however this was partly due to higher levels of fishing effort expended at the inside sites. Estimates of standardised effort per hectare, summed across all 10 gears and seasons, were derived from the statistical analysis. For the inside sites, the total standardised effort (measured in *thella jal* hours per hectare) was 153.6, compared with 82.4 for the outside sites.

To make allowance for this difference in effort, estimates of the total annual catch per hectare at inside sites, based on the observed effort pattern by gear at the inside sites, were calculated using both the predicted densities at inside and outside sites. The results are shown in Table 7.12. The predicted total catch per hectare using the inside densities was 107.7 kg per hectare (S.E. 4.9), while the corresponding figure predicted using the outside densities was 45.9 kg per hectare (S.E. 2.4). This difference was highly significant statistically, and demonstrates that the inside sites were considerably more productive than the outside sites.

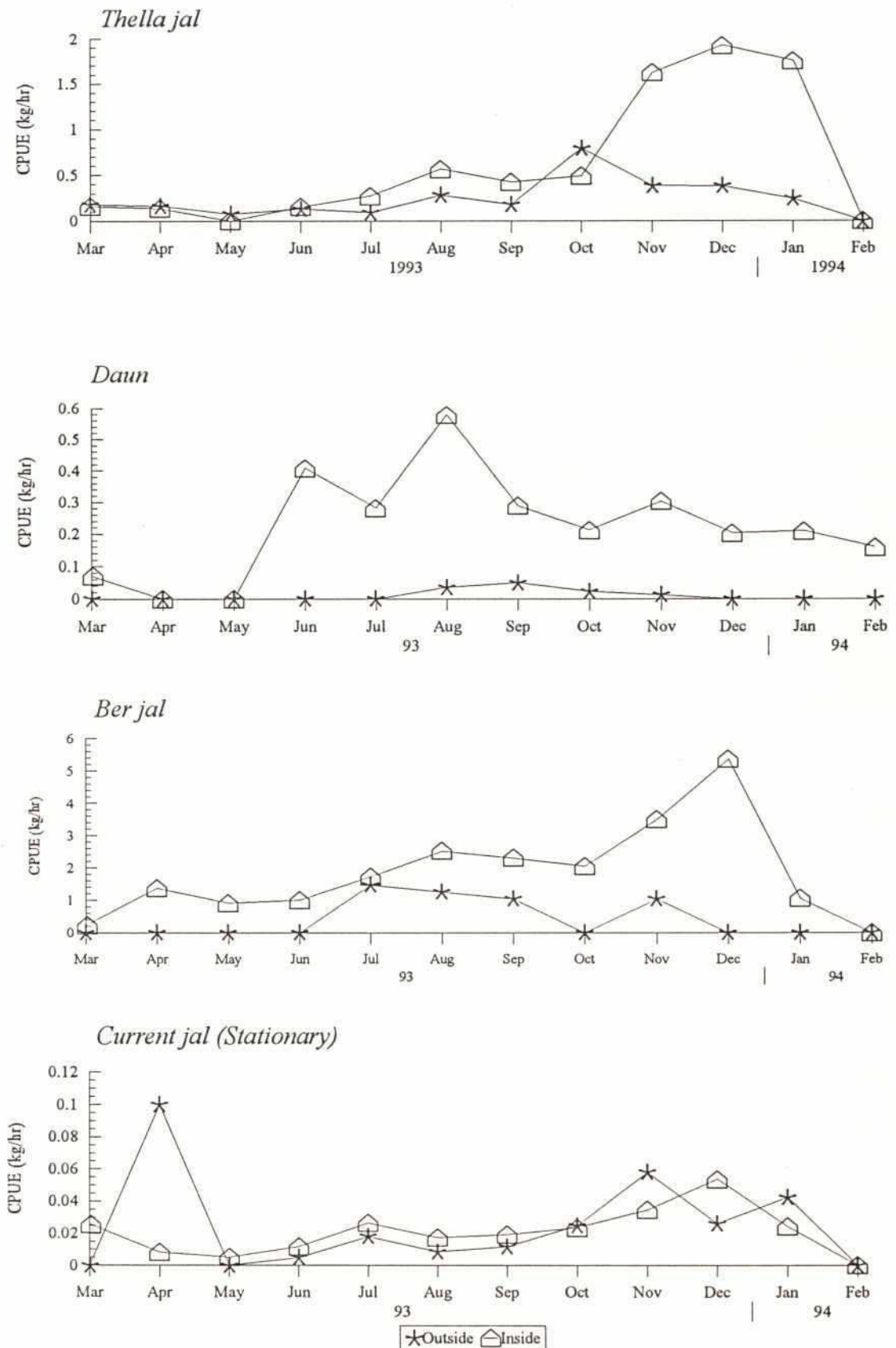
Table 7.12 Comparison of the total catch per hectare from low elevation floodplains/beel inside the PIRDP and in the North Central Region, March 1993 -February 1994

		SEASON																	
		Mar-Apr			May-June			July-Sept			Oct-Nov			Dec-Feb					
		1			2			3			4			5			TOTAL		
Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out	Obs	Pred	Pred Out		
OUTSIDE	Thella jal	0.2	0.2		0.1	0.1		0.8	0.9		4.2	6.1		1.3	2.1		6.5	9.3	
	Current jal (Stationary)	0.0	0.0		0.0	0.0		0.7	0.7		1.3	0.9		0.2	0.1		2.3	1.7	
	Ber jal	0.0	0.0		0.0	0.0		1.2	1.0		0.0	0.0		0.0	0.0		1.2	1.0	
	Daun	0.0	0.0		0.0	0.0		0.3	0.7		0.8	3.3		0.0	0.0		1.1	4.0	
	Veshal	0.0	0.0		0.0	0.0		0.7	0.7		1.9	1.9		0.0	0.0		2.6	2.6	
	Ucha	0.0	0.0		0.0	0.0		0.8	0.8		1.7	1.7		0.5	0.5		3.0	3.0	
	Jhaki jal	0.1	0.1		0.1	0.1		0.0	0.0		1.5	1.5		0.5	0.5		2.3	2.3	
TOTAL	Hand fishing	0.0	0.0		0.0	0.0		0.0	0.0		0.9	0.9		0.2	0.2		1.1	1.1	
	Tukri	0.0	0.0		0.0	0.0		0.4	0.4		0.3	0.3		0.0	0.0		0.8	0.8	
		0.4	0.4		0.2	0.2		4.9	5.1		12.6	16.6		2.7	3.5		20.9	25.8	
STD ERR		0.1			0.0			0.5			1.7			0.5			1.8		
INSIDE	Thella jal	0.2	0.2	0.2	0.0	0.0	0.0	3.4	3.4	1.4	11.3	10.0	4.8	17.7	14.8	5.2	32.7	28.4	11.7
	Current jal (Stationary)	0.2	0.2	0.2	0.3	0.3	0.1	2.1	2.1	0.9	3.0	3.8	1.9	3.1	3.6	1.2	8.8	10.0	4.3
	Ber jal	0.3	0.3	0.3	0.1	0.1	0.0	10.2	10.6	4.4	14.0	14.0	6.8	11.2	11.2	3.9	35.7	36.1	15.4
	Daun	0.0	0.0	0.0	0.5	0.5	0.2	5.7	5.3	2.2	6.8	5.7	2.8	4.6	4.6	1.6	17.6	16.2	6.8
	Doiar trap	1.0	1.0	1.1	3.1	3.1	1.1	4.5	4.5	1.9	4.8	4.8	2.3	3.6	3.6	1.3	16.9	16.9	7.7
TOTAL		1.6	1.6	1.9	4.0	4.0	1.5	25.9	26.0	10.8	40.0	38.4	18.6	40.2	37.7	13.2	111.7	107.7	45.9
STD ERR		0.0	0.2	0.5	0.0	0.8	0.6	0.0	1.6	0.9	0.0	2.9	1.7	0.0	3.5	1.2	0.0	4.9	2.4

Note: Obs = observed; Pred = predicted



Figure 7.21 Comparison of mean catch rates of dominant gears from low elevation floodplains/beel inside the PIRDP and in the North Central Region, March 1993 - February 1994





### Comparison of high elevation sites: NWR (inside)/NCR (outside)

At the inside sites, over 90% of the total catch per hectare for the period March 1993 to February 1994, excluding *katha* and *kua*, was taken by 6 gears. In descending order of contribution to the total catch per hectare, these were *doiar* traps, *polo* traps, *sip*, hand/dewatering, *jhaki jal*, and *nol barsi*. *Doiar* traps accounted for over 50% of the total. At the outside sites in the North Central Region, 92% of the total catch per hectare over the same period was taken by 8 gears. In descending order of contribution to the total catch per hectare, these were *thella jal*, *ber jal*, *jhaki jal*, *dharma jal*, *dhor jal*, *current jal*, hand fishing and *sip*. *Thella jal* accounted for 44% of the total. Merging the two gear lists resulted in a total of 12 different gears. This exceeded the maximum number of gears considered appropriate for inclusion in the statistical analysis of catch rates. Restricting the cumulative percentage to 86% reduced the combined list to 10 gears, but then there was only one gear, *jhaki jal* used at both inside and outside sites.

Inspection of the two gear lists reveals that *doiar* traps, which accounted for 51% of the catch per hectare at the inside sites, accounted for less than 1% of the total catch per hectare at the outside sites. *Thella jal*, which accounted for 44% of the outside catch per hectare, accounted for only 2% of the catch per hectare at inside sites. It is clear that the gear usage is quite different at inside and outside sites in this inter-regional comparison of high elevation floodplain/beel sites. Given these differences, and the fact that there was only one common gear out of the 10 major gears, statistical comparison of fish densities using the proposed methods was therefore not possible.

## 7.4 Biodiversity and Catch Composition

### 7.4.1 Species richness

An arithmetic mean of 57 fish species was recorded from sites inside the PIRDP for the period March 1993 - February 1994. This was 25% fewer than the mean number of species (76) found at the North West Region sites outside it for the same period (Table 7.13). Statistical comparison of the means (Students 't' test) revealed that the difference between sites was significant ( $p < 0.05$ ). On high elevation sites inside the PIRDP, an annual average of 31 fish species was recorded which was 42% lower than that from comparable sites in the North Central Region (Table 7.14). The difference between sites was also statistically significant ( $p < 0.05$ ).

A reduction of 25% to 42% in species diversity is clearly a major adverse impact of the PIRDP on fish populations. Comparisons with results from rivers and canals inside and outside the PIRDP revealed a differential impact of the scheme on species diversity between different habitats with a greater reduction in diversity on its floodplains compared to canals (11%) and rivers (17%). A more detailed examination of the impact of this reduction in species richness on fish community structure is made in Section 7.4.2 when the distributions individual species are presented.

On low elevation sites in the North Central Region, the numbers of fish species recorded from several unregulated floodplains and *beel* were substantially lower than those recorded in the North West Region from either outside or inside the PIRDP. Possible reasons for such marked inter-regional differences in species diversity are discussed in Sections 7.4.2 and 7.5.

**Table 7.13** Total annual number of fish species recorded from low elevation floodplains/*beel* inside and outside the PIRDP, March 1993 - February 1994

Site code	Inside/Outside FCDI	Number of species	% decrease compared with average NW outside
NW04	Inside	57	25
NW05	Inside	58	24
NW09	Inside	48	37
NW10	Inside	64	16
NW12	Inside	56	26
Average NWR	Inside	57 (2.6)	25
NW17	Outside	80	
NW18	Outside	71	
Average NWR	Outside	76 (4.5)	
NC23	Outside	57	25
NC27	Outside	20	74
NC28	Outside	39	49
NC31	Outside	68	11
Average NCR	Outside	46 (10.5)	39

Note: Arithmetic mean of number of species rounded to nearest whole number and standard errors of means given in parentheses



Table 7.14 Total annual number of fish species recorded from high elevation floodplains/beel inside and outside the PIRDP, March 1993 - February 1994

Site code	Inside/Outside FCDI	Number of species	% decrease compared with average NCR
NW22	Inside	33	38
NW23	Inside	29	45
Average NWR		31 (2.0)	42
NC04	Outside	64	
NC08	Outside	46	
NC09	Outside	44	
NC18	Outside	46	
NC19	Outside	65	
Average NCR		53 (4.7)	

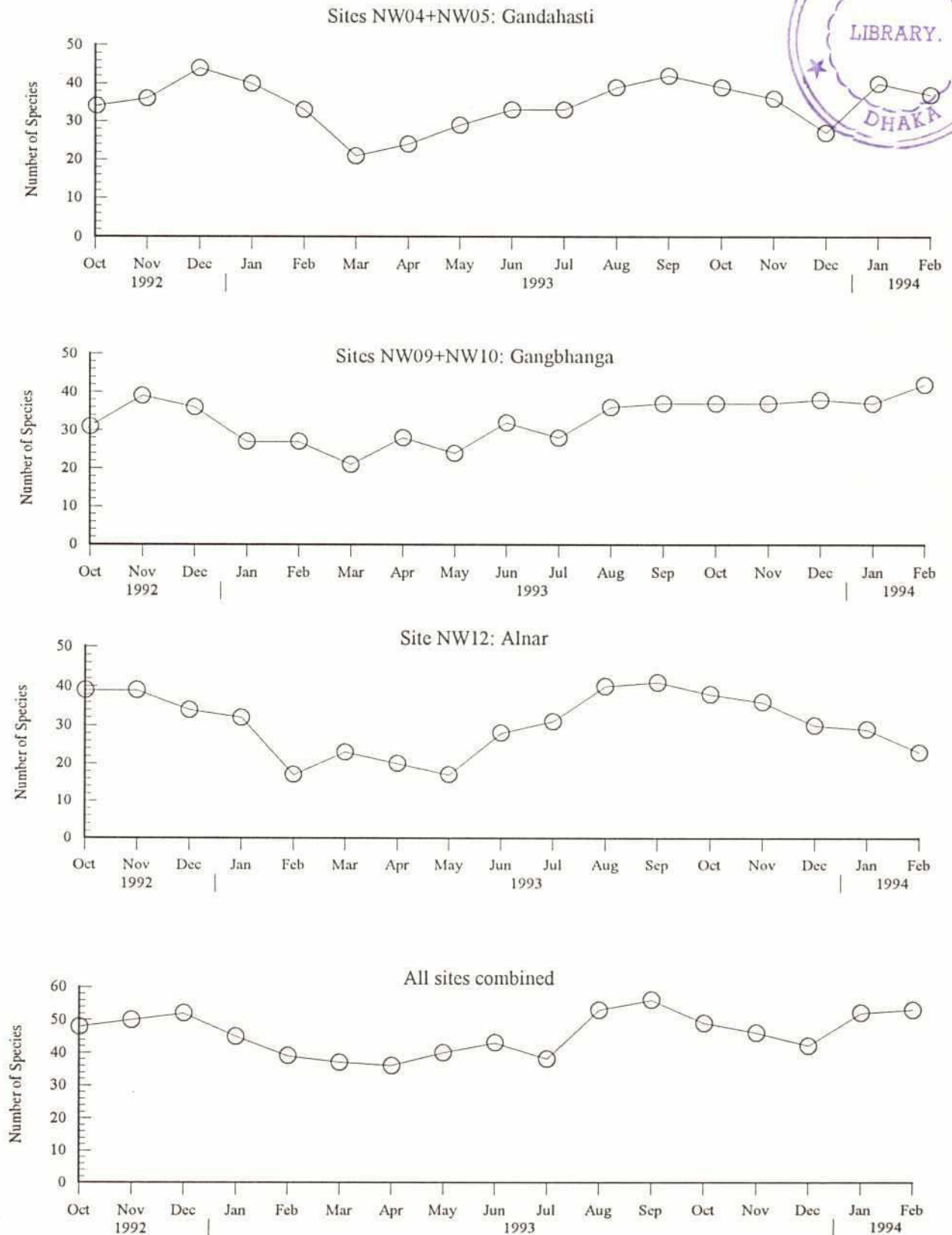
Note: Arithmetic mean of number of species rounded to nearest whole number and standard errors of means given in parentheses

Seasonal variations in species diversity followed broadly similar patterns between different low elevation sites inside the PIRDP (Fig. 7.22). Lowest numbers of species were recorded between March and May and highest numbers between August and October. However, in the Kageswari basin (sites NW09 and NW10), species number remained unusually stable up to January 1994. In the two other basins, diversity progressively declined from September to December continuing on until February in the Chiknai basin (site NW12) while rising again in January in the Badai basin (sites NW04+NW05).

Outside the PIRDP at Potajia, a similar seasonal pattern in diversity was recorded but the difference between the numbers of species recorded during the pre-monsoon and monsoon periods was considerably greater than that inside the PIRDP (Fig. 7.23). This probably resulted from the greater importance of winter fisheries, particularly *katha* and *kua*, within the PIRDP which retained relatively high levels of species diversity. Because of the larger seasonal difference in species number outside the PIRDP, the rate of increase in numbers of species during the transition period of June and July was greater than that inside the scheme.

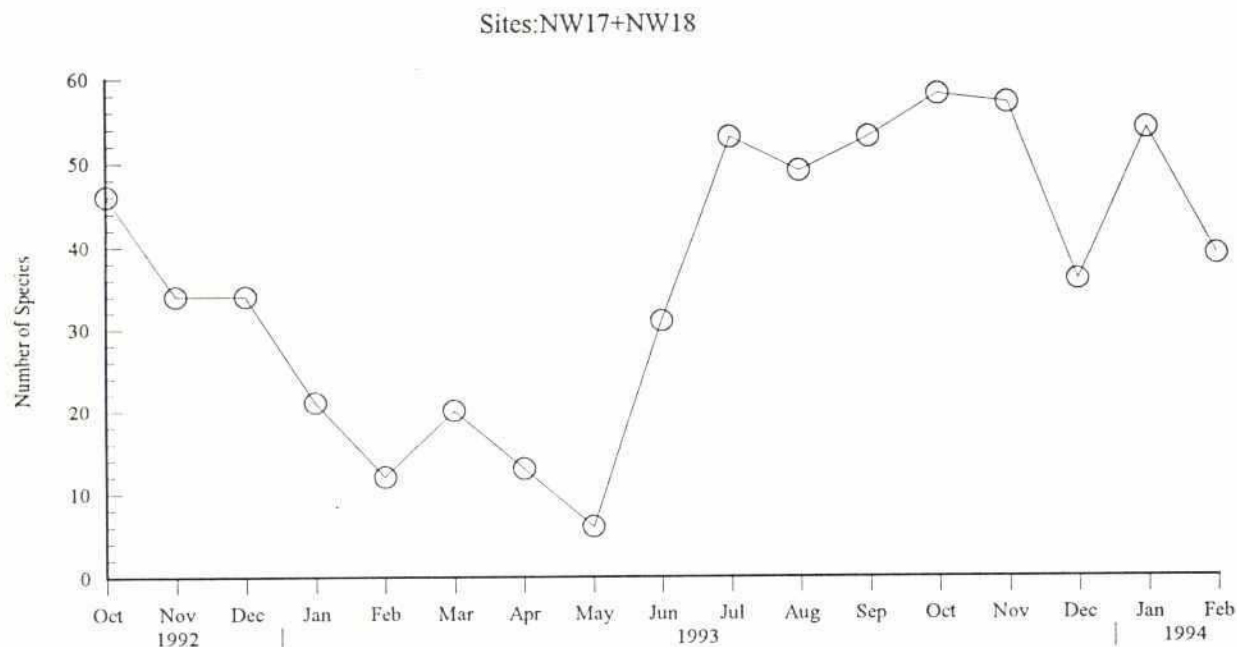


Figure 7.22 Seasonal variation in the number of fish species recorded from low elevation floodplains/beel inside the PIRDP, October 1992 - February 1994

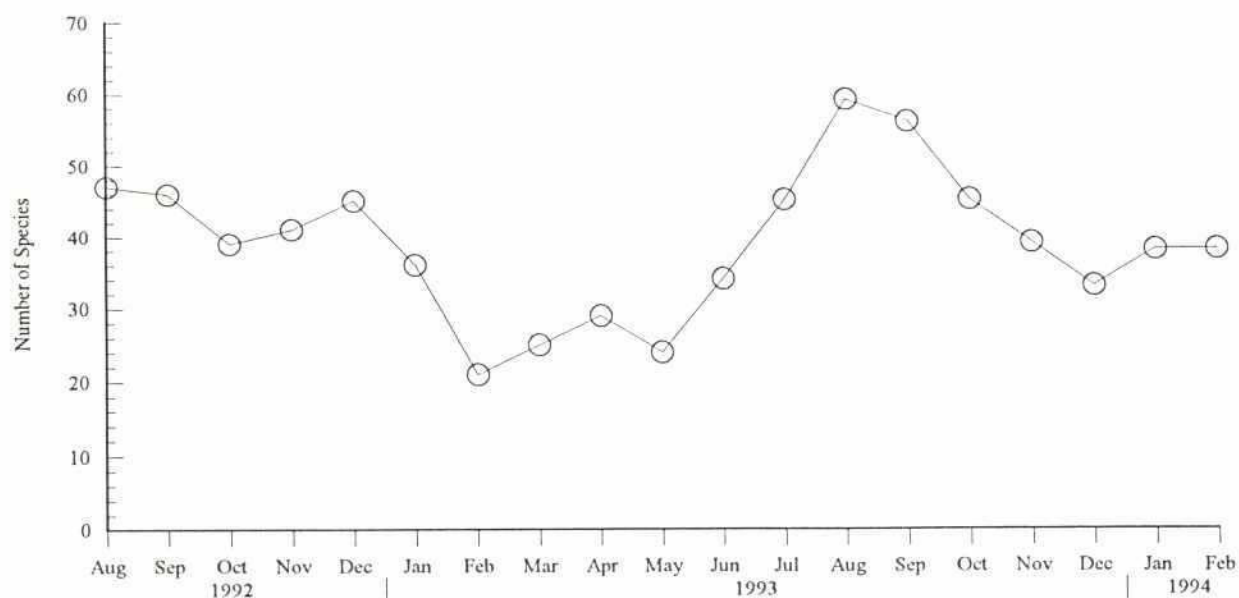


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**Figure 7.23** Seasonal variation in the number of fish species recorded from low elevation floodplains/beel outside the PIRDP



Combined sites: NC23+NC27+NC28+NC31



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In the North Central Region, species richness was generally lowest from February to May, rising fairly sharply in June and July to reach a peak in August after which there was a steady decrease until December when numbers levelled off during the winter. Again, the seasonal difference between maximum and minimum levels of diversity was more marked than that inside the PIRDP but less than that the North West Region sites outside it.

On high elevation floodplains/*beel* inside the scheme, no fishing was observed from January to May 1993. When fishing first resumed in June, 22 species of fish were recorded rising slightly to 27 species during August and September before decreasing a little during the drawdown and then considerably in February 1994. In the North Central Region, seasonal trends broadly followed those seen on lower elevation sites in the same region but with an extended period of peak diversity (August - October) and a sharp rise in species numbers in February when *katha* in perennial *beel* were fished. The perennial waters and flooding of adjacent floodplains allowed fishing to continue in those months when fishing was not possible or worthwhile on lands of equivalent elevation inside the PIRDP (Fig. 7.24).

#### 7.4.2 Catch composition

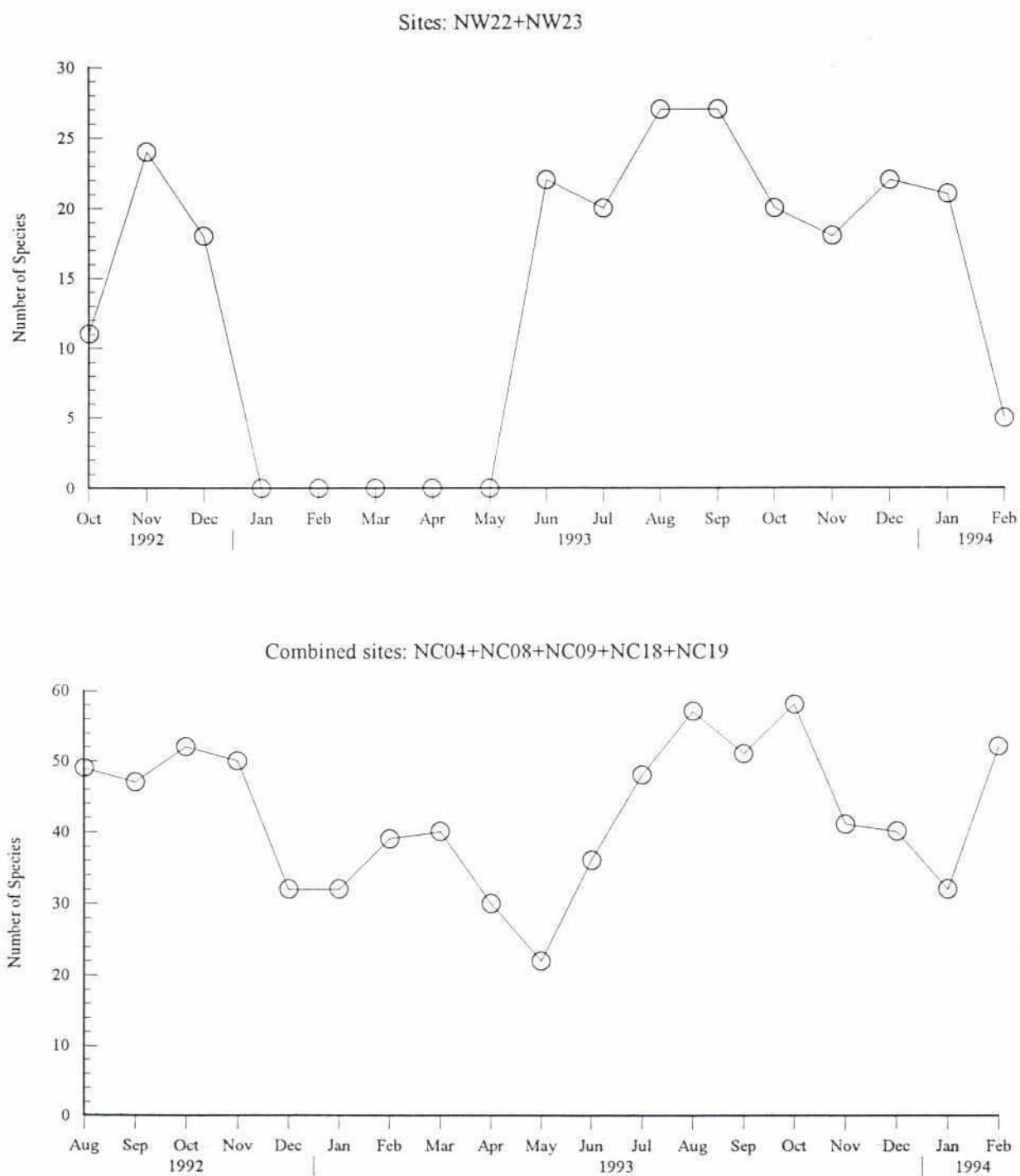
Detailed monthly catch compositions containing all species recorded at each site are given in Appendix 6, A-P. In all tables, species are divided into three categories based on habitat preference: a) riverine b) migratory and c) floodplain resident (see Section 5.3.2 for details). The percentage contributions to the total annual catches made by each of these categories are presented in Table 7.15.

Floodplain resident species dominated catches on both low and high elevation floodplains/*beel* inside and outside the PIRDP. However, the degree to which they dominated catches varied greatly between sites. At low elevation sites, floodplain resident species comprised 63% of the catch inside but only 50% outside it in the North West Region. Similarly, at high elevation sites these species comprised 87% of the PIRDP catch compared to 64% of outside catches in the North Central Region.

Riverine and migratory species accounted for 35% of the catch from low elevation sites in the North West Region outside the scheme compared with only 10% inside it. In the North Central Region, they comprised only 6% of the catch from unregulated low elevation floodplains. Inside the PIRDP riverine and migratory species were very rare on high elevation floodplains/*beel* where together they accounted for less than 1% of the annual catch compared with 13% from sites in the North Central Region.



**Figure 7.24** Seasonal variation in the number of fish species recorded from high elevation floodplains/beel inside and outside the PIRDP



Note: At sites NW22+NW23 no fishing was observed from January to May 1993

**Table 7.15** Percentage contributions of riverine, migratory and floodplain resident species to the annual catches from floodplains/beel inside and outside the PIRDP, March 1993 - February 1994

LOW ELEVATION SITES

Site code	Name	Inside/Outside FCDI	% Total annual catch		
			Riverine	Migratory	Floodplain Resident
NW04 + NW05	Gandahasti	Inside	0.4	5.3	62.8
NW09 + NW10	Gangbhanga	Inside	0.4	22.4	55.7
NW12	Alnar	Inside	0.5	7.6	69.0
Total NWR		Inside	0.4	9.6	62.8
NW17 + NW18	Potajia	Outside	8.4	27.2	49.5
NC23	Hazipur	Outside	<0.1	4.5	71.9
NC27 + NC28	Char Ghior	Outside	<0.1	7.0	54.1
NC31	Gala/Alamdi	Outside	0.2	7.8	82.1
Total NCR		Outside	<0.1	5.8	73.5

HIGH ELEVATION SITES

Site code	Name	Inside/Outside FCDI	% Total annual catch		
			Riverine	Migratory	Floodplain Resident
NW22	Kanaider	Inside	0.9	<0.1	89.2
NW23	Someshpur	Inside	<0.1	<0.1	83.8
Total NWR		Inside	0.9	<0.1	86.5
NC04	Gazaria	Outside	0.2	3.3	73.7
NC08 + NC09	Anahula	Outside	5.0	20.5	59.2
NC18 + NC19	Mailjani	Outside	0.3	18.0	56.2
Total NCR		Outside	0.5	12.1	63.9

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Examination of the catch per unit area of each category of fish from low elevation North West Region sites inside and outside the PIRDP revealed that the catch of riverine and migratory species was 53% lower inside the scheme while the catch of floodplain resident fish was 110% higher (Table 7.16). On higher elevation sites, the catch of riverine and migratory fish was 99% lower than that outside and floodplain resident fish 78% lower than the outside catch. This differential impact on migratory and non-migratory groups of fish was also observed in canal catches where there was a reduction of 71% in riverine and migratory species compared with a 41% decrease in floodplain resident fish (see Section 6.4.2). The differential impact on different groups of fish could also be seen in terms of the effect on species diversity (Table 7.17), where there was a proportionately greater decrease in the numbers of riverine and migratory species from low elevation sites inside the scheme (46%) compared with floodplain resident species (12%). A similar trend was found on higher elevation sites with reduction of 78% and 13% of migratory and non-migratory groups respectively inside the scheme. A similar differential impact was seen in canal catches.

**Table 7.16 Annual catch per unit area (kg/ha) of riverine, migratory, floodplain resident fish and prawns from combined sites inside and outside the PIRDP, March 1993 - February 1994**

Region	Elevation low/high	Inside/ Outside FCDI	Fish			Prawn
			Riverine	Migratory	Floodplain Resident	
NW	Low	Inside	0.6	13.4	87.6	37.7
NW	Low	Outside	7.1	22.9	41.7	12.6
NC	Low	Outside	0.02	2.4	30.3	8.5
NW	High	Inside	0.07	0.007	12.4	1.8
NC	High	Outside	0.8	10.9	57.6	20.8

In the North Central Region, considerably fewer riverine and migratory species were recorded compared to those in the North West Region sites outside the PIRDP. While, the average number of floodplain resident species was similar in both regions (Table 7.17).



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**Table 7.17** Total annual number of fish species, classified by habitat preference, recorded from low and high elevation floodplains/beel inside and outside the PIRDP, March 1993 - February 1994

LOW ELEVATION SITES

Site code	Name	Inside/ Outside FCDI	Number of species			Total	% change in number of species compared with NW17+NW18	
			Riverine	Migratory	Floodplain resident		Riverine + Migratory	Floodplain Resident
NW04 + NW05	Gandahasti	Inside	13	16	40	69	-40	-6
NW09 + NW10	Gangbhanga	Inside	10	17	39	66	-44	-9
NW12	Alnar	Inside	8	14	34	56	-54	-21
Average		Inside	10	16	38	64	-46	-12
NW17 + NW18	Potajia	Outside	25	23	43	91		
NC23	Hazipur	Outside	2	12	43	57	-71	0
NC27 + NC28	Char Ghior	Outside	1	9	30	40	-79	-30
NC31	Gala/Alamdi	Outside	9	13	46	68	-54	+6
Average		Outside	4	11	40	55	-69	-6

HIGH ELEVATION SITES

Site code	Name	Inside/ Outside FCDI	Number of species			Total	% change in numbers of species compared with average NCR	
			Riverine	Migratory	Floodplain Resident		Riverine + Migratory	Floodplain Resident
NW22 + NW23	Kanaider/ Someshpur	Inside	3	2	33	38	-78	-13
NC04	Gazaria	Outside	8	14	42	64		
NC08 + NC09	Anahula	Outside	8	15	27	50		
NC18 + NC19	Mailjani	Outside	6	18	45	69		
Average NCR			7	16	38	61		

Note: + and - denote increase and decrease in numbers respectively

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Percentage contributions made to annual catches from low elevation sites by dominant species, defined here as those species comprising 1% or more of the annual catch, are presented in Table 7.18. No riverine species inside the PIRDP or in the North Central region formed more than 1% of annual catches. Outside the PIRDP in the North West Region, one riverine species, *ilish*, predominated comprising 6% of catch. Inside the PIRDP, *ilish* was recorded on all low elevation floodplains but in very low numbers and monthly catches never exceeded 1% of site totals.

The relative abundance of migratory species, particularly major carps, was considerably higher at Gangbhangha (sites NW09+NW10) than at other inside sites. This difference between sites can be seen more clearly when values of CPUA of major carp species are compared with those of other riverine and migratory species (Table 7.19). The catch of four species of major carp, *rui*, *catla*, *mrigel* and *kalbaus* were six-fold higher at Gangbhangha than at Gandahasti or outside the scheme at Potajia and fifty times higher than at Alnar *beel* in the Chiknai basin. In contrast, catches of other migratory species were lower in Gangbhangha than outside the scheme or at Alnar but double that at Gandahasti. It therefore appears that there were different sets of factors determining the abundance in the catch of major carps and other migratory species. These are discussed in more detail later in the report when migrations of individual species are examined more closely (see Section 7.5). In addition to major carps, other dominant migratory species found inside the PIRDP included *fulchela*, *chapila* and *boal*. Data from monthly catch compositions from each site indicate that these species are able to remain on the floodplains throughout the year surviving in low numbers in the residual dry season *beel* or *kua*.

At Potajia (NW17+18) eight dominant migratory species contributed 27% of the annual catch. This was considerably higher than that (4-5%) from two of the three comparable drainage basins inside the scheme and also higher than at Gangbhangha (19%) where carp were more abundant. Of the eight dominant species, catfish were most important: *boal* contributed about 7% of the catch, smaller species such as *kabashi* and *golsha tengra* together comprised a further 8%, *ayre*, 1.4% and *batasi*, 1.1%. Other non-catfish species included *chapila*, *fulchela* and *rui*. In the North Central Region, four dominant migratory species provided between 3% and 7% of the annual catch of low elevation sites. The most abundant species was *rui*, followed by *catla*, *golsha tengra* and *ayre*.



Table 7.18 Percentage contribution (by weight) to the annual catch by dominant species from low elevation floodplains/beel inside and outside the PIRDP, March 1993 – February 1994

Habitat	Species name		North West Region					North Central Region			
			Inside FCDI				Outside FCDI	Outside FCDI			
Preferenc	Scientific	Bengali	NW04+NW05	NW09+NW10	NW12	All sites	NW17+NW18	NC23	NC27+NW28	NC31	All sites
Riverine	<i>Hilsa ilisha</i>	<i>Ilish</i>					6.2				
Subtotal							6.2				
Migratory	<i>Aorichthys aor</i>	<i>Ayre</i>					1.4		1.4		
	<i>Mystus bleekeri</i>	<i>Golsha tengra</i>					4.4		1.4	2.2	
	<i>Mystus cavasius</i>	<i>Kabashi</i>		1.3			3.7				
	<i>Catla catla</i>	<i>Catla</i>		2.6					2.1	1.8	
	<i>Cirrhinus mrigala</i>	<i>Mrigel</i>		2.8							
	<i>Labeo calbasu</i>	<i>Kalbasu</i>		1.6							
	<i>Labeo rohita</i>	<i>Rui</i>	1.4	6.6		2.2	1.2	2.9	1.6	2.4	2.7
	<i>Salmostoma phulo</i>	<i>Fulchela</i>	2.4		4.7	2.6	1.8				
	<i>Gudusia chapra</i>	<i>Chapila</i>		2.9			4.2				
	<i>Pseudeutropius atherinoides</i>	<i>Batasi</i>					1.1				
	<i>Wallagu attu</i>	<i>Boal</i>		1.3			6.8				
Subtotal			3.9	19.0	4.7	4.8	24.4	2.9	6.4	6.5	2.7
Floodplain Resident	<i>Anabas testudineus</i>	<i>Koi</i>						3.8	2.2	6.4	4.5
	<i>Mystus tengara</i>	<i>Bajari tengra</i>		3.8	4.9	2.2					
	<i>Mystus vittatus</i>	<i>Tengra</i>		1.5	2.3	1.2	4.0	1.5	1.5	1.0	1.3
	<i>Colisa fasciatus</i>	<i>Khalisha</i>	1.9		1.1	1.4		3.2	4.9	6.1	4.3
	<i>Colisa lalia</i>	<i>Lal khalisha</i>							2.2	2.9	1.3
	<i>Xenentodon cancila</i>	<i>Kaikka</i>	8.8	3.3	8.0	7.4		7.2	1.8	1.1	4.7
	<i>Cyprinus carpio</i>	<i>Karfu</i>					3.1				
	<i>Puntius conchoniensis</i>	<i>Canchan puti</i>	3.8	3.0	4.4	3.8	2.1	2.3			1.8
	<i>Puntius phutunio</i>	<i>Phutani puti</i>	1.1								
	<i>Puntius sophore</i>	<i>Puti</i>	4.2	6.7	13.5	7.0	11.3	11.9	10.3	15.7	13.0
	<i>Glossogobius giuris</i>	<i>Bailla</i>	4.5	2.1	4.8	4.0	5.7	1.6	3.8	1.1	1.7
	<i>Lepidocephalus guntea</i>	<i>Gutum</i>	2.1		1.2	1.6	1.3	3.3	1.8	1.4	2.5
	<i>Channa marulius</i>	<i>Gajar</i>		6.1		1.6				2.8	
	<i>Channa punctatus</i>	<i>Taki</i>	13.2	5.1	7.0	9.9	2.5	15.2	7.1	16.1	14.8
	<i>Channa striatus</i>	<i>Shol</i>	5.0			2.8		1.4	1.1	9.4	3.9
	<i>Clarias batrachus</i>	<i>Magur</i>						1.6			1.3
	<i>Heteropneustes fossilis</i>	<i>Shingi</i>						5.9	2.3	2.8	4.6
	<i>Macrognathus aculeatus</i>	<i>Tara baim</i>	1.3	1.4	2.0	1.5	2.4	1.3		1.1	1.2
	<i>Macrognathus pancalus</i>	<i>Guchi</i>	4.4	7.2	6.4	5.5	3.3	5.1	4.5	4.2	4.8
	<i>Mastacembelus armatus</i>	<i>Baral baim</i>		2.6	1.4	1.5	3.7		1.2	2.7	1.2
	<i>Ompok bimaculatus</i>	<i>Kani pabda</i>		3.2							
	<i>Tetraodon cutcutia</i>	<i>Potka</i>	2.0			1.3					
	<i>Chanda baculis</i>	<i>Chanda</i>			1.6						
	<i>Chanda nama</i>	<i>Nama chanda</i>	1.9	1.9	4.0	2.4	3.6				
	<i>Chanda ranga</i>	<i>Lal chanda</i>	3.0	2.1	3.4	2.9	1.2	1.6	2.0		1.3
Subtotal			57.2	49.8	66.0	58.0	44.2	66.9	46.4	74.6	68.0
Other	Prawn spp.	<i>Chingri/Icha</i>	31.2	21.6	22.9	27.1	14.9	23.6	38.8	9.9	20.6
Subtotal			31.2	21.6	22.9	27.1	14.9	23.6	38.8	9.9	20.6
Grand total			92.2	90.4	93.6	89.9	89.7	93.4	91.7	91.0	91.3

Notes:

1. Dominant species are defined as those species which comprised 1% or more of the total annual catch
2. Shaded values highlight the most abundant species (>4%)
3. See text for definitions of habitat preference categories (Section 5.3.2)





Table 7.19 Annual catch per unit area (kg/ha) of major carps and other migratory species from low elevation floodplains/*beel* inside and outside the PIRDP, March 1993 - February 1994

Site Code	Name	Inside/ Outside FCDI	Rui	Catla	Mrigel	Kalbaus	Total major carps	Total other riverine + migratory species
NW17 + NW18	Potajia	Outside	0.97	0.38	0.79	0.40	2.54	27.45
NW04 + NW05	Gandahasti	Inside	2.06	0.55	0.04	0.10	2.75	5.46
NW09 + NW10	Gangbhanga	Inside	7.68	3.01	3.25	1.92	16.75	10.79
NW12	Alnar	Inside	0.11	0	0	0.20	0.31	12.26
NWR combined sites (NW04 + 05 + 09 + 10 + 12)		Inside	3.07	1.06	0.86	0.58	5.57	8.33
NCR combined sites (NC23 + 27 + 28 + 31)		Outside	1.10	0.35	0.06	<0.01	1.51	0.91

The number of dominant floodplain resident species ranged from 12 to 15 at paired floodplain/*beel* sites inside and outside the PIRDP. Of the 12 dominant species found outside the scheme at Potajia, 11 were found inside the PIRDP. The one exception was an exotic species, the common carp, which probably originated from pond overflows outside the scheme. Of the remaining 11 indigenous species, only one, *tengra*, was relatively more abundant outside than inside. Those species which were particularly more abundant inside included *kaikka*, *taki* and *guchi baim*. These were also some of the most widespread as well as abundant species inside scheme, others being *puti*, *canchan puti*, *bailla* and *lal chanda*. In the North Central Region, two species, *puti* and *taki*, were considerably more abundant than others and together comprised 28% of the combined floodplain catch. One important difference between regions was the greater predominance in the North Central Region of species adapted to low oxygen conditions such as *koi*, *shingi* and *magur*. This suggests that there may be environmental differences between regions but these were not identified by the water quality monitoring programme of FAP 17.

On higher elevation floodplains/*beel* inside the PIRDP, no riverine or migratory species comprised more than 1% of the annual catch (Table 7.20). On comparable unregulated floodplains in the North Central Region, one riverine species, *piali* contributed 4% of the

Table 7.20 Percentage contribution (by weight) to the annual catch by dominant species from high elevation floodplains/beel inside and outside the PIRDP, March 1993 – February 1994

Habitat Preference	Species name		North West Region Inside FCDI			North Central Region Outside FCDI			
	Scientific	Bengali	NW22	NW23	All sites	NC04	NC08+NC09	NC18+NC19	All sites
Riverine	<i>Aspidoparia morar</i>	Piali					3.9		
Subtotal							3.9		
Migratory	<i>Catla catla</i>	Catla						6.4	3.1
	<i>Cirrhinus mrigala</i>	Mrigel					1.5	2.1	1.2
	<i>Labeo rohita</i>	Rui				1.0	3.7	4.5	2.9
	<i>Salmostoma phuko</i>	Fulchela					7.4		1.5
	<i>Gudusia chapra</i>	Chapila					1.7		
	<i>Wallagu attu</i>	Boal					1.7		
	<i>Notopterus chitala</i>	Chital						1.2	
Subtotal						1.0	16.1	14.2	8.6
Floodplain Resident	<i>Anabas testudineus</i>	Koi						1.7	
	<i>Mystus vittatus</i>	Tengra				2.0	1.1	1.1	1.5
	<i>Colisa fasciatus</i>	Khalisha	1.8	15.7	10.2	2.9	2.7	3.6	3.2
	<i>Colisa labiosus</i>	Khalisha		3.5	1.8				
	<i>Colisa lalia</i>	Lal khalisha				3.3	2.7	1.4	2.4
	<i>Colisa sota</i>	Khalisha	1.7	2.0	1.8				
	<i>Xenentodon cancila</i>	Kaikka	1.5	1.3	1.4	2.2			1.4
	<i>Puntius conchoniis</i>	Canchan puti	4.4	2.8	3.6	4.4	6.1		2.9
	<i>Puntius phutunio</i>	Phutani puti		1.3					
	<i>Puntius sophore</i>	Puti	5.3	9.0	7.1	13.3	10.7	7.0	12.2
	<i>Puntius ticto</i>	Tit puti	1.5	1.0	1.3		1.1		
	<i>Amblypharyngodon mola</i>	Mola					1.1		
	<i>Esomus danricus</i>	Darkina	2.1	8.9	5.4	1.0	1.7	1.2	1.2
	<i>Glossogobius giuris</i>	Bailla	1.0	2.3	1.6	2.1	2.6	3.6	2.8
	<i>Lepidocephalus guntea</i>	Gutum	1.2		1.0	4.0	1.4	3.5	3.5
	<i>Aplocheilichthys panchax</i>	Kanpona	3.0	2.6	2.8				
	<i>Channa orientalis</i>	Cheng		3.5	1.8				
	<i>Channa punctatus</i>	Taki	24.0	9.4	16.8	3.0	5.3	11.4	9.2
	<i>Channa striatus</i>	Shol	34.4		17.7				
	<i>Clarias batrachus</i>	Magur						1.4	
	<i>Heteropneustes fossilis</i>	Shingi		1.5		1.3		1.7	1.4
	<i>Macroglyptothorax aculeatus</i>	Tara baim		2.0	1.2	4.5	1.4	1.1	2.6
	<i>Macroglyptothorax pancalus</i>	Guchi	1.1	6.3	3.7	9.1	6.2	4.7	6.7
	<i>Mastacembelus armatus</i>	Baral baim						2.7	1.5
	<i>Badis badis</i>	Napit koi	2.2	2.4	2.3				
	<i>Chanda nama</i>	Nama chanda					4.6		
	<i>Chanda ranga</i>	Lal chanda		2.0	1.0	4.2	7.2		3.1
Subtotal			85.1	80.6	82.5	67.3	55.9	46.0	55.4
Other	Prawn spp.	Chingri/Icha	9.7	16.2	12.9	22.8	15.3	25.5	23.1
Subtotal			9.7	16.2	12.9	22.8	15.3	25.5	23.1
Grand total			94.8	96.8	95.4	91.1	91.2	85.7	87.1

Notes:

1. Dominant species are defined as those species which comprised 1% or more of the total annual catch
2. Shaded values highlight the most abundant species (>4%)
3. See text for definitions of habitat preference categories (Section 5.3.2)



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annual catch at Anahula but less than 1% at other sites. A total of 7 dominant migratory species was recorded from these floodplains which together provided 1% to 16% of site catches, the highest being at Anahula where *rui* and *mrigel* together formed 5% of the catch and *fulchela* about 8%. Another major carp, *catla* was especially abundant at Mailjani where it comprised 6% of the annual catch. Here, *rui* and *mrigel* were also important forming 5% and 2% of the catch respectively. Other dominant species included *chapila*, *boal* and *chital*.

Of the 20 dominant floodplain resident species occurring on higher elevation sites inside the scheme two species *shol* and *taki* together accounted for 34% of the catch. The next most important species comprised *khalisha* (10%), *puti* (7%) and *darkina* (5%). In the North Central Region, a total of 20 dominant species was recorded of which 14 were listed as dominant in the PIRDP sites. The commonest species again were *puti* (12%) and *taki* (9%) together with *guchi baim* (7%).

Prawns were an extremely important component of the catch at all sites, including both high and low elevation floodplains inside and outside the PIRDP in the North West Region and North Central Region. They were especially important on low elevation floodplains inside the PIRDP where they contributed 27% of catch, equivalent to a CPUA of 38 kg/ha (Table 7.16). Outside the PIRDP they were relatively less abundant in the catches from the North West Region (15%) and North Central Region (21%) where CPUA values ranged from 13 to 9 kg/ha respectively. The lower catches in the North West Region were related to lower fishing effort by shoreline gears, *thella jal* and *doiar* traps which normally target prawns and small fish and therefore may not necessarily reflect differences in densities of prawn stocks between these sites (see Section 7.3). Comparisons between high elevation sites showed an opposite trend, with a higher percentage catch contribution outside (23%) than inside (13%) and with CPUA values of 21 kg/ha outside and 2 kg/ha inside.

Unfortunately, because of taxonomic difficulties, prawns were rarely identified in the field but sub-samples were sent routinely to the University of Chittagong for identification. Results provided so far indicate that all species of prawn belong to the genus *Macrobrachium* with some species capable of surviving on the floodplain throughout the year and breeding there.

In conclusion, it is clear that floodplain fish communities inside the PIRDP were generally less diverse than those on unregulated floodplains of the North West Region and catches were highly dependent on about twenty dominant floodplain resident fish species and prawns which comprised 85% and 95% of annual catches on low and high land respectively. In view of the



substantially higher fishing pressure exerted on this simplified fish community compared to that exerted on more diverse communities outside the flood controlled area, further research is urgently needed to assess the current status of the stocks of fish and prawns to allow predictions to be made of the effects on these fisheries of further increases in fishing pressure.

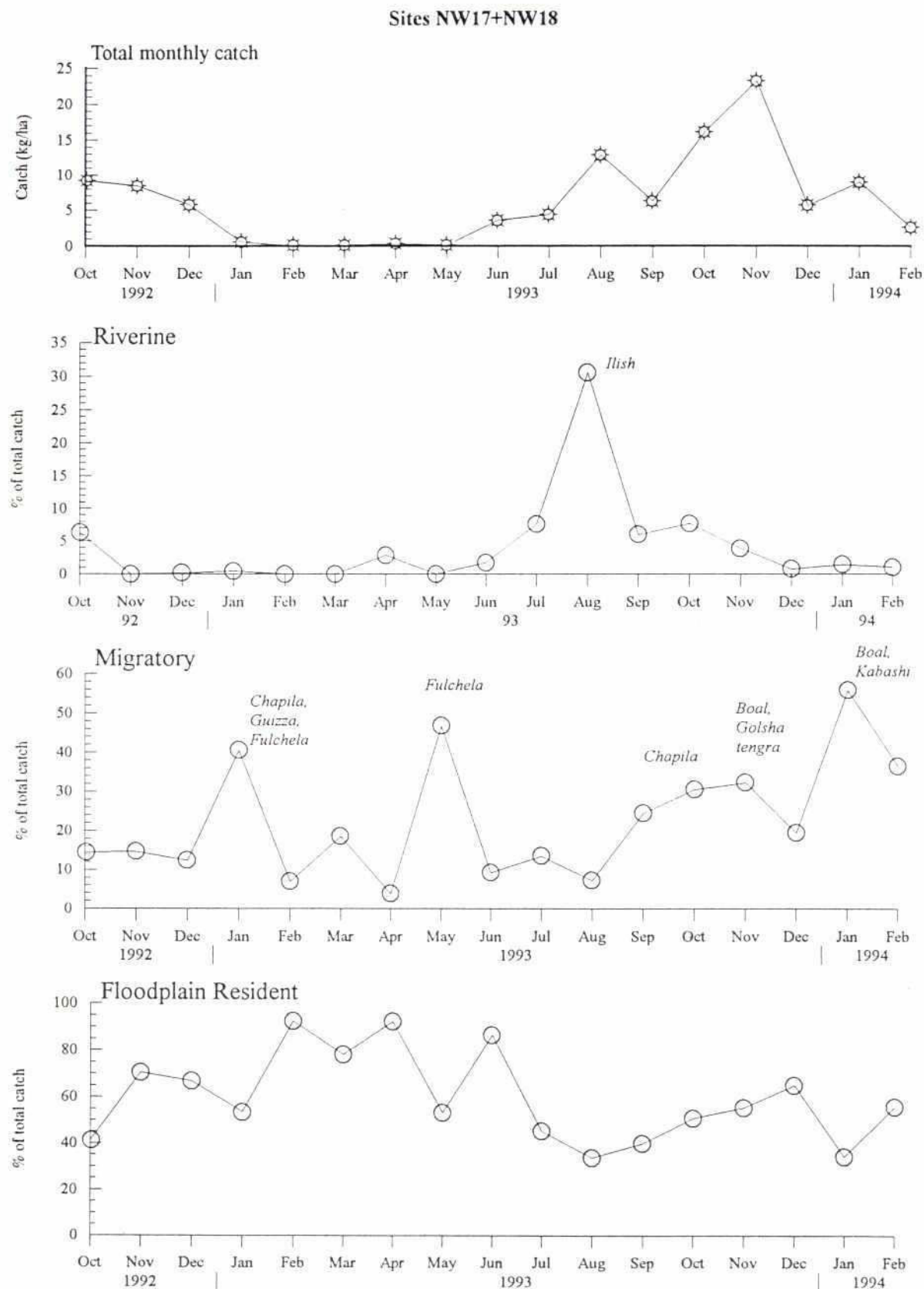
## 7.5 Fish Migrations

In the following discussion, seasonal movements of fish between floodplains/*beel* and river are identified from changes in catch compositions, temporal changes in distributions of important individual species and changes in monthly species numbers of riverine, migratory and floodplain resident fish. Where available, additional data on the average size of fish and their reproductive state (Appendix 7) was used to determine at what stage in the life cycle migrations were made between rivers and floodplains and whether these were primarily for breeding or growth.

### *Outside sites*

On the relatively free flooding areas near Potajia, outside the PIRDP, rainfall runoff connected *beel* with the Baral/Atrai River in May 1993. At this time catches remained very low but were dominated by *fulchela* which contributed 46% of the monthly catch (Fig. 7.25). Data on average weight per individual revealed that the captured *fulchela* were fry of less than 1 gram. It is possible that there was as early upstream spawning run of adult fish in May but it seems more likely that *fulchela* was able to remain in the *beel* in low numbers during the dry season then spawned here in response to the first rises in water level. Analyses of reproductive state of adult fish indicated that *fulchela* was capable of spawning several times during the year starting early in February and April through to September (Appendix 7). In mid-June, the direction of canal flows reversed as the Jamuna levels increased forcing Baral waters on to the floodplains. At this time catches of riverine and migratory species increased slightly although the contribution by *fulchela* decreased considerably. The total number of riverine and migratory species increased from two in May to nine in June indicating the commencement of lateral migrations from river to floodplains (Fig. 7.26). As water levels continued to rise in July, catch contributions by riverine and migratory species also increased slightly while their species number rose very sharply indicating further lateral migrations of different groups of fish, including the major carps. Carps entered the floodplains not by passive drift of hatchlings as in the free-flooding sites of the North Central Region but as small fingerlings which grew within the Jamuna River

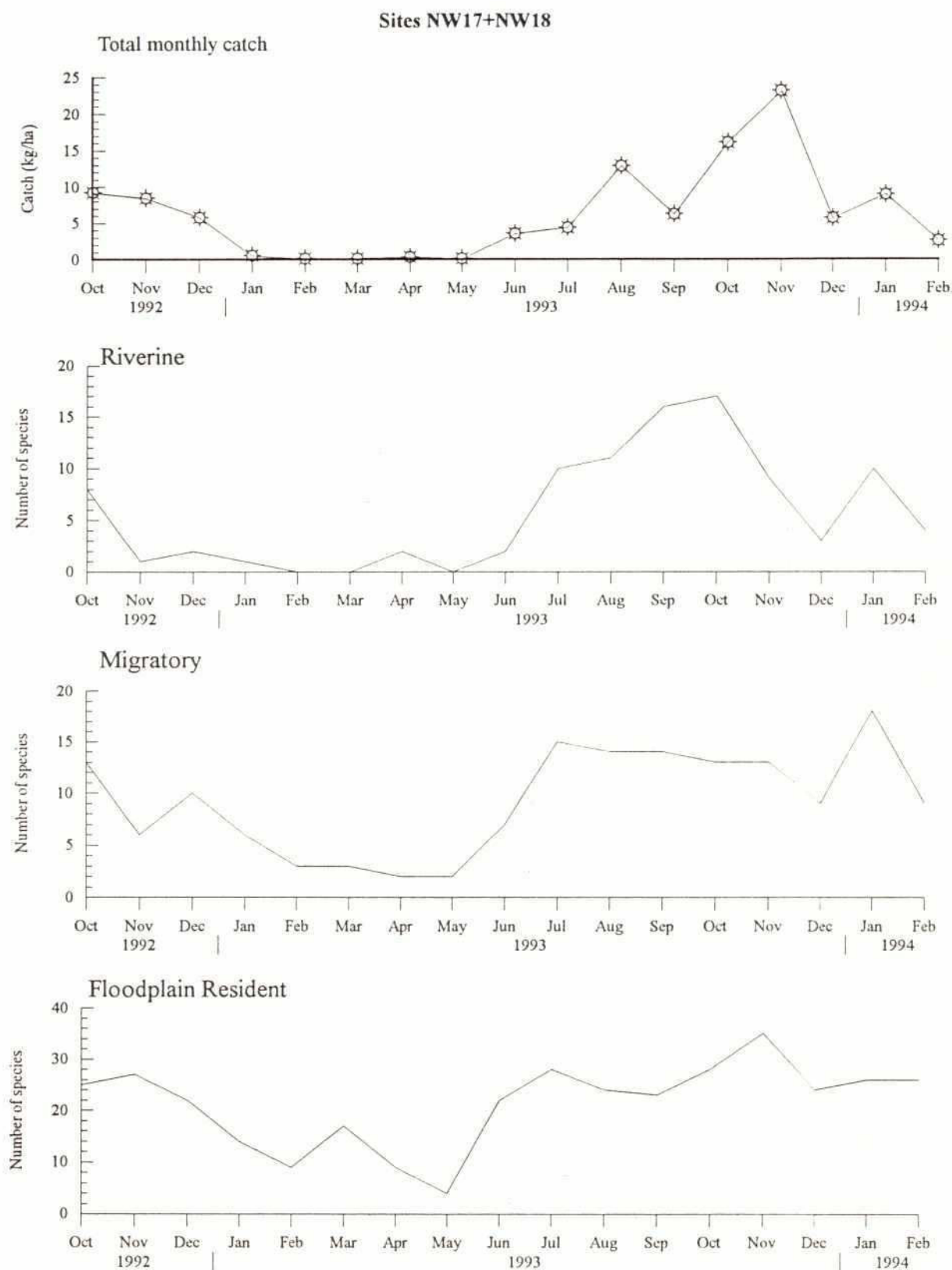
Figure 7.25 Percentage total monthly catch of riverine, migratory and floodplain resident fish from low elevation floodplains/beel outside the PIRDP



Notes: 1. See text for definition of different categories of fish based on habitat preference (section 5.3.2)

2. The most abundant species are shown for peak percentage catches of riverine and migratory fish, less abundant species are not shown

**Figure 7.26 Seasonal variation in the number of riverine, migratory and floodplain resident fish species on low elevation floodplains/beel outside the PIRDP**





then actively migrated up the Baral/Atrai River as waters backed up at the confluence with the rapidly rising Jamuna. Important riverine species included *ilish* which entered floodplains as juvenile *jatka* probably from upstream spawning grounds on the Atrai River. Other riverine species such as *kachki* and *kajuli* entered as adults in breeding condition. One of the more abundant migratory species, *golsha tengra* appeared on the floodplains in June and July coinciding with its peak breeding season which extended from June to August. Another abundant migratory species, *chapila*, was also in peak breeding condition during the same period but data from other sites suggest that it may also breed earlier and later in the year which supports claims of local fishermen that this species breeds two or three times per year and can survive on floodplains throughout the year.

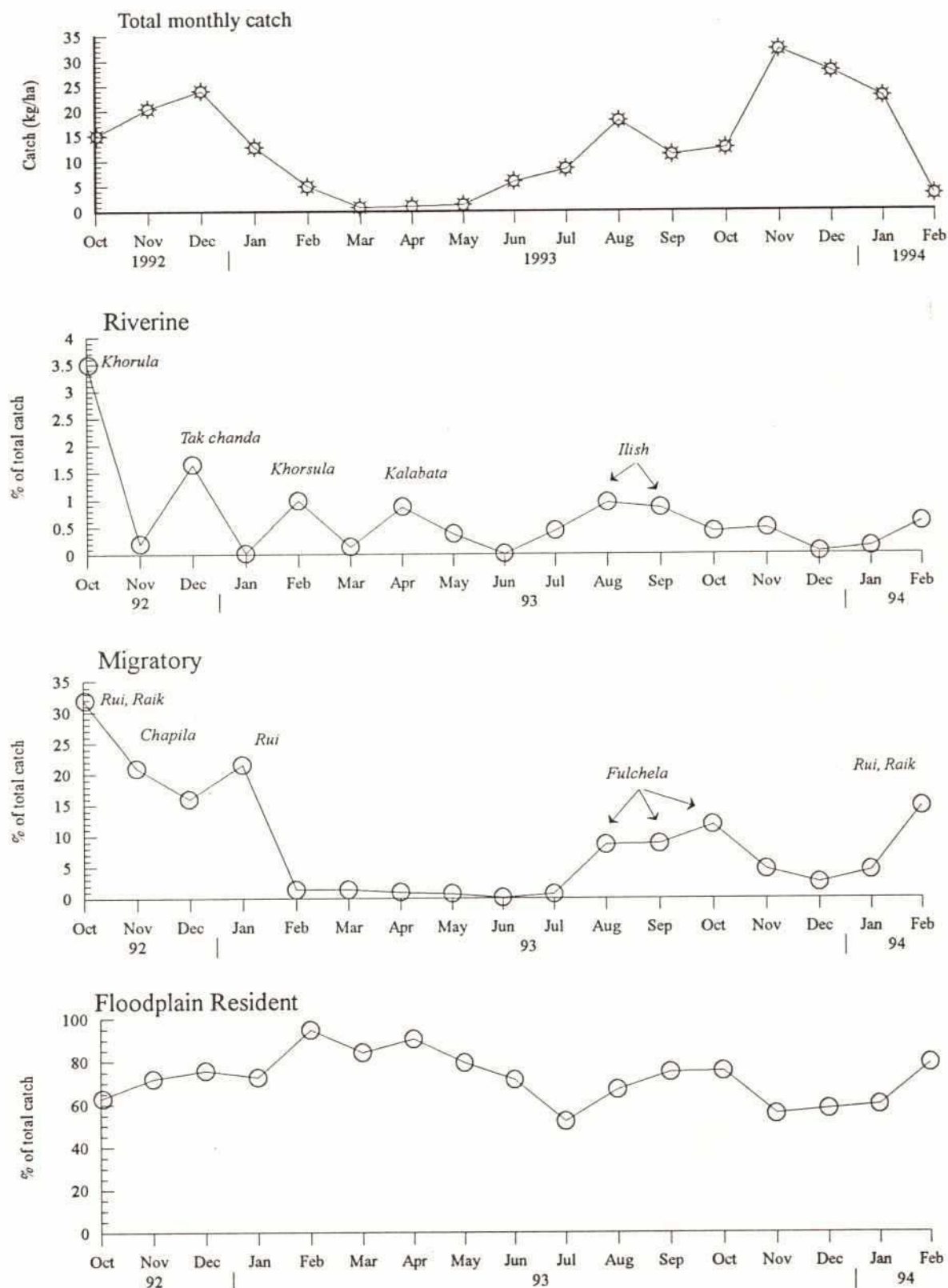
In August the contribution by riverine species increased precipitously due largely to the influx of *jatka* which comprised 28% of the monthly catch. Relative catches declined equally rapidly in September and remained fairly steady until October after which there was a steeper decline to very low levels from December to February. The numbers of riverine species continued to increase from July to October before decreasing sharply in November and December. Most of these species spent only two or three months on the floodplains and made only small contributions to the catches. Since most were not abundant species, few data were collected on their breeding condition.

Percentage contributions to the catch made by migratory species continued to increase from August to October, however species numbers reached a peak in July and very few species of any significance appeared in floodplains catches after July. Catch contribution and number of species decreased in December but temporarily increased in January probably reflecting the higher catches made in this month rather than actual movements of fish.

#### *Inside Sites*

On Gandahasti floodplains/*beel* (NW04 + NW05) in the Badai River basin, catch contributions by riverine species were insignificant throughout the year (Fig. 7.27). Migratory species made somewhat larger contributions to the catch but not until August when the total catches rose sharply. Seasonal trends in species diversity showed that a few riverine and migratory species appeared in July followed by a more rapid increase in August reaching peak levels in September when five riverine and eight migratory species were recorded (Fig. 7.28).

Figure 7.27 Percentage total monthly catch of riverine, migratory and floodplain resident fish from Gandahasti floodplain/beel, (sites NW04+NW05, inside the PIRDP)

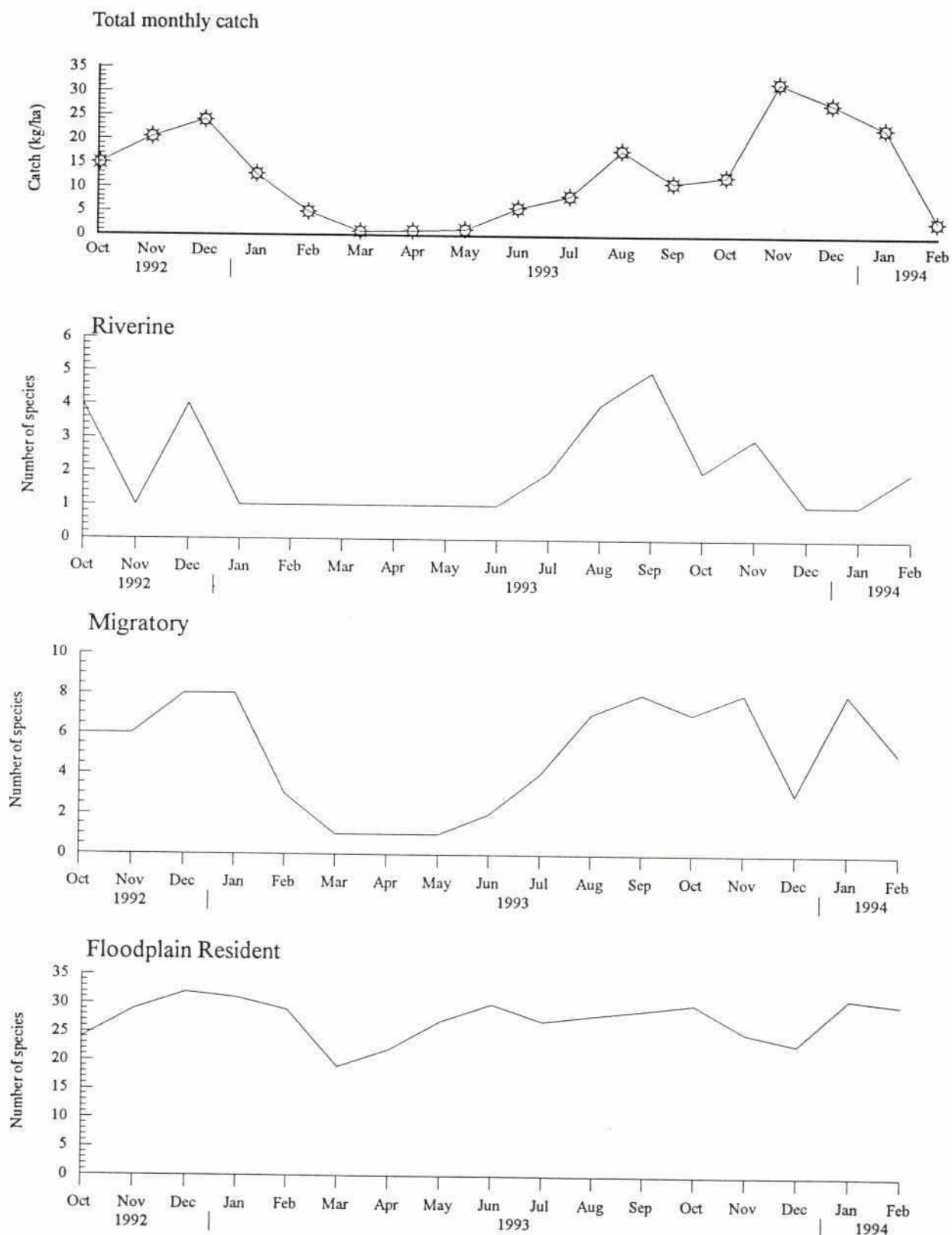


Notes: 1. See text for definition of different categories of fish based on habitat preference (section 5.3.2)

2. The most abundant species are shown for peak percentage catches of riverine and migratory fish, less abundant species are not shown

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**Figure 7.28 Seasonal variation in the number of riverine, migratory and floodplain resident fish species on Gandahasti floodplains/beel (sites NW04+NW05, inside the PIRDP)**





On the Badai River, eight riverine species entered in May when Talimnagar sluice gates were opened to drain rainfall runoff from the floodplains. The most abundant of these species were *ilish*, *piali*, *kajuli* and *gang tengra*. Two migratory species, *chapila* and *bacha* also appeared at this time and joined others such as *golsha tengra*, *kabashi*, *raik* and *fulchela* which overwintered in the river (Appendix 2, A). In June, it appears that sluice gates were closed in the first week, opened during the second which coincided with rapid increases in outside river levels and closed again for a short period before reopening partially for an undetermined period towards the end of the month (see Section 3.1.2). A few more riverine species entered the Badai at this time, notably *phasa* and *goni chapila*, but these were not abundant and made little contribution (<5%) to the monthly catch. No new migratory species of any significance entered the Badai in June.

In late July and early August sluice gates remained open to supply water to deepwater rice fields allowing the entry of a number of riverine and migratory species. The most abundant species comprised *ilish*, as young *jatka*, which provided 26% of the Badai catch in July, *chapila* and *kajuli* which entered as adults ready for breeding. Two major carps, *ruhi* and *catla* appeared in the river in July and reached peak abundance in September when they were joined by *mrigel* and *kalbaus*. *Raik* was present in most months but was particularly abundant in the drawdown of October when it contributed 61% of the Badai catch. Very few adults of this species were caught and most catches consisted of small juveniles. The major carp catches comprised a mixture of small fingerlings, juveniles and young adults. FAP 17 studies of downstream drift of fish hatchlings recorded a restricted entry of major carp hatchlings through Talimnagar regulator into the Badai between June and August. These hatchlings probably formed the main source of supply of fingerlings and juveniles seen in catches later in the year. The origin of the few larger carp is not certain but it seems likely they also migrated in from the Jamuna since carp pond overflows were rare inside the PIRDP and the chances of large carp surviving heavy fishing pressure on *beel* and *kua* during the dry season were small.

The influx of riverine and migratory species into the Badai during the full flood season, July to September, had very little impact on floodplain/*beel* catches during the same period. At this time only two species, *ruhi* and *fulchela*, comprised more than 1% of the annual catch. Since the latter species is capable of surviving on the floodplains/*beel* throughout the year and breeding there, it should be regarded as a floodplain resident in the North West Region. Compared to catches from floodplains outside the scheme at Potajia, the most obvious difference at Gandahasti was the lower dispersal of riverine and migratory species on to the

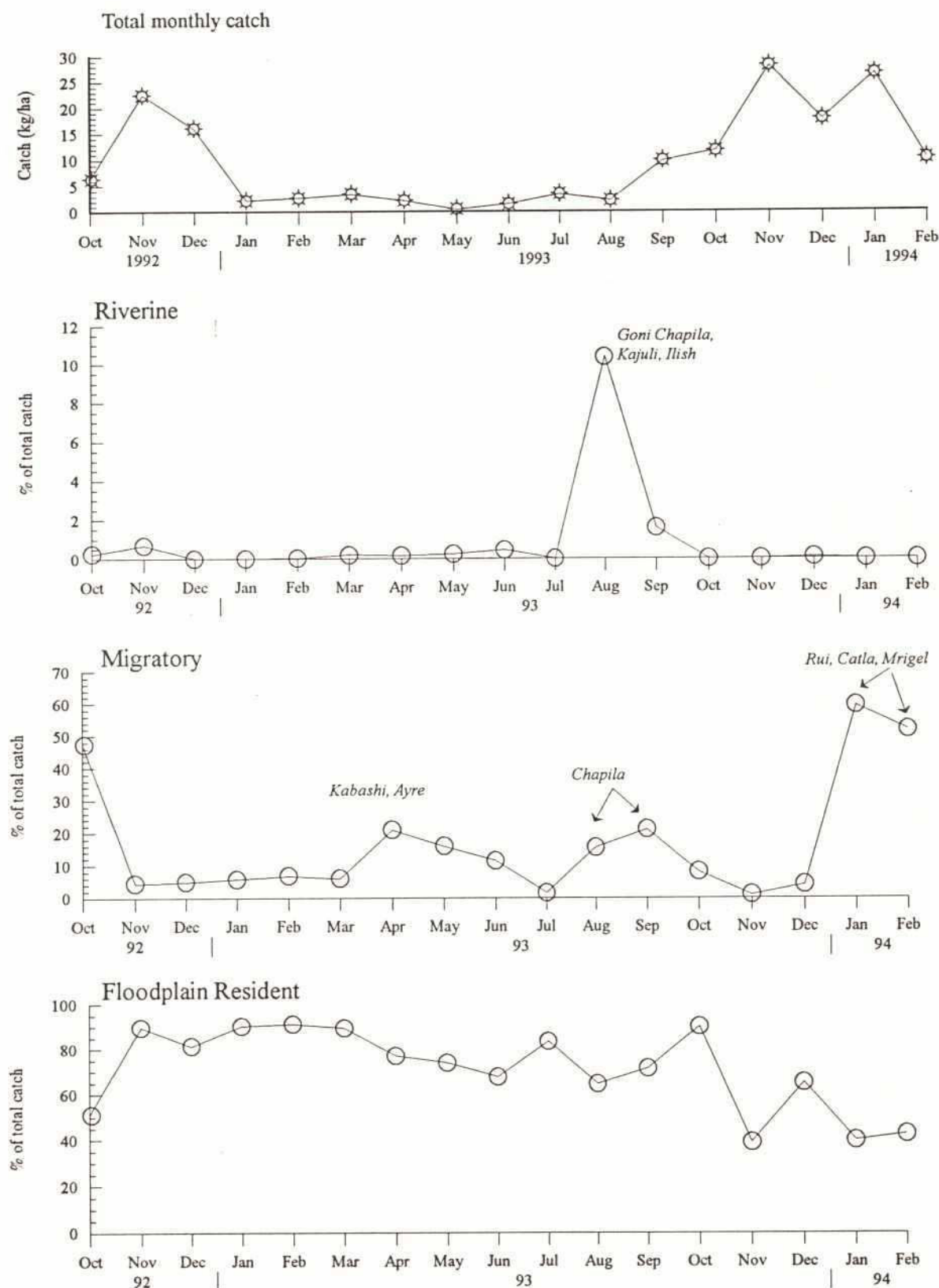
floodplains resulting in reduced catch contributions of these groups. The most notable species at Potajia included *ilish*, *golsha tengra*, *kabashi*, *boal*, *chapila* and the major carps *rui*, *catla* and *kalbaus*. In the case of *ilish*, the difference between floodplains was very obvious with young *jatka* providing 28% of the floodplain catch at Potajia in August and less than 1% in the same month at Gandahasti. During the drawdown and early winter (October - December), contributions to catches from Gandahasti floodplain by riverine and migratory species declined but the diversity of migratory species did not decrease until December after which it increased again in January when many *kua* were fished. The predominant species at this time were *rui*, *catla* and *boal*.

In the Kageswari River basin (sites NW09+NW10), there was little evidence from catch compositions or species numbers of any major migration of adult fish on to the floodplains between May and July (Figs 29 and 30). This supports findings from the Kageswari River itself, where there was also little sign of major migration into the PIRDP until August when percentage catches and diversity of riverine and migratory fish increased (Appendix 2, C). A few species, notably *chapila*, *kabashi* and *golsha tengra* appeared in the river in small numbers in May when Koitala sluice gates were opened to drain rainfall runoff. In June, when gates were partially open during the first week of the month and intermittently for about three days towards the end of the month, a few more species appeared in the river catches, the most important of which were *ilish*, *goni chapila*, *kachki* and *raik*. *Ilish* entered as juvenile *jatka* whereas the other two species entered as adults and in the case of *kachki*, in peak breeding condition. During July sluice gates were opened more frequently for deepwater rice production and remained open continuously during the last week of the month and for a further week in August (approx 8-16) which resulted in influxes of more riverine and migratory species in the Kageswari River during August and September. The most abundant of these were *ayre*, *guizza*, *bacha*, *kalabata* and *khorsula*. Juvenile major carps also appeared for the first time in the river in September but these four species may have entered earlier as hatchlings during short periods when sluice gates were opened.

On the floodplains, the percentage catch contribution and diversity of riverine species reached peak levels in August but decreased equally rapidly in September. The most important species were *goni chapila*, *ilish* and *kajuli*. At this time *kajuli* was in peak breeding condition indicated by samples from the Kageswari River. Numbers of migratory species and their contribution to the catch also increased in August and continued to rise in September before decreasing during the flood drawdown and early winter. The most abundant species was *chapila* which was present on the floodplain/*beel* throughout the year and exhibited two peak



**Figure 7.29 Percentage total monthly catch of riverine, migratory and floodplain resident fish from Gangbhangha floodplain/beel (sites NW09+NW10, inside the PIRDP)**

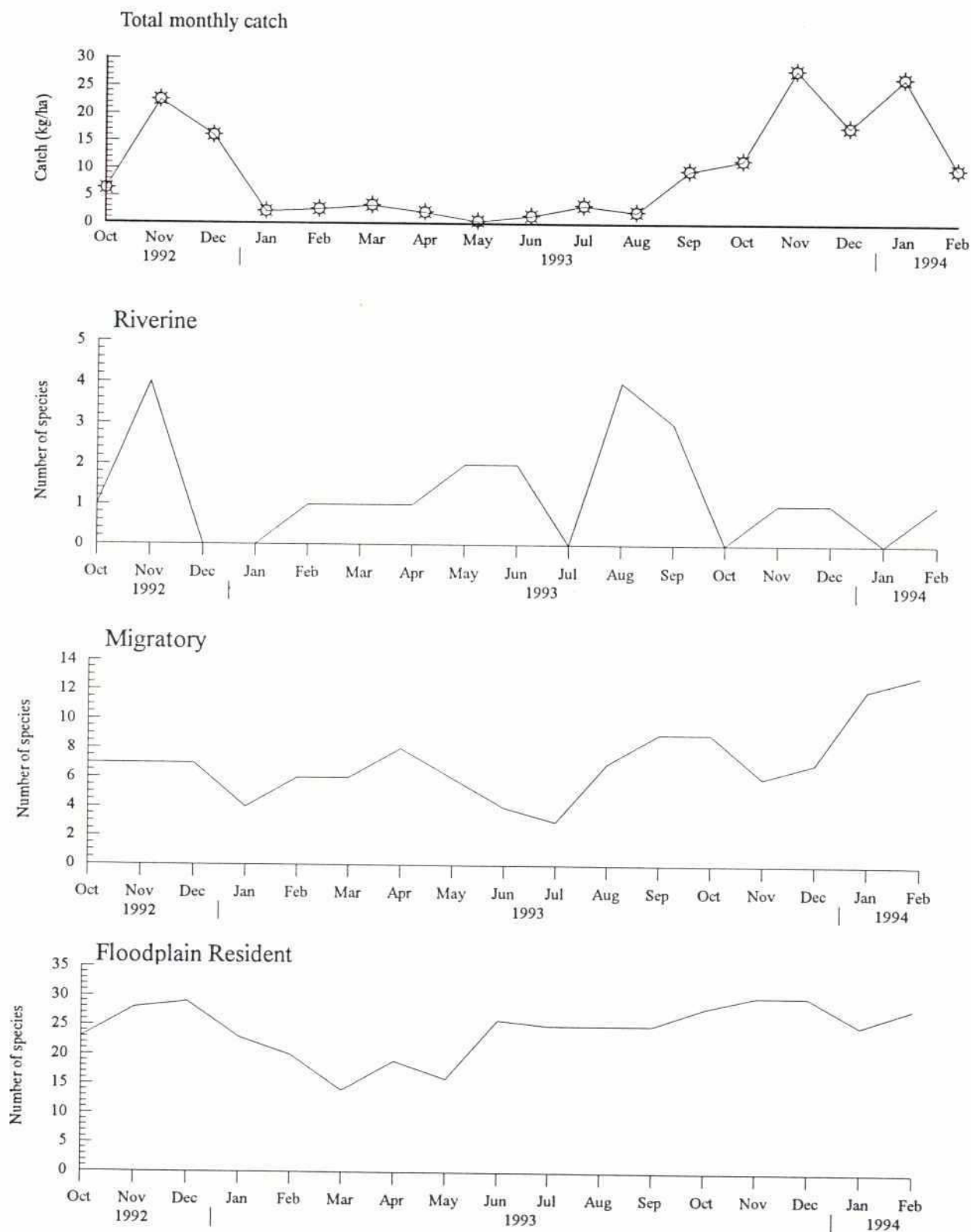


Notes: 1. See text for definition of different categories of fish based on habitat preference (section 5.3.2)  
 2. The most abundant species are shown for peak percentage catches of riverine and migratory fish, less abundant species are not shown



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**Figure 7.30 Seasonal variation in the number of riverine, migratory and floodplain resident fish species on Gangbhangra floodplain/beel (sites NW09+NW10, inside the PIRDP)**



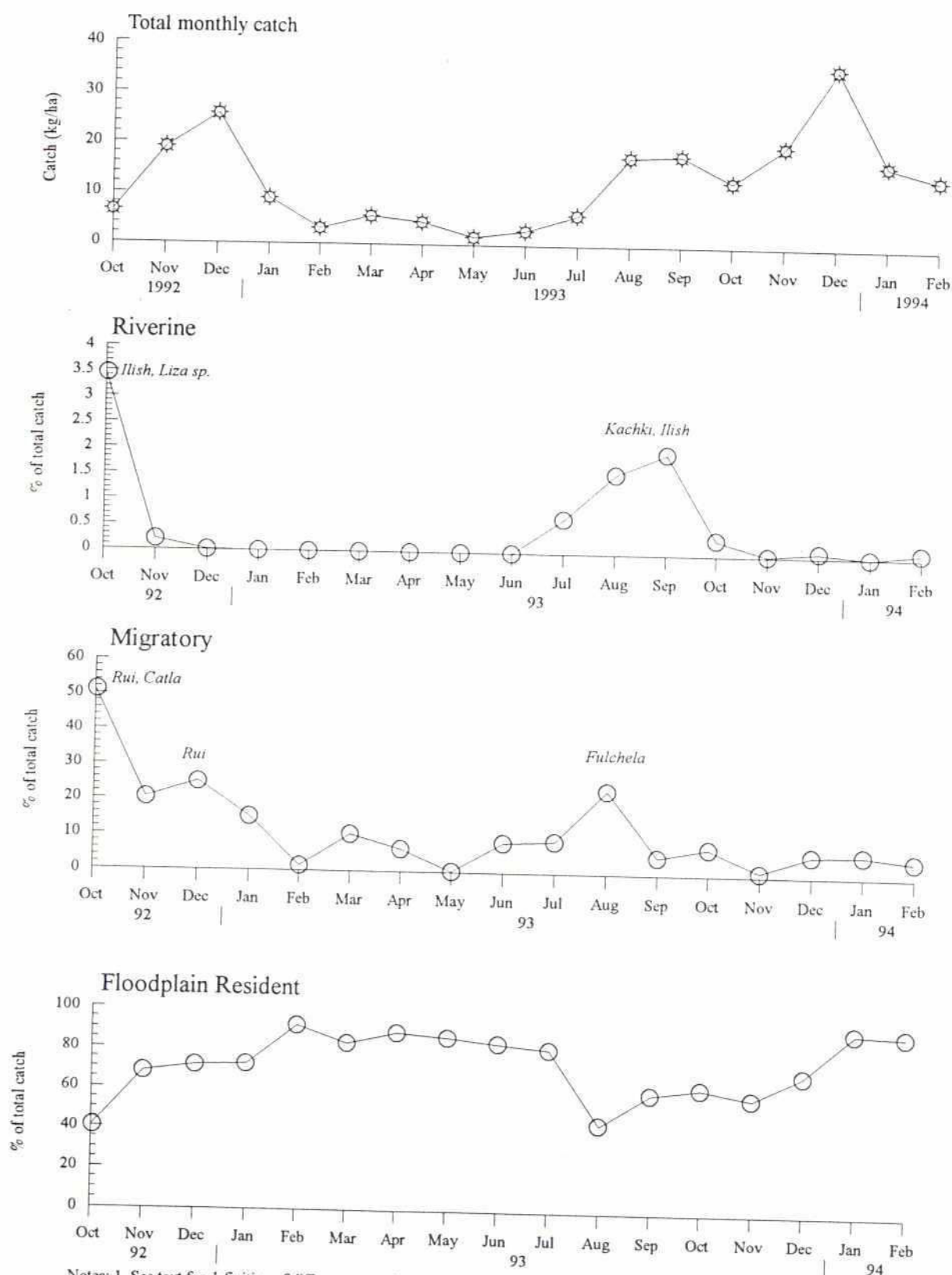
breeding periods, the first between March and April and a second from August to September. The second most abundant species was *fulchela* which also bred on floodplain at similar times to *chapila*.

Compared to riverine and migratory fish of the Badai basin, in the Kageswari system there was a greater dispersal during the full flood period (July - September) of some of the more abundant species such as *ilish*, *kajuli* and *raik*. However, their contributions to floodplain catches were still much lower than those outside the PIRDP on Potajia floodplains.

During the winter, when *katha* fishing dominated catches at Gangbhanga *beel*, the diversity and catch of migratory species increased considerably to reach peak annual levels. The most abundant species were the major carps *rui*, *catla* and *mrigel*. Most of these were juveniles, spawned in 1993 and weighing between 100-300 g per individual. It was noted earlier in this report that catches of these species at Gangbhanga were considerably higher than at Gandahasti and Alnar floodplains inside PIRDP but that this trend was not seen in the combined catches of other riverine and migratory species (see Section 7.4.2). The most obvious explanation for differences in carp catches between Gangbhanga and Gandahasti floodplains is that there was a greater supply of hatchlings through Koitala regulator than through Talimnagar. However, although data were incomplete, there was little evidence of major differences in the operations of the two sluice gates (see Section 3.1.2). Another explanation for the difference between sites was that Gangbhanga floodplains/*beel* were stocked by a nearby carp hatchery at Santia. Several enquiries were however made at different times during the study and both DoF personnel and fishermen reported that no stocking had taken place during 1993. However, the leaseholder of Gangbhanga *beel* admitted stocking 0.5 kg of carp hatchlings (mixed species) obtained from a local hatchery. He repeated stocking with both hatchlings and fingerlings on a larger scale in 1994. It is therefore seems likely that stocking was successful in 1993. A third possibility is that the large expanse of deepwater rice and the large *katha* which were permanently placed in the deepest area of the *beel* both provided more shelter from fishing gears than at other sites thereby increasing the survival rate and allowing the major carp to grow until the end of the season when floodplains dried out and the large *katha* were fished intensively.

On Alnar floodplain/*beel* in the Chiknai River basin, no riverine species were recorded from January to June 1993 (Figs 7.31 and 7.32). During this period a few migratory species *kabashi*, *boal*, *kalbaus*, *chapila* and *fulchela* which had overwintered in the *beel* appeared intermittently in catch. In May, *golsha tengra* appeared in floodplain/*beel* catches indicating

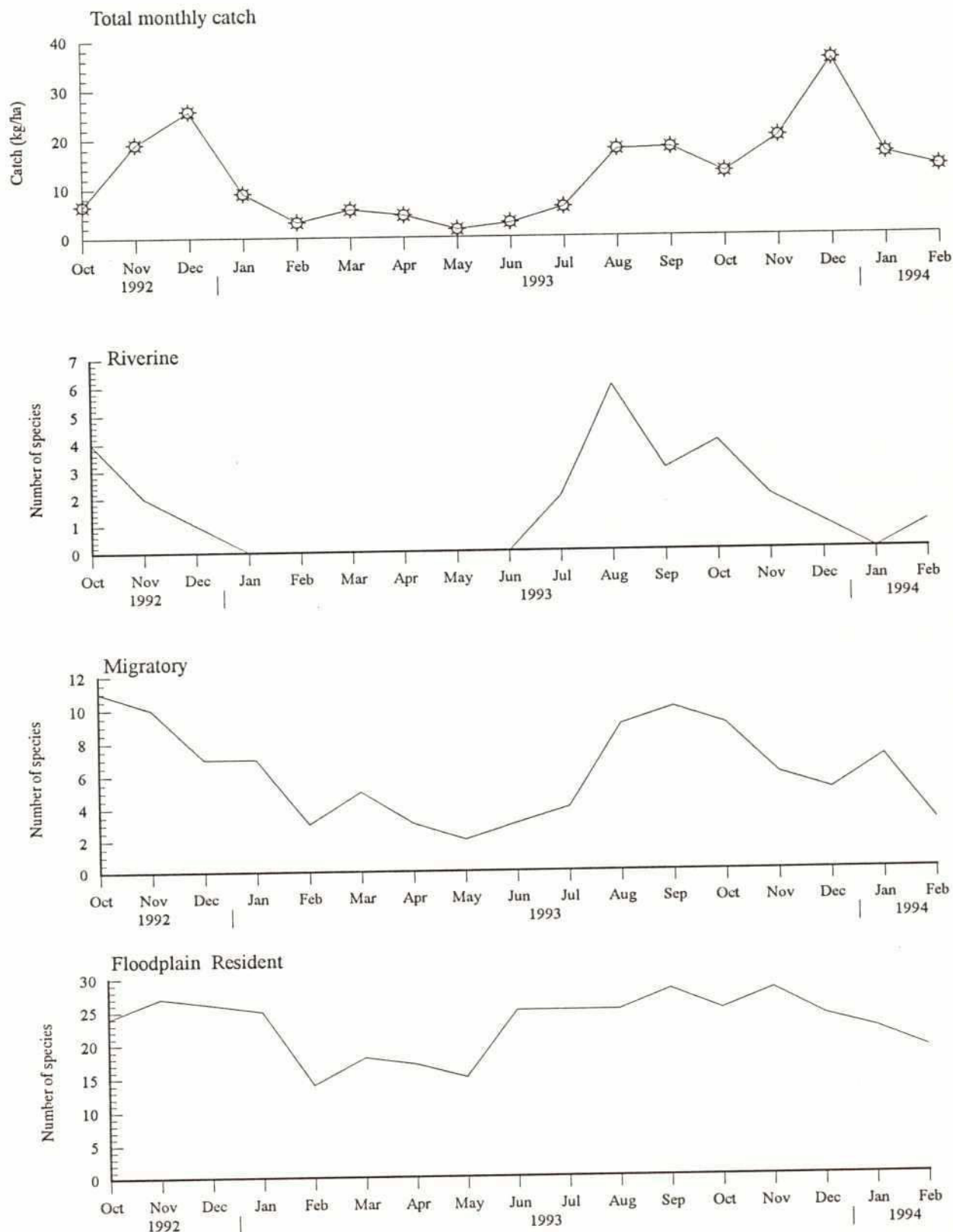
Figure 7.31 Percentage total monthly catch of riverine, migratory and floodplain resident fish from Alnar floodplain/beel, (site NW12, inside the PIRDP)



Notes: 1. See text for definition of different categories of fish based on habitat preference (section 5.3.2)  
2. The most abundant species are shown for peak percentage catches of riverine and migratory fish, less abundant species are not shown



**Figure 7.32 Seasonal variation in the number of riverine, migratory and floodplain resident fish species on Alnar floodplain/beel (site NW12, inside the PIRDP)**



a lateral migration from the Chiknai River where it was present throughout the year together with other migratory species such as *kabashi*, *fulchela*, *chapila* and *batasi*.

*Kachki* appeared in the Chiknai River in May presumably after migrating upstream against rainfall runoff entering the Baral/Atrai River through the open Demra sluice gate. These fish were adult and some were in breeding condition, however the peak breeding season occurred between August and September when both adults and juveniles were captured on the floodplain.

In June *ilish* entered the Chiknai as young *jatka* from the Atrai spawning grounds. At this time flows had reversed and Baral/Atrai floodwaters entered through Demra sluice gate. No data were available on the operation of this gate but available water level data inside and outside the sluice indicated that it operated in a similar way to Talimnagar and Koitala regulators which were partially open for a few days in June. Two other riverine species, *kajuli* and *ghaura*, entered the Chiknai in June. *Kajuli* reached peak breeding condition in July and August but both it and *ghaura* failed to enter the adjacent floodplains. The diversity of riverine species reached a peak in July and August on the Chiknai River coinciding with more prolonged periods when gates were open to supply water to deepwater rice fields. Although these species contributed between 10-20% of monthly catches in the Chiknai, they made up less than 2% of floodplain catches (Fig. 7.31).

The percentage contribution to floodplain catches made by migratory species increased sharply in August mainly due to *fulchela* which was found in peak breeding condition from March to May and July to October. Two large catfish species, *ayre* and *guizza* appeared in floodplain catches in July and August respectively. Catches from the Chiknai indicated that both species probably overwintered there. The major carps *rui* and *kalbaus* appeared in the Chiknai in August followed a month later by *catla* and *mrigel*. Examination of the average monthly weight per individual of each species suggested that these fish were too large (e.g. in September *rui*: 350 g; *catla* 320 g *mrigel* 200-700 g) to be wild fish spawned in the Jamuna in May/June or a month later in the Padma. Instead, it seems likely that these were older fish which migrated from the Baral/Atrai or overwintered in large perennial *beel* inside the scheme.

Since the Baral/Atrai is the feeder river to the Chiknai basin, recruitment of carp through passive drift of hatchlings from the Jamuna was not possible. Local fishermen, however, reported the upstream migration of small (approx 5 cm) major carps, especially *rui*, along

the Baral/Atrai into the Chiknai. No evidence from size data of captured fish was found to support these reports. In comparison with floodplains outside the scheme at Potajia, the main difference between patterns of fish movement seen in the Chiknai basin was the considerably lower dispersal of migratory or riverine fish on to regulated floodplains. This is reflected in both their reduced species diversity and contributions to the catch from Alnar floodplains and *beel*. Species whose relative abundances were lower than those at Potajia included *ilish*, *golsha tengra*, *kabashi*, *chapila*, *batasi*, *boal*, *ru* and *raik*. Many other migratory and riverine species found on floodplains outside the scheme and in the Chiknai River inside the scheme were absent from floodplain catches, notable among these were *kajuli*, *ghaura*, *kalabata*, *gharpoia*, *phasa*, *koitor*, *shillong*, *bacha* and *chital*. Reasons for the differences in dispersal patterns on regulated and unregulated floodplains remain unclear.

Independent but closely related FAP 17 studies on the downstream movements of fish hatchlings in the Jamuna River and its distributaries showed that their passive drift on river currents was blocked by closures of sluice gates at Talimnagar and Koitala. Blockage to movement was particularly harmful during the first large rises in river levels in June when concentrations and supply rates of major carp hatchlings were high. Other studies demonstrated that even when gates were open, densities and supply rates of hatchlings were significantly reduced in regulated rivers and that these reductions were directly related to water level differences across regulators (Draft Final Report, Supporting Volume No. 11).





## 8 TOTAL CATCH FROM PIRDP AND CONTROL AREA

### 8.1 Integrated Catches

In order to compare fish catches from the whole area of a FCD/I project with that of a free-flooding control area, it is necessary first to extrapolate catch estimates from each habitat e.g. river, canal, floodplain to the total area or length of each within the FCD/I and the control area and then add these extrapolated catch estimates to obtain a single total catch for each area. The integrated catch can then be divided by the total area of the FCD/I and its control to obtain values of catch per unit area of each.

Extrapolation of floodplain catch estimates was carried out using area elevation curves of sampled areas and total areas of the PIRDP and its outside control (Figs 8.1 and 8.2). Within the PIRDP, a weighted average production rate from combined low elevation sites of 139 kg/ha was applied to the area of land with an elevation of 9.5 m PWD or less. This totalled 73,693 ha and was equivalent to the area of F2-F4 land estimated by previous feasibility studies (Table 3.1). For higher land (9.5 - 12.0 m PWD) covering an area of 73,011 ha, a weighted average production rate of 14 kg/ha was applied. This was derived from estimates obtained from higher elevation floodplains at sites NW22 and NW23. Land within this range of elevation covered the whole area of F1 and part of the F0 land. The remaining area of the scheme (37,683 ha) was classified as non-cultivable urban land or other higher land (F0) which did not flood more than 0.3 m. This area of land was of negligible importance to capture fisheries and therefore omitted from the analysis. A similar procedure was followed for the estimation of the total floodplain catch from the control area. Here, only one rate of production from the combined sites NW17 and NW18 (84 kg/ha) was applied to the total control area which covered only low elevation floodplains.

Extrapolation of catch rates from rivers and canals inside and outside the PIRDP was based on the estimation of their total lengths using 1:50,000 topographical maps and multiplying these by the catch per unit length from sampled sites (Table 8.1). The riverine catch was estimated only for those rivers which retained a seasonal or perennial flow and ignored disconnected "dead" rivers. Estimation of canal lengths omitted the numerous small drainage channels, many of which were not shown on maps, but the catches of which were included as part of sampled floodplain estimates inside and outside the PIRDP.

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Figure 8.1 Area elevation curves of the PIRDP and sampled floodplains within it

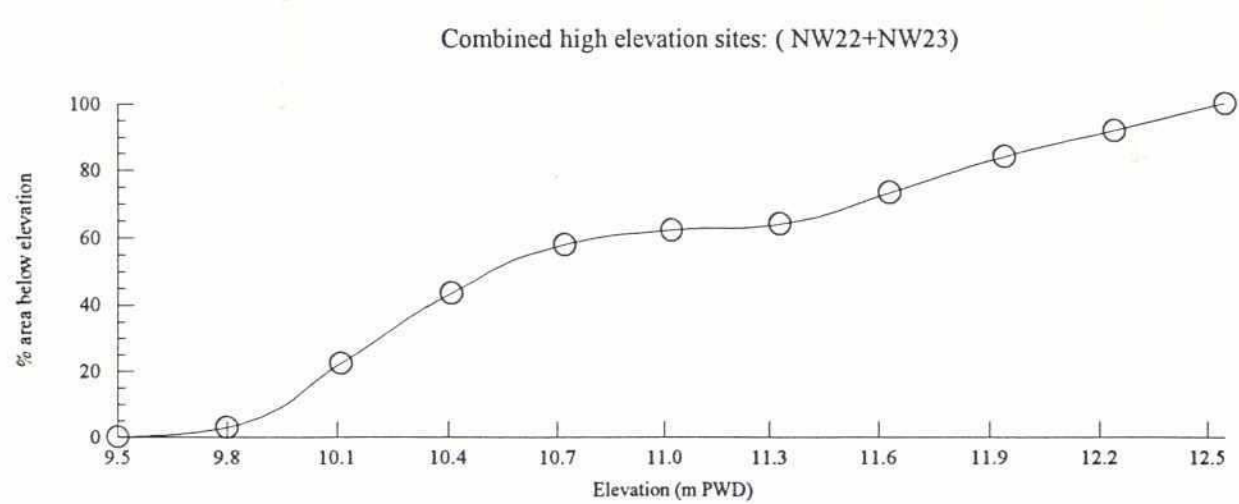
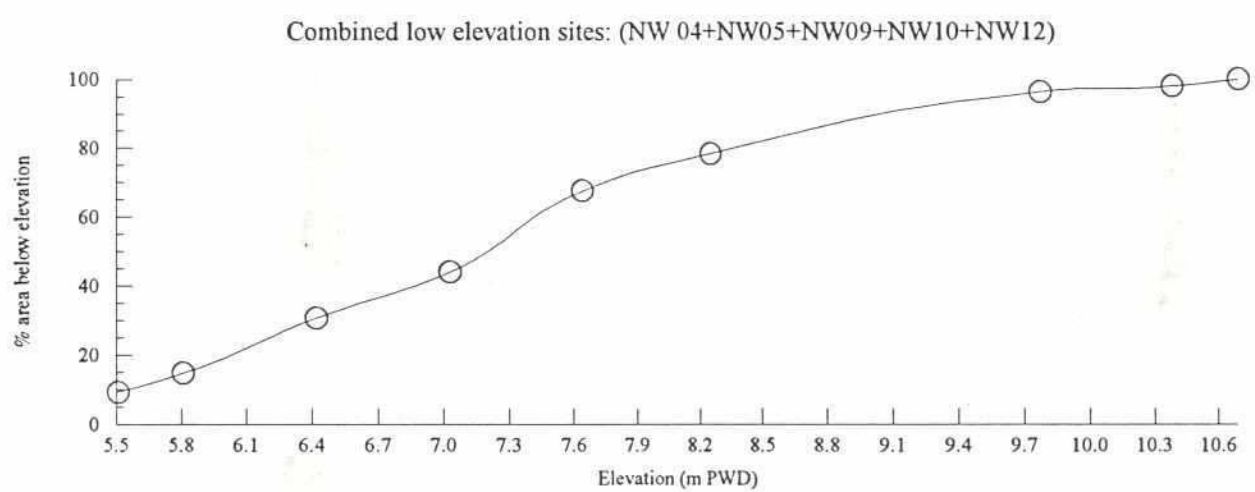
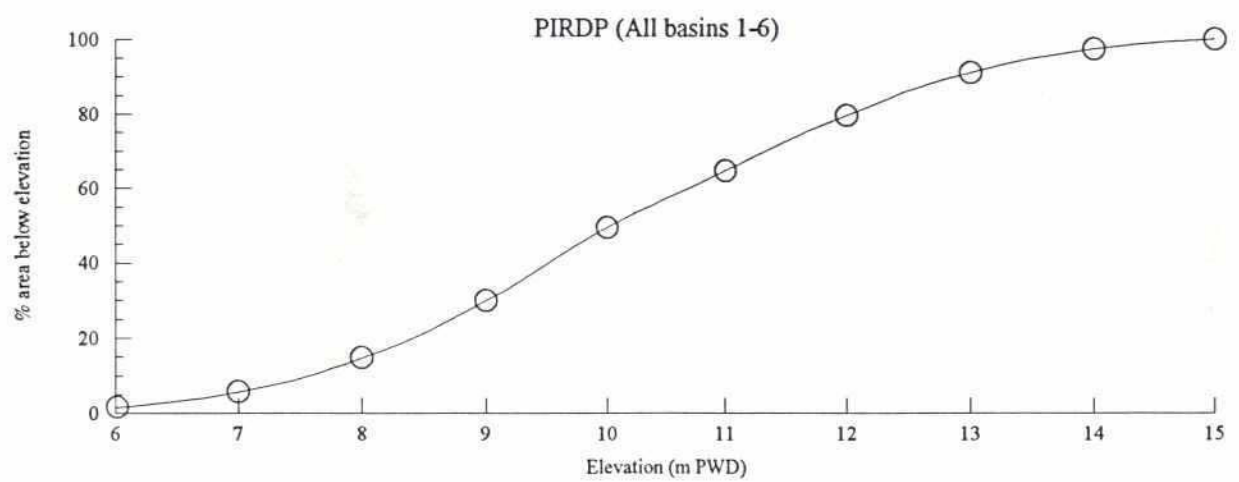
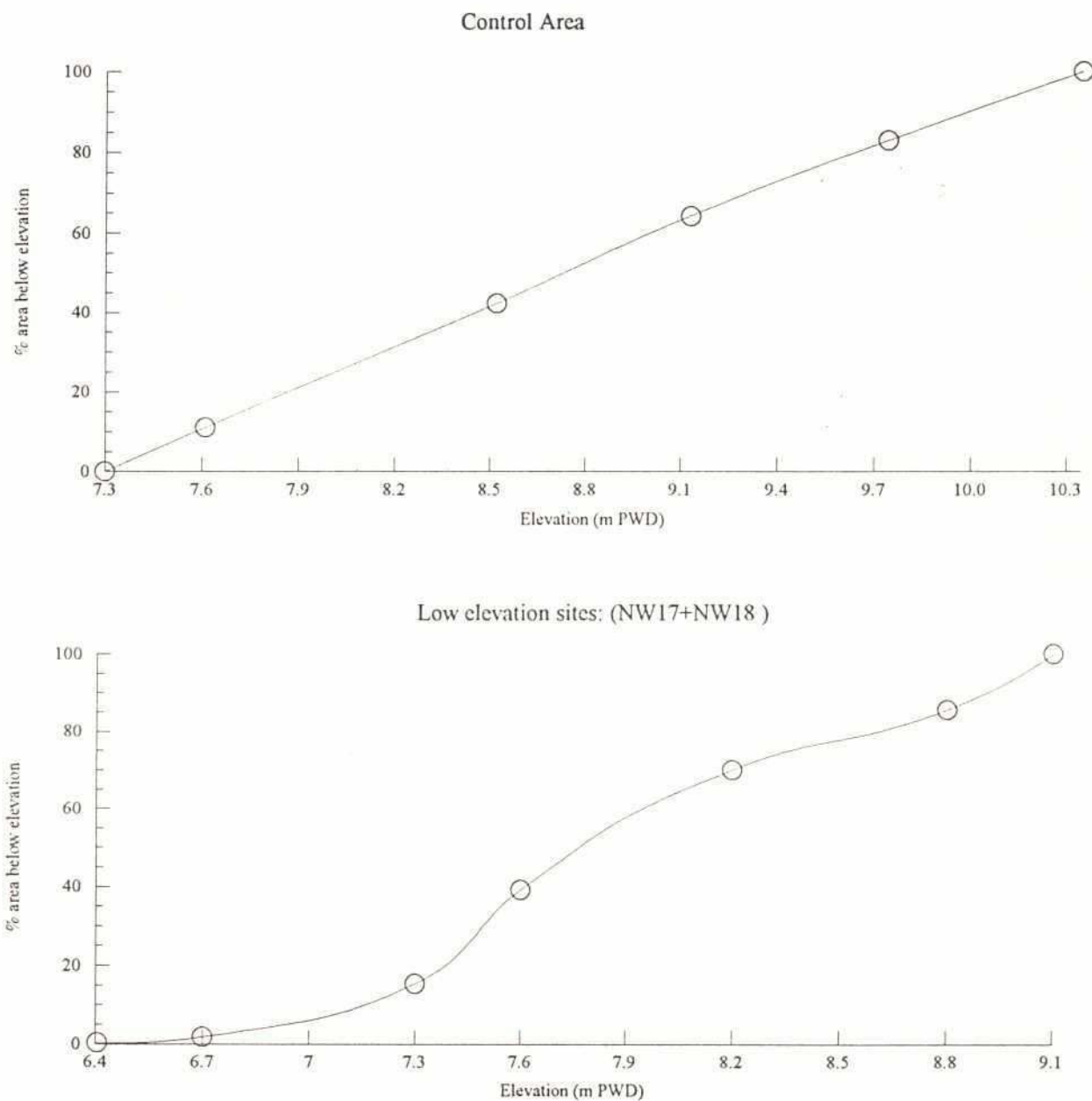




Figure 8.2 Area elevation curves of the control area and sampled floodplains within it



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Table 8.1 Total annual catch from rivers and canals in the PIRDP and its control area, March 1993 - February 1994

Habitat		PIRDP			Control Area		
		Total length (km)	Catch rate (kg/km)	Total catch (tonnes)	Total length (km)	Catch rate (kg/km)	Total catch (tonnes)
R I V E R	Ichamati	51	1292	65.8	21	4003	84.1
	Chiknai	47	2079	97.9			
	Sutikhali	17	2079	35.3			
	Kageswari	15	2028	30.4			
	Badai	21	8155	171.3			
	Total	151		400.7			
C a n a l		370	436	161.3	113	889	100.4

Total riverine and canal catches from the PIRDP were estimated at 401 and 161 tonnes respectively compared with 84 and 100 tonnes from the control area. Contributions from these habitats were low compared with those from floodplains/*beel* in both the PIRDP and its control area (Table 8.2). An estimated annual catch of 10,243 tonnes was taken in 1993/94 from low elevation floodplains of the PIRDP compared with 1,525 tonnes from its control area. A further 1,022 tonnes were taken from higher elevation floodplains within the PIRDP bringing the total for the scheme to 11,265 tonnes. No equivalent higher elevation floodplains were present in the control area.

Table 8.2 Total annual catch from floodplains/*beel* in the PIRDP and its control area, March 1993 - February 1994

Elevation	PIRDP			Control Area		
	Area (ha)	Catch rate (kg/ha)	Total catch (tonnes)	Area (ha)	Catch rate (kg/ha)	Total catch (tonnes)
Low (<9.5 m PWD)	73,693	139	10,243	18,150	84	1,525
High (9.5-12.0 m PWD)	73,011	14	1,022	-	-	-
Total	146,704		11,265	18,150		1,525

An alternative method of estimating floodplain catch involved the application of catch rates to area of land under different flood phase categories (see Table 3.1). By applying catch rates of 139 kg/ha and 14 kg/ha to deeper flooded categories F2-F4 (71,415 ha) and shallower areas of F1 (38,903 ha) respectively, resulted in a total estimated annual catch of 10,471 tonnes which was slightly lower (7%) than the estimate obtained using the area elevation curve method (11,265 tonnes).

The combined annual catch from floodplains/*beel*, canals and rivers of the PIRDP totalled 11,827 tonnes which when divided by the total area of the scheme (184,387 ha) produced an integrated catch rate of 64 kg/ha (Table 8.3). This was considerably lower than equivalent catch rate of 94 kg/ha from the control area. However, this was due to the inclusion of large areas of high land inside the PIRDP where fish productivity was greatly reduced while the same type of high land was not included in the control area. Comparison of integrated catches from low elevation floodplains (F2-F4) and their associated canals and rivers revealed that the catch rate inside the PIRDP (143 kg/ha) was 52% higher than outside it. The difference was lower than that (65%) obtained when CPUA values from floodplain sites inside (139 kg/ha) and outside (84 kg/ha) were compared and resulted from the integration of higher CPUA values of canals and rivers and a higher density of canals outside the scheme. The latter is rather surprising in view of the fact that PIRDP would be expected to lead to greater canal development.

**Table 8.3** Total annual catch from the PIRDP and its control area, March 1993 - February 1994

Habitat	PIRDP		Control Area
	Catch from total area (tonnes)	Catch from low elevation areas only (tonnes)	Low elevation area only (tonnes)
Rivers	401	200	84
Canals	161	80	100
Floodplain/ <i>beel</i>	11,265	10,243	1,525
Total	11,827	10,523	1,709
CPUA (kg/ha)	64	143	94

For the PIRDP as a whole, the total annual catch in 1993/94 of 11,827 tonnes from capture fisheries alone had an on-site value of approximately 296 million taka, assuming an average fish price of 25 taka/kg.



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## 8.2 Previous Catch Estimates for PIRDP

As part of a feasibility study carried out in 1991 for phase II of the PIRDP, an assessment was made of the losses of capture fisheries caused by phase I of the project. The analysis was based on fisheries data supplied by the Department of Fisheries, Pabna (Table 8.4). It concluded that there had been an estimated loss of 75 % (8,271 tonnes) in catches from small rivers, floodplains and *beel* inside the PIRDP between 1984 and 1990.

**Table 8.4** Estimates from previous studies of fish losses in the PIRDP, 1984 - 1990

Year	Estimated fish production (tonnes) in the PIRDP			
	River	Floodplain	<i>Beel</i>	Total
1984	1,831	8,340	911	11,082
1990	680	1,552	579	2,811

Source: Second Pabna Irrigation and Rural Development Project, Feasibility Study, Annex B, 1991

It was also estimated that for the same period there had been a loss in floodplain area of 47 % (11,707 ha to 6,208 ha) caused by flood control. This estimate was provided by the District Department of Fisheries but was not supported by other estimates of floodplain area reported by the same feasibility study which were an order of magnitude higher: F1-F4 land = 110,318 ha; F2-F4 = 71,415 ha.

The estimated annual catch of 2,811 tonnes in 1990 is clearly not supported by the estimate made by FAP 17 in 1993/94 of 11,827 tonnes. However, there is good agreement between the FAP 17 catch estimate and that derived from the annual government statistical survey in 1984 of 11,082 tonnes.

## 9 IMPACT OF PROPOSED PUMPED DRAINAGE ON FISHERIES IN THE PIRDP

Pumped drainage facilities at Bera and Koitala have not yet (up to end of 1994) operated at design levels. In 1993 some pumped drainage was carried out for short periods in September at Bera and Koitala but this had negligible impact on water levels inside the scheme.

### 9.1 Quantitative Analyses

The feasibility study of 1991 carried out hydrodynamic modelling analyses using MIKE11 to assess the impact of pumped drainage operating to design levels on flooding patterns within the project area (Table 9.1). It concluded that there would be a significant shift in flood phases with a loss of 30,784 ha of deeper flooded land (F2 to F4). The concomitant gain in drier areas was used as a basis for economic analyses of the agricultural benefits, particularly increases in *t. aman*, from such drainage. The consultants considered that pumped drainage would have no impact on fisheries since all damage had already occurred as a result of phase I embankments. The logic of this argument is obviously flawed.

The loss of 30,748 ha of flooded land would result in an estimated loss of 4,274 tonnes of fish and prawns valued at 107 million taka (Table 9.2). There would be a further loss caused by a reduction in productivity on the remaining floodplains, rivers and canals since sluice gates would be operated to prevent the entry of river floodwaters thereby effectively blocking migratory fish. The loss has been estimated for floodplains using a rate 10 kg/ha which is based on the contribution of migratory/riverine fish to floodplain catches in 1993/94. A similar procedure was used in estimating losses in rivers and canals. The loss in productivity was estimated at 407 tonnes from floodplains and 125 tonnes from rivers and canals. These should be regarded as conservative estimates since there may also be a loss in productivity of floodplain resident species which has not been taken into account in the analysis.

An increased area of higher land (F1) of 5,526 ha was estimated to produce an additional 77 tonnes of fish. Taking this into account it was estimated that the proposed pumped drainage operation would result in an annual loss of 4,729 tonnes of fish with an on-site value in 1993/94 of approximately 118 million taka.



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**Table 9.1 Impact of proposed pumped drainage on the extent of areas flooded to different depths within the PIRDP**

Basin no.	1	2	3	4	5	6	Total	Percent
Without Pumping								
F0	10920	697	45	2643	17102	5576	36983	20.1
F1	10524	4148	1827	6069	13343	2991	38902	21.1
F2	8566	5955	2237	9049	7579	911	34297	18.6
F3	5339	4385	895	8698	4707	741	24765	13.4
F4	1426	2231	320	8375	0	0	12352	6.7
non-cult	8823	4567	1274	10440	9738	2243	37085	20.1
Total	45598	21983	6598	45274	52469	12462	184384	100.0
Total(F2 + F3 + F4)	15331	12571	3452	26122	12286	1652	71414	38.7
With Pumping								
F0	10920	8590	2461	14204	23145	5825	65145	35.3
F1	10524	5650	1891	10812	12690	2861	44428	24.1
F2	8566	2309	602	6053	4348	818	22696	12.3
F3	5339	1462	437	5740	2842	715	16535	9.0
F4	1426	0	0	9	0	0	1435	0.8
non-cult	8823	3973	1208	8457	9445	2243	34149	18.5
Total	45598	21984	6599	45275	52470	12462	184388	100.0
Total(F2 + F3 + F4)	15331	3771	1039	11802	7190	1533	40666	22.1
Total area changes due to pumping (F2 + F3 + F4)	0	-8800	-2413	-14320	-5096	-119	-30748	-43
F1	0	+1502	+64	+4743	-653	-130	+5526	+14

Notes: 1. + and - denote gain and loss in area respectively  
2. F series as detailed in Table 3.1

Source: Second Pabna Irrigation and Rural Development Project, Feasibility Study, Final Report, Annex A, 1991.



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**Table 9.2**      **Estimated potential fish losses caused by pumped drainage at Bera and Koitala in the PIRDP**

Flood Phase	Change in Area (ha)	CPUA (kg/ha)	Change in catch (tonnes)	Average price (tk/kg)	Value of catch (million taka)
<b>Habitat loss</b>					
F2-F4	-30,748	139	-4,274	25	-107
F1	+5,526	14	+77	25	+2
Sub-total			-4,197	25	-105
<b>Productivity loss</b>					
	Area remaining (ha) (F2-F4)	CPUA lost kg/ha or kg/km	Change in catch (tonnes)	Average price (tk/kg)	Value of catch (million taka)
Floodplain	40,666	10	-407	25	-10
Canal + River			125	25	-3
Sub-total			532	25	-13
Total Loss		-	-4,729	25	-118

Note:      + and - denote increase and decrease in size and value of catch respectively

## 9.2 Conclusions

1. Proposals to proceed with pumped drainage from Bera and Koitala pump stations should be postponed until a critical re-evaluation is made of the potential impacts on fisheries and agriculture. The results from the FAP 17 study should be considered in this re-evaluation and should be included in further cost-benefit analyses together with realistic appraisals of the technical and economic performance of pumping operations and the reactions of farmers to the impact on agriculture.
2. The conclusions of the North West Regional Study (FAP 2) concerning future developments in the lower Atrai should also be taken into account. The study advocated partial flood protection in low-lying areas of Atrai basin subject to deep flooding and full flood protection on higher land. This was termed the "Green River" approach and was based principally on the most rational option for future agricultural development in the lower reaches of the Atrai but also took into account impacts on fisheries, groundwater supplies and water levels in the Atrai. Both this study and that

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of FAP 12 showed that rice production in the area had increased considerably following the introduction of irrigated HYV *boro* rice and that the increase was unrelated to flood control. Furthermore, the studies showed that farmers were dependent on HYV *boro* to give them food security and a surplus, while deepwater rice (*b. aman*) was seen as an important safe supplementary crop. It was reported that most farmers would be satisfied with obtaining a reliable crop of *b. aman* rather than try to replace it with higher yielding *t. aman* which needed shallow water and was therefore more prone to damage or loss by floods resulting from embankment breaches. The need for pre-monsoon protection of HYV *boro* was not seen as critical in the North West Region since most harvests were completed before the arrival of the first deeper floods. Instead, the main objective of the Green River approach was to provide a gradual deeper flood in low lands for the production of *b. aman* or transplanted deepwater rice which was gaining favour with local farmers since yields were apparently higher than those from the tradition *b. aman*.

3. In the PIRDP, farmers currently dictate the operations of regulators for the production of deepwater rice. Assuming the proposed pumping operations are technically feasible, a point yet to be demonstrated, then they would try to encourage a shift from *b. aman* to *t. aman* which would then be at permanent risk from mechanical failure of the pumps. A more sensible approach for the PIRDP, would be to abandon plans for pumped drainage and concentrate development efforts on the production of deepwater rice which provides a habitat where considerably greater yields of wild fish can be attained than from fields of *t. aman*.



## 10 RECOMMENDED MITIGATION MEASURES

Several mitigation measures are listed below. The first four are directly relevant to the PIRDP and are recommended for implementation in the short or near term. The others involve construction work or broad institutional development and therefore are of a longer term nature.

The mitigation measures question one of the principal objectives of flood control, to convert low-lying wetlands to drier land where *b. aman* can be replaced with *t. aman*. Experience in Bangladesh has shown that most flood control schemes have failed, for one reason or another, to achieve this objective. An alternative approach advocated by the North West Regional Study for partial flood control on low lands to allow the production of *b. aman* or, more recently, transplanted deepwater rice, would cause considerably less damage to fisheries. It is this policy which appears more appropriate for existing flood control schemes such as the PIRDP.

The measures listed below draw a distinction between mitigation i.e. measures to reduce losses to capture fisheries caused by flood control and compensation i.e. measures to replace such losses by culture-based techniques. Only mitigation measures are listed below. However, this does not imply that aquaculture developments should not be encouraged. Indeed the ODA has supported work in various aspects of fish culture in Bangladesh for many years, covering activities such as pond culture, cage culture, rice-fish culture and open-water stocking on floodplains. All these techniques could be developed further inside and outside flood control areas. However, FAP 17 studies (FAP 17 Phase II, Draft Proposal) have shown that considerably greater economic benefits can be derived through mitigation measures from small potential increases in capture fisheries over wide areas compared with those from aquaculture development in the same areas. Future efforts should therefore be focused on mitigation measures.

### 1 Production of deepwater rice

The most effective mitigation measure to reduce losses to capture fisheries caused by flood control is to accept the recommendations of the North West Regional Study (FAP 2) for the lower Atrai basin. This would entail the continued provision of controlled river flooding on low floodplains of the PIRDP for the production of deepwater rice rather than to attempt to convert these seasonal wetlands into drier land by complete closures of regulators and the use



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of expensive and possibly unreliable pumped drainage for the production of HYV *t. aman*. Observations from many floodplains in the North West Region indicate that it would also be possible to obtain a harvest of HYV *boro* during winter as well as a harvest of deepwater rice. The benefit to fisheries of growing deepwater rice as opposed to *t. aman* was estimated at 4,729 tonnes of fish per year with an on-site value of 118 million taka. This amount of fish is equivalent to the annual consumption of about 0.5 million people which is one third of the population of the PIRDP.

## 2 Increased fish migration across FCDI structures

The supply of fish hatchlings should be increased by modification of sluice gate operating schedules. This measure is designed to reduce the negative impact of flood control on fish productivity caused by blocking movements of fish hatchlings, especially those of major carps, between rivers and floodplains at critical times of the year. Hydrodynamic modelling will be needed to predict geographical areas of conflict between the water requirements of rice and fish. These should be taken into account in the design of the gate operations to achieve an integrated approach to water management through controlled flooding. It is anticipated that this mitigation measure will also result in increased species diversity as more migratory fish will be able to move from rivers to the floodplains of the PIRDP.

## 3 Fisheries conservation

Dry season fish sanctuaries should be established using *beel* and *kua* to protect overwintering broodstock. This measure is designed to reduce the negative impacts inside flood protected areas of increased fishing pressure during the dry season which can result in decreased fish productivity. It is anticipated that protection of the overwintering broodstock will result in increased recruitment of juveniles to the fishery which in turn will lead to increased productivity.

## 4 Habitat rehabilitation and production

Perennial *beel* should be rehabilitated by reconnection to original feeder river systems and maintenance of adequate dry season water levels within the *beel*. This measure is designed to reduce the negative impact of flood control caused by loss of winter and pre-monsoon habitats. Inside the PIRDP, it is anticipated that excavations of canals will be needed together

with modifications to sluice gate operations. Canal excavation outside the scheme may also be needed to ensure early entry of river floodwaters. Sills should be constructed using changes in gradients of drainage canals to maintain pre-monsoon flooding level in areas surrounding the *beel*.

## 5 Prohibited fishing zones at regulators

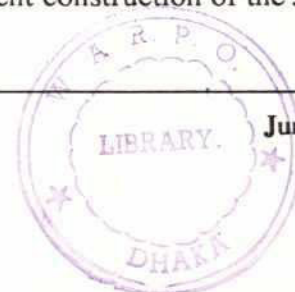
Flood control structures which block or delay movements of fish in rivers or canals thereby increasing their susceptibility to capture should be classified as prohibited fishing zones. Fishing from the structure itself and from a set distance upstream or downstream from it should be made illegal. Distances will vary depending on the location of the structure but as an example, at Talimnagar regulator fishing should be prohibited on it and for a distance of 1 km upstream and downstream.

## 6 Monitoring biodiversity

A national capability to provide systematic quantitative information on geographical variations in diversity of aquatic resources of Bangladesh should be established. This measure is designed to improve the basic knowledge of the diversity of fish, shrimp and prawns and to identify environmental problems, including flood control, linked with reductions in biodiversity. This information can then be considered at the project identification and planning stage of future developments which impact on aquatic resources. This measure should involve the strengthening of institutions such as DoF and FRI through training in a) fish taxonomies b) procedures for the establishment of fish reference collections c) methods for planning and implementing field surveys and sample collections and d) data analysis. It is anticipated that there would be a need to assist institutions in the design and implementation of national field surveys and sample collections.

## 7 Design and construction of new types of regulator

A regulator should be designed and field tested so that the principal form of control is through undershot gates with outer vents to provide overshot flow to facilitate the downstream passage of fish hatchlings. Undershot gates should be of sufficient width to generate minimum head differences across the structure when gates are fully open. This type of regulator was proposed for the regulation of the Lohajang River in the Tangail Compartmentalization Pilot Project. However, in view of current construction of the Jamuna





Bridge which involves the closure of the Northern Dhaleswari River which feeds the Lohajang, a new location is needed for meaningful field trials of a new regulator design. The most appropriate location for such a regulator would be along the right and left banks of the Jamuna River in conjunction with FAP 1 activities and the construction of the Jamuna Bridge respectively.

#### 8 Strengthening of technical assessment and planning capabilities of BWDB/WARPO

There is a need to establish within BWDB/WARPO a multidisciplinary technical assessment unit comprising expertise from fisheries, agriculture, environment, hydrology and hydraulic engineering. The unit should be responsible for the re-evaluation of operating procedures of existing structures and for the examination of future flood control projects. Proposals for major new road or rail links should also be assessed by the unit in terms of their impact on flooding patterns, fisheries and agriculture. The eventual siting of the assessment unit would be dependent on the future roles of BWDB and WARPO.

#### 9 Establishment of national database on FCD/I projects

A detailed and comprehensive national database should be established by BWDB to provide information on all flood control projects in Bangladesh and the major regulatory structures within these projects. The database should provide a basic description of the design and size of each structure, its function within the project area and its state of repair. Daily water level data at each structure should also be provided with computed head differences. The database should be made available, in a user-friendly form, to other government agencies.

#### 10 Improvement of data collection by BWDB

There is an urgent need to improve the quality of data collection by BWDB personnel responsible for the operation of regulatory structures. Supervisory personnel should ensure that accurate detailed daily records are maintained of water levels at the structure (inside and outside), numbers of gates open and height to which each gate is opened. These data should be incorporated into the national database at monthly intervals.



## 11 Establishment of water-user groups

Local groups of water users should be established in flood control projects to represent the full range of sectors affected by modified flooding patterns. This should include capture fisheries as a water-user group. Representatives from each group should form a local committee in association with relevant government departments to establish operating procedures of regulatory structures. The committee would provide the mechanism for the establishment of local integrated water management.

## 12 Training within BWDB

An annual series of training courses should be established within BWDB to provide engineers with a basic understanding of the water requirements within each natural resource sector, focusing attention on fisheries and agriculture. The course content relating to fisheries should contain descriptions of identified adverse impacts of flood control on fish and various methods of mitigation against such impacts.

## 13 Development of flood modelling techniques

There is a need to continue the development of flood modelling techniques using the MIKE11 hydrodynamic model. The SWMC and FAP 19 are currently active in this field but require future support, both financial and technical, to continue to make progress. The work would require detailed field surveys to improve basic topographical information.

## 11 FUTURE RESEARCH REQUIREMENTS

FAP 17 Phase I investigations provided quantitative baseline data in many aspects of freshwater fisheries in Bangladesh. However, the study was conducted over a short time period covering only one year of field data collection. There is a need to build upon the baseline data by the establishment of long-term studies which focus on fewer geographical areas than in Phase I but in greater depth and detail of research activities. The studies should be complemented by detailed, quantitative hydrological studies so that fisheries data can be related directly to flooding patterns. The areas of work listed below are relevant not only to the PIRDP but other FCD projects and free-flooding areas of Bangladesh.

1. Investigation of the biology and ecology of selected fish and prawn species dominating floodplain catches inside and outside FCD areas. Information collected should include data on age, breeding biology, feeding habits and micro-distributions in relation to seasonal changes in flooding and the distribution of aquatic vegetation including deepwater rice. The study should also include detailed limnological investigations which examine plankton, macroinvertebrates and water quality, particularly nutrient levels. This study will provide an understanding of the overall functioning of the dominant fish and prawn community.
2. Stock assessment using length frequency analysis to obtain information on the population dynamics of selected species of fish and prawns dominating floodplain catches. This study will provide information on growth, mortality and the status of stocks and allow predications to be made of the effects on fisheries of further increases in fishing pressure. This study is particularly relevant to flood controlled areas where higher levels of fishing effort have been recorded on fish communities in which diversity has been reduced and a greater dependence placed on a small number of floodplain resident species. The current status of the stocks of these species is not known.
3. Establishment of catch assessment surveys using methods outlined in the FAP 17 Draft Final Report Guidelines to obtain estimates of fish densities and yield per unit area of floodplain. These data when collected over a long-term period of at least three to five years and linked with a concomitant set of quantitative data on flooding patterns will provide the first rational basis for the development of a quantitative

floodplain fisheries model. This can then be used as a predictive tool to provide future advice on fisheries management and development.

4. Investigation of the movements of fish and prawns between rivers and floodplains which are free-flooding and others on which flooding is controlled. This study will require continuous daily monitoring of catches in canals linking rivers with floodplains.
5. Investigation of the impact of water regulators on the survival and movement by passive downstream drift of fish and prawn larvae in relation to seasonal changes in river discharge. This study has particular relevance on the Brahmaputra/Jamuna and Padma rivers which annually provide a considerable supply of major carp hatchlings together with many other species of fish and prawns.
6. Determination of water velocities from a range of different types of structures operating under varying head differences and gate openings. These data should be collected by BWDB and incorporated into a national database on water regulators (mitigation method no. 9).
7. Determination of swimming speeds of selected fish species. This work requires carefully controlled laboratory flume studies and therefore the most appropriate approach may be a joint study between the Fisheries Research Institute (FRI) and the River Research Institute. Results from this study would be related to data on water velocities at regulators (No. 6 above) to provide quantitative management advice on the operation of various types of regulator.
8. Investigation of the physiological effects on fish of passage through regulators under different prevailing head differences. This work requires the controlled release of selected species upstream of a regulator and their subsequent capture downstream. Physiological examinations could be undertaken by FRI and or universities.
9. Identification of possible spawning grounds of major carps in the Brahmaputra and Padma rivers in Bangladesh and investigation of upstream breeding migrations in these rivers.



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10. Investigation of the migrations of fish along rivers of the North Central Region to identify possible environmental factors which might explain the general scarcity of riverine and migratory species.
11. Assessment of the impact of FCD/I projects on the diversity of fish and prawns. Standardised systematic, intensive sampling is required to record not only the more common species but also the numerous rarer species which may be more vulnerable to adverse impacts caused by flood control.
12. Evaluation of the potential of small, indigenous species of fish (not major carps) as candidates for stock enhancement programmes through open-water stocking. The programme requires initial screening of a range of species using small pond culture techniques. These should be followed by a series of open-water stocking trials to evaluate their performance and record the reaction of local fishing communities to the stocking programme. The selection of fish species smaller than major carps should direct a greater share of benefits from stocking programmes to traditional fishermen than is the case with major carps.

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## APPENDIX 1



Appendix 1 Table A Percentage monthly catch by gear type : inside FCDI (site NW03 Badai River)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
270	Katha	0.064	48.565	35.849	59.111	-	46.886	-	-	-	-	-	-	-	23.313	31.725	93.350	96.566	21279.636	33.453									
266	Veshal	61.563	17.301	14.002	-	-	-	-	-	9.703	6.394	10.118	24.123	85.695	47.293	25.109	0.245	-	-	16866.540	26.515								
45	Ber jal	-	4.695	7.208	2.124	74.729	36.612	20.140	66.702	9.086	56.632	42.452	47.553	0.932	1.927	4.855	-	-	9422.759	14.813									
272	Daun	13.912	12.740	2.795	-	-	4.145	5.768	15.641	24.639	3.642	2.945	9.571	8.505	17.496	2.683	0.116	-	-	4030.859	6.337								
95	Doiar trap	-	-	1.887	3.835	-	-	5.733	6.748	23.967	25.358	19.454	3.432	0.295	-	0.111	-	-	2818.369	4.431									
202	Moi jal	0.751	2.709	3.688	18.763	12.064	1.782	7.303	5.499	12.638	4.777	18.782	3.915	0.222	1.340	1.397	0.719	-	1940.952	3.051									
271	Suti jal	4.375	3.199	-	-	-	-	-	-	-	-	-	-	-	1.557	16.230	-	-	1773.250	2.788									
298	Akra	-	-	15.145	12.643	3.224	0.433	-	-	-	-	-	-	-	-	13.130	3.169	0.792	1749.474	2.750									
164	Jhaki jal	3.115	5.574	3.306	0.929	6.718	3.088	5.832	0.561	4.853	2.311	0.517	4.272	2.112	6.230	1.831	0.751	1.875	1619.801	2.546									
30	Sip	13.727	5.217	7.673	0.921	2.447	-	34.330	2.735	4.173	0.154	-	0.073	0.964	0.524	1.259	1.109	-	692.185	1.088									
88	Current jal (Stationary)	-	-	-	-	-	5.279	3.702	1.559	8.495	0.724	4.596	1.379	0.456	0.095	0.599	0.178	-	639.150	1.005									
123	Koi jal	-	-	8.447	1.674	0.819	0.068	-	-	0.760	0.007	0.933	5.153	0.069	-	0.912	0.362	0.767	483.774	0.761									
278	Nol barsi	-	-	-	-	-	1.577	17.192	0.418	-	-	-	-	-	-	-	-	-	130.903	0.206									
105	Dharma jal	0.150	-	-	-	-	-	-	-	1.687	-	-	-	0.469	0.083	-	-	-	69.509	0.109									
170	Juti	-	-	-	-	-	-	-	-	-	-	0.136	0.433	0.040	-	-	-	-	32.232	0.051									
255	Thella jal	-	-	-	-	-	-	-	-	-	-	0.066	0.096	0.242	-	-	-	-	29.745	0.047									
282	Current jal (Drifting)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.108	0.049	-	-	15.084	0.024									
307	Hand fishing	-	-	-	-	-	0.131	-	-	-	-	-	-	-	-	0.079	-	-	9.288	0.015									
301	Chunga	-	-	-	-	-	-	-	-	-	-	-	-	-	0.034	0.033	-	-	6.436	0.010									
314	Boat Katha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.387	0.002									
152	Tana Barsi	2.344	-	-	-	-	-	-	0.137	-	-	-	-	-	-	-	-	-	-	-									
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	63611.333	100								

Note: - denotes zero catch



Appendix 1 Table B Percentage monthly catch by gear type: inside FCDI (site NW06 Ichamati River)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
		Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
45	Ber jal	-	4,600	-	-	-	-	6,612	11,368	21,725	-	37,069	54,725	10,567	17,497	78,675	69,821	-	5807,372	25.717									
30	Sip	41,293	26,450	1,647	-	-	-	1,398	8,213	35,052	30,411	7,547	10,898	56,264	75,883	13,917	9,241	17,146	4893,955	21.672									
255	Thella jal	38,549	41,711	22,079	5,775	24,073	44,194	14,042	30,502	13,126	4,342	4,269	7,003	19,248	-	-	-	13,560	3275,314	14.504									
95	Doiar trap	-	5,417	22,554	64,368	53,913	50,903	31,702	12,444	0,070	2,552	0,890	1,337	1,169	-	-	-	8,383	2499,500	11.069									
164	Jhaki jal	7,321	1,888	18,770	26,952	5,241	4,078	29,398	8,278	17,512	31,972	24,554	-	0,588	-	0,209	-	17,352	2460,241	10.895									
88	Current jal (Stationary)	1,843	3,095	7,517	2,905	2,922	0,565	4,215	6,490	3,265	2,900	0,639	1,503	4,787	2,317	6,246	14,722	17,108	1039,536	4.603									
263	Ucha	-	-	-	-	-	-	-	-	1,403	0,225	16,429	6,534	7,232	4,126	0,397	4,534	16,472	837,343	3.708									
202	Moi jal	-	-	22,834	-	-	-	5,940	-	1,457	27,216	8,153	-	-	-	-	-	9,979	752,039	3.330									
266	Veshal	10,994	16,782	4,558	-	-	-	6,546	20,544	6,211	-	-	3,643	-	-	-	-	-	725,105	3.211									
272	Daun	-	-	-	-	-	-	0,147	2,163	0,028	0,383	0,450	14,357	-	-	0,136	-	-	241,348	1.069									
123	Koi jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,683	-	19,723	0.087									
149	Hogra	-	-	-	-	-	-	-	-	0,153	-	-	-	0,144	0,178	0,069	-	-	12,790	0.057									
152	Tana Barsi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,351	-	-	9,450	0.042									
278	Nol barsi	-	0,057	0,041	-	13,851	0,260	-	-	-	-	-	-	-	-	-	-	-	8,021	0.036									
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	22581,737	100									

Note: - denotes zero catch

Appendix 1 Table C Percentage monthly catch by gear type: inside FCDI (Site NW07 Kageswari River)

Gear Code	Gear name	Year : 1992												Year : 1993												Year: 1994			Total annual catch (Mar'93 – Feb'94)	
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%										
266	Veshal	78.720	33.546	11.189	—	—	—	0.328	59.048	61.896	76.527	73.670	96.542	68.113	21.944	37.979	—	—	7519.245	43.630										
164	Jhaki jal	1.647	39.038	30.429	17.678	0.902	2.343	18.109	0.716	12.317	1.769	0.665	—	—	29.570	14.181	41.696	—	2503.875	14.529										
95	Doiar trap	—	0.249	26.212	62.200	0.961	67.719	26.275	37.486	9.936	15.231	0.668	0.238	0.738	1.379	2.143	11.919	46.620	1617.295	9.384										
255	Thella jal	—	5.687	—	—	0.272	3.975	5.832	—	—	—	—	0.110	11.305	16.162	1.143	—	—	1268.436	7.360										
271	Suti jal	—	1.963	—	—	—	—	—	—	—	—	—	—	—	14.757	—	—	—	996.175	5.780										
298	Akra	—	0.266	21.583	17.168	5.145	5.627	0.095	—	—	—	—	—	—	1.768	29.224	8.084	23.044	649.414	3.768										
45	Ber jal	12.205	—	—	—	—	7.893	38.132	—	7.794	3.784	13.235	—	—	—	7.904	33.206	—	494.701	2.870										
270	Katha	—	—	2.793	—	92.445	—	—	—	—	—	—	—	—	—	—	—	—	401.500	2.330										
307	Hand fishing	—	5.686	—	—	—	12.248	10.890	—	—	—	—	—	—	2.998	—	—	—	344.968	2.002										
170	Juti	—	3.717	—	—	—	—	—	—	4.594	1.499	—	—	0.689	4.434	—	—	—	319.818	1.856										
88	Current jal (Stationary)	1.787	0.091	—	—	0.276	0.196	0.339	—	—	—	9.581	0.950	0.498	—	—	5.096	30.261	234.926	1.363										
30	Sip	1.072	9.063	7.794	2.954	—	—	—	2.750	3.463	0.710	1.052	0.686	2.471	1.751	0.108	—	—	225.068	1.306										
272	Daun	4.569	0.695	—	—	—	—	—	—	—	—	1.130	1.474	7.193	0.199	—	—	—	211.341	1.226										
202	Mot jal	—	—	—	—	—	—	—	—	—	—	—	—	—	2.371	3.811	—	—	194.119	1.126										
310	Kakila bana	—	—	—	—	—	—	—	—	—	—	—	—	2.414	2.112	—	—	—	121.500	0.705										
152	Tana Barsi	—	—	—	—	—	—	—	—	—	—	—	—	—	0.019	3.507	—	—	54.033	0.314										
314	Boat Katha	—	—	—	—	—	—	—	—	—	—	—	—	—	0.536	—	—	—	45.440	0.264										
317	Thushi	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30.857	0.179										
89	Dhor jal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.249	0.007										
301	Chunga	—	—	—	—	—	—	—	—	—	0.127	—	—	—	—	—	—	0.075	0.175	0.001										
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	17234.135	100										

Note: - denotes zero catch

Appendix 1 Table D Percentage monthly catch by gear type: inside FCDI (site NW11 Chiknai River)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
271	Suti jal	27.684	20.339	-	-	-	-	-	-	-	-	-	-	26.612	64.485	-	-	-	4021.354	25.784									
45	Ber jal	20.823	31.179	22.364	39.820	68.033	53.759	78.492	41.734	74.599	43.150	16.704	56.646	12.033	4.124	23.337	3.487	-	4010.797	25.717									
164	Jhaki jal	5.093	7.639	6.412	7.591	2.489	7.175	10.143	27.659	8.231	17.555	46.822	5.599	4.200	10.801	35.309	16.803	-	2156.294	13.826									
272	Daun	26.273	17.983	1.901	-	-	-	-	7.624	-	-	0.155	19.605	25.893	10.508	0.893	-	5.460	1488.031	9.541									
266	Veshal	11.592	15.828	3.153	-	-	-	-	1.237	10.123	3.927	15.226	13.129	26.332	3.973	3.745	-	-	1211.998	7.771									
298	Akra	-	-	6.305	23.696	2.192	0.653	-	-	-	-	-	-	-	0.388	9.251	52.740	36.972	652.999	4.187									
202	Moi jal	-	0.953	3.140	4.175	0.926	-	-	3.442	3.711	26.324	11.788	0.257	-	-	0.859	0.962	-	342.326	2.195									
30	Sip	7.767	3.093	25.079	8.959	1.375	-	2.739	-	0.666	2.133	-	0.122	1.981	1.411	7.309	5.457	20.489	325.512	2.087									
88	Current jal (Stationary)	-	-	-	-	-	-	-	15.298	-	1.762	2.868	4.139	-	-	0.456	1.261	-	241.830	1.551									
277	Kachitana	-	-	-	-	-	26.635	1.859	-	-	-	-	-	-	-	-	9.077	-	229.925	1.474									
306	Baoli jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.325	-	-	223.889	1.436									
255	Thella jal	0.672	0.503	0.511	1.858	1.107	7.810	3.648	-	0.165	-	-	0.206	2.794	1.324	0.289	-	7.444	206.065	1.321									
95	Doiar trap	-	-	-	-	-	-	-	3.005	2.505	5.148	6.436	0.191	0.052	-	0.290	3.837	29.634	194.944	1.250									
310	Kakila bana	-	-	-	-	-	-	-	-	-	-	-	-	-	2.986	-	-	-	164.957	1.058									
123	Koi jal	-	-	21.141	10.969	1.594	-	-	-	-	-	-	0.106	-	-	2.936	4.030	-	78.920	0.506									
307	Hand fishing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.347	-	19.716	0.126									
276	Hat panch	-	-	-	-	-	-	3.118	-	-	-	-	-	-	-	-	-	-	16.909	0.108									
314	Boat Katha	-	-	-	2.932	1.170	1.360	-	-	-	-	-	-	-	-	-	-	-	7.845	0.050									
170	Juti	0.095	0.130	-	-	-	-	-	-	-	-	-	-	-	-	0.104	-	-	1.801	0.012									
297	Horhori	-	-	9.994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
270	Katha	-	2.353	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
317	Thushi	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	15596.112	100									

Note: — denotes zero catch





Appendix 1 Table F Percentage monthly catch by gear type: outside FCDI (site NW15 Karatoya River)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
270	Katha	—	0.005	50.941	41.723	65.085	50.922	34.261	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: - denotes zero catch



Appendix 1 Table G Percentage monthly catch by gear type: outside FCDI (site NC21 Gazikhali River)

Gear Code	Gear name	Year: 1992					Year: 1993								Year: 1994			Total annual catch (Mar'93 – Feb'94)				
		Aug	Sep	Oct	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
270	Katha	—	—	—	16.630	—	—	27.418	—	—	—	—	—	—	—	—	65.059	87.172	94.306	1733.563	38.418	
164	Jhaki jal	38.633	11.516	35.329	—	—	—	44.020	60.127	92.147	1.893	1.878	6.234	12.331	11.652	9.383	10.968	2.485	0.428	647.096	14.341	
89	Dhor jal	32.664	61.207	1.885	—	—	—	49.559	3.191	—	2.816	21.158	91.034	38.984	24.361	1.904	3.386	6.557	2.786	—	543.818	
266	Veshal	—	18.066	52.452	67.675	—	—	—	—	—	80.855	—	—	6.440	25.289	—	7.176	—	—	—	12.052	
45	Ber jal	19.287	5.430	—	—	100.000	—	—	27.908	—	—	—	—	—	14.672	10.199	—	—	—	—	12.024	
30	Sip	0.409	1.956	9.442	—	—	—	—	—	—	—	—	—	25.789	10.199	—	—	—	—	—	7.467	
307	Hand fishing	—	—	—	15.695	—	—	12.140	1.785	7.853	—	73.708	—	5.514	6.792	51.823	—	—	—	—	4.615	
255	Thella jal	—	—	—	—	—	—	—	—	—	—	—	—	6.156	4.185	13.192	4.140	0.585	—	—	3.565	
282	Current jal (Drifting)	—	—	—	—	—	—	—	—	—	—	3.255	—	—	4.441	11.232	6.931	3.786	1.895	—	3.024	
271	Suti jal	—	—	—	—	—	—	—	—	—	—	—	—	—	5.051	—	—	—	—	—	0.859	
296	Tukri	—	—	—	—	—	—	7.876	—	—	11.297	—	—	—	—	—	—	—	—	—	0.850	
202	Moi jal	9.007	1.825	0.891	—	—	—	—	—	—	—	—	—	—	—	—	1.604	—	—	—	0.758	
304	Satiber jal	—	—	—	—	—	—	—	6.990	—	1.903	—	—	0.953	2.648	—	—	—	—	—	0.694	
95	Doiar trap	—	—	—	—	—	—	4.902	—	—	—	—	—	—	—	—	—	—	—	—	0.457	
263	Ucha	—	—	—	—	—	—	—	—	—	1.236	—	2.733	2.186	0.127	—	—	—	—	—	0.375	
170	Juti	—	—	—	—	—	—	—	—	—	—	—	—	1.646	0.784	—	—	—	—	—	0.173	
301	Chunga	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.133	
88	Current jal (Stationary)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.168	—	—	—	—	0.092	
314	Boat Katha	—	—	—	—	—	—	1.315	—	—	—	—	—	—	—	0.099	0.436	—	—	—	0.062	
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0.040
																						4512.340
																						100

Notes: 1. No fishing activities were observed in November 1992

2. - denotes zero catch



Appendix 1 Table II Percentage monthly catch by gear type: outside FCDI (site NC25 Kaliganga River)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
95	Doiar trap	–	21.204	4.016	18.544	3.030	–	–	–	44.391	47.935	57.162	62.134	11.989	18.024	5.868	0.635	–	–	5078.856	18.394								
45	Ber jal	72.183	24.143	6.916	11.420	18.624	26.848	29.426	9.555	57.957	16.065	30.854	12.628	3.898	4.680	30.439	4.535	1.398	–	23.287	3937.128	14.259							
270	Katha	–	–	75.438	30.479	28.630	–	–	–	–	–	–	–	–	–	–	7.795	81.272	51.292	–	–	3548.260	12.850						
266	Veshal	0.766	19.818	2.825	3.766	11.417	16.593	13.047	6.516	–	16.258	3.044	5.120	23.869	49.836	9.217	5.568	1.127	–	–	3415.300	12.369							
164	Jhaki jal	0.747	0.884	4.965	15.319	8.031	16.769	2.484	23.644	23.925	5.380	5.080	0.403	–	1.966	4.404	20.484	0.884	7.530	11.521	2162.606	7.832							
307	Hand fishing	–	–	–	–	–	–	3.694	41.287	4.153	–	–	–	–	0.227	10.677	12.074	–	0.361	3.885	1878.142	6.802							
255	Thella jal	–	0.460	0.110	6.258	–	–	–	–	–	–	2.449	0.414	0.499	0.335	9.696	15.041	0.566	–	–	1854.559	6.717							
88	Current jal (Stationary)	4.399	8.028	0.282	0.478	16.246	19.719	1.634	0.464	0.682	0.927	8.064	1.889	4.256	6.657	4.392	6.692	22.537	3.692	–	1519.108	5.502							
89	Dhor jal	5.715	1.989	1.047	0.494	–	–	4.076	–	1.123	1.807	2.514	0.727	13.296	1.408	6.500	–	–	0.943	–	964.079	3.492							
272	Daun	14.058	21.624	1.907	0.211	–	–	–	17.553	1.329	1.248	1.137	2.718	5.960	10.495	1.442	1.531	0.138	–	–	774.855	2.806							
152	Tana Barsi	–	–	–	–	–	–	–	–	–	–	–	–	–	0.591	1.651	7.165	3.127	7.413	–	772.821	2.799							
202	Moi jal	1.041	0.360	0.173	0.722	9.247	6.946	0.637	–	13.056	5.371	6.795	0.506	1.174	–	–	1.468	2.257	4.943	–	438.518	1.588							
310	Kakila bana	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.831	1.537	–	–	–	341.682	1.237							
282	Current jal (Drifting)	–	–	–	–	–	7.419	–	0.216	3.560	–	–	–	–	1.623	0.731	0.381	0.381	3.396	–	234.320	0.849							
278	Nol barsi	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.461	–	–	–	224.054	0.811							
30	Sip	1.090	1.489	1.717	10.654	–	–	–	–	–	–	1.396	4.182	0.387	0.205	0.851	1.241	0.177	–	–	213.225	0.772							
263	Ucha	–	–	–	–	–	–	–	–	–	–	–	–	0.130	0.949	1.083	0.608	–	0.468	–	164.880	0.597							
304	Saiber jal	–	–	–	–	–	–	45.002	–	8.613	1.797	–	–	–	–	–	–	–	–	–	43.073	0.156							
314	Boat Katha	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	29.671	0.107							
98	Net/Basket+Dewatering	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.774	0.043							
298	Akra	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.022	0.018							
126	Ferra jal	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–						
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	27611.933	100						

Note: - denotes zero catch.

Appendix 1 Table 1 Percentage monthly catch by gear type:outside FCDI (site NC29 Ichamati River)

Appendix 1 Table 1 Percentage monthly catch by gear type:outside F.CDI (site NC.29 Ichamati River)																													
Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
266	Veshal	66.254	66.191	24.398	14.482	0.109	1.032	1.833	-	5.400	7.180	37.248	95.647	78.186	85.012	77.209	14.253	1.396	-	-	14310.533	56.022							
270	Katha	-	-	-	30.098	45.887	93.825	-	44.577	-	-	-	-	-	-	-	62.327	61.321	74.837	-	5127.892	20.074							
45	Ber jal	6.308	9.339	28.808	52.867	53.370	2.595	55.468	24.916	18.475	30.298	31.874	-	4.958	-	9.437	1.404	26.763	17.484	6.422	2390.251	9.357							
202	Moi jal	10.207	0.375	4.244	-	-	-	-	-	-	13.299	25.257	2.554	2.168	-	2.352	5.995	2.710	3.717	2.888	791.849	3.100							
164	Jhaki jal	0.611	1.164	2.265	-	-	-	16.698	8.839	-	12.839	-	-	-	-	3.712	7.077	-	-	3.158	692.518	2.711							
95	Doiar trap	13.660	10.600	0.141	1.424	0.628	-	17.950	-	-	0.056	3.641	1.197	7.058	0.752	2.232	0.523	1.284	3.820	0.921	527.995	2.067							
30	Sip	2.755	4.044	35.994	0.005	0.006	-	6.082	2.277	-	10.295	-	-	0.315	0.571	3.029	3.479	1.134	-	-	482.044	1.887							
272	Daun	0.204	8.263	3.306	0.975	-	-	-	-	7.474	8.960	0.827	-	5.477	10.952	0.957	-	-	0.174	5.481	338.289	1.324							
255	Thella jal	-	-	-	-	-	1.670	1.969	11.452	65.647	15.982	1.153	0.178	-	0.059	0.698	1.006	0.690	-	-	417.980	1.636							
88	Current jal (Stationary)	-	0.025	0.843	0.150	-	0.746	-	4.454	3.004	0.287	-	0.424	1.839	0.553	0.177	0.746	1.197	1.958	170.954	0.669								
278	Nol bari	-	-	-	-	-	-	-	-	0.803	-	-	-	-	0.483	-	-	1.368	4.056	96.936	0.379								
314	Boat Katha	-	-	-	-	-	0.132	-	0.047	-	-	-	-	-	-	-	1.398	0.963	0.054	54.588	0.214								
307	Hand fishing	-	-	-	-	-	-	1.001	-	-	-	-	-	-	1.619	0.070	0.516	1.176	0.225	-	37.382	0.146							
263	Ucha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.167	0.087							
298	Akra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.923	-	-	-	19.852	0.078							
296	Tukri	-	-	-	-	-	-	2.437	-	-	-	-	-	-	-	-	0.217	-	-	-	13.803	0.054							
170	Juti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.126	-	-	-	-	3.243	0.013							
301	Chunga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.135	-	-	-	25544.308	100							

Note: - denotes zero catch

## APPENDIX 2





[illegible]

III.2



Appendix 2 Table B Monthly catch composition (% by weight):inside FCDI (site NW06 Ichamati River)

Species Code		Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
					Dec	Nov	Oct	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
17	Riverine	<i>Barilius barila</i>	Bengali																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

Note: - denotes zero catch





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Appendix 2 Table B Monthly catch composition (% by weight): inside FCDI (site NW/06 Ichamati River)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
				Dec	Nov	Oct	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
41		<i>Channa punctatus</i>	Taki	5.689	14.151	0.300	1.014	14.139	2.271	3.823	5.492	1.431	3.295	0.413	2.214	1.388	0.483	0.276	0.348	1.590	415.252	1.839									
42		<i>Channa striatus</i>	Shol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.096	0.869	-	12.766	0.057									
49		<i>Clarias batrachus</i>	Magur	0.281	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
88		<i>Heteropneustes fossilis</i>	Shingi	-	0.312	-	-	3.245	-	-	0.146	0.095	0.052	-	-	-	-	-	-	-	106.693	0.472									
121		<i>Macrognathus aculeatus</i>	Tam baïm	0.237	0.057	0.059	-	-	3.635	2.055	2.055	0.430	0.430	-	0.095	-	-	-	-	-	102.125	0.452									
123		<i>Macrognathus pancalus</i>	Guchi	1.730	3.285	3.614	0.248	1.159	5.839	15.636	8.440	10.207	12.780	6.988	3.682	2.105	1.459	0.103	0.251	7.394	1450.256	6.422									
122		<i>Mastomembelus armatus</i>	Barni baïm	0.071	-	-	-	-	-	-	0.757	0.022	-	0.074	-	5.237	0.170	0.761	-	-	0.688	128.434	0.569								
15		<i>Badis badis</i>	Napii koi	-	0.572	0.142	-	0.007	0.609	-	0.139	0.286	0.142	0.103	0.034	0.131	-	-	-	0.469	43.552	0.193									
203		<i>Tetraodon cutcutin</i>	Pokla	0.272	0.245	0.364	-	-	-	0.221	2.383	0.469	-	0.764	0.791	0.147	-	-	-	-	84.180	0.373									
35		<i>Chanda baculis</i>	Chanda	2.313	0.826	0.094	0.939	2.156	2.979	0.445	1.180	0.069	0.315	0.273	2.798	0.239	-	0.029	0.038	0.285	174.129	0.771									
36		<i>Chanda nama</i>	Nama chanda	0.163	0.553	0.741	1.957	1.008	0.175	0.779	1.984	4.697	0.607	17.287	8.658	4.131	1.403	8.737	21.240	1.147	1210.688	5.361									
37		<i>Chanda ranga</i>	Lalchanda	1.120	0.416	1.217	1.171	1.648	1.639	1.550	2.674	0.398	-	0.491	1.707	1.754	1.169	0.641	3.627	0.715	278.771	1.234									
	Subtotal			67.364	55.317	40.603	44.185	41.747	42.292	47.516	69.642	43.450	76.934	61.471	68.060	64.722	28.827	18.667	41.604	36.947	10642.023	47.126									
931	Other	<i>Prawn spp.</i>	Chingri/Icha	18.313	29.490	31.333	51.160	57.512	55.685	24.216	26.172	15.978	21.906	32.999	14.897	17.156	2.535	1.267	5.705	33.259	4967.225	21.996									
	Total			18.313	29.490	31.333	51.160	57.512	55.685	24.216	26.172	15.978	21.906	32.999	14.897	17.156	2.535	1.267	5.705	33.259	4967.225	21.996									
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	22582.215	100								

Note: - denotes zero catch

Appendix 2 Table C Monthly catch composition (% by weight): inside FCDI (site NW07 Kageswari River)

Appendix 2 Table C. Monthly catch composition (% by weight): inside PCDI (Site NW0/ Kageswari River)																							
Species Code	Habitat Preference	Scientific	Species name	Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)					
				Dec	Nov	Oct	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
218	Riverine	<i>Barilius evazardi</i>	Bengali	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.703	0.016
59		<i>Crossocheilus latius</i>	Kalabara	-	0.075	0.813	-	-	-	-	-	-	0.275	0.663	0.080	2.000	-	-	-	-	-	51.981	0.302
139		<i>Nemacheilus bota</i>	Balichan	-	0.756	0.867	-	-	-	-	-	-	0.485	-	-	-	-	-	-	-	-	4.767	0.028
28		<i>Bota dario</i>	Rani	-	0.689	6.238	-	-	-	-	-	-	-	-	0.634	1.812	0.033	-	-	-	55.559	0.321	
29		<i>Bota lobachata</i>	Putul	-	-	-	-	-	-	-	-	-	-	-	0.585	-	-	-	-	-	11.931	0.069	
89		<i>Hilsa ilisha</i>	Ish	-	0.753	12.930	-	-	-	-	-	0.114	0.872	7.363	6.310	0.478	-	-	-	-	210.818	1.223	
85		<i>Goniolosa manmina</i>	Goni chupla	-	-	-	-	-	-	-	-	0.261	0.544	0.544	-	-	-	-	-	-	6.552	0.038	
58		<i>Corica soborna</i>	Kuchbi	-	-	0.117	-	-	-	-	-	0.084	0.525	0.393	-	0.226	0.004	-	0.066	-	1.241	0.007	
193		<i>Seipituna phasa</i>	Phasa	-	-	-	-	-	-	-	-	-	-	0.147	-	-	-	-	-	-	0.943	0.005	
30		<i>Brachygnathus nuntus</i>	Nunabaila	-	-	-	-	-	-	-	-	-	-	0.041	-	-	-	-	-	-	41.483	0.241	
185		<i>Brachygnathus nuntus</i>	Khorala	-	0.018	-	-	-	-	-	-	-	-	0.775	0.578	1.035	-	-	-	-	7.278	0.042	
923		<i>Rhinomugil corsala</i>	Beta	-	-	-	-	-	-	-	-	-	-	0.863	-	-	-	-	-	-	23.493	0.136	
2		<i>Siamugil casasia</i>	Kajuli	-	-	-	-	-	-	-	-	-	-	2.095	3.822	-	-	-	-	-	113.249	0.657	
51		<i>Alia colla</i>	Ghaura	-	-	-	-	-	-	-	-	-	1.232	2.755	-	-	-	-	-	-	1.128	0.007	
80		<i>Clupeosoma garua</i>	Gang tengra	-	-	-	-	-	-	-	0.150	-	-	-	-	-	-	-	-	-	33.146	0.192	
81		<i>Gargus viridescens</i>	Gang tengra	-	-	-	-	-	-	-	-	-	1.100	0.627	0.564	0.214	0.013	-	-	-	0.677	0.004	
84		<i>Gargus youssoufi</i>	Telchitra	-	-	-	-	-	-	-	-	-	0.069	-	-	-	-	-	-	-	0.624	0.004	
172		<i>Glyptothorax telchitra</i>	Titiri	-	-	-	-	-	-	-	-	-	-	0.074	-	-	-	-	-	-	-	-	-
	Subtotal	<i>Psilochinchus suento</i>		20.964	2.291	-	-	-	-	-	0.150	0.459	4.825	16.340	12.574	5.907	0.050	-	0.066	-	381.783	3.376	
130	Migratory	<i>Aorichthys aor</i>	Ayre	-	-	-	-	-	-	-	-	-	-	1.636	0.030	0.739	-	-	-	-	30.944	0.180	
135		<i>Aorichthys seenghala</i>	Guizna	-	-	-	-	-	-	-	-	-	-	1.426	-	-	-	-	-	-	12.022	0.070	
25		<i>Bataio tengra</i>	Tengra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131		<i>Mystus bleekeri</i>	Golsia tengra	-	-	0.035	-	4.437	-	-	0.992	0.846	6.189	0.099	0.259	0.564	0.101	0.470	0.289	-	49.738	0.289	
132		<i>Mystus cavasius</i>	Kabashi	-	-	-	-	-	-	-	0.445	0.337	-	-	-	-	-	0.466	-	1.279	118.831	0.690	
32		<i>Catla catla</i>	Catla	-	-	0.805	-	-	-	-	-	-	-	-	-	3.128	5.666	-	-	-	190.553	1.106	
47		<i>Cirrhinus mirgala</i>	Mrigel	-	-	0.261	-	-	-	-	-	-	-	-	-	7.567	0.739	-	-	-	170.753	0.991	
48		<i>Cirrhinus reba</i>	Riak	-	1.600	42.241	-	-	-	-	-	0.300	-	-	-	10.203	8.328	0.025	1.261	-	418.606	2.429	
100		<i>Labo baia</i>	Bata	-	-	5.275	-	-	-	-	-	-	-	-	-	0.305	0.059	-	-	-	7.544	0.044	
101		<i>Labo boga</i>	Bhangan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.177	0.024	
102		<i>Labo calbasu</i>	Kalbasu	-	-	0.261	-	-	-	-	-	-	-	-	-	-	-	-	-	-	109.953	0.638	
107		<i>Labo robita</i>	Rui	-	-	8.669	-	-	-	-	-	-	-	-	-	2.985	2.094	-	-	-	107.697	0.625	
188		<i>Salmostoma boctia</i>	Katari	-	-	0.012	-	-	0.012	-	-	-	-	0.230	-	-	-	-	-	-	2.054	0.012	
189		<i>Salmostoma phulo</i>	Fulchela	-	0.486	0.279	0.649	0.005	0.001	0.751	0.172	0.184	1.608	1.955	0.990	0.989	0.286	0.120	-	99.524	0.577		
86		<i>Gudusia chapra</i>	Charla	-	0.046	-	-	-	-	-	0.608	0.618	2.139	9.937	5.048	0.198	0.021	-	-	222.548	1.291		
76		<i>Eutropichthys vacha</i>	Bacha	-	-	-	-	-	-	-	-	-	-	-	-	0.709	-	-	-	5.980	0.035		
169		<i>Pseudotropheus atherinoides</i>	Bama	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.132	0.007		
209		<i>Wallago attu</i>	Baal	-	-	-	3.980	-	-	-	-	4.594	1.499	-	-	-	0.544	-	-	61.540	0.357		
	Subtotal			57.838	2.131	2.257	1.505	8.422	0.014	0.751	2.216	6.878	11.435	17.294	34.543	20.979	1.288	1.632	1.569	-	1613.596	9.363	
6	Floodplain Resident	<i>Anabas testudineus</i>	Koi	-	0.129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
136		<i>Mystus tengra</i>	Bejari tengra	-	0.183	-	-	0.528	-	-	0.047	0.447	0.068	-	-	-	-	0.952	1.073	1.944	90.365	0.524	
137		<i>Mystus vittatus</i>	Tengra	-	0.025	9.299	1.870	54.796	3.513	6.906	1.724	8.896	4.947	0.013	0.318	0.312	9.853	8.201	25.328	18.553	1156.585	6.711	
55		<i>Colisa fasciatus</i>	Khaisha	-	0.659	-	-	0.038	0.242	0.185	0.198	0.400	0.900	-	0.044	0.710	0.295	0.059	0.513	-	51.713	0.300	
211		<i>Colisa latiosa</i>	Khaisha	-	-	-	-	-	0.121	-	0.166	0.785	0.907	-	-	-	-	-	-	-	17.169	0.100	
57		<i>Colisa soma</i>	Khaisha	-	0.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.089	0.006	
210		<i>Xenentodon canalis</i>	Kalka	-	1.649	11.009	1.818	-	-	0.268	0.697	3.472	5.386	1.888	6.757	18.865	18.393	1.281	4.877	5.275	1804.022	10.468	
187		<i>Osteobrama cotio cotio</i>	Ked	-	0.008	-	-	-	0.535	1.439	-	-	-	-	-	-	-	-	-	-	-	-	-
175		<i>Puntius conchionus</i>	Canchan puti	-	1.023	-	6.740	0.472	0.876	13.366	27.159	8.058	1.432	0.521	8.879	5.661	4.050	9.287	1.835	8.411	1060.691	6.155	
176		<i>Puntius gefus</i>	Gifputi	-	-	-	-	-	-	-	0.252	0.895	-	-	0.206	-	-	-	-	-	15.234	0.088	
178		<i>Puntius phutuzio</i>	Phutani puti	-	-	-	-	-	-	0.106	0.438	0.141	0.741	0.129	0.226	0.005	0.166	0.718	0.033	0.079	36.985	0.215	
180		<i>Puntius sophore</i>	Puti	-	1.197	32.227	39.629	7.305	2.374	12.875	8.922	24.720	42.050	6.367	6.772	8.305	24.025	28.127	15.403	8.359	3035.413	17.613	
212		<i>Puntius acro</i>	Titi puti	-	0.635	-	-	0.001	0.083	-	-	-	-	-	0.125	-	-	-	-	-	7.750	0.045	
5		<i>Amblythyraxodon mola</i>	Mola	-	0.016	0.033	0.316	-	-	-	-	0.047	0.217	-	0.469	-	-	-	-	-	12.048	0.070	
69		<i>Brachydanio rerio</i>	Anju	-	-	-	-	-	-	-	-	-	-	0.076	-	-	-	-	-	-	2.673	0.016	
Note: – denotes zero catch																							
11.5																							
(Cont.)																							

Note: - denotes zero catch



Appendix 2 Table C: Monthly catch composition (% by weight): inside FCDI (site NW07 Kageswari River)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992					Year: 1993					Year: 1994		Total annual catch (Mar '93 – Feb '94)								
				Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%		
75		<i>Ecomus danicus</i>		Bengali	0.068	1.305	0.036					0.207	3.122	1.646	1.345	0.056	0.188	1.824	0.086	0.798	0.653	109.070	0.633	
83		<i>Glossogobius giuris</i>			0.820	3.614	13.904	6.397	4.955	7.064	10.561	15.091	5.746	3.763	12.346	2.937	6.470	3.282	4.567	7.000	9.344	957.770	5.557	
91		<i>Hypophthalmichthys molitrix</i>																				30.806	0.179	
110		<i>Lepidocephalus guntea</i>			0.036	0.796	1.959	6.235	6.161	10.534	2.401	0.585	0.610	1.906	0.008	0.502		2.740	0.485	5.956	1.264	367.746	2.134	
9		<i>Aplocheilichthys punctatus</i>			0.013						1.864	0.538	0.492	0.152	0.003		0.501	0.148	0.194	0.066		42.561	0.247	
39		<i>Channa marulius</i>			2.092	0.568													2.108			26.640	0.155	
40		<i>Channa orientalis</i>				0.170																10.056	0.058	
41		<i>Channa punctatus</i>			1.250	7.536	5.477	1.645	6.239	3.999	3.897	11.267	10.501	1.533	4.711	4.837	3.534	10.895	6.930	9.301	4.663	1264.038	7.334	
42		<i>Channa striata</i>			1.046													0.074	0.744			11.018	0.064	
49		<i>Clarias batrachus</i>			2.732	0.031														1.231			14.414	0.084
88		<i>Heteropneustes fossilis</i>			0.492	1.179	1.461	0.107	0.037	0.816			0.569	0.289		0.159		1.373	3.949	1.370	0.530	157.074	0.911	
121		<i>Macrognathus aculeatus</i>			0.191	0.663	2.681	3.100	0.969	23.815	2.799	0.860	2.137	0.794	2.083	0.878		1.029	3.996	0.974		415.827	2.413	
123		<i>Macrognathus punctatus</i>			0.365	1.603	18.540	19.107	7.201	32.922	26.378	7.706	4.232	1.477	0.691	0.526	0.776	2.936	13.614	4.587	22.624	1020.553	5.922	
122		<i>Mystus embelus armatus</i>			5.225	8.162	4.327	0.428	1.520	1.790	3.607	0.099		0.208	0.917	1.556	6.886	3.251	8.762	0.900	1.936	543.400	3.153	
15		<i>Budis badis</i>				0.012			0.027	0.270	0.060	0.207	0.361		0.014	0.125	1.838	0.444	0.057	0.623	0.052	80.467	0.467	
124		<i>Monopterus albus</i>																				2.449	0.014	
147		<i>Ompok bimaculatus</i>												0.022				0.533				30.809	0.179	
148		<i>Ompok pabda</i>				1.391																		
203		<i>Tetraodon lineatus</i>			0.899	0.430								0.042	0.950	2.273	3.196	0.346	0.970			163.821	0.951	
35		<i>Chanda baillii</i>			0.449	0.843	0.244			0.030	0.265		0.035	0.150	0.461	1.010	1.526	0.701		0.033		102.787	0.596	
36		<i>Chanda nama</i>			0.647	4.536	0.763	3.413	0.007	0.061	1.252	0.874	4.538	6.242	3.842	4.043	4.344	1.194	0.116	1.270	0.189	403.902	2.344	
37		<i>Chanda ranga</i>			0.957	0.869	0.323	0.590		0.126	0.664	0.286	1.383	2.303	0.975	3.189	2.595	1.093	1.184	1.361	5.035	273.277	1.586	
214		<i>Oryzias melastigma</i>												0.098								0.738	0.004	
Subtotal					21.151	92.715	93.632	91.085	90.277	89.172	88.934	80.235	81.875	77.350	39.242	46.016	67.347	87.941	95.837	86.224	86.887	13320.960	77.293	
937	Others	Unidentified fish																						
931		Prawn spp.		Chingri/Taha	0.045	2.863	4.110	7.410	1.301	10.814	10.314	17.398	10.786	6.389	27.122	6.867	5.766	10.221	2.531	12.141	13.113	1689.208	9.801	
Subtotal					0.045	2.863	4.110	7.410	1.301	10.814	10.314	17.398	10.786	6.389	27.122	6.867	5.766	10.720	2.531	12.141	13.113	1717.939	9.968	
Grand total					100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	17234.278	100

Note: - denotes zero catch



Appendix 2 Table D Monthly catch composition (% by weight): inside FCDI (site NW11 Chiknai River)

Species Code	Habitat Preference	Species name	Year:1992												Year:1993												Year:1994		Total annual catch (Mar'93 - Feb'94)	
			Scientific	Bengali	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
12	Riverine	<i>Aspidoparia jaya</i>																				3,343	0.021							
59		<i>Crossocheilus latius</i>			0.010		0.003															3,217	0.021							
139		<i>Nemacheilus botia</i>								0.353	0.599	0.118	0.117	0.166	0.029	0.378						6,402	0.041							
198		<i>Somileptes gongota</i>								0.350				2.279								20,714	0.133							
28		<i>Botia darbo</i>					0.037															34,280	0.220							
29		<i>Botia khachara</i>																				0.652	0.004							
89		<i>Hilsa ilisha</i>				8.944									0.113							105,179	0.674							
58		<i>Corien soborna</i>				0.317	0.113						0.196	1.217	0.908	2.501	1.233	0.127	0.097	0.261		69,825	0.448							
193		<i>Setipinn phasa</i>					0.042															1,159	0.007							
14		<i>Awaous stamineus</i>									0.329				0.006															
30		<i>Brachygo bius natus</i>										0.081			0.002	0.055	0.037					2,369	0.015							
185		<i>Rhinomugil corsula</i>									0.033				0.033				0.187			10,594	0.068							
923		<i>Sinemugil cascasia</i>									0.651	0.004			0.004	1.290						31,235	0.200							
163		<i>Pisodonophis боро</i>							0.059																					
2		<i>Alia coila</i>											5.322	6.062	1.851	7.518						257,855	1.653							
51		<i>Clupisoma garua</i>										0.589	0.264	4.364	0.869							50,259	0.322							
196		<i>Silonia sibundia</i>											0.449	0.051								3,640	0.023							
81		<i>Gagata yousseoufi</i>										0.589	1.564		0.326							19,047	0.122							
84		<i>Glyptothorax tekhitia</i>			2.981							0.044	0.176	0.123		0.008						4,280	0.027							
93		<i>Ichthyocampus carce</i>										0.173										0,939	0.006							
171		<i>Psibryhynchus balitora</i>													0.270							1,559	0.010							
	Subtotal				12.251		0.574	0.152	0.762	0.929	0.118	1.419	0.313	12.371	10.704	19.507	12.492	1.070	0.558	0.490		626,548	4.017							
130	Migratory	<i>Aorichthys aor</i>						2.126	2.633	1.416	1.990			0.501	0.340		1.579					50,813	0.326							
135		<i>Aorichthys seenghala</i>								0.628			0.594				2.096					45,871	0.294							
131		<i>Mystus bleekeri</i>					2.474	14.296	31.189	17.207	46.977	37.747	4.293	1.103	3.576	0.574	0.640	1.916	0.614	3.561	4.860	714,457	4.581							
132		<i>Mystus cavasius</i>			0.027	1.498	5.123	1.765	1.765	5.930	2.797	4.370	0.315	0.971	1.110	2.699	2.508	0.701	1.867	0.763	0.674	258,676	1.659							
32		<i>Catla catla</i>															1.350	6.557				140,654	0.902							
47		<i>Cirrhinus mrigala</i>															6.444	1.437				172,710	1.107							
48		<i>Cirrhinus reba</i>					0.464	0.855		0.563		1.056			0.285	0.560	5.298	13.088		1.120										
102		<i>Labeo calbasu</i>			2.442	0.335				0.217		0.649				0.176	0.099	4.862	0.910			358,284	2.297							
107		<i>Labeo rohita</i>			8.137											2.413	2.954	0.587	0.532			90,408	0.580							
44		<i>Chela labuwa</i>				0.059																113,759	0.729							
188		<i>Salmostoma bocaila</i>				0.068	0.040			0.016	0.035	0.023			0.503		5.439		0.010			115,656	0.742							
189		<i>Salmostoma phulo</i>			2.240	6.475	10.363	0.093		2.008		2.857	1.968	2.009	1.282	0.611	3.708	6.241	1.588	26.087	0.277	711,574	4.562							
154		<i>Securikula goza</i>														0.154						3,147	0.020							
86		<i>Gudusia chapra</i>					0.096	1.401		1.695		1.986	0.322	0.043	1.372	0.004	1.576		1.653			146,614	0.940							
76		<i>Eutropiichthys vacha</i>												0.404	0.016	0.314	0.512		0.142			18,122	0.116							
169		<i>Pseudotropheus atherinoides</i>				0.458	0.210					0.223	0.134	0.006	0.302		0.036		0.401			27,120	0.174							
209		<i>Wallaguta attu</i>			11.292	0.718	37.452	10.969		3.405										2.936	4.029	76,750	0.492							
144		<i>Notopterus chitala</i>					0.052																							
216		<i>Nemacheilus zonaltemanus</i>														0.113						0,652	0.004							
	Subtotal				24.138	12.696	71.865	46.650		33.084	51.799	48.911	7.627	5.037	8.785	7.463	34.394	35.388	6.665	35.518	9.839	3,627	3045,267	19,526						
136	Foodplain	<i>Mystus tengra</i>			0.768	0.895	0.692	0.106				0.649		0.228		0.307		0.398	2.202				134,119	0.860						
137	Resident	<i>Mystus vittatus</i>			2.656	4.635	1.640	3.013		3.612	7.476	2.650	0.488		1.826			0.774	5.056				495,045	3.174						
55		<i>Colisa fasciatus</i>			0.526	0.060	0.003					1.449		1.247	0.037	0.008		1.351	1.007	0.034	1.510	2,368	121,414	0.778						
211		<i>Colisa labiosa</i>			6.492									2.378								21,609	0.139							
									</																					

Note: - denotes zero catch









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### III.10

### III.10









Appendix 2 Table G Monthly catch composition (% by weight): outside FCDI (site NC21 Gazikhal River)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992					Year: 1993					Year: 1994			Total annual catch (Mar'93 - Feb'94)											
				Aug	Sep	Oct	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%					
13	Riverine	<i>Aspidogaster morar</i>	Bengali																					4.940	0.109			
18		<i>Basilus bama</i>	Phai																						6.163	0.137		
59		<i>Crossocheilus latius</i>	Bani koksa																						10.417	0.231		
139		<i>Nemacheilus botia</i>	Kalabara		1.743	1.053																				3.042	0.067	
28		<i>Botia dario</i>	Balichana		0.165	0.479																				1.987	0.044	
58		<i>Carissa subvina</i>	Rani																							6.592	0.146	
14		<i>Awaxia stamineus</i>	Kichki																							20.020	0.444	
185		<i>Rhinomugil corsulin</i>	Itale																							4.128	0.091	
163		<i>Phoxodonophis boro</i>	Khorula																							0.744	0.016	
2		<i>Alia colia</i>	Khuru																							55.881	1.238	
51		<i>Clupisoma garua</i>	Kijuli	5.942	1.819	1.386																				68.072	1.509	
196		<i>Silonia silondia</i>	Ghaura	8.990	2.808	0.345																				78.261	1.734	
16		<i>Bagarius bagarius</i>	Shillong	0.984	0.277																					25.620	0.568	
77		<i>Gugunia cenia</i>	Baghair	0.749		7.460																				8.314	0.184	
80		<i>Gugunia viridescens</i>	Kuawa	0.886	0.249																					0.196	0.004	
81		<i>Gugunia yassouffi</i>	Gang tengra	4.775	1.737	0.296																				25.910	0.574	
	Subtotal		Gang tengra	22.325	8.797	11.019																				320.287	7.098	
130	Migratory	<i>Aorichthys aor</i>	Ayre																							27.591	0.611	
135		<i>Aorichthys seenghala</i>	Guiza																							0.150	0.003	
25		<i>Batasio tengra</i>	Tengra																							1.217	0.027	
131		<i>Mystus bleekeri</i>	Golsa tengra																							180.233	3.994	
132		<i>Mystus cavasius</i>	Kabashi																							2.196	0.483	
32		<i>Catla catla</i>	Chila	1.135	1.024	5.953																				15.361	0.340	
47		<i>Cirrhinus mrigala</i>	Mrigel																							0.061	0.015	
48		<i>Cirrhinus reba</i>	Raik																							69.512	1.540	
100		<i>Labo bat</i>	Bata		0.161	1.557																				21.438	0.475	
101		<i>Labo boga</i>	Bhanga		0.823																							
102		<i>Labo albus</i>	Kalbas	0.907																						46.784	1.037	
107		<i>Labo rohita</i>	Rui		4.154	12.060																				142.704	3.163	
188		<i>Salmostoma bacaila</i>	Kanari		4.666	0.202																						
189		<i>Salmostoma phulo</i>	Fulchala	2.345	0.277	0.075																				60.269	1.336	
86		<i>Gudusia chapra</i>	Chapra		0.026																					0.628	0.014	
169		<i>Pseudotyroneus atherinoides</i>	Bains		2.361	0.124																				0.351	0.008	
209		<i>Wallagutta attu</i>	Baal		34.310																					174.596	3.869	
144		<i>Notopierus chinla</i>	Chinal																							7.340	0.163	
	Subtotal			4.387	47.802	19.972	1.371	80.674	1.951	0.865	0.408	3.751	5.017	4.365	5.383	5.466	22.307	6.469	17.228	27.862	37.062	0.006	0.001		816.991	18.106		
6	Floodplain	<i>Anabas testudineus</i>	Koi																							0.006	0.001	
136	Resident	<i>Mystus tengra</i>	Bajjori tengra																							0.240	0.035	
137		<i>Mystus vittatus</i>	Tengra	6.439	2.219	15.590																				326.458	7.235	
55		<i>Colisa fasciatus</i>	Khalisha																							1.905	0.408	
211		<i>Colisa labiosa</i>	Khalisha																							1.885	0.408	
56		<i>Colisa lila</i>	Lal khulisha																							0.187	0.042	
210		<i>Xenentodon canzlin</i>	Kaikka	0.227	2.275	6.605																				3.991	0.088	
62		<i>Cyprinus carpio</i>	Karf																							0.109	0.021	
187		<i>Osteobrama cotio cotio</i>	Kedi																							89.030	1.973	
175		<i>Puntius conchonius</i>	Nanchan puti																							212.687	4.713	
176		<i>Puntius gedius</i>	Gillputi																							9.065	0.201	
178		<i>Puntius phutunio</i>	Phumai puti																							2.940	0.061	
180		<i>Puntius sophore</i>	Puti	1.815	2.191	5.229																				433.212	9.601	
181		<i>Puntius terio</i>	Teri puti	0.098	0.028	1.513																				0.174	0.038	
212		<i>Puntius ticto</i>	Titi puti																							5.577	0.115	
																										0.487	0.011	
																										12.941	0.287	

Notes: 1. No fishing activities were observed in November 1992

2. - denotes zero catch

Appendix 2 Table G Monthly catch composition (% by weight): outside FCDI (site NC21 Gazikhali River)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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Note: 1. No fishing activities were observed in November 1992.

2. - denotes zero catch



Appendix 2 Table II Monthly catch composition (% by weight):outside FCDI (site NC25 Kaliganga River)

Appendix 2 Table II Monthly catch composition (% by weight) outside PC-DI (site RC-23 Kanganga Krel)																									
Species Code	Habitat Preference	Scientific	Species name	Year: 1992					Year: 1993					Year: 1994		Total annual catch (Mar'93 - Feb'94)									
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
186	Riverine	<i>Rita rita</i>	Bengali	0.531	0.539	0.106	0.814	0.011	19.429	11.194	9.903	2.006	3.464	1.351	0.071	0.086	0.820	0.049	0.469	0.263	—	3.033	42.561	0.154	
13		<i>Aspidoparia morar</i>	Pali	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	630.145	2.282	
218		<i>Barilius evezandi</i>	Kalabata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.012	0.011	
59		<i>Crossocheilus latius</i>	Bulchita	0.394	0.023	0.992	1.602	0.042	0.137	0.023	0.107	0.726	1.856	0.123	0.063	0.078	0.004	0.054	0.107	0.129	1.428	0.113	25.539	0.092	
139		<i>Nemachellius botia</i>	Gharphola	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24.718	0.090	
198		<i>Somileptes gaogosa</i>	Rani	0.835	0.017	—	0.155	0.658	0.101	0.047	—	—	—	—	0.055	0.057	0.074	0.016	0.070	0.106	0.362	0.735	7.335	0.027	
28		<i>Botia dario</i>	Goni chapila	—	—	—	—	—	—	—	—	—	—	—	0.055	—	—	—	—	—	—	—	3.850	0.014	
85		<i>Goniilosa manmina</i>	Kuchki	—	—	—	—	—	—	—	—	—	—	—	0.258	0.044	2.741	0.463	—	0.068	—	—	15.153	0.055	
58		<i>Corisa soborna</i>	Phasa	—	—	0.019	—	0.597	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.847	0.010	
193		<i>Setipinna phasa</i>	Dali chawa	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	114.492	0.415	
159		<i>Parapocryptes batoides</i>	Belo	—	—	—	—	—	—	0.064	—	—	13.233	1.446	2.803	2.315	0.094	0.042	0.003	—	—	0.684	0.200	0.001	
14		<i>Awaous stamineus</i>	Khorsula	0.038	0.121	0.052	—	1.311	5.856	0.734	—	—	—	0.049	0.009	0.016	0.016	0.505	0.118	0.007	0.688	0.192	92.752	0.336	
185		<i>Rhinomugil corsula</i>	Bota	—	—	0.002	—	—	—	—	—	—	—	—	—	—	—	—	0.002	—	—	—	61.158	0.221	
923		<i>Siganus gl caucasia</i>	Gangmagur	—	—	—	—	—	—	—	—	—	—	—	0.437	—	—	—	—	—	—	—	0.226	0.001	
165		<i>Plotosus canius</i>	Kajuli	0.347	0.166	0.144	1.662	0.315	0.244	0.027	—	—	—	0.407	12.212	0.870	1.180	0.811	1.099	2.477	0.024	—	3.860	0.014	
2		<i>Allia colla</i>	Kajuli	—	—	0.023	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	372.489	1.349	
3		<i>Allia punctata</i>	Ghaura	0.577	0.779	2.025	10.023	2.179	0.069	0.080	0.080	0.012	4.738	0.012	4.738	6.387	5.163	0.219	1.217	1.785	0.029	1.095	454.677	1.647	
51		<i>Clupeosoma garua</i>	Shillong	—	0.126	—	0.329	—	0.150	0.251	0.251	0.323	0.502	0.018	0.018	0.281	1.028	0.310	—	0.307	—	—	9.708	0.035	
196		<i>Silonia silondia</i>	Baghar	—	—	—	—	—	0.039	0.007	—	—	—	—	—	—	—	0.067	0.011	0.005	0.077	6.232	99.681	0.361	
16		<i>Bagarius bagarius</i>	Gangta cenin	—	—	—	0.154	0.024	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12.335	0.045	
77	<i>Gangta videsensis</i>	Gangta tengra	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.439	0.002		
80	<i>Gangta yousouffi</i>	Gang tengra	0.087	0.005	0.036	2.878	3.341	0.235	0.034	0.034	0.038	—	—	1.602	0.050	0.323	0.143	0.135	0.598	0.479	0.758	88.848	0.322		
81	<i>Sisor thalophilus</i>	Sisor	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.672	0.017		
197	<i>Poma pama</i>	Poa	—	—	—	0.003	0.725	—	—	—	—	—	—	—	—	0.166	—	—	—	—	—	4.722	0.017		
155	<i>Palonchus balitora</i>	Balitora	—	—	—	0.001	—	—	—	0.110	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
171	<i>Cynoglossus cynoglossus</i>	Khongi	2.808	2.362	3.990	18.242	16.764	26.931	12.606	10.667	28.146	5.937	23.933	10.051	8.347	5.379	8.486	6.845	1.344	—	—	2075.419	7.516		
953	Subtotal			0.257	—	0.487	0.602	13.455	8.256	—	—	—	0.019	0.037	0.053	0.019	0.910	0.467	4.823	6.711	13.236	5.380	719.779	2.607	
130	Migratory	<i>Aorichthys nor</i>	Ayre	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.530	0.952	
135		<i>Aorichthys semghula</i>	Guizna	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	69.264	0.251	
25		<i>Baiao tengra</i>	Tengra	—	—	—	—	—	0.064	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
131		<i>Mystus Heckeri</i>	Golsa tengra	—	—	—	1.096	3.914	2.079	—	—	—	—	0.232	0.008	—	—	0.172	0.523	0.704	12.274	5.135	5.515	505.682	1.831
132		<i>Mystus cavasius</i>	Kabashi	—	2.208	46.802	6.055	11.687	8.652	0.478	0.541	10.124	0.445	0.201	—	—	0.018	1.483	0.654	0.594	0.269	0.233	3.271	207.768	0.752
949		<i>Mystus sp</i>		—	—	—	0.016	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
32		<i>Cydia caida</i>	Caida	—	1.372	—	0.163	—	—	—	—	—	—	—	0.477	13.594	18.445	—	0.013	—	—	—	887.794	3.215	
47		<i>Cirrhinus mirgula</i>	Mirgel	6.955	1.924	0.445	0.218	5.942	1.535	0.571	—	—	—	—	0.528	37.959	10.448	0.045	0.034	—	—	—	1372.953	4.972	
48		<i>Cirrhinus rebi</i>	Raik	—	9.345	0.135	0.135	—	—	—	—	—	—	—	0.976	7.187	1.426	7.360	11.865	0.132	0.134	1.742	1344.740	4.870	
100		<i>Labo bat</i>	Bat	—	1.098	1.357	0.026	—	—	—	—	—	—	—	—	—	—	0.712	0.361	0.134	—	—	84.277	0.305	
101		<i>Labo boga</i>	Bhagan	3.176	0.884	0.198	0.493	—	—	—	—	—	—	—	1.409	—	—	—	0.038	—	—	—	13.591	0.049	
102		<i>Labo calbasu</i>	Kalbasu	1.409	15.428	—	0.369	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
107		<i>Labo robita</i>	Rui	—	0.135	0.135	0.458	0.230	0.161	—	—	—	—	0.067	0.018	0.158	14.203	13.694	0.260	2.426	2.564	2.948	0.792	1054.005	3.817
188		<i>Salmostoma bacula</i>	Kamri	13.835	0.011	0.020	0.467	0.060	1.029	0.245	5.063	1.222	0.412	2.350	4.611	1.756	0.105	0.475	0.977	1.036	0.180	0.034	1.285	238.523	0.864
189		<i>Salmostoma phulo</i>	Fulchda	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9.373	0.034
154		<i>Securilla gora</i>	Chora chela	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.022	—	—	—	1.867	0.007	
86		<i>Gudusia chura</i>	Chapila	18.082	0.010	0.572	0.753	0.301	0.497	0.087	0.090	0.618	0.101	0.101	0.636	1.603	0.732	—	1.234	0.203	0.506	0.177	2.573	194.518	0.704
76		<i>Euroleptichthys vadua</i>	Bacha	0.138	4.313	0.191	0.309	1.960	—	—	—	—	—	—	—	—	—	0.475	0.024	0.150	—	0.060	0.060	25.015	0.091
169		<i>Pseudotropheus atherinoides</i>	Bama	0.121	0.055	0.686	3.728	3.330	—	—	0.009	—	—	0.299	—	—	—	0.039	0.003	0.217	0.228	1.843	0.187	43.110	0.156
209		<i>Wallaga attu</i>	Bod	4.179	4.507	1.151	4.294	—	—	—	—	—	—	—	—	—	—	0.431	3.477	7.040	4.857	12.443	2.986	1032.789	3.740
144	<i>Notopterus chinla</i>	Chiml	48.286	41.289	52.241	19.046	40.879	22.273	6.443	1.861	11.154	3.513	6.479	13.355	69.716	54.196	23.325	17.878	48.222	43.474	23.174	8642.933	31.302		
	Subtotal			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.251	0.001	



Appendix 2 Table H Monthly catch composition (% by weight):outside PCDI (site NC25 Kaliganga River)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
136	6 Floodplain Resident	Anabas testudineus	Bengali Koi	0.125	-	0.086	0.035	-	-	-	-	-	-	-	-	-	-	-	-	-	0.349	0.145									
137		Mystus tengra	Bajari tengra	0.068	-	1.503	4.986	0.271	-	-	-	-	-	-	-	-	-	-	-	-	0.689	0.291									
55		Mystus vittatus	Tengra	0.010	-	0.117	0.622	0.288	-	-	-	-	-	-	-	-	-	-	-	-	2.904	2.904									
211		Colisa fasciatus	Khalisha	0.010	0.042	0.042	0.288	-	0.027	-	-	-	0.355	0.003	0.003	-	-	-	-	-	2.904	2.904									
56		Colisa labialis	Khalisha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.308	0.308									
210		Colisa lalia	Lal khalisha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.308	0.308									
62		Xenotodon canalla	Kaikka	2.807	7.313	0.731	0.639	0.343	0.672	0.367	1.264	30.292	0.071	0.167	0.012	0.012	0.012	0.012	0.012	0.012	0.009	0.169									
175		Cyprinus carpio	Karfu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.405	2.405									
176		Puntius conchionius	Canchan puti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.821	0.821									
178		Puntius gelius	Giliputi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.405	2.405									
179		Puntius phutunio	Phutani puti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.821	0.821									
180		Puntius sarana	Sarpu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.821	0.821									
181		Puntius sophore	Pu	1.373	1.656	0.466	3.645	1.301	0.672	0.367	1.264	21.846	0.071	0.272	0.012	0.012	0.012	0.012	0.012	0.012	2.405	2.405									
212		Puntius terio	Teri puti	0.367	3.630	0.871	3.579	1.727	20.968	13.274	21.846	30.292	20.697	4.472	3.455	0.009	0.009	0.009	0.009	0.009	3.592	3.592									
5		Puntius ticto	Titi puti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.221	2.221									
68		Amblythrinops mola	Mola	0.010	0.004	0.004	0.004	0.014	-	-	-	-	-	-	-	-	-	-	-	-	4.111	4.111									
75		Danio devario	Chebli	0.020	0.007	2.204	0.529	0.238	-	-	-	-	-	-	-	-	-	-	-	-	3.981	3.981									
182		Esomus danicus	Darkina	0.192	0.067	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
83		Rasbora daniconius	Darkina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
91		Glossogobius giuris	Bulla	16.443	4.618	0.624	0.507	9.764	16.197	53.827	60.980	21.782	7.189	7.902	19.310	9.848	3.827	10.725	3.150	0.733	6.710	11.048									
109		Hypophthalmichthys molitrix	Silver carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
110		Lepidocyphalus bormorei	Pulya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
39		Lepidocyphalus guntia	Gutum	0.166	0.563	0.840	0.297	0.729	0.234	0.255	-	-	0.164	0.071	0.102	0.038	0.032	0.476	1.923	0.401	2.258	2.081									
41		Aplocheilichthys panchax	Kanpuna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
42		Channa marulius	Gajar	6.091	9.370	0.278	0.003	0.003	-	-	-	-	0.058	0.028	0.078	0.757	0.234	0.036	0.114	0.350	8.860	7.100									
88		Channa striata	Taki	-	0.135	1.054	1.927	0.527	0.128	0.255	0.347	0.043	0.787	4.028	13.387	0.016	0.016	0.176	1.409	1.105	3.590	5.453									
121		Heteropneustes fossilis	Shol	-	-	0.042	0.042	-	-	-	-	-	-	-	0.016	0.036	0.036	0.032	0.672	2.063	2.042	2.101									
123		Macrognathus aculeatus	Shingi	0.443	0.349	0.122	0.083	-	-	-	-	-	-	-	-	0.036	0.036	0.032	0.672	0.052	48.035	0.174									
122		Macrognathus punctatus	Tara baum	9.505	0.163	0.050	1.183	0.135	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
15		Mastomys armatus	Guchi	4.938	22.288	3.635	3.724	0.112	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
147		Basil basil	Baral baum	0.125	-	0.542	0.200	0.112	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
148		Ompok bimaculatus	Napit kai	0.125	-	0.542	0.200	0.112	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
145		Ompok pabda	Kani puti	3.134	0.705	1.105	0.002	0.002	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
203		Notoporus notoporus	Madhu pabda	0.470	0.048	0.002	0.002	0.002	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
33		Tetraodon lineatus	Foli	-	-	0.002	0.298	0.014	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
35		Chanda baalis	Poda	-	-	-	0.086	0.995	0.128	0.255	0.347	0.043	4.093	0.248	0.262	0.044	0.044	0.176	1.409	1.105	3.590	5.453									
36		Chanda nama	Choka	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.300	0.300									
37		Chanda ranga	Chanda	0.642	0.017	0.046	0.039	-	0.112	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
214		Chanda nama	Nana chanda	0.458	0.026	0.150	0.204	-	0.112	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		Oryzias latipes	Lal chanda	-	-	-	-	-	-	-	-	-	-																		



Appendix 2 Table 1 Monthly catch composition (% by weight):outside FCDI (site NC29 Ichamati River)

Appendix 2 Table 1 Monthly catch composition (% by weight):Goutse RCDI (line NC-29 Ichamati River)																											
Species Code	Habitat Preference	Scientific	Species name	Year: 1992					Year: 1993					Year: 1994					Total annual catch (Mar'93 - Feb'94)								
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct			Nov	Dec	Jan	Feb	Kg	%	
186	Riverine	<i>Rita titia</i>	Bengali				0.051						0.021	0.103	0.133									0.531	0.002		
13		<i>Aspidoptera morar</i>	Pali										0.791	0.176	0.010									8.014	0.031		
218		<i>Burilus evezardi</i>												0.321	1.032									3.119	0.012		
59		<i>Crossocheilus latius</i>	Kalabata				1.413																	48.461	0.190		
139		<i>Nemachellus boia</i>	Balichata			1.127	0.291	0.029	0.234																151.017	0.591	
198		<i>Somileptes gangetan</i>	Charpata			0.047																			2.594	0.010	
28		<i>Bola dario</i>	Rail			0.121	0.195	0.015																	94.359	0.369	
85		<i>Goniistius maninina</i>	Goat chapila			0.232								0.266	0.541	0.912									18.828	0.074	
58		<i>Corica soborna</i>	Kachhi			0.417	0.374							0.033	0.120										244.551	0.957	
193		<i>Seitipinna phasa</i>	Phasa			0.063								1.591	3.311	1.971									2.029	0.008	
170		<i>Pseudopocryptes lanceolatus</i>	Chewa											23.082											3.346	0.013	
14		<i>Awania stamineus</i>	Belo																						2.029	0.008	
128		<i>Liza pusa</i>	Bata			0.232								0.030	0.124										3.346	0.013	
185		<i>Rhinomugil exocela</i>	Khoraila			0.111								0.215	0.103										4.971	0.019	
923	<i>Siamugil caesus</i>	Bata			0.063									0.103										1.722	0.007		
2		<i>Allia colla</i>	Kajuli			0.094							2.954	1.798	0.239									109.750	0.430		
51		<i>Clupisoma garua</i>	Chaura			2.138	1.082						7.162	7.873	2.498	0.194								365.867	1.432		
196		<i>Silonia silondia</i>	Shillong			0.445	0.274																	221.058	0.865		
16		<i>Bagritus bagritus</i>	Baghair																					92.172	0.361		
81		<i>Gangta youssoufi</i>	Gangtenga			0.388	0.188	0.076					0.865	1.831	0.083	0.011											
87		<i>Hura hura</i>	Kumikani					0.183																			
93		<i>Ichthyomimus carce</i>	Kumirer khil					0.062																			
155		<i>Pama pama</i>	Poa			0.007		0.039																			
171	Subtotal	<i>Psilolynchus balitora</i>	Balitora		4.055	6.880	3.430	1.518	0.236				37.570	16.785	6.989	4.002	2.091	0.568		1.408	0.215				1372.389	5.373	
130	Migratory	<i>Aorichthys aor</i>	Ayre		7.441	0.309	0.074	0.644	0.230				1.171	0.239	0.994	0.210	2.091	0.568		0.432	0.351				287.879	1.127	
135		<i>Aorichthys scenogula</i>	Guizza											0.022	0.058	0.268	0.268	0.021							0.955	0.004	
131		<i>Mystus bleekeri</i>	Golsa tenga						2.405				8.601		0.592	1.383	0.180	0.093							846.645	3.314	
132		<i>Mystus cavatus</i>	Kabashi			0.868	1.281	3.698	7.049						0.169				1.565	10.987	9.362	5.452	0.630			109.678	0.429
32		<i>Catla catla</i>	Catla			10.380	15.123								11.999	15.631	14.712	0.348	1.204	0.149	0.149	0.374				874.358	3.423
47		<i>Cirrhinus mrigala</i>	Mrigel			3.433	6.852		0.205	0.105					0.865	10.979	1.924	2.993	0.028	0.330						575.200	2.252
48		<i>Cirrhinus reba</i>	Raik			7.475	13.659	5.497	1.354	2.091			0.413	0.604	10.478	21.849	11.000	0.053	0.022	0.890						1845.869	7.226
100		<i>Labeo bata</i>	Bata			6.122	2.425	1.211							0.863	0.175	0.975									20.803	0.081
101		<i>Labeo boga</i>	Bhangan			0.031	0.497		0.497						0.392	0.134	1.082	1.132	0.586	0.128						135.775	0.532
102		<i>Labeo calbasu</i>	Kalbasu			0.582	0.074	1.130	1.112	0.098									0.112							173.377	0.679
103		<i>Labeo dero</i>	Kursha																							2.700	0.011
104		<i>Labeo gausius</i>	Goat						0.013																		
107		<i>Labeo rohita</i>	Rui			16.483	10.255	0.791	0.149	0.081				10.358	6.818	21.346	1.550	2.024	2.024	3.060	1.048	1.243				1082.933	4.240
188		<i>Salmostoma boanila</i>	Kanari			0.695	0.955	1.947	0.763	0.035					0.483			0.004	0.004							8.941	0.035
189	<i>Salmostoma phulo</i>	Fulchela						0.394	5.245				2.492	2.534	1.603	2.454	0.333	0.440	0.440	0.374					522.722	2.046	
154	<i>Securicula gora</i>	Chorn chela			0.176												0.084								9.145	0.036	
86	<i>Gudusia chapra</i>	Chapila			3.009	0.925	0.384						3.561	0.052	0.190	0.100	0.130	0.130		0.043					69.642	0.273	
76	<i>Eutrochilichthys vachha</i>	Bacha			0.324		0.285						0.345	1.715	0.886	0.133									61.057	0.239	
169	<i>Pseudotropheus atherinoides</i>	Bemai			0.012	0.500	0.012	2.889	0.692								3.526	4.359	2.823	2.085	2.572				615.753	2.411	
209	<i>Wallagiu attu</i>	Bawal			7.422	33.443		3.308	1.635								1.241	4.013							572.724	2.242	
144	Subtotal	<i>Notopterus chinla</i>	Chinl		57.025	86.908	47.433	17.649	19.667				7.990	31.478	57.123	65.126	28.557	24.397	29.198	16.446	14.582					7816.156	30.599
(Cont.)																											







## APPENDIX 3

Appendix 3 Table A Percentage monthly catch by gear type: inside FCDI (site NW08 Santia Khal)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
164	Jhaki jal	37.287	37.067	9.753	5.392	46.384	21.535	60.008	34.203	11.168	4.211	17.284	4.658	1.866	20.791	38.094	71.385	21.427	1402.935	23.659									
95	Doiar trap	-	0.189	21.582	-	-	-	-	1.381	37.015	34.166	24.939	9.987	27.448	16.976	7.770	6.488	4.607	881.263	14.862									
266	Veshal	47.843	15.599	-	-	-	-	-	-	-	36.219	53.956	80.233	51.298	-	-	-	-	799.650	13.485									
45	Ber jal	-	-	-	-	-	-	-	31.287	-	-	-	0.209	-	13.248	-	-	18.976	497.361	8.388									
298	Akra	-	-	1.859	3.959	-	26.510	-	-	-	-	-	-	-	9.435	7.204	7.085	11.017	384.717	6.488									
270	Katha	-	-	-	-	-	33.595	-	28.576	-	-	-	-	-	-	22.595	7.389	-	358.100	6.039									
255	Thella jal	3.069	13.081	8.905	-	-	6.890	-	-	-	-	3.207	3.885	12.663	11.285	-	-	-	339.078	5.718									
307	Hand fishing	-	26.248	51.516	14.626	-	-	-	-	-	-	-	-	-	10.949	10.386	6.304	1.267	338.847	5.714									
30	Sip	6.639	2.579	0.849	-	-	-	-	0.180	25.283	0.263	-	1.028	3.126	13.154	0.685	-	-	310.616	5.238									
88	Current jal (Stationary)	5.163	1.128	5.536	-	-	0.246	0.534	0.673	1.937	-	0.614	-	1.220	0.951	2.958	0.159	32.383	241.882	4.079									
202	Moi jal	-	4.109	-	76.023	-	-	23.041	3.700	1.013	15.964	-	-	-	2.770	6.109	1.191	10.323	231.137	3.898									
89	Dhor jal	-	-	-	-	-	4.182	16.417	-	-	8.781	-	-	2.379	-	4.200	-	-	88.997	1.501									
272	Daun	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.692	0.315									
123	Koi jal	-	-	-	-	-	7.042	-	-	-	-	-	-	-	-	-	-	-	13.206	0.223									
278	Nolbarsi	-	-	-	-	-	-	-	-	23.586	-	-	-	-	-	-	-	-	12.788	0.216									
291	Urani	-	-	-	-	-	-	-	-	-	-	-	-	-	0.444	-	-	-	8.896	0.150									
276	Hat panch	-	-	-	-	53.616	-	-	-	-	0.396	-	-	-	-	-	-	-	1.538	0.026									
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	5929.703	100									

Note: - denotes zero catch

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Appendix 3 Table B Percentage monthly catch by gear type: outside FCDI (site NW16 Potajia Khal)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994			Total annual catch (Mar'93 – Feb'94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		Oct			Nov			Dec			Jan			Mar			April			May			June			July			Aug			Sep			Oct			Nov			Dec			Jan			Feb			Kg			%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							

Notes: 1. No fishing activities were observed in February 1993

2. - denotes zero catch



Appendix 3 Table C Percentage monthly catch by gear type: outside FC DI (site NC22 Chandrakhal Khal)

Gear Code	Gear name	Year : 1992												Year : 1993								Year : 1994		Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	Nov	Feb	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	kg	%						
266	Veshal	84.678	87.098	8.372	73.885	—	—	27.873	100.000	87.794	63.232	29.686	26.870	48.569	96.345	—	—	1171.0	36.344						
271	Suti jal	—	—	35.272	—	—	—	—	—	—	—	0.234	46.878	3.470	—	—	—	714.14	22.165						
164	Jhaki jal	4.163	9.676	53.339	26.115	—	100.000	28.340	—	9.540	1.988	7.815	8.158	19.200	—	2.588	9.790	328.52	10.196						
270	Katha	—	—	—	—	100.000	—	—	—	—	—	—	—	—	—	97.412	90.210	231.35	7.180						
307	Hand fishing	—	—	—	—	—	—	—	—	—	—	—	3.246	16.531	3.655	—	—	171.88	5.335						
68	Uttar jal	—	—	—	—	—	—	—	—	—	—	31.311	2.480	—	—	—	—	148.99	4.624						
255	Thella jal	—	—	—	—	—	—	—	—	—	18.326	9.633	3.921	—	—	—	—	125.31	3.889						
30	Sip	11.159	3.227	1.103	—	—	—	—	—	2.666	3.128	21.322	1.170	0.189	—	—	—	102.77	3.190						
89	Dhor jal	—	—	—	—	—	—	—	—	—	—	—	5.238	1.150	—	—	—	85.345	2.649						
291	Urani	—	—	—	—	—	—	—	—	—	—	—	—	9.298	—	—	—	68.9	2.138						
170	Juti	—	—	—	—	—	—	—	—	—	—	—	1.792	—	—	—	—	26.288	0.816						
45	Ber jal	—	—	1.913	—	—	—	—	—	—	13.325	—	—	—	—	—	—	24.103	0.748						
95	Doiar trap	—	—	—	—	—	—	43.787	—	—	—	—	—	1.594	—	—	—	19.77	0.614						
88	Current jal (Stationary)	—	—	—	—	—	—	—	—	—	—	—	0.246	—	—	—	—	3.615	0.112						
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	3222.021	100						

Notes : 1. No fishing activities were observed in December 1992, January 1993 and March 1993  
2. - denotes zero catch



III.3

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Appendix 3 Table D Percentage monthly catch by gear type: outside FCDI (site NC26 Mailagi Khal)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
266	Veshal	72.248	97.558	36.744	4.636	-	-	-	-	-	-	-	78.840	75.266	63.338	55.567	39.932	28.180	49.559	18.216	-	12074.549	43.818						
270	Katha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
95	Doiar trap	-	-	36.523	44.417	54.964	12.439	-	-	-	-	-	14.479	9.761	21.003	2.519	15.374	15.374	3.656	0.568	-	2688.067	9.755						
164	Jhaki jal	9.209	-	5.569	17.507	28.223	80.306	28.811	23.604	74.132	22.294	17.670	-	0.139	-	0.724	12.944	12.944	2.966	0.568	-	2360.594	8.566						
255	Thella jal	-	0.160	3.559	2.948	6.057	2.700	-	-	-	27.233	-	-	5.181	4.926	15.896	7.944	20.443	2.966	15.203	-	1744.028	6.329						
302	Kua	-	-	-	-	10.756	-	71.189	62.184	-	20.099	5.662	-	-	-	1.796	1.796	1.691	1.324	0.636	-	1704.431	6.185						
263	Ucha	-	0.151	0.823	1.001	-	-	-	-	-	-	-	-	2.192	4.807	11.413	0.995	39.672	29.402	60.127	-	1666.325	6.047						
307	Hand fishing	-	-	-	-	-	-	-	0.780	-	14.791	-	-	-	-	3.227	6.339	4.940	-	-	-	1137.832	4.129						
291	Urani	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.401	4.940	-	-	-	1024.951	3.719						
278	Nol barsi	-	-	-	-	-	-	-	12.770	0.061	-	-	-	3.002	-	-	3.037	-	-	2.357	-	913.981	3.317						
45	Ber jal	17.320	1.893	15.823	26.693	-	-	-	25.806	-	-	-	6.390	-	-	0.743	1.622	-	-	-	-	472.561	1.715						
202	Moi jal	-	-	-	2.636	-	-	-	-	-	-	-	-	-	-	-	0.870	-	-	-	-	322.719	1.171						
296	Tukri	-	-	-	-	-	1.582	-	-	-	-	-	-	-	-	-	0.207	-	-	-	-	291.071	1.056						
88	Current jal (Stationary)	-	0.104	0.318	0.161	-	1.591	-	-	-	-	-	-	-	-	3.197	0.207	-	-	-	-	278.823	1.012						
30	Sip	0.037	0.135	0.642	-	-	-	-	-	-	15.583	-	1.242	0.238	1.219	1.681	0.422	-	-	0.571	-	211.186	0.766						
89	Dhor jal	-	-	-	-	-	-	-	-	-	-	-	-	0.291	0.723	1.737	0.053	-	-	-	-	178.908	0.649						
170	Juti	-	-	-	-	-	-	-	-	-	-	-	17.772	0.678	1.804	1.804	-	0.521	-	-	-	165.197	0.599						
272	Daun	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.207	-	-	-	-	-	134.071	0.487						
298	Akra	-	-	-	-	-	-	-	-	-	-	-	-	0.069	3.882	0.056	-	-	-	-	-	63.544	0.231						
304	Saiber jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.040	1.876	1.195	0.574	-	46.630	0.169						
98	Net/Basket+Dewatening	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.559	-	-	23.808	0.086						
105	Dharma jal	-	-	-	-	-	-	-	0.662	-	-	-	-	-	-	-	-	-	0.430	1.748	-	19.832	0.072						
123	Koi jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.057	-	0.619	-	-	-	16.331	0.059						
314	Boat Katha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.172	-	-	-	-	-	13.772	0.050						
271	Suti jal	1.187	-	-	-	-	1.382	-	-	-	-	0.309	-	-	-	-	0.024	-	-	-	-	2.582	0.009						
97	By hand/Dewatening	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.648	0.002						
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	27556.441	100						

Key: - denotes zero catch

Note: - denotes zero catch

Appendix 3 Table E Percentage monthly catch by gear type: outside FCDI (site NC30 Sakini Khal)

Appendix 3 Table E Percentage monthly catch by gear type: outside FCDI (site NC30 Sakini Khal)																							
Gear Code	Gear name	Year: 1992						Year: 1993						Year: 1994			Total annual catch (Mar'93 – Feb'94)						
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
164	Jhaki jal	-	-	-	10.765	73.785	29.623	39.823	73.643	-	49.153	-	-	-	-	4.310	26.140	97.198	97.092	79.322	1003.592	30.604	
266	Veshal	75.233	97.523	17.542	-	-	-	-	-	-	4.075	-	75.898	68.585	9.270	12.297	-	-	-	-	-	618.031	18.846
263	Ucha	-	-	18.418	9.353	-	-	-	7.443	100.000	-	-	-	2.189	50.992	6.808	-	-	7.627	-	539.865	16.463	
105	Dharma jal	18.804	-	-	-	-	-	-	-	-	-	-	-	22.624	10.124	5.978	-	-	-	-	183.191	5.586	
307	Hand fishing	-	-	-	30.721	-	8.090	-	-	-	-	-	-	-	-	-	16.542	-	2.894	-	151.026	4.605	
30	Sip	-	-	64.040	39.758	-	12.243	2.351	9.121	-	11.202	-	6.083	1.902	2.200	2.487	11.699	1.159	2.908	-	140.264	4.277	
255	Thella jal	-	2.477	-	-	-	-	-	-	-	-	-	-	-	8.571	2.467	2.130	1.500	-	7.096	134.880	4.113	
88	Current jal (Stationary)	5.963	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.567	-	-	-	102.000	3.110	
270	Katha	-	-	-	-	-	-	-	-	-	-	100.000	-	-	-	-	-	-	-	-	75.677	2.308	
271	Suti jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.597	-	-	1.690	-	51.369	1.566	
296	Tukri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.631	-	-	-	-	40.013	1.220	
170	Juti	-	-	-	-	-	-	-	-	-	-	-	20.486	-	-	-	-	-	-	-	34.758	1.060	
45	Ber jal	-	-	-	-	-	-	-	-	-	28.879	-	-	4.700	1.499	0.921	-	-	1.371	-	30.005	0.915	
272	Daun	-	-	-	-	-	-	-	8.544	-	-	-	-	-	-	-	2.586	-	-	-	23.222	0.708	
98	Net/Basket+Dewatening	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.846	0.143	-	-	22.800	0.695	
222	Polo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.840	0.239	
314	Boat Katha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.954	0.151	
278	Nol barsi	-	-	-	-	-	-	-	1.249	-	-	-	0.679	-	0.340	-	-	-	-	-	2.941	0.090	
95	Doiar trap	-	-	-	-	-	-	-	-	-	6.690	-	-	-	-	-	-	-	-	-	2.666	0.081	
298	Akra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
89	Dhor jal	-	-	-	-	-	43.170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
302	Kua	-	-	-	9.403	26.215	6.874	57.826	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
202	Moi jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	3279.314	100	

Note: - denotes zero catch





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## APPENDIX 4



Appendix 4 Table A Monthly catch composition (% by weight): inside FCDI (site NW08 Santia Khal)

Appendix 4 Table A Monthly catch composition (% by weight) : inside FCDI (site NW06 Santia Khar)																								
Species Code	Habitat Preference	Scientific	Species name	Year: 1992					Year: 1993					Year: 1994				Total annual catch (Mar'93 - Feb'94)						
				Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%		
59	Riverine	<i>Crossocheilus latius</i>	Kalabata	0.973	0.317		0.189		0.538														1.009	0.017
139		<i>Nemachellius botia</i>	Balichina																				0.432	0.007
28		<i>Botia dario</i>	Rani						0.376														0.706	0.012
89		<i>Hilsa ilisha</i>	Ilish																				1.000	0.017
90		<i>Hilsa tili</i>	Chandana																				0.159	0.003
8		<i>Anodontostoma chacunda</i>	Koi puri																				0.568	0.010
79		<i>Gangra nagra</i>	Gang tengra																				0.080	0.001
84		<i>Glyptothorax telichira</i>	Telchira																				0.478	0.008
Subtotal				0.973	0.317		0.189		0.914		0.185			0.883	0.142					0.074		4.432	0.075	
131	Migratory	<i>Mystus bleekeri</i>	Golcha tengra			0.038					0.261	9.180	0.770									26.081	0.440	
132		<i>Mystus cavasius</i>	Kabashi								1.746											6.756	0.114	
32		<i>Catla catla</i>	Carla								5.335											61.130	1.031	
47		<i>Cirrhinus mirgala</i>	Mrigel								4.503													
48		<i>Cirrhinus reba</i>	Raik	7.253	0.921		0.253															0.464		
107		<i>Labeo rohita</i>	Rui	22.450	1.355	0.115				7.042		1.121											2.384	0.040
188		<i>Salmostoma baculla</i>	Katari									0.052		0.021	0.316	0.205		0.299		0.094	0.123	4.126	0.070	
189		<i>Salmostoma phulo</i>	Fulchela	0.255	0.014							13.957		12.714	1.758	1.206		0.852		2.764		134.289	2.265	
86		<i>Gudusia chapra</i>	Chapila	6.806	2.220					2.560		7.578		0.171				2.602				51.895	0.875	
209		<i>Wallago attu</i>	Bod																			1.086	0.018	
216		<i>Nemachellius zonaterinus</i>		36.764	4.510	0.154	0.253		9.602		34.553	9.180	13.676	2.141	12.428	0.309	6.853	16.387		4.366	0.557	51.6314	8.707	
Subtotal				0.766	0.276	0.046		3.145			0.201			0.589	0.683	1.005				0.927		31.352	0.529	
6	Floodplain Resident	<i>Anabas testudineus</i>	Koi					3.145																
136		<i>Mystus tengra</i>	Bajari tengra	2.514	0.276	0.046		1.081			2.025		0.148	0.240	0.351	0.406	0.501		0.025			27.529	0.464	
137		<i>Mystus vittatus</i>	Tengra	0.153	0.604	0.471	6.325	3.385	11.249	22.753	0.934	0.603		0.725	1.863	0.213	0.342	4.325		3.483	106.082	1.789		
55		<i>Colisa fasciatus</i>	Khalisha	1.517	4.063	0.950		0.064		0.192	0.026	0.767	2.664	1.560	1.059	4.667	4.711	2.513		0.127		173.881	2.932	
211		<i>Colisa labiosus</i>	Khalisha								0.039	0.402	2.884	0.473			0.389					20.029	0.338	
56		<i>Colisa lala</i>	Lal khalisha	0.025	0.107			0.064		0.192					0.060		0.541					0.195	0.003	
57		<i>Colisa sasa</i>	Khalisha		1.653	0.414									0.541	0.159	4.155					85.793	1.447	
210		<i>Xenentodon canalis</i>	Kaikka	0.293	0.095	0.146		3.512	0.504	1.510	0.438		0.987	2.763	0.680	2.213	0.332	0.482		0.296		59.198	0.998	
187		<i>Osteochroma cotio cotio</i>	Keti					0.931																
175		<i>Puntius conchatus</i>	Chachan puri			0.038	0.256	0.064	0.162	5.805	0.627	0.505	0.909	1.723	0.478	0.575	2.089	2.033		1.968		144.514	2.437	
176		<i>Puntius gelius</i>	Gilipuri								0.750	0.164	0.105	0.580	0.220	0.155	0.122	0.011				8.454	0.143	
177		<i>Puntius guganio</i>	Mola puri								0.032		0.162									0.755	0.013	
178		<i>Puntius phutunio</i>	Phutunai puri										0.081			0.232	0.769					17.551	0.296	
180		<i>Puntius sophore</i>	Puri	11.810	32.590	41.638	19.058	36.540	17.183	28.212	11.411	20.157	19.181	12.087	19.161	20.649	19.311	31.496		17.924	44.096	1306.027	22.025	
181		<i>Puntius terio</i>	Teri puri																				0.080	0.001
212		<i>Puntius ticto</i>	Tti puri	4.746	0.886	0.899					0.220			0.057		0.027	0.191	0.137		0.092		7.053	0.119	
5		<i>Amblypharyngodon mola</i>	Mola	0.645	0.224					1.943	0.158	0.164	2.089	3.457	2.079	0.518	0.082	0.206		0.308		26.361	0.445	
69		<i>Brachydanio rerio</i>	Ajuja									0.845	0.221	0.060			0.031					2.025	0.034	
75		<i>Esomus danicus</i>	Duckian	1.164	0.366	8.252	0.079	0.360	0.025		0.039	7.152	3.657	0.878	0.921	1.998	7.380	3.488		0.427	213.951	3.608		
83		<i>Glossogobius giuris</i>	Bailla	12.126	10.803	8.868	20.789	4.212	2.973	2.784	1.861	6.984	16.536	15.235	6.801	7.458	7.016	2.532		13.552	5.351	431.493	7.277	
110	<i>Lepidogobius punctea</i>	Gutum	0.746	3.501	6.494	1.208	4.274	1.564	8.564	1.540	4.214	0.783	1.573	1.741	1.378	0.646	1.430		1.744		68.576	1.156		
9	<i>Aplocheilichthys punctata</i>	Karpona										0.192	0.120	0.001	0.069	0.040	0.005				2.537	0.043		
39	<i>Channa marulius</i>	Gajar	0.364	0.119						7.397						3.109					90.983	1.534		
40	<i>Channa orientalis</i>	Cheng		1.027							4.610	0.498			2.706	2.355					72.922	1.230		
41	<i>Channa punctatus</i>	Taki	4.045	31.828	23.928	38.421	32.194	13.030	5.539	5.560	25.549	2.701	2.220	8.038	20.066	14.775	24.334		24.773	13.632	917.230	15.468		
42	<i>Channa striata</i>	Shol		0.084										0.754							1.688	0.028		
49	<i>Channa batrachus</i>	Magur					6.005																	
150	<i>Oreochromis mossambicus</i>	Tilapia																			5.977	0.101		
151	<i>Oreochromis nilotica</i>	Nilotica	0.592	0.194								0.692									3.972	0.067		
88	<i>Heteropneustes fossilis</i>	Shingi		0.142	0.077	0.060	0.159	13.510	5.613	1.211	4.703	0.477	1.806						0.263	1.323	82.183	1.386		

Notes: - denotes zero catch

(Cont.)

Note: - denotes zero catch



Appendix 4 Table A Monthly catch composition (% by weight): inside FCDI (site NW08 Santia Khal)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
				Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
121		<i>Macrognathus aculeatus</i>	Bengali	1.100	1.751	1.942	3.190	2.641	6.582		3.605	1.208	2.821		1.366	3.038	8.399	0.215	6.494	6.385	303.402	5.117									
123		<i>Macrognathus punctatus</i>	Guchi	5.890	0.345	3.026	4.348	1.453	13.677	9.671	7.034	0.856	3.382	3.042	1.089	2.650	2.144	1.102	2.781	8.260	208.764	3.521									
122		<i>Macracemulus armatus</i>	Batal buim	0.161	0.053				0.797						0.569			3.571		1.981	37.726	0.636									
15		<i>Badis badis</i>	Napit kai	0.008	0.003				0.096				1.349	0.199		0.131	0.102	0.009	0.013	0.299	10.485	0.177									
148		<i>Ompok pabda</i>	Modhu pabda																												
203		<i>Tetraodon cutcutia</i>	Poska										0.034				0.014				0.404	0.007									
35		<i>Chanda chanda</i>	Chanda		0.117	0.320			0.108				0.028	2.331		0.116	0.452	0.128			14.221	0.240									
36		<i>Chanda nama</i>	Nama chanda	1.203	0.275	0.234			0.285	0.096	13.805		3.702	3.798	2.934	0.401	1.073	0.358	0.772	0.749	7.182	0.121									
37		<i>Chanda nanga</i>	Lal chanda	9.133	2.642	1.486		0.180					0.706	2.765	9.242	3.767	5.988	1.026	0.094	0.184	115.452	1.947									
	Subtotal			59.003	93.745	99.228	94.664	99.331	81.649	93.498	58.985	79.790	73.999	64.901	62.386	77.031	86.818	80.388	96.218	84.637	4807.491	81.074									
120	Others	<i>Macrobrachium rosenbergi</i>	Golden								0.096										0.372	0.006									
931		<i>Prawn spp.</i>	Chingri/Teja	3.260	1.427	0.618	4.894	0.668	7.834	6.503	6.180	11.030	12.325	32.073	25.043	22.659	6.328	3.224	3.224	10.921	601.134	10.138									
	Subtotal			3.260	1.427	0.618	4.894	0.668	7.834	6.503	6.276	11.030	12.325	32.073	25.043	22.659	6.328	3.224	3.224	10.921	601.506	10.144									
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	5925.743	100								

Note: - denotes zero catch

Note: - denotes zero catch

Appendix 4 Table B Monthly catch composition (% by weight): outside FCDI (site NW16 Potajia Khal)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992				Year: 1993								Year: 1994		Total annual catch (Mar'93 – Feb'94)						
				Oct	Nov	Dec	Jan	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%			
59	Riverine	<i>Crossocheilus laius</i>	Bengali Kalabata	-	0.041	0.083	-	-	-	-	-	-	-	-	0.072	0.239	-	-	-	-	-	-	4.253	0.063
139		<i>Nemacheilus boia</i>	Balichata	-	-	0.010	-	-	-	-	-	0.655	-	-	-	-	-	-	-	-	-	-	-	-
198		<i>Somileptes gongota</i>	Gharpoia	-	0.010	0.125	-	-	-	-	-	-	-	-	0.296	0.127	-	-	-	-	-	-	4.344	0.064
28		<i>Boia dario</i>	Rani	-	-	-	-	-	-	-	-	-	0.195	0.361	0.308	0.572	-	-	-	-	-	-	3.622	0.054
29		<i>Boia lobachata</i>	Putul	-	-	-	-	-	-	-	-	-	4.083	1.600	0.168	0.572	-	-	-	-	-	-	32.524	0.481
89		<i>Hilsa ilisha</i>	Ilis	-	-	-	-	-	-	-	-	-	0.006	0.052	0.016	0.002	0.068	0.009	-	-	-	-	1.848	0.027
58		<i>Carica soborna</i>	Kachki	0.001	0.113	0.098	-	-	-	-	-	0.006	-	-	-	-	0.205	-	-	-	-	-	4.720	0.070
71		<i>Eleotris lutea</i>	Kuli	-	-	-	-	-	-	-	-	-	2.650	-	-	-	-	-	-	-	-	-	4.720	0.070
30		<i>Brachyogobius nunnus</i>	Nuna bailla	-	-	-	-	-	-	-	-	0.140	0.167	2.219	0.048	-	-	-	-	-	-	-	14.824	0.219
2		<i>Allia coila</i>	Kajuli	-	-	-	-	-	-	-	-	2.106	10.839	0.796	0.301	-	-	-	-	-	-	-	4.488	0.066
51		<i>Clupisoma garua</i>	Ghaura	-	-	-	-	-	-	-	-	-	-	-	0.016	-	-	-	-	-	-	-	33.867	0.501
81		<i>Gagata youssoufi</i>	Gang tengra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.068	0.001
	Subtotal			0.001	0.163	0.315	-	-	-	-	-	0.801	9.207	15.072	1.411	1.550	0.273	0.009	-	-	-	-	104.558	1.548
130	Migratory	<i>Aorichthys aor</i>	Ayre	-	0.291	6.690	-	-	3.394	-	-	0.085	-	-	0.836	-	-	-	-	-	-	-	6.837	0.101
131		<i>Mystus beckeri</i>	Goldsha tengra	-	0.460	1.173	-	1.356	1.476	3.340	0.851	2.305	0.885	0.599	0.451	0.359	1.110	-	0.102	0.296	-	-	47.286	0.700
132		<i>Mystus cavasius</i>	Kabashi	-	0.083	-	-	-	9.943	-	0.195	0.879	0.833	0.244	-	0.281	-	-	-	6.084	-	-	41.799	0.619
32		<i>Catla catla</i>	Catla	-	-	-	-	-	-	-	-	0.067	-	3.356	2.850	-	-	-	-	-	-	-	48.091	0.712
47		<i>Cirrhinus mrigala</i>	Mrigel	0.040	0.062	-	-	-	15.864	-	-	-	-	0.999	-	-	-	-	-	-	-	-	18.965	0.281
48		<i>Cirrhinus reba</i>	Raik	0.241	0.011	-	-	-	-	-	-	0.189	1.755	0.807	2.280	-	0.034	-	-	-	-	-	33.958	0.503
100		<i>Labo bata</i>	Bata	0.029	0.090	0.090	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
101		<i>Labo boga</i>	Bhangan	-	-	-	-	-	-	-	-	0.196	1.431	0.258	0.112	-	-	-	-	-	-	-	9.181	0.136
102		<i>Labo calbasu</i>	Kalbasu	-	-	-	-	-	-	-	-	0.680	-	0.879	0.183	-	-	-	-	-	-	-	22.797	0.337
107		<i>Labo rohita</i>	Rui	0.610	3.010	-	-	1.264	-	-	-	-	3.336	-	8.399	3.696	-	-	-	-	-	-	138.163	2.045
188		<i>Salmostoma bacaila</i>	Katari	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
189		<i>Salmostoma phulo</i>	Fulchela	4.449	2.227	1.814	0.225	0.098	0.886	4.232	1.044	0.330	0.516	0.016	0.462	0.304	1.005	-	-	-	-	-	26.922	0.399
86		<i>Gudusia chapra</i>	Chapla	0.444	0.380	0.740	-	-	-	-	0.297	-	3.148	2.544	2.310	0.328	-	-	-	-	-	-	50.422	0.746
76		<i>Eutropichthys vacha</i>	Bacha	-	-	-	-	-	-	-	0.476	0.024	-	-	-	-	-	-	-	-	-	-	0.964	0.014
169		<i>Pseudotropheus atherinoides</i>	Batasi	-	-	0.667	-	-	0.517	0.965	-	0.195	-	0.235	0.252	-	-	-	-	-	-	-	6.183	0.092
209		<i>Wallagu attu</i>	Boal	14.371	11.135	7.359	18.041	15.071	11.621	-	-	-	3.200	-	3.576	-	-	-	-	-	-	-	442.551	6.551
	Subtotal			21.182	17.666	18.615	18.266	17.788	43.700	8.536	3.145	10.687	10.597	19.025	16.060	1.272	14.314	20.828	66.358	894.119	13.236	-	-	-
136	Floodplain	<i>Mystus tengra</i>	Bajari tengra	3.971	1.581	1.416	0.233	0.011	-	3.860	0.727	0.790	0.166	-	0.322	0.484	0.650	1.295	0.716	-	-	-	31.857	0.472
137	Resident	<i>Mystus vittatus</i>	Tengra	0.373	12.789	7.496	30.282	2.057	2.060	2.964	1.373	1.686	1.433	0.271	6.942	3.716	4.606	15.996	2.839	-	-	-	322.046	4.768
55		<i>Codisa fasciatus</i>	Khalisha	0.681	0.258	0.387	0.233	0.175	0.579	-	0.017	0.614	-	0.024	1.818	3.615	3.109	4.049	1.199	-	-	-	166.169	2.460
211		<i>Codisa la biosus</i>	Khalisha	-	-	-	-	-	-	-	-	-	-	-	0.220	0.172	-	-	-	-	-	-	10.017	0.148
56		<i>Codisa lalia</i>	Lal khalisha	0.350	-	-	-	0.312	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.817	0.012
57		<i>Codisa sola</i>	Khalisha	2.276	0.288	0.046	-	0.330	0.239	0.305	6.898	0.006	0.052	-	-	-	-	0.073	-	-	-	1.827	0.027	
210		<i>Xenentodon canalia</i>	Kaikka	1.314	1.017	0.220	-	-	0.295	-	-	1.333	1.342	1.052	2.515	1.616	6.406	0.209	-	-	-	135.030	1.999	
62		<i>Cyprinus carpio</i>	Korfu	-	1.831	-	-	-	-	-	0.006	0.089	-	-	-	-	-	13.619	-	-	-	-	84.498	1.251
129		<i>Mylopharyngodon piceus</i>	Kalo carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.011	0.000	
187		<i>Osteobrama cotio cotio</i>	Keti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.630	0.024	
175		<i>Puntius conchomius</i>	Canchan puti	0.080	0.619	2.970	1.273	0.006	0.538	7.216	3.427	3.443	3.682	0.382	5.865	7.441	5.191	0.222	3.238	-	-	-	321.845	4.765
173		<i>Puntius cosuatis</i>	Kosua ti	-	0.027	0.027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
176		<i>Puntius gelius</i>	Giliputi	-	0.181	0.151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix 4 Table B Monthly catch composition (% by weight): outside FCDI (site NW16 Potajia Khal)

Species		Species name		Year: 1992				Year: 1993								Year: 1994		Total annual catch (Mar'93 – Feb'94)			
Code	Habitat Preference	Scientific	Bengali	Oct	Nov	Dec	Jan	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%
177		<i>Puntius guganio</i>	<i>Mda puti</i>	–	–	0.971	1.459	–	–	–	0.196	–	–	–	–	–	0.048	–	–	0.341	0.005
178		<i>Puntius phutunio</i>	<i>Phutani puti</i>	–	–	–	–	–	–	–	–	0.036	–	0.008	–	0.020	–	–	–	0.996	0.015
180		<i>Puntius sophore</i>	<i>Puti</i>	26.273	24.766	29.918	29.712	8.427	9.577	29.366	13.149	14.573	5.570	1.498	8.453	31.408	23.041	19.870	7.871	1284.660	19.018
181		<i>Puntius terio</i>	<i>Teri puti</i>	–	0.049	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
212		<i>Puntius ticto</i>	<i>Titi puti</i>	3.582	0.157	0.158	–	–	–	–	–	0.073	–	–	–	0.358	–	–	–	–	–
5		<i>Amblythyringodon mola</i>	<i>Mola</i>	0.082	0.206	0.208	0.698	–	0.222	0.930	7.100	1.237	1.165	0.229	2.889	–	–	1.625	–	–	–
68		<i>Danio devario</i>	<i>Chebi</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.009	–	–	–
75		<i>Esomus danricus</i>	<i>Darkina</i>	0.323	1.096	0.357	–	0.011	0.184	0.661	2.685	3.745	–	0.078	1.759	0.108	0.125	0.039	–	10.766	0.159
83		<i>Glossogobius giuris</i>	<i>Bailia</i>	1.520	4.637	3.890	6.317	5.669	1.130	3.278	8.861	9.109	6.636	3.590	3.182	14.989	3.998	1.030	0.349	50.756	0.751
91		<i>Hypophthalmichthys molitrix</i>	<i>Silver carp</i>	–	–	–	–	–	–	–	3.923	–	–	–	–	–	–	–	–	6.818	0.101
110		<i>Lepidocyphalus guntea</i>	<i>Gutum</i>	3.312	2.080	1.599	–	8.915	5.466	4.826	0.426	0.994	0.500	0.729	2.106	3.609	1.280	1.690	0.464	524.818	7.769
9		<i>Aptochelilus panchax</i>	<i>Kanpona</i>	0.253	–	–	–	0.071	0.027	0.100	–	0.188	–	0.024	0.032	–	–	–	0.143	169.476	2.509
39		<i>Channa marulius</i>	<i>Gajar</i>	0.569	2.787	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.231	0.033
41		<i>Channa punctatus</i>	<i>Taki</i>	2.947	4.927	4.422	2.175	3.970	4.785	1.118	7.018	4.225	–	0.535	0.857	8.771	12.907	3.826	5.507	16.866	0.250
42		<i>Channa striata</i>	<i>Shol</i>	0.006	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	384.840	5.697
49		<i>Clarias batrachus</i>	<i>Magur</i>	0.030	–	–	–	–	–	–	–	0.281	–	–	–	–	–	1.135	–	8.569	0.127
88		<i>Heteropneustes fossilis</i>	<i>Shingi</i>	3.278	0.262	0.246	2.640	0.942	1.696	–	–	4.207	–	–	–	0.605	1.110	0.790	1.440	61.741	0.914
121		<i>Macrognathus aculeatus</i>	<i>Tara baim</i>	0.298	0.245	0.396	–	0.627	1.580	2.562	2.230	0.985	1.844	0.144	0.823	1.452	4.172	1.224	–	94.551	1.400
123		<i>Macrognathus pancalus</i>	<i>Guchi</i>	3.386	1.240	1.707	0.584	35.020	12.029	9.451	0.748	1.243	–	0.526	2.832	5.295	5.548	5.328	0.186	343.437	5.084
122		<i>Mastacembelus armatus</i>	<i>Baral baim</i>	3.868	0.430	0.136	–	1.691	–	–	0.855	0.162	0.888	7.778	1.489	0.549	9.273	0.243	–	128.889	1.908
15		<i>Badis badis</i>	<i>Napit koi</i>	0.655	0.732	0.111	–	0.059	0.080	0.202	0.196	0.246	–	–	0.036	0.293	0.396	–	–	11.768	0.174
147		<i>Ompok bimaculatus</i>	<i>Kani pabda</i>	0.240	–	–	–	–	–	–	–	–	–	–	0.359	–	–	0.237	–	3.024	0.045
148		<i>Ompok pabda</i>	<i>Madhu pabda</i>	–	0.387	0.286	–	–	1.144	–	0.012	0.374	–	–	–	–	0.561	2.643	–	23.053	0.341
145		<i>Notopterus notopterus</i>	<i>Foli</i>	0.331	0.509	5.317	–	0.316	0.059	–	–	–	–	–	0.081	0.215	–	0.510	–	9.937	0.147
203		<i>Tetraodon cautiella</i>	<i>Potka</i>	0.004	–	–	–	–	–	–	–	–	–	–	1.177	0.214	–	0.539	–	22.121	0.327
33		<i>Chaca chaca</i>	<i>Cheka</i>	0.020	–	–	–	–	0.221	–	–	–	–	–	–	–	–	–	–	0.205	0.003
35		<i>Chanda baculis</i>	<i>Chanda</i>	0.749	0.289	0.635	–	0.040	0.037	–	0.088	0.398	0.258	0.321	0.587	–	0.479	0.264	0.615	17.705	0.262
36		<i>Chanda nama</i>	<i>Nama chanda</i>	2.706	2.767	2.910	–	0.262	0.208	8.069	10.203	3.358	2.096	1.050	3.946	0.173	0.275	0.014	0.172	102.370	1.515
37		<i>Chanda ranga</i>	<i>Lal chanda</i>	2.486	0.770	0.629	–	0.040	–	–	1.092	1.208	0.568	1.033	6.239	0.575	0.919	0.239	0.438	109.258	1.617
214		<i>Oryzias melastigma</i>	<i>Kanpona</i>	–	–	–	–	–	–	–	–	0.109	–	–	–	–	–	–	–	0.609	0.009
Subtotal				65.964	66.926	66.609	75.606	67.259	43.843	74.908	71.231	54.709	26.975	19.758	54.545	85.676	84.568	76.481	29.398	4532.236	67.095
931	Other	Prawn spp.	<i>Chingri/icha</i>	12.853	15.243	14.459	6.129	14.952	12.455	16.555	24.822	25.395	47.355	59.804	27.845	12.779	1.109	2.691	4.244	1224.080	18.121
Subtotal				12.853	15.243	14.459	6.129	14.952	12.455	16.555	24.822	25.395	47.355	59.804	27.845	12.779	1.109	2.691	4.244	1224.080	18.121
Grand total				100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	6754.993	100

Notes: 1. No fishing activities were observed in February 1993

2. - denotes zero catch



Appendix 4 Table C Monthly catch composition (% by weight): outside PCDI (site NC22 Chandrakali Khal)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993				Year: 1994				Total annual catch (Mar'93 - Feb'94)	
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	%
139	Riverine	<i>Nemacheilus bota</i>	Bengali																						0.072
28		<i>Bota dario</i>	Rani																						0.121
89		<i>Hilsa ilisha</i>	Ilish	2.570																					0.392
85		<i>Goniola manamina</i>	Goni chapla												3.077										0.066
14		<i>Awaxus stamineus</i>	Bele										2.702												0.173
923		<i>Siganus tucana</i>	Bata																						0.029
2		<i>Alia colla</i>	Kajuli																						0.218
51		<i>Clupeoides garua</i>	Ghaura																						0.068
81		<i>Glyptothorax youssoufi</i>	Gang tengra																						0.968
131	Subtotal			2.570									2.702	7.384	23.796	2.144	4.999	0.695					55.253		1.729
132	Migratory	<i>Mystus heckeri</i>	Golda tengra																						0.247
132		<i>Mystus cavasius</i>	Kabashi			0.147																			0.828
32		<i>Catla catla</i>	Catla		21.977																				0.386
47		<i>Cirrhinus mrigala</i>	Mrigal		20.820																				2.094
48		<i>Cirrhinus reba</i>	Raik		8.703																				0.743
100		<i>Labeo bata</i>	Bata	0.128		0.189																			0.039
107		<i>Labeo rohita</i>	Rui	1.477																					3.340
188		<i>Salmostoma bacalla</i>	Kamri	1.606																					0.040
189		<i>Salmostoma phulo</i>	Fulchela	0.642																					0.625
86		<i>Gudusia chapra</i>	Chapla	0.507																					0.091
209		<i>Wallago attu</i>	Bawl	3.919																					
6	Subtotal			7.773	57.155	0.336	12.034						0.798	1.728	12.398	16.897	46.243	3.800	0.039				2.706		8.434
136	Floodplain Resident	<i>Anabus testudineus</i>	Koi	2.858	2.077	0.047																			0.379
137		<i>Mystus tengra</i>	Bayad tengra	32.586	1.523	0.525																			4.337
55		<i>Mystus vittatus</i>	Tengra	6.763	3.790	8.498	1.775																		6.513
211		<i>Colisa fasciatus</i>	Khalisha	0.494	1.272	0.692	0.150																		1.495
56		<i>Colisa labiosa</i>	Khalisha	1.154																					0.124
57		<i>Colisa lila</i>	Lal khalisha			0.611																			0.462
210		<i>Colisa soma</i>	Khalisha	2.955	2.845	4.746	4.932																		0.078
62		<i>Xenentodon omeila</i>	Kalka																						5.660
174		<i>Cyprinus carpio</i>	Karlu																						0.365
175		<i>Puntius chola</i>	Chola puti																						0.026
176		<i>Puntius conchionus</i>	Chandhan puti																						7.133
178		<i>Puntius gelius</i>	Giliputi																						0.010
180		<i>Puntius phutunio</i>	Phutun puti																						0.252
181		<i>Puntius sophore</i>	Puti	26.523	17.595	11.838	15.913																		23.398
212		<i>Puntius terio</i>	Teri puti	2.891	2.402	2.867	1.354																		0.005
5		<i>Puntius ticto</i>	Titi puti																						0.157
69		<i>Amphiprionopsodon mola</i>	Mola																						0.005
68		<i>Brachydanio rerio</i>	Anju																						0.005
75		<i>Esomus danicus</i>	Chedi																						0.005
83		<i>Glossogobius giuris</i>	Durkina	2.919	0.948	4.467	2.572																		0.002
91		<i>Hypophthalmichthys molitrix</i>	Bulla																						0.002
43		<i>Chela chela</i>	Silver carp																						0.002
110		<i>Lepidocephalus guntea</i>	Gurum	0.422	3.841	19.361	3.205																		2.574
9		<i>Aplocheilichthys punctata</i>	Kanpoota																						0.035

Note: 1. No fishing activities were observed in December 1992, January and March 1993.  
2. - denotes zero catch

Appendix 4 Table C Monthly catch composition (% by weight): outside FCDI (site NC22 Chandrakali Khal)

Species Code	Habitat Preference	Scientific	Species name	Year : 1992				Year : 1993								Year : 1994		Total annual catch (Mar'93 - Feb'94)								
				Aug	Sep	Oct	Nov	Feb	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%					
39		<i>Channa marulius</i>	Bengali			0.567																	0.466	0.014		
40		<i>Channa orientalis</i>	Gajar	1.606								0.440	0.144									40.605	22.702	319.026	9.901	
41		<i>Channa punctatus</i>	Cheng		2.892	3.930	4.346	32.739		15.738	8.486	10.431	4.068	0.882	11.244	6.528	9.891	31.659	18.277	3.392	6.947	3.392	6.947	13.977	0.434	
42		<i>Channa striatus</i>	Taki																							
49		<i>Clarias batrachus</i>	Shol																							
150		<i>Oreochromis mossambicus</i>	Magur																							
88		<i>Heteropneustes fossilis</i>	Tilapia	0.206		0.030					0.660	3.809	0.377	0.198	0.417	0.138						5.161	7.885	28.821	0.894	
121		<i>Macrobrachius aculeatus</i>	Shingi	2.634		1.385					0.786	1.754	0.218	0.475	4.561	0.419						1.129	75.738	2.351		
123		<i>Macrobrachius punctulatus</i>	Tara baum	1.982	1.360	8.579	0.906	17.817	6.242	17.845	5.500	5.965	2.301	5.144	7.009	1.043	12.044	0.758	1.304			0.758	1.304	154.051	4.781	
122		<i>Mastomys natalensis</i>	Guchi	0.128	0.159	1.383																2.454	3.486	59.308	1.841	
13		<i>Basil basilis</i>	Bara baum																							
145		<i>Notopterus notopterus</i>	Nagri koi					4.232			1.320	0.233	0.183		1.870	0.122						2.454	3.486	59.308	1.841	
203		<i>Tetraodon cutculia</i>	Foli																							
35		<i>Chanda baualis</i>	Polka	0.450		0.096	0.403					0.599			0.164											
36		<i>Chanda nama</i>	Chanda	0.321																						
37		<i>Chanda nama</i>	Nama chanda	0.064	0.517	0.012																				
		<i>Chanda nama</i>	Lal chanda	2.699		0.426																				
Subtotal				89.656	42.845	92.505	85.077	94.877	83.019	96.126	88.784	59.337	59.488	41.680	87.884	97.280	94.646	93.106	95.131					18.452	0.573	
120	Others	<i>Macrobrachium rosenbergii</i>	Golda																							
931		Prawn spp.	Chingri/Taha			7.159	2.888	5.123	16.982	0.374	2.105	4.469	21.472	7.076	7.106	2.681	5.352	2.201	2.164					7.551	0.234	
Subtotal						7.159	2.888	5.123	16.982	0.374	2.105	4.469	21.472	7.076	7.621	2.681	5.352	2.201	2.164					202.251	6.277	
Grand total				100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100					3222.034	100

1. No fishing activities were observed in December 1992, January and March 1993

Notes: 1. No fishing activities were observed in December 1992, January and March 1993

2. - denotes zero catch



Appendix 4 Table D Monthly catch composition (% by weight): outside FCDI (site NC26 Mailagi Khal)

Species Code	Habitat Preference	Scientific	Species name		Year: 1992					Year: 1993					Year: 1994		Total annual catch (Mar'93 - Feb'94)										
			Bengali		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%		
13	Riverine	<i>Aspichthys monur</i>				0.002																	0.056		2.265	0.008	
59		<i>Crossocheilus latius</i>																								53.667	0.195
139		<i>Nemachilus botia</i>																								0.242	0.001
198		<i>Somleptes gangetica</i>																								24.165	0.088
28		<i>Botia dario</i>				0.014	0.275																			0.203	0.001
29		<i>Botia lohachata</i>																								1.856	0.007
89		<i>Hilsa ilisha</i>																						0.191		0.248	0.001
193		<i>Seripinnia phasa</i>																								5.790	0.021
14		<i>Awaous samineus</i>					0.099																			0.317	0.001
51		<i>Alia colla</i>				2.303	0.444	0.036																		56.107	0.204
81		<i>Clupeasma garua</i>				0.021	0.296																			25.546	0.093
202		<i>Gangta yousseufi</i>				0.203	0.064																			11.051	0.040
		<i>Tenisonoides buchannani</i>																									
		Subtotal				2.541	1.709	0.036																			
130	Migratory	<i>Aorichthys aor</i>			0.034	0.099		0.085	0.045		0.763	9.701			0.018	0.422	1.664	3.001	0.931	0.024		0.056	0.191		181.457	0.658	
135		<i>Aorichthys seenghala</i>																								151.701	0.550
131		<i>Myxus bleekeri</i>																								5.554	0.020
132		<i>Myxus caninus</i>			0.031	0.159	0.003	0.001			1.609	7.151			1.875	0.034	0.107	0.068	0.057	0.560	0.737		1.918	3.630		195.888	0.711
32		<i>Catla catla</i>			28.699	51.356					0.775				0.083	2.029	21.493	17.269	0.124	0.037	0.560					24.031	0.087
47		<i>Cirrhinus mrigala</i>			9.766	1.291										1.625	4.676	4.824	0.169	0.074	0.672					771.034	2.798
48		<i>Cirrhinus reba</i>			4.011	3.855	0.005									0.552	1.700	3.792	0.289	0.488	0.488					281.641	1.022
100		<i>Labeo bata</i>				0.473										0.386	0.498	0.498	2.378	0.672						285.611	1.036
101		<i>Labeo boga</i>														0.039	0.096	0.096								14.988	0.054
102		<i>Labeo calbasu</i>														3.146	0.389	3.426								31.481	0.114
103		<i>Labeo dero</i>					0.197																			60.410	0.219
107		<i>Labeo rohita</i>			26.108	24.881					4.176	0.305	1.451			0.031	2.920	32.481	13.135	4.089	1.261		3.213	4.749		147.488	5.362
188		<i>Salmostoma bawila</i>			2.136	0.485	0.037	0.043	0.055		0.124					0.459	0.018	0.136	0.393	0.647						9.840	0.036
189		<i>Salmostoma phulo</i>				0.081	0.571					0.285				0.029	0.503	0.136	0.393	0.647						70.259	0.255
169	<i>Gudusia chapra</i>			0.354	0.010										0.010	0.027	0.010	0.027							0.594	0.002	
209	<i>Pseudotropheus atherinoides</i>			0.006	0.016	0.174		0.061	0.262	4.115	4.105			0.967	0.167	0.027	0.027	0.004							426.573	1.548	
144	<i>Wallago attu</i>				0.345			1.046		6.541	10.779			17.773		1.233	2.207	1.918							209.468	0.760	
	Subtotal			71.145	83.248	0.790	0.130	1.207	4.439	14.232	33.472	0.238		21.189	10.509	65.334	47.174	7.735	7.631	11.388	6.486	15.089			4094.052	14.857	
6	Floodplain Resident	<i>Anabas testudineus</i>			0.718	1.247	0.632	0.655	1.061	4.439	14.232	33.472	0.238		21.189	10.509	65.334	47.174	7.735	7.631	11.388	6.486	15.089			4094.052	14.857
136		<i>Myxus tengra</i>				0.718	1.247	0.632	0.655	1.061	4.439	14.232	33.472	0.238		21.189	10.509	65.334	47.174	7.735	7.631	11.388	6.486	15.089		4094.052	14.857
137		<i>Myxus vittatus</i>				0.718	1.247	0.632	0.655	1.061	4.439	14.232	33.472	0.238		21.189	10.509	65.334	47.174	7.735	7.631	11.388	6.486	15.089		4094.052	14.857
55		<i>Colisa fasciatus</i>			2.370	0.119	1.784	5.052	6.924	3.986	3.419	1.833	1.012	0.462	1.294	1.002	0.334	0.150	1.380	2.017	3.856	1.867	2.777	4.591	157	1.666	
211		<i>Colisa latipes</i>				0.068	3.058	2.996	3.341	5.065	0.714	0.692	3.258	2.093	0.784	1.826	0.032	0.036	4.238	4.592	3.063	1.008	3.366	9.563	3.471	956.377	3.471
56		<i>Colisa lalia</i>								0.535					0.109	0.343		0.047								12.646	0.046
57		<i>Colisa socia</i>								0.535					0.109	0.343		0.047								12.646	0.046
210		<i>Xenentodon cunctila</i>				0.036	1.424	1.792	3.507	3.480	12.266	2.495	0.774		0.052	1.581	0.743	2.289	3.336	1.794	5.473	1.382	3.647			662.300	2.403
62		<i>Cyprinus carpio</i>			0.909	8.864	5.664	5.628	4.757	3.480	12.266	2.495	0.774		0.052	1.581	0.743	2.289	3.336	1.794	5.473	1.382	3.647			662.300	2.403
187		<i>Osteochroma cotio cotio</i>							0.523						0.292											506.002	1.836
174		<i>Puntius chola</i>																								0.928	0.003
175		<i>Puntius conchonius</i>																								0.248	0.001
176		<i>Puntius gelius</i>																								61.4670	2.231
970		<i>Puntius gonianotus</i>																								42.927	0.156
178	<i>Puntius phutunio</i>																								9.432	0.034	
179	<i>Puntius sarana</i>																								104.110	0.378	

Note: - deoestrogen catch



Appendix 4 Table D Monthly catch composition (% by weight): outside FCDI (site NC26 Mailagi Khal)

Species				Habitat		Species name		Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
Code	Preference	Scientific	Bengali	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%											
180		<i>Puntius sophore</i>	Puti	16.180	1.463	36.235	49.847	49.459	35.192	31.282	4.216	21.801	6.649	14.860	20.300	1.348	3.307	11.996	33.395	16.972	11.320	7.986	5398.914	19.592											
181		<i>Puntius terio</i>	Teri puni	0.435		14.235	5.716	7.073											0.045				4.899	0.018											
212		<i>Puntius ticto</i>	Ti puni		0.200	2.141	1.142	1.686	5.779	1.451	0.366	0.969	3.702		1.572	0.316	0.056	5.021	3.982	0.813	0.770	4.054	918.810	3.334											
183		<i>Rasbora elanga</i>	Sephatia																0.296				32.584	0.118											
5		<i>Amblypharyngodon mola</i>	Mola	0.041	0.121	0.101	0.902	0.086		0.038	0.163	3.271		0.073	3.531	0.127	0.516	0.934	0.111	0.074	0.023	0.955	151.880	0.551											
68		<i>Danio devario</i>	Chebi	0.060	0.073	0.087	0.167	0.167	0.127	0.038	1.113			0.083	0.055		0.114		0.116				20.415	0.074											
75		<i>Esomus danicus</i>	Darkina			0.539	0.118	0.170	0.148	0.077	0.570	1.561	0.221	0.355	2.426	0.084	0.048	0.171	0.461	0.173	0.112	0.467	105.269	0.382											
182		<i>Rasbora daniconius</i>	Darkina															0.098					7.832	0.028											
83		<i>Glossogobius giuris</i>	Balla	3.395	0.629	2.188	2.067	1.993	6.432	6.591	1.136	2.702	4.487	14.643	4.134	2.015	1.316	4.720	1.304	2.103	1.798	3.490	741.967	2.692											
91		<i>Hyporhamphichthys molitrix</i>	Silver carp																			0.471	161.778	0.587											
109		<i>Lepidocephalus berdmorei</i>	Pulyan												0.125								0.262	0.001											
110		<i>Lepidocephalus guntea</i>	Gutum		0.024	2.980	2.712	3.487	8.817	2.136	2.578	2.136	9.250	1.291	0.723	0.353	0.655	2.925	2.708	3.264	1.771	2.587	662.711	2.405											
9		<i>Aplodichthys punctatus</i>	Kunpona								0.448		0.557	0.157	0.393	0.045		0.032	0.004				10.152	0.037											
38		<i>Channa barca</i>	Tin shol											0.104			0.114						1.919	0.007											
40		<i>Channa marulius</i>	Gujar			1.082	0.047	0.517		2.725	11.330					0.618		1.857	1.006	2.446	14.793		484.509	1.758											
41		<i>Channa orientalis</i>	Cheng					0.072											0.104				23.472	0.085											
42		<i>Channa punctatus</i>	Traki	1.193	0.118	10.047	7.258	4.827	11.914	9.619	15.898	5.121	7.697	6.582	15.093	1.348	2.023	5.423	15.293	15.234	15.965	12.010	2873.716	10.428											
42		<i>Channa argus</i>	Shol		0.263	0.527	1.023									0.881	3.974	2.476	3.164	8.668	22.219	4.850	989.473	3.591											
49		<i>Clarias batrachus</i>	Magur				0.099	0.094				19.331			0.309			0.005		1.718	1.762	2.012	126.598	0.459											
150		<i>Oreochromis mossambicus</i>	Tilapia								0.895			1.648									7.776	0.028											
88		<i>Heteropneustes fossilis</i>	Shingi		0.038	1.074	0.266	0.064	1.495	0.162	3.420	6.102	12.181	0.493	0.563	0.008	0.224	1.911	0.133	4.910	2.042	8.442	381.457	1.384											
121		<i>Macrognathus aculeatus</i>	Tura baim		0.036	1.287	0.555	0.599				0.248	0.669	1.283	1.117	0.233	0.122	0.277	0.842	1.361	0.249	0.079	156.214	0.567											
123		<i>Macrognathus punctatus</i>	Guchi	0.285	0.093	2.489	1.016	1.398	2.708	1.415	0.488	6.429	16.901	4.068	1.719	0.372	0.540	4.492	2.246	5.022	4.142	4.966	826.420	2.999											
122		<i>Mastomys armatus</i>	Barni baim			0.256	0.060	0.617		0.447			3.320	1.950		0.231	0.229	2.102	1.037	0.222	1.202	0.136	309.898	1.125											
15		<i>Basia basia</i>	Napli koi				0.076	0.090					0.336		0.094	0.011	0.161	0.381	0.233	0.035	0.025	0.005	60.206	0.218											
145		<i>Nothopterus nothopterus</i>	Foli			0.211			0.033							0.519	0.320	2.503	0.379	0.582		0.867	272.825	0.990											
203		<i>Tetraodon cutcutin</i>	Pokra	0.048	0.949	1.936	2.613	0.133						0.052	0.393	0.111	0.230	0.586	0.734	0.121			137.861	0.500											
33		<i>Channa chana</i>	Chena													0.013							0.258	0.001											
35		<i>Chanda beculis</i>	Chunda													0.060	0.142	0.024	0.382				46.697	0.169											
36		<i>Chanda nama</i>	Nama chunda	1.425	0.274	0.708	0.603	0.682	0.056	0.298	0.099		0.448	1.322	2.488	0.244	0.466	1.815	0.349	0.720	0.106	0.443	236.755	0.859											
37		<i>Chanda rang</i>	Lai chanda		0.242	0.463	0.627	0.119	0.806	0.301	1.343	0.060	0.841	2.493	1.896	0.359	0.789	2.531	0.508	1.210	0.920	2.504	354.772	1.287											
	Subtotal			26.281	14.752	93.206	93.271	93.743	93.949	83.326	59.167	86.483	88.729	62.199	74.646	16.514	21.752	70.650	87.524	85.042	89.114	79.732	1990.928	72.544											
120	Others	<i>Macrobrachium rosenbergii</i>	Golda			0.233											0.365							5.430	0.020										
931		Prawn spp.	Chingri/Taha	0.033	0.154	5.735	6.599	4.963	1.612	1.905	7.361	13.279	11.271	13.493	12.899	16.345	27.706	20.683	4.819	3.569	4.345	4.967	3282.496	11.912											
160		<i>Paratelphusa sp</i>	Kania kakra		0.136																														
945		<i>Crab sp</i>	Kakra													0.141							2.777	0.010											
	Subtotal			0.033	0.290	5.968	6.599	4.963	1.612	1.905	7.361	13.279	11.271	13.493	12.899	16.486	28.071	20.683	4.819	3.569	4.345	4.967	3290.703	11.941											
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	27557.140	100										

Note: - denotes zero catch

Appendix 4 Table E. Monthly catch composition (% by weight): outside FCDI (site NC30 Sakini Khal)

Species			Species name		Year: 1992												Year: 1993												Total annual catch																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Habitat	Preference	Scientific	Bengali		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb

Note: - denotes zero catch



29X

Appendix 4 Table E Monthly catch composition (% by weight): outside PCDI (site NC30 Sakini Kha I)

Species Code		Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Total annual catch (Mar'93 - Feb'94)	
					Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%					
121			<i>Macrognathus aculeatus</i>	Bengali		0.805		0.088				1.083		5.601		3.110		1.008	0.358				20.264	0.618						
123			<i>Macrognathus pancalis</i>	Guchi		0.078		0.049	0.139	0.390	2.959	1.738	21.429	10.404	1.475	0.213	0.390	4.686	1.633	0.453		2.913	75.341	2.297						
122			<i>Macrinemobius armanus</i>	Batal butin			8.225	5.105									0.755	5.793					50.438	1.538						
15			<i>Budis budis</i>	Napti koi		0.166	0.209				0.163				0.394	0.426	0.022	0.506			0.242		5.588	0.170						
148			<i>Ompok pabda</i>	Madhu pabda													0.098							0.008						
145			<i>Noopterus noopterus</i>	Foli			0.470			0.570							0.380	0.156	0.316				4.141	0.126						
203			<i>Tetraodon cucutia</i>	Potika		0.581										0.644		1.195					12.127	0.370						
33			<i>Channa chana</i>	Cheka															0.255				2.248	0.069						
35			<i>Chanda baulis</i>	Chanda															0.047				1.071	0.033						
36			<i>Chanda nama</i>	Nama chanda		0.189				0.398		0.357		3.287		1.764	3.037	0.347	0.030	0.109	0.253		14.324	0.437						
37			<i>Chanda ringa</i>	Lal chanda		0.583	0.094			2.997		1.585			1.771	4.259		0.030	0.290	0.253	0.126	0.126	17.191	32.581						
998	Subtotal					32.581	98.495	97.480	91.794	97.330	91.788	68.144	28.572	78.161	66.864	56.561	35.110	79.486	96.919	97.892	94.627	98.087	2584.327	78.807						
931	Others		Unidentified fish																				0.114	0.003						
			Prawn spp.	Chingri/Taha				2.520	8.205	1.355	7.995	28.632	71.429	21.398	15.929	16.990	0.380	18.433	2.786	2.063	3.349	1.913	310.607	9.472						
	Subtotal							2.520	8.205	1.355	7.995	28.632	71.429	21.398	15.929	16.990	0.380	18.433	2.786	2.108	3.349	1.913	310.721	9.475						
	Grand total					100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	3279.327	100						

Note: - denotes zero catch



Table 4. Monthly catch composition from canals (% by weight): outside FCDI (combined sites NC22 + NC26 + NC30)

[illegible]

Note: - denotes zero switch

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Appendix 4 Table F Monthly catch composition from canals (% by weight): outside PCDI (combined sites NC22+NC26+NC30)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar '93 - Feb '94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Note: - denotes zero catch



25

## APPENDIX 5



Appendix 5 Table A Percentage monthly catch from low elevation floodplains/beel by gear type: inside FCDI (sites NW04+NW05)

Appendix 5 Table A Percentage monthly catch from low elevation floodplains/beer by gear type, inside FCDI (sites NW04-FW03)

Gear Code	Gear name	Year:1992					Year:1993												Year: 1994			Total annual catch (Mar'93-Feb'94)	
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%			
95	Doi ar trap	1.811	2.395	12.979	26.152	16.686	81.519	86.133	81.533	78.927	43.238	12.040	13.307	6.482	18.216	40.711	41.763	13.671	34787.389	29.281			
255	Thella jal	2.145	2.177	14.683	1.352	-	0.768	2.614	-	0.304	2.629	1.234	1.574	8.884	36.687	28.995	26.701	-	22748.051	19.147			
272	Daun	16.828	11.432	3.915	-	0.916	3.088	-	-	5.540	9.323	38.563	45.763	39.969	19.870	9.061	1.109	-	22412.157	18.865			
45	Ber jal	50.803	76.431	13.807	1.594	-	-	-	-	-	8.685	32.839	30.494	31.257	14.437	4.050	-	-	16163.800	13.605			
88	Current jal (Stationary)	25.135	5.406	6.061	0.932	0.611	7.260	6.265	-	1.044	7.034	1.083	2.337	8.755	8.345	9.594	1.953	0.540	6674.378	5.618			
302	Kua	-	-	45.278	67.945	69.819	-	-	-	-	-	-	-	-	-	-	23.829	85.102	6617.423	5.570			
202	Moi jal	-	-	-	0.667	6.275	-	-	-	-	28.320	12.222	4.663	1.592	1.178	0.435	0.753	-	4310.514	3.628			
278	Nol barsi	-	0.020	-	-	1.582	-	-	18.467	14.186	0.771	1.204	0.612	-	-	1.667	2.540	0.505	1742.846	1.467			
164	Jhaki jal	-	0.145	2.694	0.782	0.944	1.051	4.988	-	-	-	-	0.014	0.551	0.359	2.191	0.089	-	914.876	0.770			
123	Koi jal	0.560	0.149	-	-	-	-	-	-	-	-	-	-	-	-	1.425	1.242	-	669.293	0.563			
307	Hand fishing	-	-	-	-	-	1.261	-	-	-	-	0.812	1.157	2.059	0.363	1.287	-	-	565.197	0.476			
296	Tukri	2.566	1.162	-	-	-	-	-	-	-	-	-	-	-	0.203	1.287	-	-	532.245	0.448			
266	Veshal	-	0.360	-	-	-	-	-	-	-	-	-	-	-	-	0.535	-	0.182	347.328	0.292			
298	Akra	-	-	0.370	0.288	3.167	3.312	-	-	-	-	-	-	-	0.263	-	-	-	148.409	0.125			
310	Kakila bana	-	-	-	-	-	-	-	-	-	-	-	-	-	0.080	0.050	0.020	-	69.476	0.058			
291	Urani	-	-	0.213	-	-	-	-	-	-	-	0.003	0.027	0.266	-	-	-	-	36.242	0.031			
170	Juti	0.152	0.324	-	-	-	-	-	-	-	-	-	0.053	0.106	-	-	-	-	30.181	0.025			
89	Dhor jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.780	0.013			
263	Ucha	-	-	-	-	-	1.741	-	-	-	-	-	-	-	-	-	-	-	11.418	0.010			
30	Sip	-	-	-	-	-	-	-	-	-	-	-	-	0.079	-	-	-	-	8.060	0.007			
270	Katha	-	-	-	0.287	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	11880.558	100			

Note: - denotes zero catch

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Appendix 5 Table B Percentage monthly catch from low elevation floodplains/beel by gear type: inside FCDI (sites NW09 + NW10)

Gear Code	Gear name	Year: 1992					Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%		
270	Katha																		13339.643	27.592		
45	Ber jal	38.240	30.484			40.404	2.454	53.557	37.759	4.952		16.684	46.522	55.327	7.748	45.191	89.625	83.450	9919.891	20.518		
255	Thella jal	1.253	13.054	31.635	1.131	30.043	2.699	0.258					3.562	0.328	62.086	16.306	3.626	4.018	8777.506	18.155		
272	Dawn	49.074	4.655										37.948	34.317	5.506		0.228	3.285	4055.848	8.389		
95	Doiar trap	1.447	18.093	12.424	9.256	1.587							4.420	1.422	11.405	2.443	0.202	0.202	3314.262	6.855		
88	Current jal (Stationary)	7.741	3.127	0.746	6.068		4.793	0.984	2.922	34.725	13.466	50.448	6.664	4.043	4.933	2.657	0.154	0.540	2201.114	4.553		
298	Akra		1.505	3.978	11.467	7.782	32.786	8.539	0.961						0.896	12.355	1.881	6.738	2031.439	4.202		
164	Jhaki jal	0.988	9.237	16.882	51.034	10.763	42.003	13.083	4.734	7.725						6.354	4.387	1.299	1755.657	3.631		
263	Ucha		12.095	25.104	10.367	5.247	14.566	13.068	11.243						5.174	2.234		0.468	1122.225	2.321		
276	Hat panch															5.082			373.525	0.773		
97	By hand/Dewatering		2.676						3.670							4.818			360.895	0.746		
266	Veshal	1.258				0.224	0.188	1.057		3.722	3.714			3.675	0.475				307.120	0.635		
123	Koi jal										5.475	1.436		0.337	0.260	0.590			191.369	0.396		
296	Tukri			0.062									0.885		0.795	0.367			155.008	0.321		
306	Baoli jal							8.756	23.425										120.519	0.249		
307	Hand fishing		3.881	1.555	0.372														104.419	0.216		
202	Moi jal			7.533	5.493	3.089			1.279						0.538	1.287			64.877	0.134		
170	Juti													0.550		0.317	0.099		60.751	0.126		
278	Nol barsi										2.751								38.591	0.080		
314	Boat Katha			0.081	4.814	0.862	0.438	0.699	6.826										24.899	0.052		
30	Sip						0.072		7.181		0.021	0.088			0.024				18.241	0.038		
291	Urani														0.076				8.841	0.018		
286	Deal trap	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	48346.637	100		

Note: - denotes zero catch







Appendix 5 Table D Percentage monthly catch from combined low elevation floodplains/beel by gear type: inside FC DI (sites NW04+NW05+NW09+NW10+NW12)

Gear Code	Gear name	Year: 1992					Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
		Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%		
95	Doar trap	1.770	13.023	13.028	24.455	16.346	16.710	30.972	76.624	71.990	40.232	10.207	7.745	5.661	19.510	29.203	24.142	9.208	47719.399	21.474		
255	Thella jal	1.787	5.104	14.311	1.236	5.277	5.561	3.692	-	0.542	3.182	10.700	15.082	11.884	43.334	21.841	14.030	1.444	42421.481	19.090		
45	Berjal	43.957	47.772	7.684	1.147	7.097	0.845	14.370	3.871	0.467	14.594	38.726	33.379	35.614	10.436	21.936	1.123	-	38648.296	17.392		
272	Daun	21.115	7.634	2.179	-	0.594	0.503	-	-	4.765	6.885	26.217	33.924	32.683	14.197	4.827	0.653	1.181	28697.441	12.914		
270	Katha	-	-	17.078	14.076	-	28.025	26.456	-	-	-	-	-	-	-	-	34.248	63.241	21511.493	9.680		
88	Current jal (Stationary)	20.635	4.446	4.174	1.488	0.983	5.442	6.343	1.192	8.847	14.231	4.462	6.641	10.189	8.786	7.367	2.861	1.126	15048.386	6.772		
302	Kua	-	-	25.197	48.893	45.277	-	-	-	-	-	-	-	-	-	-	12.521	18.668	6617.423	2.978		
164	Jhakijal	0.150	4.528	5.903	4.364	8.619	24.902	8.625	0.485	0.728	-	-	-	-	-	-	5.291	1.411	5157.499	2.321		
202	Moi jal	-	-	1.845	1.876	6.442	0.375	-	0.131	-	18.722	8.226	2.177	-	0.138	4.142	0.396	-	-	1.977		
298	Akra	-	0.424	3.160	1.156	7.227	11.893	2.291	0.099	-	-	-	-	-	0.230	3.095	3.667	-	4394.146	1.665		
278	Nol barsi	-	0.010	-	-	1.026	-	0.926	12.234	11.245	0.912	0.811	0.286	0.830	0.689	0.236	-	-	3700.699	0.846		
307	Hand fishing	-	1.109	0.290	0.023	-	0.206	-	-	-	-	-	-	-	0.022	2.686	0.885	-	1879.110	0.667		
263	Ucha	-	3.413	4.684	0.636	0.922	5.298	3.506	1.152	-	-	0.040	-	-	1.331	0.383	-	-	1483.057	0.514		
123	Koi jal	0.401	0.076	-	-	0.039	0.065	0.283	-	1.396	0.739	0.058	0.006	0.793	0.277	1.518	0.141	0.168	1142.500	0.488		
266	Veshal	8.238	7.908	-	-	-	-	-	-	-	-	-	-	0.902	0.407	0.686	-	-	1084.017	0.359		
296	Tukri	1.839	0.595	0.012	-	-	-	-	-	-	0.501	0.547	0.722	1.073	0.417	0.063	-	-	796.866	0.309		
276	Hat panch	-	-	0.323	-	-	-	-	-	-	-	-	-	-	-	0.872	-	-	687.253	0.168		
97	By hand/Dewatering	-	-	-	-	-	-	-	0.376	-	-	-	-	-	-	0.826	-	-	360.895	0.054		
306	Baol jal	-	-	-	-	-	-	2.349	2.401	-	-	-	-	-	-	-	0.011	-	120.519	0.051		
291	Urani	-	-	0.119	-	-	-	-	-	-	-	-	-	-	-	-	-	-	114.088	0.043		
310	Kakila bana	-	-	-	-	-	-	-	-	-	-	-	-	-	0.066	0.188	-	-	95.268	0.041		
170	Juti	0.109	0.166	-	-	-	-	-	-	-	-	0.002	0.013	0.274	0.154	0.060	0.031	-	90.932	0.012		
30	Sip	-	-	-	-	-	-	-	-	0.021	0.003	0.004	-	-	0.006	-	-	-	27.651	0.011		
314	Boat Katha	-	-	0.015	0.296	0.151	0.151	0.188	0.736	-	-	-	-	-	-	-	-	-	24.899	0.007		
89	Dhor jal	-	0.425	-	-	-	-	-	0.700	-	-	-	-	-	-	-	-	-	15.780	0.003		
222	Polo	-	-	-	-	-	-	-	-	-	-	-	0.025	0.055	-	0.017	-	-	7.429	-		
175	Kathijal	-	-	-	0.355	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
271	Suti jal	-	3.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
286	Deal trap	-	0.337	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	222220.052	100		

– denotes zero catch

Appendix 5 Table E Percentage monthly catch from low elevation floodplains/beel by gear type: outside FCDI (sites NW17+NW18)

Gear Code	Gear name	Year : 1992												Year : 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
45	Ber jal	24.992	29.017	36.850	51.553	-	-	22.241	-	18.462	33.491	60.006	36.062	23.293	38.917	39.893	1.209	8.718	21218.963	32.732									
270	Katha	-	-	-	-	-	7.257	-	-	-	-	-	-	-	4.096	18.536	87.005	21.844	7975.138	12.302									
202	Moi jal	5.146	19.473	-	-	-	-	-	-	-	54.967	32.183	26.571	3.200	3.574	9.112	-	-	7766.549	11.980									
88	Current jal (Stationary)	5.446	4.122	0.934	22.978	11.873	13.594	8.914	16.084	4.171	2.444	3.515	16.586	40.948	0.452	0.273	0.753	0.697	6631.230	10.229									
297	Horhori	33.653	-	16.686	-	-	-	-	-	-	5.672	-	6.357	16.017	9.668	6.445	2.295	3.692	4721.412	7.283									
272	Daun	0.525	-	-	-	-	-	-	-	73.982	1.177	4.126	10.594	4.052	-	-	-	-	3483.230	5.373									
307	Hand fishing	-	8.343	2.908	-	-	5.596	0.459	-	-	-	-	-	-	7.839	10.396	-	7.511	2010.838	3.102									
123	Kol jal	1.272	6.269	1.600	6.439	-	-	-	-	-	-	-	-	0.031	10.285	2.538	0.535	0.751	2000.923	3.087									
30	Sip	0.061	0.307	0.821	-	-	-	-	-	-	-	-	0.541	1.347	5.873	4.876	5.747	0.917	1867.336	2.881									
95	Doiar trap	11.303	20.092	24.724	-	-	-	-	-	1.748	1.904	0.035	-	0.716	7.131	2.429	-	-	1582.568	2.441									
266	Veshal	1.315	3.872	-	-	-	-	-	-	-	0.153	-	3.288	1.301	4.408	-	-	-	1110.209	1.713									
164	Jhaki jal	1.933	2.565	8.176	3.409	31.906	-	-	-	-	-	-	-	1.363	3.837	1.202	1.088	2.532	1031.729	1.592									
302	Kua	-	-	5.853	-	-	23.811	-	-	-	-	-	-	-	-	-	-	33.758	705.200	1.088									
298	Akra	-	2.254	0.774	8.404	4.029	2.677	3.582	-	-	-	-	-	-	0.629	2.104	1.023	16.625	622.161	0.960									
255	Thella jal	14.356	2.024	0.370	-	-	-	2.409	-	1.637	-	0.043	-	2.569	0.997	0.892	0.344	-	614.681	0.948									
306	Baoli jal	-	-	-	-	-	-	-	-	-	-	-	-	3.762	-	-	-	2.954	525.942	0.811									
276	Hat panch	-	1.065	-	-	-	47.066	62.396	-	-	-	-	-	-	1.130	-	-	-	422.631	0.652									
282	Current jal (Drifting)	-	-	-	-	-	-	-	-	-	-	-	-	1.212	0.833	-	-	-	298.782	0.461									
175	Kathi jal	-	-	-	-	-	-	-	83.916	-	-	-	-	-	-	-	-	-	81.840	0.126									
170	Juti	-	-	-	-	-	-	-	-	-	-	-	-	-	0.332	-	-	-	59.200	0.091									
317	Thushi	-	-	-	-	52.192	-	-	-	-	-	-	-	-	-	1.305	-	-	57.040	0.088									
89	Dhor jal	-	0.199	-	-	-	-	-	-	-	0.192	-	-	-	-	-	-	-	39.004	0.060									
286	Deal trap	-	0.399	0.303	-	-	-	-	-	-	-	0.092	-	-	-	-	-	-	-	-									
314	Boat Katha	-	-	-	7.218	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	64826.605	100									

Note: - denotes zero catch.







Appendix 5 Table G Percentage monthly catch from low elevation floodplains/beel by gear type: North Central Region, outside FCDI (sites NC27 + NC28)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
263	Ucha	-	-	54.661	50.187	48.313	-	4.279	21.440	-	-	-	-	-	74.562	64.539	44.242	30.773	13.898	5.254	1219.821	39.552							
302	Kua	-	-	-	-	-	28.892	-	-	-	-	-	-	-	-	-	-	16.781	-	56.970	386.780	12.541							
88	Current jal (Stationary)	15.296	5.987	-	-	-	-	-	-	-	-	38.231	64.530	12.815	9.391	7.987	17.569	3.354	-	-	356.979	11.575							
164	Jhaki jal	79.244	89.639	39.146	13.662	1.431	17.189	-	3.887	27.221	64.272	-	-	-	-	23.595	11.936	5.780	-	1.984	-	261.150	8.468						
89	Dhor jal	5.460	4.072	3.900	33.421	2.024	22.400	0.948	13.202	-	-	-	10.157	-	-	1.271	9.882	12.970	37.561	-	-	206.305	6.689						
255	Thella jal	-	-	-	-	-	-	2.614	47.658	36.975	35.728	-	-	-	-	-	15.811	4.407	2.815	1.266	-	170.405	5.525						
95	Doiar trap	-	-	-	-	11.966	20.793	-	-	-	-	100.000	-	-	-	-	-	7.867	39.522	4.840	-	146.987	4.766						
270	Katha	-	-	-	-	12.825	-	-	-	-	-	-	-	-	-	-	-	-	-	29.686	138.400	4.488							
278	Nol barsi	-	-	-	-	23.441	-	-	13.813	-	-	-	25.313	-	-	-	8.089	2.845	-	-	-	72.397	2.347						
30	Sip	-	0.302	2.293	2.729	-	-	-	-	-	-	-	-	-	7.088	1.204	-	-	-	-	-	50.401	1.634						
296	Tukri	-	-	-	-	-	-	-	-	-	-	-	-	-	4.729	-	1.519	1.009	1.508	-	-	42.111	1.365						
45	Ber jal	-	-	-	-	-	-	92.159	-	-	-	61.769	-	-	-	-	-	-	-	-	-	24.025	0.779						
272	Daun	-	-	-	-	-	-	-	-	-	-	-	-	-	0.807	-	-	-	-	-	-	4.954	0.161						
314	Boat Katha	-	-	-	-	-	10.726	-	-	-	-	-	-	-	-	-	-	-	1.343	-	-	2.162	0.070						
170	Juti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.533	-	-	-	-	1.179	0.038						
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	3084.056	100						

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Appendix 5 Table II Percentage monthly catch from low elevation floodplain/beel by gear type: North Central Region, outside FCDI (site NC31)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%								
302	Kua	-	-	-	4.154	34.064	44.916	-	-	-	-	-	-	-	-	-	51.781	71.699	93.806	3098.150	28.901								
255	Thella jal	2.495	-	-	55.222	37.273	25.953	-	-	-	-	-	-	-	-	-	22.356	10.092	-	1697.730	15.837								
88	Current jal (Stationary)	11.526	15.960	51.437	0.319	-	-	31.692	-	4.498	11.898	19.618	29.206	29.565	10.796	3.950	0.397	-	-	1278.539	11.927								
263	Ucha	-	-	-	3.659	0.744	-	-	-	-	-	-	-	-	-	-	5.822	-	-	1044.320	9.742								
272	Daun	3.307	4.347	5.542	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	674.950	6.296								
45	Ber jal	67.041	34.328	-	22.955	-	-	-	-	-	-	-	-	-	-	-	-	-	-	657.342	6.132								
164	Jhaki jal	-	-	-	8.586	15.025	29.131	77.808	93.688	-	-	-	-	-	-	6.393	1.291	13.744	4.152	411.773	3.841								
266	Vesha l	1.111	45.365	17.144	-	-	-	-	-	12.900	0.977	11.006	15.362	10.937	-	-	-	-	-	391.149	3.649								
30	Sip	-	-	25.877	-	-	-	-	6.312	5.776	7.416	15.001	7.139	7.077	3.132	-	-	-	-	369.263	3.445								
95	Doar trap	-	-	-	-	5.590	-	-	-	43.994	4.049	1.553	-	-	-	8.861	-	-	-	307.381	2.867								
278	Nol barsi	3.251	-	-	-	-	-	-	-	32.833	2.396	7.123	1.584	-	-	5.876	2.419	0.617	-	277.860	2.592								
307	Hand fishing	-	-	-	3.579	7.159	-	-	14.188	-	-	-	-	-	-	5.943	1.984	3.450	2.042	237.191	2.213								
222	Polo	-	-	-	1.526	0.145	-	-	-	-	-	-	-	-	-	4.525	1.535	-	-	136.500	1.273								
105	Dharma jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.885	1.645	-	-	85.169	0.794								
296	Tukri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.798	0.250								
170	Juti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.258	-	-	-	25.902	0.242								
202	Moi jal	11.269	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	10720.017	100								

Notes: 1. No fishing activities were observed in February 1993

2. - denotes zero catch

Appendix 5 Table 1 Percentage monthly catch from combined low elevation floodplains/heel by gear type: North Central Region, outside FCDI (sites NC23+NC27+NC28+NC31)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994				Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
255	Thella jal	3.074	2.300	8.585	29.896	15.534	12.790	3.797	27.226	44.645	36.940	22.827	1.448	19.575	18.173	44.823	23.576	14.705	6.677	2.017	7964.205	23.875									
302	Kua	-	-	-	8.768	48.610	67.912	-	-	-	-	-	-	-	-	-	-	-	-	-	7762.820	23.272									
266	Veshal	9.894	32.163	2.925	0.620	0.419	-	-	-	-	-	33.446	1.184	12.938	8.918	23.367	3.795	-	-	-	2844.476	8.527									
263	Ucha	-	-	1.640	6.102	10.300	-	4.088	7.510	-	-	-	-	-	-	-	8.326	6.365	0.734	1.351	2478.942	7.431									
88	Current jal (Stationary)	10.878	17.553	14.278	0.112	-	-	-	-	12.534	61.995	1.893	18.241	15.650	15.327	10.492	6.112	3.923	0.325	-	2462.050	7.381									
164	Jhaki jal	9.264	20.064	5.401	20.574	9.710	10.541	2.309	28.399	28.746	-	2.547	-	0.985	-	2.831	17.584	2.485	6.622	2.564	2276.011	6.823									
45	Ber jal	27.741	21.405	55.329	27.358	-	-	88.192	-	-	-	-	61.115	21.543	4.632	-	4.857	-	-	-	1344.117	4.029									
307	Hand fishing	-	-	3.606	1.252	2.632	1.061	0.381	11.178	10.183	-	-	0.599	3.975	8.848	2.385	3.195	0.121	1.541	1.010	1270.029	3.807									
296	Tukri	-	-	-	-	-	1.574	-	0.486	0.562	-	-	-	-	-	-	7.163	-	1.190	1.794	837.840	2.512									
270	Katha	-	-	-	-	2.662	-	-	-	-	-	-	-	-	-	-	-	-	-	7.634	706.900	2.119									
272	Daun	1.204	2.711	0.502	-	-	-	-	-	-	-	-	-	-	3.237	7.290	1.898	3.453	-	-	679.904	2.038									
89	Dhor jal	31.232	0.847	4.864	4.523	0.678	2.543	1.233	13.253	-	-	1.399	0.862	8.702	3.386	1.022	1.246	1.551	2.447	-	621.307	1.863									
30	Sip	0.212	0.640	2.477	0.262	-	-	-	-	-	1.065	3.007	12.150	7.996	4.323	1.720	0.914	0.148	-	-	570.992	1.712									
95	Doiar trap	-	-	-	-	4.538	2.361	-	-	-	-	-	2.764	0.513	-	-	-	5.028	2.087	1.245	454.368	1.362									
278	Nol barsi	1.183	-	-	-	4.865	-	-	4.838	-	-	21.060	1.636	3.617	0.523	0.424	1.759	1.456	0.230	-	387.807	1.163									
170	Juti	0.455	0.879	-	-	-	-	-	-	-	-	13.820	-	1.270	4.594	1.974	0.089	-	-	-	321.304	0.963									
222	Polo	-	-	-	0.534	0.053	-	-	-	-	-	-	-	-	-	0.327	1.905	0.708	-	-	193.962	0.581									
105	Dharma jal	0.763	1.440	0.393	-	-	-	-	-	3.330	-	-	-	-	1.944	-	0.103	-	-	-	93.329	0.280									
298	Akra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.632	-	-	38.157	0.114									
304	Satiber jal	-	-	-	-	-	-	-	7.110	-	-	-	-	-	-	-	-	-	-	-	24.932	0.075									
97	By hand/Dewatering	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.267	-	-	-	21.200	0.064									
314	Boat Katha	-	-	-	-	-	1.218	-	-	-	-	-	-	-	-	-	-	-	0.071	-	2.162	0.006									
123	Koi jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.626	0.002									
202	Moi jal	4.101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	33357.440	100								

Note: - denotes zero catch



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Appendix 5 Table J Percentage monthly catch from high elevation floodplain/beel by gear type: inside FCDI (site NW22)

Gear Code	Gear name	Year: 1992				Year: 1993						Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Oct	Nov	Dec	June	July	Aug	Sep	Nov	Dec	Jan	Feb	Kg	%	
222	Polo	—	—	—	—	—	—	—	—	61.019	25.708	—	928.169	30.855	
95	Dojar trap	100.000	13.022	46.338	—	40.739	56.420	50.457	35.015	2.420	23.309	—	610.015	20.279	
30	Sip	—	7.047	—	73.376	3.822	5.739	0.891	57.806	1.974	—	—	461.182	15.331	
164	Jhaki jal	—	—	—	3.752	55.439	29.994	—	—	4.503	23.147	—	279.218	9.282	
97	By hand/Dewatering	—	71.107	4.282	—	—	—	—	—	3.703	21.987	—	192.981	6.415	
255	Thella jal	—	—	—	—	—	—	—	—	11.285	—	—	139.850	4.649	
296	Tukri	—	—	—	—	—	—	—	—	8.708	0.185	—	109.150	3.628	
278	Nol barsi	—	—	41.017	18.288	—	—	2.599	6.608	0.725	3.455	—	90.350	3.004	
88	Current jal (Stationary)	—	2.819	5.596	4.584	—	—	31.097	0.571	0.721	—	—	67.575	2.246	
307	Hand fishing	—	6.004	2.768	—	—	—	—	—	2.733	0.408	81.732	49.217	1.636	
263	Ucha	—	—	—	—	—	—	—	—	2.209	1.801	—	39.428	1.311	
272	Daun	—	—	—	—	—	7.847	14.207	—	—	—	—	36.942	1.228	
298	Akra	—	—	—	—	—	—	—	—	—	—	18.268	2.820	0.094	
291	Urani	—	—	—	—	—	—	0.748	—	—	—	—	1.260	0.042	
		100	100	100	100	100	100	100	100	100	100	100	3008.157	100	

Notes: 1. No fishing activities were observed from January to May 1993 and October 1993

2. - denotes zero catch

222

Appendix 5 Table K Percentage monthly catch from high elevation floodplain/beel by gear type: inside FCDI (site NW23)

Gear Code	Gear name	Year: 1993										Year: 1994		Total annual catch (Mar'93 - Feb'94)	
		June	July	Aug	Sep	Oct	Nov	Dec	Jan	Kg	%				
95	Dojar trap	100.000	100.000	66.222	89.550	86.109	73.185	-	-	2408.041	82.459	-	-	-	-
97	By hand/Dewatering	-	-	-	-	10.787	9.378	58.873	62.253	225.657	7.727	-	-	-	-
278	Nol barsi	-	-	23.735	6.413	0.182	-	-	-	113.275	3.879	-	-	-	-
307	Hand fishing	-	-	10.043	-	-	17.437	41.127	37.747	90.181	3.088	-	-	-	-
30	Sip	-	-	-	-	2.329	-	-	-	27.668	0.947	-	-	-	-
88	Current jal (Stationary)	-	-	-	1.820	0.261	-	-	-	24.940	0.854	-	-	-	-
272	Daun	-	-	-	1.325	-	-	-	-	15.900	0.544	-	-	-	-
291	Urani	-	-	-	0.892	0.331	-	-	-	14.640	0.501	-	-	-	-
		100	100	100	100	100	100	100	100	2920.302	100	100	100	100	100

Notes: 1. No catch rates were monitored from October to December 1992

2. No fishing activities were observed from January to May 1993 and February 1994

3. - denotes zero catch



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Appendix 5 Table L Percentage monthly catch from combined high elevation floodplains/beel by gear type: inside FCDI (sites NW22 + NW23)

Gear Code	Gear name	Year : 1992				Year : 1993							Year : 1994		Total annual catch (Mar'93 – Feb'93)	
		Oct	Nov	Dec	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
95	Doiar trap	100.000	13.022	46.338	69.229	72.309	60.972	84.741	86.109	39.159	2.190	22.590	—	3018.056	50.908	
222	Polo	—	—	—	—	—	—	—	—	—	55.218	24.914	—	928.169	15.656	
30	Sip	—	7.047	—	22.578	1.786	3.074	0.110	2.329	51.531	1.786	—	—	488.850	8.246	
97	By hand/Dewatering	—	71.107	4.282	—	—	—	—	10.787	1.018	8.949	23.230	—	418.638	7.061	
164	Jhaki jal	—	—	—	1.154	25.905	16.067	—	—	—	4.075	22.432	—	279.218	4.710	
278	Nol barsi	—	—	41.017	5.627	—	11.021	5.944	0.182	5.890	0.656	3.349	—	203.625	3.435	
255	Thella jal	—	—	—	—	—	—	—	—	—	10.212	—	—	139.850	2.359	
307	Hand fishing	—	6.004	2.768	—	—	4.663	—	—	1.893	6.384	1.561	81.732	139.398	2.351	
296	Tukri	—	—	—	—	—	—	—	—	—	7.880	0.180	—	109.150	1.841	
88	Current jal (Stationary)	—	2.819	5.596	1.411	—	—	5.422	0.261	0.509	0.653	—	—	92.515	1.561	
272	Daun	—	—	—	—	—	4.203	2.910	—	—	—	—	—	52.842	0.891	
263	Ucha	—	—	—	—	—	—	—	—	—	1.999	1.746	—	39.428	0.665	
291	Urani	—	—	—	—	—	—	0.875	0.331	—	—	—	—	15.900	0.268	
298	Akra	—	—	—	—	—	—	—	—	—	—	—	18.268	2.820	0.048	
		100	100	100	100	100	100	100	100	100	100	100	100	5928.459	100	

Notes: 1. No fishing activities were observed from January to May, 1993.

Notes: 1. No fishing activities were observed from January to May 1993  
2. — denotes zero catch



Appendix 5 Table M Percentage monthly catch from high elevation floodplain/beel by gear type : North Central Region, outside FCDI (site NC04)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994			Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%										
255	Thella jal	40.729	21.574	33.436	35.299	32.108	—	29.997	82.386	31.145	44.023	37.439	40.913	51.601	15.473	19.115	6.464	14.340	5453.181	40.715										
164	Jhaki jal	14.543	6.295	38.559	48.248	15.857	100.000	70.003	—	58.047	4.228	2.519	20.198	24.483	31.106	39.849	49.076	24.945	2900.670	21.657										
45	Ber jal	3.768	14.732	2.373	—	—	—	—	—	—	22.279	33.263	20.618	6.591	—	—	—	—	1683.193	12.567										
88	Current jal (Stationary)	1.594	45.973	3.744	0.599	1.347	—	—	—	1.261	5.254	4.795	2.427	10.072	1.551	—	—	—	796.498	5.947										
298	Akra	—	—	—	9.968	50.688	—	—	—	—	—	—	—	—	15.112	19.165	44.003	40.264	543.332	4.057										
277	Kachitana	39.047	4.794	6.910	—	—	—	—	—	—	18.646	18.112	—	—	—	—	—	—	537.850	4.016										
266	Veshal	—	—	—	—	—	—	—	—	—	0.680	—	—	0.997	—	—	—	—	367.048	2.741										
270	Katha	—	—	2.689	2.663	—	—	—	—	—	—	—	—	—	14.800	16.581	—	20.451	298.146	2.226										
105	Dharma jal	0.320	6.632	12.288	—	—	—	—	—	0.611	—	—	1.366	2.848	4.603	—	—	—	243.995	1.822										
307	Hand fishing	—	—	—	3.223	—	—	—	—	—	—	—	—	0.695	15.192	—	—	—	203.452	1.519										
291	Urani	—	—	—	—	—	—	—	—	—	—	—	—	1.569	—	—	—	—	90.232	0.674										
278	Nol barsi	—	—	—	—	—	—	—	—	—	0.206	1.641	—	0.472	—	4.255	—	—	80.802	0.603										
30	Sip	—	—	—	—	—	—	1.183	8.935	—	—	—	—	0.044	1.607	0.943	—	—	54.310	0.405										
175	Kathi jal	—	—	—	—	—	—	16.430	—	—	—	2.231	—	—	—	—	—	—	51.177	0.382										
89	Dhor jal	—	—	—	—	—	—	—	—	—	4.684	—	—	—	—	—	—	—	45.171	0.337										
263	Ucha	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	36.208	0.270										
314	Boat Katha	—	—	—	—	—	—	—	—	—	—	—	—	0.629	0.557	0.092	0.458	—	8.166	0.061										
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	13393.431	100										

Notes: 1. No fishing activities were observed from February to March 1993

2. - denotes zero catch

Appendix 5 Table N Percentage monthly catch from high elevation floodplains/beel by gear type: North Central Region, outside FCDI (sites NC08+NC09)

Gear Code	Gear name	Year : 1992						Year : 1993						Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	May	June	July	Aug	Sep	Oct	Nov	Dec	Kg	%	
45	Ber jal	48.296	85.559	—	—	—	80.873	—	50.557	12.017	—	—	1890.636	47.881	
255	Thella jal	51.704	6.850	32.606	100.000	100.000	13.923	73.381	21.687	32.597	26.604	11.594	960.394	24.322	
105	Dharma jal	—	6.658	50.142	—	—	—	8.265	21.476	22.177	3.112	—	418.123	10.589	
307	Hand fishing	—	—	—	—	—	—	—	—	21.442	29.081	83.172	347.338	8.796	
175	Kathi jal	—	—	—	—	—	4.790	1.579	—	5.412	—	—	124.026	3.141	
30	Sip	—	—	—	—	—	0.320	3.119	1.294	2.858	3.218	—	51.669	1.309	
272	Daun	—	—	—	—	—	0.085	9.131	2.359	0.176	—	—	48.008	1.216	
88	Current jal (Stationary)	—	—	—	—	—	0.009	3.268	2.306	0.341	3.575	—	37.036	0.938	
97	By hand/Dewatering	—	—	—	—	—	—	—	—	—	34.410	—	31.760	0.804	
164	Jhaki jal	—	0.933	17.252	—	—	—	—	0.322	2.809	—	—	26.106	0.661	
89	Dhor jal	—	—	—	—	—	—	1.258	—	—	—	5.234	12.152	0.308	
278	Nol barsi	—	—	—	—	—	—	—	—	0.170	—	—	1.381	0.035	
		100	100	100	100	100	100	100	100	100	100	100	3948.629	100	

Notes: 1. No fishing activities were observed from November to December 1992, from January to April 1993 and from January to February 1994

2 - Denotes zero catch





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Appendix 5 Table P Percentage monthly catch from combined high elevation floodplains/beel by gear type: NCR, outside FCDI (sites NC04 + NC08 + NC09 + NC18 + NC19)

Gear Code	Gear name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
255	Thella jal	32.915	12.844	35.448	25.161	77.033	76.592	7.318	35.120	37.392	48.804	46.088	27.251	47.497	50.102	44.716	33.619	26.816	46.869	13.893	13263.927	41.836							
45	Ber jal	15.131	37.158	1.606	-	-	-	-	-	-	-	-	55.287	24.076	17.178	6.242	-	-	-	-	-	4231.162	13.346						
164	Jhaki jal	7.981	4.110	28.083	22.060	11.245	9.425	7.445	6.040	58.453	21.784	37.483	1.742	1.824	5.188	14.827	20.367	13.762	23.044	19.406	3561.780	11.234							
105	Dharma jal	16.379	8.619	14.880	1.911	1.441	-	-	-	-	-	0.387	-	1.328	20.820	7.397	3.136	0.752	6.604	-	2703.318	8.527							
89	Dhor jal	-	0.136	-	2.648	0.670	-	-	3.122	-	-	6.605	2.289	0.646	-	4.956	0.783	19.634	-	1.736	1100.286	3.470							
88	Current jal (Stationary)	0.727	19.929	2.788	9.149	6.233	2.417	-	0.498	-	-	0.799	2.877	5.463	1.300	5.910	2.639	0.909	4.766	0.114	1088.837	3.434							
307	Hand fishing	-	-	-	1.124	-	-	-	4.913	-	-	-	-	-	-	5.833	10.095	6.625	-	1.400	965.647	3.046							
270	Katha	-	-	1.820	0.928	-	-	38.826	32.431	-	-	-	-	-	-	-	8.448	3.407	-	40.156	803.826	2.535							
30	Sip	8.436	0.147	8.005	32.912	0.146	0.016	-	-	4.155	0.564	5.657	0.187	0.446	1.225	5.538	1.180	0.843	2.160	-	792.740	2.500							
302	Kua	-	-	-	-	-	-	44.960	-	-	-	-	-	-	-	-	8.248	21.534	-	6.585	709.700	2.238							
298	Akra	-	-	-	3.475	3.231	-	-	0.697	-	-	-	-	-	-	-	8.626	4.581	12.350	10.325	568.786	1.794							
277	Kachitana	17.803	2.076	4.677	-	-	-	-	-	-	-	-	6.621	13.110	-	-	-	-	-	-	537.850	1.696							
266	Veshal	-	-	-	-	-	-	-	-	-	-	-	0.241	-	3.642	0.557	-	-	-	-	367.048	1.158							
175	Katha jal	-	-	-	-	-	-	-	-	-	7.826	-	2.806	1.752	-	0.428	-	-	-	-	175.203	0.553							
272	Daun	0.629	9.582	1.299	0.633	-	-	-	-	-	10.441	2.981	0.287	1.027	0.410	0.606	-	-	-	-	157.443	0.497							
170	Juti	-	-	-	-	-	-	-	-	-	-	-	-	-	0.081	0.940	-	-	2.276	-	131.215	0.414							
278	Nol barsi	-	5.399	1.396	-	-	-	-	-	-	1.483	-	0.121	2.833	-	0.277	-	0.874	-	-	129.761	0.409							
296	Tukri	-	-	-	-	-	-	-	15.050	-	9.100	-	-	-	0.054	0.157	0.658	-	0.437	1.430	102.296	0.323							
291	Urani	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.877	-	-	-	-	90.232	0.285							
202	Moi jal	-	-	-	-	-	10.122	1.155	0.904	-	-	-	-	-	-	-	-	-	3.560	2.197	80.272	0.253							
123	Koi jal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.344	0.198	0.244	-	-	44.514	0.140							
263	Ucha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.352	-	-	-	-	36.208	0.114							
97	By hand/Dewatering	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.685	-	-	-	31.760	0.100							
314	Boat Katha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.318	0.019	0.210	0.481	15.296	0.048							
95	Doiar trap	-	-	-	-	-	1.428	-	-	-	-	-	0.290	-	-	0.043	-	-	-	-	12.341	0.039							
149	Horga	-	-	-	-	-	-	-	1.224	-	-	-	-	-	-	-	-	-	-	-	3.038	0.010							
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	31704.483	100							

Note: - denotes zero catch

## APPENDIX 6



Appendix 6 Table A Monthly catch composition from low elevation floodplains/beel (% by weight): inside FCDI (sites NW04 + NW05)

Appendix 6 Table A. Monthly catch composition from low elevation floodplains/pond (%) by weight: major fish species			Year : 1992												Year : 1993												Year : 1994		Total annual catch (Mar'93 - Feb'94)	
Species Code	Habitat Preference	Scientific	Species name												Year : 1993												Year : 1994		Kg	%
			Bengal	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb										
12	Riverine	<i>Aspidopteria jaya</i>	Paili																		0.282	7.207	0.006							
218		<i>Bariilus evezardi</i>																			0.303	7.742	0.007							
59		<i>Bariilus shara</i>	Koksa							0.373												4.032	0.003							
139		<i>Crossochilus latius</i>	Kalabam							0.868												7.118	0.006							
28		<i>Nemachellius boia</i>	Bulicham									0.004			0.083	0.400	0.102					0.215	0.00018							
89		<i>Boia dario</i>	Rani		0.621										0.395	0.400						75.568	0.064							
85		<i>Hilsa ilisha</i>	Fish		0.994										0.308							149.977	0.126							
58		<i>Goniilosa maximina</i>	Goni chripila												0.193							19.650	0.017							
193		<i>Cortia soborna</i>	Kachhi			0.193	0.001								0.185		0.0003					17.010	0.014							
27		<i>Setipinna phasa</i>	Phasa				0.007																							
30		<i>Baleophthalmus boddarti</i>	Dabuk																0.131			16.953	0.014							
185		<i>Brachygnathus nuntus</i>	Nunbaila												0.077	0.014	0.371	0.039				144.296	0.121							
163		<i>Rhinomugil corsala</i>	Khorsala				0.099	0.017	0.984	0.133				0.032								0.872	0.001							
108		<i>Pseudonophis boro</i>	Khuru				1.540							0.153								22.566	0.019							
		<i>Leiognathus equulus</i>	Tak chanda																											
Subtotal				3.496	0.193	1.648	0.017	0.984	0.133	0.868	0.373	0.004	0.425	0.943	0.845	0.414	0.473	0.039	0.131	0.586		473.206	0.398							
130	Migratory	<i>Aorichthys nor</i>	Ayre													0.118	0.161					54.636	0.046							
131		<i>Mystus bleekeri</i>	Goldha tenga				0.191	0.168					0.172		0.055	0.004			0.435			112.025	0.094							
32		<i>Catla catla</i>	Catla			0.061	0.146	0.110							0.095		1.597		0.111			451.434	0.380							
47		<i>Cirrhinus mrigala</i>	Mrigal												0.372							33.974	0.029							
48		<i>Cirrhinus reba</i>	Raik			0.608	0.133	0.379							0.193	1.243	0.579	0.005	0.469			506.122	0.426							
100		<i>Labeo bata</i>	Bata												0.018							1.677	0.001							
102		<i>Labeo calbasu</i>	Kalbasu			0.041	0.461	0.264						0.011	0.185	0.006	0.078		0.199			76.643	0.065							
107		<i>Labeo rohita</i>	Rui			4.651	11.901	18.699	1.107				0.149	0.330	7.280	6.176	1.299	2.165	0.010			1694.160	1.426							
188		<i>Salmostoma bacalla</i>	Katari			2.238	0.877	0.113				0.054																		
189		<i>Salmostoma phulo</i>	Fulchela			5.731						0.054										2883.649	2.427							
154		<i>Securicula gara</i>	Chorn chela			13.343	0.934	0.590	0.055				0.018	0.013	0.509	0.267	0.057		0.072			1.926	0.002							
86		<i>Gudusia chupra</i>	Chupla											0.018	0.570	0.509	0.057				174.186	0.147								
76		<i>Eutropichthys vachha</i>	Bucha												0.044							6.458	0.005							
169		<i>Pseudoeutropius atherinoides</i>	Bansa																			18.821	0.016							
209		<i>Wallagiu attu</i>	Baul				1.299	1.165	0.201								0.071		1.059			247.644	0.208							
216		<i>Nemichellius zonalternans</i>	Baul									0.018										0.862	0.001							
Subtotal				31.916	20.941	15.943	21.488	13.363	1.390	0.923	0.677	0.072	0.668	8.544	8.707	11.717	4.592	2.424	4.363	14.668		6287.791	5.293							
6	Floodplain Resident	<i>Anabas testudineus</i>	Koi		0.071	0.021	1.003	2.039	2.724				0.728	0.002	0.202	0.030			0.672	3.103		272.645	0.229							
136		<i>Mystus tengra</i>	Bejari tenga		2.088	0.049	0.042				0.796	0.805	0.009	0.059		0.049	0.067	0.231	0.692	0.891		284.033	0.239							
137		<i>Mystus vittatus</i>	Tengra		0.587	0.818	1.011	0.830	1.336		0.278	0.454	0.655	0.113	0.177	0.268	0.184	0.080	1.531	7.074		664.083	0.559							
55		<i>Colisa fasciatus</i>	Khalsha		0.670	4.291	1.061	1.295	1.458		0.342	3.202	2.417	4.009	1.464	1.881	1.257	1.754	2.931	3.684		2284.525	1.923							
211		<i>Colisa latipes</i>	Khalsha									2.582	3.817	1.806	0.414	0.382	0.185	0.205		0.070		506.465	0.426							
56		<i>Colisa lalia</i>	Lal khalsha			0.046	0.018		0.058				0.096									4.392	0.004							
57		<i>Colisa soma</i>	Khalsha		2.639	2.678	0.345	0.587	3.282	1.021	1.970	0.015	0.176	0.044	0.044	0.921	0.260		0.961	0.022		531.115	0.447							
210		<i>Xenentodon canalin</i>	Khalsha		4.572	4.551	6.961	4.492	3.733	0.165	0.813	0.611	1.491	4.829	12.389	18.939	14.123	9.917	1.703	6.408		10399.554	8.753							
62		<i>Cyprinus carpio</i>	Karui																0.193	0.529		49.500	0.042							
65		<i>Cyprinus specularis</i>	Mirror carp																0.200	0.529		50.885	0.043							
174		<i>Puntius chola</i>	Chala puti					0.008																						
175		<i>Puntius conchomus</i>	Canchan puti			0.630	1.668	5.316	7.463	6.802	5.974	0.413	1.626	1.585	1.248	1.787	3.503	6.869	5.750	7.528		4537.377	3.819							
176		<i>Puntius gelius</i>	Gilputi			0.062	0.299	0.036	0.413		0.445	1.081	0.887	0.636	0.429	0.128	0.503	0.385	1.012	0.025		679.758	0.572							
178		<i>Puntius phutnio</i>	Phutni puti			0.110	0.988	0.008	0.008		0.249	0.781	0.721	0.760	0.575	0.321	0.621	2.299	1.960			1342.434	1.130							
179		<i>Puntius sarana</i>	Sarputi						0.019																					
180		<i>Puntius sophore</i>	Puti		8.054	7.471	21.253	17.699	11.287	9.926	8.602	6.969	6.027	0.791	0.645	2.559	4.642	3.137	7.007	11.845		4930.911	4.150							
181		<i>Puntius terio</i>	Teri puti			0.179					0.071											0.581	0.0005							
212		<i>Puntius ticto</i>	Tir puti		5.497	1.427	0.003	0.161		0.321						0.040			0.070	0.144		39.790	0.033							
5		<i>Amblypharyngodon mola</i>	Mola			0.276	0.116	0.006		0.466		0.031	0.169	0.004	0.074	0.001	0.001					23.855	0.020							
Subtotal																														
- denotes zero catch																														

Note: - denotes zero catch

V1.1

(Cont.)



Appendix 6 Table A Monthly catch composition from low elevation floodplains/beel (% by weight): inside FCDI (sites NW04 + NW05)

Species		Habitat Preference	Scientific	Species name		Year : 1992				Year : 1993				Year : 1994				Total annual catch (Mar'93 - Feb'94)					
Code				Bengali	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%
69		<i>Brachydanio rerio</i>	Anji																		0.253	0.0002	
75		<i>Esomus danicus</i>	Durkin	0.026	0.046	0.120	0.027	0.424	0.201	0.707	2.319	2.239	0.427	0.057	0.449	0.203	0.004		0.015		243.434	0.205	
83		<i>Glossogobius giuris</i>	Bulla	0.553	2.241	6.005	14.262	14.485	20.267	32.858	9.319	2.647	2.288	2.047	2.716	4.259	2.670	6.885	6.152	4.967	5325.209	4.482	
91		<i>Hypophthalmichthys molitrix</i>	Silver carp																0.178	0.264	39.981	0.034	
110		<i>Lepidosephalus guntea</i>	Gutum	0.194	2.241	2.026	1.577	1.954	11.695	8.867	4.859	9.013	2.473	0.512	0.650	0.236	1.495	3.188	2.156	1.936	2538.639	2.137	
9		<i>Aplochailus panchax</i>	Kanpona	0.001	0.034	0.167	0.103	0.166	0.024	0.604	0.776	0.355	0.479	0.071	0.208	0.038	0.042	0.254	0.001	0.048	167.505	0.141	
39		<i>Channa marulius</i>	Gajer	0.827			0.022	0.044							0.099			0.630	0.277	0.112	207.350	0.175	
40		<i>Channa orientalis</i>	Cheng			0.065				0.058	0.178	1.859	0.209	0.007	0.142						120.251	0.101	
41		<i>Channa punctatus</i>	Taki	16.647	9.134	9.702	11.173	18.701	4.780	1.557	12.439	16.916	6.857	33.529	32.591	25.051	6.465	5.235	3.403	9.412	15728.111	13.239	
42		<i>Channa striatus</i>	Shol	0.358	1.844	2.099	3.439	0.608			0.178	0.352	3.648	3.994	5.572	7.227	8.540	4.467	2.364	3.717	5918.846	4.982	
49		<i>Clarias batrachus</i>	Magur		0.021	0.239	0.626	0.826				0.154			0.009				0.593	1.568	158.838	0.134	
88		<i>Heteropneustes fossilis</i>	Shing	0.527	0.057	0.287	0.900	11.506	0.461	0.205	7.105	1.198	1.093	0.256	0.557	0.482	0.109	0.141	0.693	2.969	618.536	0.521	
121		<i>Macrognathus aculeatus</i>	Tara baui	1.836	0.206	2.141	1.571	0.832	7.616	8.075	8.865	3.599	4.819	0.428	0.505	0.586	0.622	0.243	1.788	1.719	1482.351	1.248	
123		<i>Macrognathus punctatus</i>	Guchi	0.933	5.393	6.756	2.499	4.032	16.721	9.902	7.599	5.098	4.859	3.534	0.936	4.296	2.482	4.513	8.065	5.233	5222.265	4.396	
122		<i>Mistaceimbelus armatus</i>	Burai baui	0.589	0.046	0.404	0.579	0.306					0.023	0.820	1.801	1.805	1.086	0.205	1.550	2.864	1168.013	0.983	
15		<i>Radis badiis</i>	Nari koi	0.004		0.138	0.080	0.877		0.189	0.893	3.867	1.551	0.330	0.180	0.234	0.357	0.663	0.436	0.213	725.091	0.610	
147		<i>Ompok bimaculatus</i>	Kani pabda			0.029		0.334											0.006		1.662	0.001	
148		<i>Ompok pabda</i>	Madhu pabda	0.090	0.453	0.007	0.178	0.213		0.307	0.203	0.710	0.255	0.332	0.314	0.376	4.327	2.207	2.676	1.476	2356.375	1.983	
203		<i>Tetraodon lineatus</i>	Poka		0.025	0.625	0.234	0.243										0.001			0.335	0.0003	
33		<i>Channa chana</i>	Chana		1.124	0.434				0.044	1.219	0.625		0.0004	0.001	0.006			0.003	44.379	0.037		
35		<i>Chanda baualis</i>																					
36		<i>Chanda nama</i>	Nama chanda	3.856	4.274	1.571	0.693	0.063	0.129	1.508	0.892	0.076	1.986	5.857	7.794	1.478	0.641	0.504	0.495	0.121	2269.281	1.910	
37		<i>Chanda rangi</i>	Lal chanda	12.227	22.402	8.036	1.187	7.014	3.062	7.076	3.915	1.629	3.592	4.267	2.454	1.942	0.805	4.689	4.282	0.511	3592.210	3.024	
910		<i>Chanda sp</i>	Chanda													0.852					87.281	0.073	
214		<i>Oryzias melastigma</i>	Kanpona								0.068	0.552									27.312	0.023	
Subtotal				62.854	71.969	75.754	72.660	94.672	84.171	90.450	79.269	71.453	51.974	66.947	75.026	75.541	55.507	57.776	59.810	78.981	74645.411	62.830	
931	Others	Prawn spp.	Chingri/cha	1.735	6.896	6.257	5.519	2.980	14.306	7.758	19.681	28.471	46.933	23.563	15.420	12.327	38.163	39.760	35.675	5.765	37065.078	31.198	
97		<i>Kachuga tectum</i>	Kori kalyan			0.196	0.243																
168		<i>Pomatom</i>	Kakra			0.203	0.073																
207		<i>Trionyx gangeticus</i>	Kachhim														1.264				333.813	0.281	
Subtotal				1.735	6.896	6.655	5.835	2.980	14.306	7.758	19.681	28.471	46.933	23.563	15.420	12.327	39.427	39.760	35.675	5.765	37398.891	31.479	
Grand total				100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	118805.288	100

Note : - denotes zero catch

Appendix 6 Table B Monthly catch composition from low elevation floodplains/beel (% by weight): inside FCDI (sites NW09 + NW10)

Appendix 6 Table B Monthly catch composition from low elevation floodplains/beel (% by weight): Inland FCDI (sites NW09+FNW10)																												
Species Code	Habitat Preference	Scientific	Species name	Year : 1992												Year : 1993						Year : 1994			Total annual catch (Mar'93 – Feb'94)			
				Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%						
13	Riverine	<i>Aspiloptera morar</i>	Pail																						2.647	0.005		
59		<i>Crossocheilus latius</i>	Kalabata																							2.818	0.006	
139		<i>Nemacheilus boha</i>	Balichan																							2.080	0.004	
28		<i>Boita dario</i>	Rani																							0.081	0.0002	
89		<i>Hilsa ilisha</i>	Ilish																							53.044	0.110	
85		<i>Goniilosa manimina</i>	Goni chapla																							49.733	0.103	
58		<i>Carissa soborna</i>	Kachki																							30.300	0.063	
14		<i>Awacous stamineus</i>	Bele																							24.385	0.050	
2		<i>Allia coila</i>	Kajali																							5.851	0.012	
87		<i>Harn bara</i>	Kumkana																									
93		<i>Ichthyocampus carce</i>	Kumirer khil																									
	Subtotal			0.249	0.683			0.031	0.204	0.166	0.236	0.437		10.377	1.582			0.091								170.939	0.354	
130	Migratory	<i>Aorichthys aor</i>	Ayre																							227.904	0.471	
135		<i>Aorichthys seenghala</i>	Guizza																							73.014	0.151	
131		<i>Mystus bleekeri</i>	Golsha tengra																							123.519	0.255	
132		<i>Mystus cavasius</i>	Kabashi																							603.355	1.248	
32		<i>Catla catla</i>	Catla																							7.780	9.129	
47		<i>Cirrhinus mrigala</i>	Mrigel																							9.334	5.966	
48		<i>Cirrhinus reba</i>	Raik																							1.799	0.025	
102		<i>Labeo calbasu</i>	Kalbasu																							3.643	0.754	
103		<i>Labeo dero</i>	Kursha																							6.883	0.210	
107		<i>Labeo rohita</i>	Rui																							31.746	16.668	
188		<i>Salmostoma bacalla</i>	Kamri																							2.772	0.006	
189		<i>Salmostoma phulo</i>	Fulchela																							342.133	0.708	
86		<i>Gudusia chapra</i>	Chapla																							5.452	1393.141	
169		<i>Pseudotropheus atherinoides</i>	Bansa																							0.006	1.392	
944		<i>Ompok pabo</i>	Pabda																							41.588	0.086	
209		<i>Wallago attu</i>	Bawl																							4.354	2.234	
144		<i>Notopisurus chinla</i>	Chinl																							2.561	3.438	
	Subtotal			47.354	4.373	4.813	5.691	6.756	5.979	20.792	15.729	11.323	1.458	15.390	20.962	7.911	0.945	4.111	59.246	51.696		10833.533			22.408			
6	Floodplain Resident	<i>Ambas testudineus</i>	Koi																							19.499	0.040	
136		<i>Mystus tengra</i>	Bajni tengra																							7.804	4.141	
137		<i>Mystus vittatus</i>	Tengra																							3.514	1.399	
55		<i>Colisa fasciatus</i>	Khalasha																							0.621	0.043	
211		<i>Colisa latiosa</i>	Khalasha																							0.431	1.302	
56		<i>Colisa lilia</i>	Lal khalasha																							0.232	0.130	
57		<i>Colisa socia</i>	Khalasha																							0.262	0.258	
210		<i>Xenentodon canalla</i>	Kakka																							8.029	2.719	
60		<i>Ctenopharyngodon idellus</i>	Gheso carp																							0.227	0.020	
62		<i>Cyprinus carpio</i>	Karu																							0.237	0.004	
65		<i>Cyprinus specularis</i>	Mirror carp																							0.471	19.714	
174		<i>Puntius chola</i>	Chala puti																							0.654	0.001	
175		<i>Puntius conchatus</i>	Canchan puti																							1.113	1458.339	
176		<i>Puntius getsi</i>	Gilputi																							0.723	260.852	
178		<i>Puntius phutunio</i>	Phutani puti																							0.041	168.367	
179		<i>Puntius sarana</i>	Sarputi																							4.433	3223.024	
180		<i>Puntius sophore</i>	Puti																								6.666	

Note : - denotes zero catch



Appendix 6 Table B Monthly catch composition from low elevation floodplains/beel (% by weight): inside PCDI (sites NW09 + NW10)

Species Code	Habitat Preference	Scientific	Species name	Year : 1992												Year : 1993												Year : 1994		Total annual catch (Mar'93 - Feb'94)	
				Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Year : 1994	Year : 1994	KG	%							
212		<i>Puntius fero</i>	Bengal	0.368	0.465	0.326	0.181	0.031	-	-	-	-	-	-	-	0.351	-	0.069	-	0.128	0.008	0.002	0.003	0.003	0.003	0.003	0.003	0.003	10.465	0.022	
5		<i>Amblybaryngodon mola</i>	Mela	-	-	-	-	-	-	-	-	-	-	-	-	0.055	0.161	-	-	-	-	0.003	0.001	-	-	-	-	-	28.588	0.059	
69		<i>Brachydanio rerio</i>	Anju	-	-	-	-	-	-	-	-	-	-	-	-	0.224	-	0.032	-	-	-	0.002	-	-	-	-	-	-	1.819	0.004	
75		<i>Esomus danicus</i>	Durkinn	0.061	0.629	0.212	0.124	6.622	-	-	-	-	-	-	-	0.275	0.910	1.178	0.230	0.003	0.030	0.021	-	-	-	-	-	-	63.415	0.131	
83		<i>Glossogobius giuris</i>	Bailla	4.302	6.245	4.091	8.746	8.742	3.016	15.975	11.329	6.190	8.733	3.086	1.603	0.666	2.261	3.048	0.095	0.401	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	1001.372	2.071	
91		<i>Hypophthalmichthys molitrix</i>	Silver carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
110		<i>Lepidocyphalus guntea</i>	Gutum	0.141	1.234	0.814	0.929	6.063	2.420	1.570	1.650	0.112	2.481	1.876	-	1.306	1.173	0.277	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	90.851	0.188	
9		<i>Aplochalchus panchax</i>	Kanpona	0.022	0.260	0.003	-	-	-	-	-	-	-	-	-	0.268	0.591	-	0.032	0.010	0.076	0.025	-	-	-	-	-	-	340.409	0.704	
39		<i>Channa marulius</i>	Gajar	0.089	2.093	0.147	5.367	1.089	41.129	-	-	-	-	-	-	7.723	1.819	1.224	12.033	11.684	4.197	5.843	2.875	0.937	0.937	0.937	0.937	0.937	2948.399	6.098	
40		<i>Channa orientalis</i>	Cheng	-	0.009	-	-	-	-	-	-	-	-	-	-	0.390	1.819	-	-	-	0.163	0.163	0.163	0.163	0.163	0.163	0.163	0.163	46.805	0.097	
41		<i>Channa punctatus</i>	Taki	2.152	8.001	6.151	9.541	3.603	1.075	1.607	0.499	0.808	5.041	7.867	12.764	11.951	3.367	7.794	0.827	3.462	0.827	0.827	0.827	0.827	0.827	0.827	0.827	0.827	2466.789	5.102	
42		<i>Channa striata</i>	Shol	-	2.773	4.766	-	-	-	-	-	-	-	-	-	-	-	-	0.029	1.659	0.644	0.150	-	-	-	-	-	-	167.021	0.345	
49		<i>Clarias batrachus</i>	Magur	-	-	0.021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.045	-	-	-	-	-	-	-	5.250	0.011	
88		<i>Heteropneustes fossilis</i>	Shingi	0.107	2.718	0.018	0.467	0.440	0.072	0.783	0.074	1.262	0.951	1.545	0.042	0.129	-	0.042	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	75.809	0.157	
121		<i>Macrogynathus aculeatus</i>	Tara bati	0.029	1.482	1.037	2.300	1.649	10.802	3.803	4.736	3.142	5.567	3.153	0.217	0.217	1.354	1.381	0.356	1.138	0.356	1.138	0.356	1.138	0.356	1.138	0.356	1.138	673.005	1.392	
123		<i>Macrogynathus punctatus</i>	Guchi	0.044	14.252	3.112	7.845	23.977	24.513	25.550	21.723	2.763	16.254	4.638	0.356	6.318	9.834	11.911	1.520	1.901	1.901	1.901	1.901	1.901	1.901	1.901	1.901	1.901	3474.009	7.186	
122		<i>Maximambulus armatus</i>	Bural bati	27.025	0.730	4.327	2.957	2.862	4.107	4.425	6.984	0.022	0.350	1.205	10.227	8.742	0.576	0.405	0.376	4.028	4.028	4.028	4.028	4.028	4.028	4.028	4.028	4.028	1260.317	2.607	
15		<i>Budis budis</i>	Napti kol	0.001	0.001	0.183	0.003	0.003	0.010	0.005	-	0.022	0.350	0.121	0.098	0.019	0.814	0.145	-	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	116.506	0.241	
147		<i>Ompok bimaculatus</i>	Kam pabla	0.136	0.010	-	0.091	0.017	0.014	0.837	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1538.276	3.182
148		<i>Ompok pabda</i>	Midhu pabla	-	-	0.076	0.983	-	-	-	1.423	0.212	0.030	0.697	2.473	0.025	0.290	-	-	0.478	0.478	0.478	0.478	0.478	0.478	0.478	0.478	0.478	310.341	0.642	
203		<i>Tetraodon auttaia</i>	Potka	-	-	1.578	0.911	-	-	0.038	-	0.136	0.485	0.567	0.206	0.615	1.871	2.233	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	449.186	0.929	
35		<i>Chanda baicalis</i>	Chanda	0.007	0.546	0.184	3.303	0.143	-	0.008	-	1.248	0.895	0.019	0.299	0.035	-	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	180.909	0.374	
36		<i>Chanda nama</i>	Nama chanda	7.315	1.324	0.206	3.303	0.143	-	0.497	9.155	3.868	5.518	5.168	10.484	1.618	0.217	2.530	0.117	0.005	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	893.593	1.848	
37		<i>Chanda rangi</i>	Lal chanda	6.997	7.143	0.726	0.955	0.561	-	0.132	0.061	3.275	9.349	2.345	3.347	3.886	1.937	3.704	0.071	0.188	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	1008.595	2.086	
Subtotal				51.267	89.616	81.287	90.384	91.177	89.327	76.930	73.875	67.629	83.491	64.477	71.490	90.031	38.927	65.228	39.893	42.508	39.893	42.508	42.508	42.508	42.508	42.508	42.508	42.508	26912.326	55.665	
998	Others	Unidentified fish		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.192	0.015
931		Prawn spp.	Chingrit/cha	1.129	5.326	13.899	3.925	2.036	4.491	2.110	10.159	20.610	15.050	9.755	5.965	1.908	60.124	30.569	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	10422.717	21.558	
Subtotal				1.129	5.326	13.899	3.925	2.036	4.491	2.110	10.159	20.610	15.050	9.755	5.965	2.057	60.124	30.569	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	10429.909	21.573	
Grand total				100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	48346.7	100

Legend : - denotes zero catch

Note : - denotes zero catch



Appendix 6 Table C Monthly catch composition from low elevation floodplain/beel (% by weight): inside FCDI (site NW12)

Species Code	Habitat Preference	Scientific	Species name		Year: 1992				Year: 1993								Year: 1994		Total annual catch																
			Bengali		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March '93 - Feb'94	%												
139	Riverine	<i>Nemacheilus botia</i>	Balichata			0.010																											0.497	0.001	
28		<i>Boita dario</i>	Rani	0.014																													77.193	0.140	
89		<i>Hilsa ilisha</i>	Ilish	1.184										0.559	0.441	0.543	0.062																3.385	0.006	
85		<i>Goniolosa manminia</i>	Goni chapila																														130.981	0.238	
58		<i>Cortica soborna</i>	Kachki	0.823	0.195										0.608	1.299	0.212	0.002																34.981	0.064
30		<i>Brachygybius nurus</i>	Nunubailin												0.124	0.123	0.025	0.021	0.093														6.879	0.012	
128		<i>Liza parsia</i>	Bata												0.110																				
922		<i>Liza sp</i>	Bata	1.136																															
185		<i>Rhinomugil corsula</i>	Khorula	0.298	0.008																													13.758	0.025
923		<i>Siamugil cascasia</i>	Bata																															2.382	0.004
81		<i>Gangia youssouffi</i>	Gang tengra	3.454	0.2027	0.0104								0.671	1.5559	1.9649	0.3089	0.0228	0.0925														270.056	0.4903	
130	Subtotal	<i>Aorichthys aor</i>	Ayze	0.860	0.054								0.033	0.023	0.337	0.467	0.650		0.712													133.234	0.242		
135		<i>Aorichthys seenghala</i>	Guizza				0.268							0.046	0.373	0.327		0.183		0.020												66.165	0.120		
131		<i>Mystus bleekeri</i>	Golsna tengra		0.001									0.535	0.173	0.369	0.871	0.045	0.096													177.448	0.322		
132		<i>Mystus cavasius</i>	Kabashi	0.081			0.202		0.450		0.056			0.015			0.103																331.661	0.602	
32		<i>Catla catla</i>	Carla	20.880	4.117		0.658					1.400																							
47		<i>Cirrhinus mrigala</i>	Mrigel	0.683	0.014																														
48		<i>Cirrhinus reba</i>	Ralk	0.048	0.019	0.206																													
100		<i>Labeo bata</i>	Bata	0.014											0.868	0.267	0.091	0.016														76.854	0.140		
101		<i>Labeo boga</i>	Bhangun																																
102		<i>Labeo calbasu</i>	Kalbasu	2.687	0.018	0.261	0.707		2.788					0.051	0.185		0.099																4.547	0.008	
107		<i>Labeo rohita</i>	Rui	21.825	12.194	13.140	9.819														0.633												70.311	0.128	
188		<i>Salmostoma bacaila</i>	Kamari			0.002					0.036					0.101																	37.080	0.067	
189		<i>Salmostoma phulo</i>	Fulchela	0.511	0.502	0.258	0.025		0.050	0.077	0.344	0.143		7.940	22.121	2.995	3.567	0.545	5.150	0.065	0.011											2612.605	4.744		
154		<i>Securicula gora</i>	Chora chela												0.029	0.061																	5.698	0.010	
86		<i>Gudusia chapra</i>	Chapila	0.132	0.812	0.043			0.035					0.557	0.166	0.334	2.024	0.013	0.294		0.014												175.972	0.320	
169		<i>Pseudotropheus atherinoides</i>	Batani																															4.350	0.008
209		<i>Wallagu attu</i>	Bawl	3.463	2.707	11.143	3.488		7.141	6.354								0.003	0.296		3.593												489.946	0.890	
	Subtotal			51.183	20.436	25.052	15.166	1.4666	10.462	6.467	0.3991	8.45	9.0651	23.491	5.0509	7.6033	1.2731	6.0185	6.3685	4.7204												4192.93	7.6139		
6	Floodplain Resident	<i>Anabas testudineus</i>	Koi	0.123	0.660		3.284					1.391	1.047		0.048	0.094																	43.759	0.079	
136		<i>Mystus tengra</i>	Bujari tengra	1.566		0.051	0.419	0.337	3.058	0.368	2.690	0.069	0.144	0.147	1.512	1.284	0.148	5.433	10.558	22.740													2682.018	4.870	
137		<i>Mystus vittatus</i>	Tengra	0.027	0.470	0.217	2.530	2.543	2.680	8.465	0.171	1.949	2.685	0.883	1.056	1.691	0.444	1.140	5.588	6.454													1284.809	2.333	
55		<i>Colisa fasciatus</i>	Khalisha	0.031	2.517	1.327	1.220		6.385	0.004		3.660	0.083	0.085	0.293	0.017	3.127	0.932	0.776	0.004													577.116	1.048	
211		<i>Colisa labiosus</i>	Khalisha								0.037	4.948	0.306	0.202	0.021	0.037	0.406																101.380	0.184	
56		<i>Colisa lala</i>	Lal khalisha		0.090										0.055																			3.534	0.006
57		<i>Colisa sota</i>	Khalisha	0.289	0.530	0.209	0.177								0.014			0.681															49.497	0.090	
210		<i>Xenentodon cancula</i>	Nakka	2.794	0.498	2.475	3.324	0.230	1.502	0.450	0.785	0.536	6.122	3.869	3.593	6.908	8.931	18.636	1.514	7.614													4427.537	8.040	
62		<i>Cyprinus carpio</i>	Karu																															20.742	0.038
187		<i>Osteobrama cotio cotio</i>	Keti													0.048																		3.070	0.006
175		<i>Puntius conchonus</i>	Canchan puri		6.800	1.472	0.557	7.437	9.047	2.889	4.591	1.656	5.177	0.341	1.813	7.159	3.183	3.654	6.490	9.837													2395.422	4.350	
176		<i>Puntius gelius</i>	Gilputi			0.016						0.029	0.085	0.191	0.003			0.129	1.160	0.013	0.129												177.644	0.323	
178		<i>Puntius phutunio</i>	Phutani puri	0.002	0.002							0.291		0.082	0.002	0.101	0.506	0.057															36.077	0.102	
180		<i>Puntius sphore</i>	Puri	4.098	13.796	34.504	31.555	22.843	23.853	24.141	4.425	11.049	20.256	0.099	4.251	6.774	5.932	13.889	36.707	17.049													7430.148	13.492	
212		<i>Puntius ticto</i>	Tit puri	0.362	1.226										0.003	0.002																		16.199	0.029

Note: - denotes zero catch

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Appendix 6 Table C. Monthly catch composition from low elevation floodplain/beel (% by weight): inside FCDI (site NW12)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch March '93 – Feb'94					
				Bengali	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%												
5		<i>Amblyrhynchodon mola</i>	Mola	0.010	0.027	0.010	—	0.011	—	—	—	—	—	0.026	0.057	0.179	0.038	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.124	0.027	
75		<i>Esomus danicus</i>	Darkina	0.036	0.039	0.031	—	0.001	—	—	—	—	—	0.467	0.745	0.229	0.050	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	68.116	0.124	
83		<i>Glossogobius giuris</i>	Bailla	2.938	19.230	9.674	—	6.495	15.167	11.798	19.234	55.827	10.168	3.997	1.613	4.387	3.520	4.281	4.408	2.570	1.302	—	—	—	—	—	—	—	—	—	—	—	2650.909	4.814	
110		<i>Lepidocephalus guntea</i>	Gutum	0.206	1.907	0.410	—	0.079	0.939	1.694	1.985	—	0.330	1.713	1.670	0.248	0.281	3.179	1.124	0.509	0.818	—	—	—	—	—	—	—	—	—	—	—	677.409	1.230	
9		<i>Aplocheilichthys panchax</i>	Kanpoza	—	0.324	0.052	—	—	—	—	—	—	—	0.056	0.321	0.031	0.004	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	27.956	0.051	
39		<i>Channa marulius</i>	Gajar	2.511	0.367	0.275	—	0.861	—	—	—	—	—	—	—	—	1.449	3.960	0.303	0.268	0.873	—	—	—	—	—	—	—	—	—	—	—	381.134	0.692	
40		<i>Channa orientalis</i>	Cheng	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
41		<i>Channa punctatus</i>	Taki	10.874	9.614	7.393	—	5.949	11.200	3.598	13.220	4.274	14.080	5.117	0.233	5.504	8.406	4.020	8.565	11.781	10.111	—	—	—	—	—	—	—	—	—	—	—	3864.852	7.018	
42		<i>Channa striatus</i>	Shol	—	—	0.040	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	107.077	0.194	
49		<i>Clarias batrachus</i>	Magur	—	—	0.037	—	0.155	—	0.272	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.400	0.010	
88		<i>Heteropneustes fossilis</i>	Shingi	0.879	0.454	0.059	—	0.177	0.052	2.190	0.217	0.521	1.335	0.664	0.153	0.244	0.244	0.096	0.041	0.107	0.026	—	—	—	—	—	—	—	—	—	—	—	133.330	0.242	
121		<i>Macrognathus neuleatus</i>	Tara baim	1.158	0.154	0.339	—	2.750	4.194	0.864	2.390	2.223	5.220	8.725	0.915	2.908	2.872	3.568	0.034	2.105	0.572	—	—	—	—	—	—	—	—	—	—	—	1091.142	1.981	
123		<i>Macrognathus panculus</i>	Guchi	3.308	2.093	7.531	—	3.337	23.742	14.126	12.336	6.369	9.592	5.244	3.561	9.691	5.791	6.834	4.019	6.977	6.428	—	—	—	—	—	—	—	—	—	—	—	3547.600	6.442	
122		<i>Mastacembelus armatus</i>	Bam' baim	0.652	0.794	0.072	—	1.709	1.420	0.022	0.047	—	0.253	0.592	0.278	7.093	4.111	0.167	—	1.588	0.163	—	—	—	—	—	—	—	—	—	—	—	788.998	1.433	
15		<i>Badis badis</i>	Napit koi	0.017	0.367	0.081	—	0.158	—	0.159	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	203.545	0.370	
145		<i>Notopierus notopierus</i>	Foli	—	0.018	0.235	—	0.958	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
203		<i>Tetraodon cutcutia</i>	Poka	0.284	0.173	0.156	—	0.137	—	—	0.064	—	—	0.099	0.876	—	0.057	0.134	0.271	0.247	—	—	—	—	—	—	—	—	—	—	—	—	119.043	0.216	
35		<i>Chanda baculis</i>	Chanda	1.146	1.748	2.018	—	0.011	—	0.136	0.893	—	0.564	0.001	7.986	0.057	0.276	0.357	0.371	0.397	4.446	—	—	—	—	—	—	—	—	—	—	—	853.077	1.549	
36		<i>Chanda nama</i>	Nama chanda	3.649	2.271	2.266	—	2.925	0.732	0.468	1.051	3.418	1.771	9.688	9.752	11.152	6.540	1.980	0.771	0.007	1.064	—	—	—	—	—	—	—	—	—	—	—	2185.205	3.968	
37		<i>Chanda nama</i>	Lal chanda	3.457	1.878	0.300	—	3.352	0.791	1.017	0.579	0.299	11.835	8.035	5.763	2.725	1.011	6.266	3.652	0.474	0.742	—	—	—	—	—	—	—	—	—	—	—	1877.879	3.410	
Subtotal				40.412	68.046	71.237	—	72.131	91.625	82.866	88.333	86.152	83.310	80.733	43.654	59.108	62.060	57.403	69.049	90.662	89.704	—	—	—	—	—	—	—	—	—	—	—	37988.6	68.983	
931	Others	Prawn spp.	Chingri/Chn	4.949	11.314	3.654	—	12.701	6.907	6.671	5.199	13.448	8.239	9.529	31.298	33.875	30.026	41.299	24.839	2.969	5.474	—	—	—	—	—	—	—	—	—	—	—	12617.455	22.912	
168		Potamon	Kakra	—	—	0.046	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Subtotal				4.9492	11.314	3.6997	—	12.701	6.9071	6.6713	5.1993	13.448	8.2394	9.5287	31.298	33.875	30.026	41.299	24.839	2.9694	5.4737	—	—	—	—	—	—	—	—	—	—	—	12617.4	22.912	
Grand total																																		55069.115	100

Note: - denotes zero catch



Appendix 6 Table D Monthly catch composition from combined low elevation floodplains/beel (% by weight): inside PCDI (sites NW04+NW05+NW09+NW10+NW12)

Species Code		Habitat Preference	Scientific	Species name	Year: 1992				Year: 1993				Year: 1994				Total annual catch (Mar'93 - Feb'94)							
				Bengali	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
12		Riverine	<i>Aspidoptera jaya</i>	Pali	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.207	0.003	
13			<i>Aspidoptera minor</i>	Pali	-	-	-	-	-	-	-	-	-	0.041	-	-	-	-	-	-	-	2.647	0.001	
218			<i>Barilius evezardi</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.742	0.003	
21			<i>Barilius sharna</i>	Koksa	-	-	-	-	-	-	-	0.222	-	-	-	-	-	-	-	-	-	4.032	0.002	
59			<i>Crossocheilus latius</i>	Kalabata	-	0.053	-	-	-	0.070	0.217	0.045	0.020	0.003	-	-	-	-	-	-	-	9.936	0.004	
139			<i>Nemachellus beata</i>	Balichin	0.038	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	2.295	0.001	
28			<i>Betta dario</i>	Rani	0.444	0.123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.146	0.034	
89			<i>Hilina lilina</i>	Ilsh	0.866	-	-	-	-	-	-	-	-	-	0.375	0.641	0.501	0.014	-	-	-	280.214	0.126	
85			<i>Goni low manminia</i>	Goni chapila	-	-	-	-	-	-	-	-	-	-	0.020	0.243	0.090	-	-	-	-	72.768	0.033	
58			<i>Cortina sobarna</i>	Kachhi	0.110	0.156	0.001	-	-	-	-	-	-	-	-	0.176	0.628	0.049	0.016	-	-	178.291	0.080	
193			<i>Setipinna phasa</i>	Phasa	0.141	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.953	0.008	
27			<i>Baleophthalmus beddardi</i>	Dihuk	-	-	-	-	-	-	-	-	-	-	-	0.077	-	-	-	-	-	-	-	
14			<i>Amiaous stamineus</i>	Be-le	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30			<i>Brachyogobius numus</i>	Numbullin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	179.277	0.081	
128			<i>Liza parva</i>	Beta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.879	0.003	
922			<i>Liza sp</i>	Beta	0.152	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
185			<i>Rhinomugil corsula</i>	Khorula	1.237	0.002	0.051	0.012	0.638	0.022	-	-	-	-	-	-	-	-	-	-	-	0.872	0.0004	
923			<i>Siamugil caesioides</i>	Beta	-	-	-	-	-	-	-	-	-	-	-	0.063	0.076	0.220	0.048	0.069	-	13.758	0.006	
163			<i>Piscicorophis baro</i>	Kharu	-	-	-	-	-	-	-	-	-	-	-	0.103	0.031	0.013	0.042	-	-	22.566	0.010	
2			<i>Alia oxia</i>	Kojuli	-	-	-	-	-	-	-	-	-	-	-	0.111	-	-	-	-	-	24.385	0.011	
81			<i>Gangra youssoufi</i>	Gang tengra	-	-	-	-	-	-	-	-	-	-	0.023	-	-	-	-	-	-	2.382	0.001	
87			<i>Hemibar</i>	Kumbari	-	-	-	-	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
93			<i>Ichthyomphalus curce</i>	Kumirer khil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
108			<i>Leigantius equulus</i>	Thk chanda	-	-	0.796	-	-	-	-	-	-	-	-	0.030	-	-	-	-	-	5.851	0.003	
				Subtotal	2.989	0.335	0.855	0.012	0.644	0.092	0.262	0.247	0.044	0.048	0.418	1.503	1.363	0.288	0.281	0.064	0.069	0.173	914.271	0.411
130		Migratory	<i>Aurichthys aor</i>	Ayre	0.015	0.011	-	-	-	-	-	-	-	0.023	0.007	0.018	0.388	0.178	0.197	0.021	0.291	0.382	415.774	0.187
135			<i>Aurichthys seenghala</i>	Guizun	0.024	-	-	-	-	-	-	-	-	-	-	0.029	0.122	0.076	0.088	0.119	0.003	-	139.179	0.063
131			<i>Mystus bleleri</i>	Gulshen tengra	0.086	0.034	0.102	0.187	0.055	0.017	0.124	0.299	2.037	2.037	0.238	0.051	0.146	0.226	0.007	0.029	0.245	0.518	412.992	0.186
132			<i>Mystus aviasius</i>	Kobushi	0.011	-	-	0.014	0.014	0.675	1.859	0.514	0.311	0.311	0.036	0.013	0.030	0.058	0.944	-	1.227	0.389	935.016	0.421
32			<i>Chitra catla</i>	Citra	3.946	1.295	0.076	0.223	-	-	-	-	-	-	-	-	0.044	-	-	-	-	2.467	0.002	
47			<i>Cirrhinus mrigala</i>	Mrigel	0.350	0.003	0.114	-	-	-	1.289	-	-	-	-	-	0.203	0.028	0.350	0.034	2.890	2.144	1377.350	0.620
48			<i>Cirrhinus reba</i>	Ralk	4.764	0.312	0.136	0.273	-	-	-	-	-	-	-	0.401	0.548	0.675	0.151	0.636	-	1.677	0.001	
100			<i>Labeo bata</i>	Bata	0.002	-	-	-	-	-	-	-	-	-	-	-	0.009	-	-	-	-	1.468	0.426	
101			<i>Labeo boga</i>	Bhangan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.547	0.001	
102			<i>Labeo albasu</i>	Kalbasu	1.712	0.024	0.321	0.345	-	1.374	-	-	-	-	-	0.022	0.233	0.045	0.045	2.235	0.076	937.264	0.422	
103			<i>Labeo dero</i>	Kurba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.465	54.087	0.024	
107			<i>Labeo rohita</i>	Rui	15.851	5.327	10.570	15.657	0.743	0.056	0.182	-	-	-	-	0.054	0.033	2.160	0.466	7.903	7.911	4903.046	2.206	
188			<i>Silimostoma boailin</i>	Katari	-	0.053	0.001	-	-	0.053	0.024	0.024	-	-	0.098	0.032	0.033	-	0.005	0.005	-	33.409	0.015	
189			<i>Silimostoma phulo</i>	Fulchela	4.147	1.327	0.525	0.087	0.073	0.251	0.652	0.731	0.063	0.063	1.847	11.515	4.808	4.525	0.916	1.863	0.091	5838.387	2.627	
154			<i>Seurialia gora</i>	Chora chela	-	-	-	-	-	-	-	-	-	-	-	0.017	0.020	-	-	-	0.014	7.624	0.003	
86			<i>Gudusia chapra</i>	Chapra	5.406	7.103	0.496	0.487	0.569	0.666	0.144	0.445	-	-	0.272	0.949	3.356	1.818	0.075	0.234	1.965	1743.299	0.784	
76			<i>Eutropichthys vacha</i>	Bacha	-	-	-	-	-	-	-	-	-	-	-	0.029	0.010	0.013	0.042	-	0.002	6.458	0.003	
169			<i>Pseudotropheus atherinoides</i>	Bansa	-	-	-	-	-	-	-	-	-	-	-	0.005	-	-	-	-	-	24.563	0.011	
944			<i>Ompok pabo</i>	Padra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.117	-	41.588	0.019	
209			<i>Wallagiu attu</i>	Boul	0.464	0.620	3.790	1.602	0.874	4.348	3.060	-	-	0.001	-	-	0.04	0.001	0.087	2.559	1.233	1371.720	0.617	
144			<i>Notopterus chitala</i>	Chital	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.793	425.286	0.191	
216			<i>Nemachilus zonalternans</i>	-	-	-	-	-	-	-	-	-	-	0.013	-	-	-	-	-	-	-	0.862	0.004	
				Subtotal	36.879	16.109	16.230	19.134	2.328	7.440	8.924	2.137	2.449	2.498	13.101	10.038	9.823	3.129	3.776	21.695	23.782	21314.256	9.591	
																						(Cont.)		

Note: - denotes zero catch



Appendix 6 Table D. Monthly catch composition from combined low elevation floodplains/bed (% by weight): inside I'CDI (sites NW04+NW05+NW09+NW10+NW12)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
				Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
6	Floodplain	<i>Anabas testudineus</i>	Bengali	0.109	0.532	0.531	2.187	1.767	1.507	0.844	1.752	0.763	0.216	0.052	0.131	0.063	0.024	0.353	0.681	335.903	0.151										
136	Resident	<i>Mystus tengara</i>	Kol	1.696	0.409	0.969	0.173	0.153	1.507	0.844	1.752	0.888	0.615	0.103	1.544	1.424	2.292	4.521	11.264	4788.135	2.155										
137		<i>Mystus vittatus</i>	Tengra	0.429	0.885	5.324	2.178	2.100	1.590	6.573	0.756	0.711	1.074	0.354	0.433	0.844	0.189	0.579	2.814	4.774	2666.701	1.200									
55		<i>Colisa fasciatus</i>	Khaliba	0.610	6.590	1.085	1.208	0.994	3.185	0.199	1.912	2.530	2.975	1.027	1.089	0.918	1.677	1.048	1.736	0.825	3178.799	1.430									
211		<i>Colisa labiosa</i>	Khaliba	0.024	0.597	0.010	0.037	0.037	0.016	0.207	1.553	3.648	1.470	0.346	0.212	0.105	0.185	0.004	0.015	0.015	640.328	0.288									
56		<i>Colisa laia</i>	Khaliba	1.920	1.651	0.237	0.490	2.152	0.166	0.493	1.496	1.669	0.027	0.119	0.025	0.545	0.326	0.031	0.505	0.006	79.626	0.004									
57		<i>Xenentodon canaliculatus</i>	Kaika	3.640	2.987	4.357	4.058	2.629	0.820	0.466	0.236	0.587	2.313	4.506	8.112	13.455	10.370	11.791	16.161	4.773	638.618	0.287									
210		<i>Ctenopharyngodon idellus</i>	Gheso carp	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	16415.484	7.387									
60		<i>Cyprinus carpio</i>	Karlu	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	25.857	0.012									
62		<i>Cyprinus specularis</i>	Mirror carp	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	96.242	0.043									
187		<i>Osteobrama cotio cotio</i>	Keil	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	70.599	0.032									
174		<i>Puntius chola</i>	Chala puti	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	3.070	0.001									
175		<i>Puntius conchatus</i>	Canchan puti	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	0.654	0.0003									
176		<i>Puntius gelius</i>	Gilputi	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	8391.138	3.776									
178		<i>Puntius phutuno</i>	Phutanai puti	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	1118.254	0.503									
179		<i>Puntius sarana</i>	Sarputi	0.0002	0.056	0.511	0.006	0.012	0.041	0.011	0.377	0.813	0.603	0.484	0.535	0.376	0.192	0.811	0.536	0.320	1566.878	0.705									
180		<i>Puntius sophore</i>	Puti	6.446	11.306	25.224	21.116	16.419	13.785	16.207	4.814	9.518	9.824	2.637	2.307	6.858	4.341	6.673	11.992	11.374	15584.083	7.013									
181		<i>Puntius terio</i>	Teri puti	4.018	1.111	0.068	0.127	0.005	0.052	0.018	0.324	0.205	0.730	1.219	1.623	4.860	2.985	5.778	6.196	4.647	0.581	0.0003									
212		<i>Puntius ticto</i>	Titi puti	0.001	0.146	0.060	0.007	0.007	0.076	0.018	0.040	0.033	0.145	0.004	0.047	0.003	0.001	0.058	0.033	0.033	66.454	0.030									
5		<i>Amblypharyngodon mola</i>	Mola	0.001	0.146	0.060	0.007	0.007	0.076	0.018	0.040	0.033	0.145	0.004	0.047	0.003	0.001	0.058	0.033	0.033	67.567	0.030									
69		<i>Brachydactylus terio</i>	Anju	0.003	0.211	0.114	0.028	1.438	0.033	0.177	1.553	1.879	0.687	0.021	0.001	0.001	0.062	0.020	0.008	0.002	2.072	0.001									
75		<i>Esomus danricus</i>	Darika	1.451	6.911	6.643	12.222	13.596	10.155	21.766	23.494	4.163	3.509	1.965	3.033	3.205	5.494	5.494	0.008	0.002	374.965	0.169									
83		<i>Glossogobius giuris</i>	Balla	0.003	0.211	0.114	0.028	1.438	0.033	0.177	1.553	1.879	0.687	0.021	0.001	0.001	0.062	0.020	0.008	0.002	8977.490	0.400									
91		<i>Hypophthalmichthys molitrix</i>	Silver carp	0.255	1.726	2.065	2.475	0.394	0.134	7.188	8.762	14.952	6.255	22.955	19.646	17.953	5.282	6.659	3.987	7.569	22059.752	9.927									
110		<i>Lepidocyprinus guinea</i>	Gutum	0.188	1.884	1.327	1.209	2.497	3.574	3.595	3.071	6.810	2.318	0.899	0.385	0.509	1.679	2.078	0.094	0.839	130.832	0.059									
9		<i>Aplocheilichthys punctata</i>	Kanpoua	0.004	0.159	0.102	0.074	0.107	0.004	0.151	0.480	0.341	0.402	0.049	0.104	0.022	0.086	0.151	0.001	0.011	355.645	1.600									
39		<i>Channa marulius</i>	Gajar	0.939	0.673	0.107	0.534	0.220	14.158	0.015	0.106	0.728	0.050	0.050	3.002	3.791	1.127	0.004	0.001	0.011	217.819	0.098									
40		<i>Channa orientalis</i>	Cheng	0.002	0.034	0.003	0.034	0.034	0.034	0.015	0.106	0.440	0.389	0.050	0.050	3.002	3.791	1.127	0.004	0.001	353.683	1.592									
41		<i>Channa punctatus</i>	Taki	13.637	8.910	8.334	9.929	14.730	2.922	7.188	8.762	14.952	6.255	22.955	19.646	17.953	5.282	6.659	3.987	7.569	288.978	0.130									
42		<i>Channa striata</i>	Sbol	0.255	1.726	2.065	2.475	0.394	0.134	7.188	8.762	14.952	6.255	22.955	19.646	17.953	5.282	6.659	3.987	7.569	22059.752	9.927									
49		<i>Channa batrachus</i>	Magur	0.011	0.138	0.485	0.535	0.535	0.134	0.134	0.106	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	169.448	0.076									
88		<i>Heteropneustes fossilis</i>	Shingl	0.510	0.899	0.169	0.715	7.548	1.179	0.366	4.407	1.226	0.986	0.729	0.349	0.340	0.079	0.141	0.385	0.669	82.675	0.372									
121		<i>Macrognathus aculeatus</i>	Tara balm	1.466	0.559	1.413	1.874	1.567	5.386	4.191	6.447	3.810	5.721	0.678	1.187	1.039	1.276	0.376	0.376	1.027	3246.498	1.461									
123		<i>Macrognathus punctatus</i>	Guchl	1.114	7.235	6.232	3.011	11.001	18.124	15.272	8.678	5.584	6.475	3.586	5.141	5.060	5.636	5.859	4.339	1.276	12243.874	5.510									
122		<i>Mastacembelus armatus</i>	Bari balm	4.677	0.396	1.108	0.972	0.951	1.424	1.210	0.716	0.040	0.136	0.681	5.269	4.046	0.810	0.179	1.193	2.144	32173.28	1.448									
15		<i>Basilichthys</i>	Napit kol	0.005	0.076	0.131	0.092	0.569	0.082	0.048	0.533	3.120	1.148	0.382	0.383	0.174	0.539	0.414	0.229	0.133	1045.142	0.470									
147		<i>Ompok bimaculatus</i>	Kani pabda	0.021	0.003	0.015	0.006	0.219	0.005	0.225	0.146	0.020	0.004	0.028	0.510	0.009	0.075	2.851	4.457	1538.276	0.692										
148		<i>Ompok pabda</i>	Madhu pabda	0.064	0.230	0.019	0.188	0.138	0.138	0.138	0.146	0.020	0.004	0.028	0.510	0.009	0.075	2.851	4.457	1538.276	0.692										
145		<i>Notopoma notopoma</i>	Foli	0.004	0.048	0.687	0.210	0.178	0.178	0.178	0.146	0.020	0.004	0.028	0.510	0.009	0.075	2.851	4.457	1538.276	0.692										
203		<i>Tetraodon lineatus</i>	Pokla	0.038	0.048	0.687	0.210	0.178	0.178	0.178	0.146	0.020	0.004	0.028	0.510	0.009	0.075	2.851	4.457	1538.276	0.692										
33		<i>Channa argus</i>	Chaka	0.159	1.089	0.826	0.003	0.168	0.168	0.168	0.146	0.020	0.004	0.028	0.510	0.009	0.075	2.851	4.457	1538.276	0.692										
35		<i>Chanda baculis</i>	Chanda	4.362	3.016	1.488	1.342	0.195	0.252	0.107	0.443	0.728	0.674	0.121	2.287	0.081	0.076	0.056	0.157	0.335	2924.604	1.316									
36		<i>Chanda nama</i>	Nama chanda	10.245	13.786	4.386	1.647	4.786	1.000	2.084	2.433	3.388	5.281	4.617	2.727	2.202	1.959	4.213	0.492	0.492	1078.365	0.485									
37		<i>Chanda ranga</i>	Lal chanda	0.021	0.003	0.015	0.006	0.219																							







Appendix 6 Table 2: Monthly catch composition from low elevation floodplains/beel (% by weight): outside FCDI (sites NW17+NW18)

Species Code	Habitat Preference	Scientific	Species name	Year : 1992												Year : 1993												Year : 1994		Total annual catch (Mar-'93 - Feb-'94)	
				Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%									
6	Floodplain	<i>Anabus testudineus</i>	Bengali																												
136	Resident	<i>Myxus tengra</i>	Koi	0.716	0.103	0.174													0.258	0.356	0.049	0.992	1.449	1.190	242.331	0.374					
137		<i>Myxus vivatus</i>	Tengra	0.626	0.928	4.522	2.282	0.816	13.923	22.303									1.225	0.980	1.036	4.556	2.378	0.905	2563.595	3.955					
55		<i>Colisa fasciatus</i>	Khalisha	0.595	0.494				0.038										0.284	0.943	0.277	0.065		0.602	213.127	0.329					
211		<i>Colisa labiosus</i>	Khalisha																0.079	1.096	0.214	0.010			65.644	0.101					
56		<i>Colisa lalia</i>	Lal Khalisha																						2.810	0.004					
57		<i>Colisa sora</i>	Khalisha	5.857	1.220	0.506	0.026	2.141	0.015											0.200	0.015		0.002			44.943	0.069				
210		<i>Xenotodon canalis</i>	Kaika	0.342	0.068	1.360	3.687	4.093	0.873	3.337	28.309								1.629	0.706	0.886	0.903	1.395	0.716	609.998	0.941					
62		<i>Cyprinus carpio</i>	Karu	0.114	0.563																			1.030	1986.627	3.065					
65		<i>Cyprinus specularis</i>	Mirror carp	0.032	0.160																										
129		<i>Mylopharyngodon piceus</i>	Kalo carp																												
187		<i>Osteobrama coele ostio</i>	Keti																0.026	0.004						0.445	0.001				
175		<i>Puntius conchionus</i>	Canchon pui																0.442	0.934	0.666	0.603	6.992	0.926	132.250	0.204					
176		<i>Puntius gellus</i>	Gilipui																0.006	0.002		0.082	0.151	6.451	1382.119	2.132					
178		<i>Puntius phutunio</i>	Phutani pui																						0.014	9.118	0.014				
180		<i>Puntius sophore</i>	Pui	5.523	29.004	24.931	15.718	8.742	21.517	19.448	0.509								0.003	6.277	4.182	14.314	17.056	6.393	7301.255	11.263	0.006				
181		<i>Puntius terio</i>	Teri pui																							0.141	0.0002				
212		<i>Puntius ticto</i>	Tik pui	1.909	2.675	0.035																			0.091	6.185	0.010				
5		<i>Amblypharyngodon mola</i>	Mola																0.491	0.095	0.105	0.005	0.005	0.005	67.904	0.105					
68		<i>Danio devario</i>	Chebi																	0.004	0.024		0.065			1.569	0.002				
75		<i>Esomus danicus</i>	Duckina	0.017	0.176	0.006			0.191										0.328	0.097	0.073	0.015			0.302	104.495	0.161				
182		<i>Rasbora daniconius</i>	Duckina																												
83		<i>Glossogobius giuris</i>	Bulla	3.336	16.993	14.219	2.891	1.467	3.606	4.705									7.438	5.039	4.967	7.861	2.963	8.371	10.734	3712.680	5.727				
91		<i>Hyporhamphichthys molitrix</i>	Silver carp																												
110		<i>Lepidoxephalus guntea</i>	Gutum	1.755	2.970	1.877	1.222		1.488	0.564									0.191	7.036	0.812	0.400	0.646	2.008	0.911	861.673	1.329				
9		<i>Aplocheilichthys punctata</i>	Kanpona	0.218																					0.060	3.554	0.005				
39		<i>Chauna marulius</i>	Gujar	0.046	0.229																				0.175	99.130	0.153				
40		<i>Chauna orientalis</i>	Cheng																												
41		<i>Chauna punctatus</i>	Taki	0.689	5.044	2.196	3.172	10.028	27.832										0.282	0.222					0.362	22.539	0.035				
42		<i>Chauna striatus</i>	Shol																19.568	1.593	1.893	1.267	0.949	2.201	3.643	1612.029	2.487				
49		<i>Clarias batrachus</i>	Magur																						0.576	12.050	0.019				
88		<i>Heteropneustes fossilis</i>	Shing	0.189	0.253	0.436	0.054		0.728																		4.025	0.006			
121		<i>Macrognathus aculeatus</i>	Tura baui	0.736	0.613	1.482	0.687		1.351										5.057	0.426	0.201	0.199	0.182	0.286	0.143	280.520	0.433				
123		<i>Macrognathus punctatus</i>	Guchi	4.702	3.714	4.696	8.430	4.144	2.705	4.249									29.348	1.603	2.088	2.710	1.314	0.571	0.389	1543.365	2.381				
122		<i>Macromelasma armatus</i>	Bandi baui	1.064	0.903	3.392	9.511	52.192	2.616										0.658	4.264	2.475	4.974	3.401	2.999	3.991	217.569	3.266				
15		<i>Basilichthys</i>	Nipri koi	0.617	0.120	0.005	0.052												7.231	0.101	1.187	6.487	5.514	3.322	4.249	2427.519	3.745				
147		<i>Ompok bimaculatus</i>	Kani pabda																0.066	0.100	0.139	0.030	0.084	0.100	0.108	61.765	0.095				
148		<i>Ompok pabda</i>	Machhu pabda	0.178	0.002	0.169													0.218	0.063			0.056	0.023	6.821	519.653	0.802				
145		<i>Notopoma notopoma</i>	Foli																						2.387	357.251	0.551				
203		<i>Tetraodon lineatus</i>	Pokna	0.170																						147.722	0.228				
33		<i>Channa chinensis</i>	Cheka		0.384	0.516														0.053			0.396	0.080	0.048	70.827	0.109				
35		<i>Channa becaulis</i>	Chanda	0.072	0.507	0.210			0.025										0.013	0.465	0.367	0.049	0.141	0.043		63.726	0.098				
36		<i>Channa nama</i>	Nann chanda	4.685	0.914	1.026			0.123	0.688	8.885								9.115	5.207	6.252	7.438	4.453	1.696	1.165	200.378	0.309				
37		<i>Channa ruanga</i>	Lal chanda	6.999	0.127	0.662	0.052		0.092	0.121									0.732	1.987	3.356	0.451	0.129	1.548	0.483	2361.981	3.644				
214		<i>Oxyeleotris melastigma</i>	Kanpona																0.007							7741.27	1.194				
Subtotal				41.188	70.523	66.802	53.541	92.439	78.199	92.138	53.277								86.425	33.909	40.062	50.958	55.319	64.906	34.290	32076.684	49.481				
120	Others	<i>Macrobrachium rosenbergii</i>	Golda																								0.001				
931		Prawn spp.	Chingri/Chn	38.013	14.839	20.603	5.416	0.612	3.241	1.161									2.643	33.592	28.340	29.427	10.852	8.545	14.908	9686.543	14.942				
Subtotal				38.013	14.839	20.603	5.416	0.612	3.241	1.161									2.643	33.592	28.340	29.427	10.852	8.545	14.908	9687.355	14.943				
Grand total				100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100				

Note: - denotes zero catch



Appendix 6 Table F Monthly catch composition from low elevation floodplain/beel (% by weight): outside PCDI (site NC23)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Total annual catch (Mar'93 - Feb'94)	
				Bengali												Year: 1993												Kg	
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb							
59	Riverine	<i>Crossocheilus latius</i>	Kalabata	-	-	4.703	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
139		<i>Neumachilus botia</i>	Balichata	-	-	-	-	-	-	-	-	-	-	-	-	0.049	-	-	-	-	-	-	-	-	-				
28		<i>Botia dario</i>	Rani	0.172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.408				
29		<i>Botia lohachata</i>	Putul	-	-	-	-	-	-	-	-	-	-	-	-	0.006	-	-	-	-	-	-	-	-	-				
2	Subtotal	<i>Allia colla</i>	Kajuli	0.090	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0002				
				0.262	4.703	-	-	-	-	-	-	-	-	-	-	0.054	-	-	-	-	-	-	-	-	0.454				
130	Migratory	<i>Aorichthys aor</i>	Alre	-	-	-	-	0.111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002				
131		<i>Myxus bleekeri</i>	Golsha tengra	-	-	-	-	0.338	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.045				
132		<i>Myxus cavasius</i>	Kabashil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.266				
32		<i>Catla catla</i>	Catla	9.884	-	-	0.078	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
47		<i>Cirrhinus mrigala</i>	Mrigel	0.714	-	-	-	0.101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.149				
48		<i>Cirrhinus reba</i>	Raika	2.585	9.238	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.110				
100		<i>Labo bara</i>	Bara	0.326	0.167	-	-	-	-	-	-	-	-	-	-	0.021	1.833	0.579	0.205	0.354	0.038	-	-	-	0.412				
102		<i>La beo calbasu</i>	Kalhaus	0.272	-	-	-	0.062	-	-	-	-	-	-	-	0.083	-	-	-	-	-	-	-	-	0.006				
107		<i>La beo robila</i>	Rul	2.490	5.216	0.653	-	3.209	-	-	-	-	-	-	0.109	10.159	2.777	0.787	1.037	4.771	5.467	-	-	-	0.004				
188		<i>Salmostoma bacalla</i>	Kairi	0.045	-	-	-	0.085	-	-	-	-	-	-	0.051	7.084	2.105	0.461	0.059	-	-	-	-	-	0.001				
189		<i>Salmostoma phulo</i>	Fulcheh	0.332	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.124				
154		<i>Securidula gora</i>	Chora cheh	0.017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001				
86		<i>Gudusia chapra</i>	Chapila	1.824	0.125	-	-	0.009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.224				
169		<i>Pseudotripturus atherinoides</i>	Batasi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
209		<i>Walagru attu</i>	Botal	0.362	-	-	0.159	5.457	5.036	-	-	-	-	-	-	0.005	-	-	-	-	-	-	-	-	0.0002				
				18.850	14.746	7.731	0.243	9.287	5.036	-	-	-	-	-	-	7.322	15.742	13.430	2.063	1.798	8.833	3.430	0.837	75.615	0.387				
6	Subtotal		Kol	4.604	21.288	7.349	1.232	5.292	10.938	5.553	-	-	-	-	-	28.397	6.932	1.532	2.471	12.959	3.151	3.805	3.151	8.833	888.821	4.546			
136	Floodplain Resident	<i>Anabas testudineus</i>	Bajari tengra	0.163	-	-	0.249	0.334	-	0.781	0.405	0.147	0.328	-	0.985	0.153	0.011	0.506	0.006	0.011	2.471	12.959	3.151	3.805	734.829	3.758			
137		<i>Myxus tengra</i>	Tengra	2.163	7.574	0.380	2.681	6.818	3.895	0.157	5.841	1.274	0.157	-	0.791	1.784	0.605	0.739	0.455	1.943	2.827	1.601	1.724	283.594	1.450				
55		<i>Colisa fasciatus</i>	Khaliba	9.011	1.721	21.879	7.877	6.859	7.353	1.851	2.838	4.880	6.414	0.821	0.821	3.776	3.027	2.948	2.907	3.563	3.873	2.817	1.527	627.154	3.207				
211		<i>Colisa labiosa</i>	Khaliba	-	-	-	0.026	4.534	-	-	1.576	0.417	0.218	-	0.224	0.636	0.585	0.418	0.145	0.020	0.020	0.020	0.020	25.620	0.131				
56		<i>Colisa laia</i>	Lal khalisha	-	-	-	1.684	0.057	1.588	0.137	0.434	0.417	0.218	-	0.094	1.327	0.111	0.419	0.453	0.353	0.149	0.045	0.229	65.013	0.332				
57		<i>Colisa sota</i>	Khaliba	-	-	-	0.168	1.019	0.153	0.098	0.329	-	-	-	0.094	1.327	0.111	0.419	0.453	0.353	0.149	0.045	0.229	65.013	0.332				
210		<i>Xenentodon canella</i>	Kalka	3.552	1.187	1.418	4.149	0.582	0.053	1.809	3.245	-	-	-	0.064	1.424	5.876	5.117	15.696	3.548	1.887	1.042	0.203	141.0305	7.214				
60		<i>Ctenopharyngodon idella</i>	Gheso carp	-	-	-	-	-	-	-	1.809	2.247	-	-	-	-	-	-	-	0.046	0.089	-	-	-	8.032	0.041			
62		<i>Cyprinus carpio</i>	Karlu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.030	0.218	1.088	3.181	40.594	0.208				
187		<i>Osteobrama cotlo cotlo</i>	Keti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
174		<i>Puntius chola</i>	Chala puti	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
175		<i>Puntius conchatus</i>	Canchan puti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
173		<i>Puntius coarctatus</i>	Kousati	-	-	-	0.003	4.759	1.066	-	-	-	-	-	6.128	1.323	2.195	0.314	2.046	4.917	0.453	0.031	0.031	453.409	0.001				
176		<i>Puntius gellus</i>	Gliputi	-	-	-	0.215	-	-	-	-	-	-	-	-	0.038	-	-	-	-	-	-	-	-	0.135				
178		<i>Puntius phutius</i>	Phutan puti	-	-	-	0.028	0.367	-	-	-	-	-	-	0.206	0.038	-	-	-	-	-	-	-	-	453.409				
180		<i>Puntius sophore</i>	Puti	0.336	0.085	0.083	0.083	0.001	-	-	-	-	-	-	0.206	0.038	-	-	-	-	-	-	-	-	0.093				
181		<i>Puntius terio</i>	Teri puti	10.024	2.508	34.505	40.085	28.019	12.314	30.855	0.066	2.459	0.877	4.103	0.316	0.266	1.788	3.517	0.892	0.301	0.128	0.128	0.128	137.780	0.705				
212		<i>Puntius ticto</i>	Titi puti	4.747	7.300	0.578	1.677	0.461	-	-	0.066	4.988	2.459	0.877	4.103	0.266	1.788	3.517	0.892	0.301	0.128	0.128	0.128	6.622	2328.255				
5		<i>Amblypharyngodon mola</i>	Mole	0.716	1.167	0.053	0.947	0.219	0.274	0.203	1.547	0.203	0.219	0.947	0.281	0.003	0.303	0.186	0.733	0.063	0.166	0.166	0.166	4.701	0.024				
69		<i>Brachydanio rerio</i>	Aju	-	-	-	-	0.461	-	-	0.203	0.219	0.947	0.281	0.003	0.303	0.186	0.733	0.063	0.166	0.166	0.166	0.166	60.558	0.310				
68		<i>Danio devario</i>	Chebi	-	-	-	-	0.947	-	-	-	-	-	-	1.176	16.762	5.793	0.154	0.001	0.291	-	-	-	-	109.144				
75		<i>Exocoetis danicus</i>	Dankina	25.311	0.125	-	0.051	0.016	0.586	0.173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.191				
182		<i>Rasbora daniconius</i>	Dankina	-	-	-	0.005	0.665	-	-	-	-	-	-	1.191	1.305	1.230	0.053	0.188	0.012	0.327	-	-	-	39.486				
83		<i>Glossogobius giuris</i>	Dankina	0.230	0.292	0.357	0.003	0.025	0.576	2.342	0.412	1.671	2.450	9.827	0.368	1.525	0.416	1.046	3.618	0.265	0.363	0.180	0.180	316.567	1.619				
91		<i>Hypophthalmichthys molitrix</i>	Baika	-	-	-	1.785	1.212	-	-	-	-	-	-	9.827	0.368	1.525	0.416	1.046	3.618	0.265	0.363	0.180	1.880	0.010				
91		<i>Silver carp</i>	Silver carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
43		<i>Chela cachus</i>	Chep cheh	0.017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
109		<i>Lepidocephalus berdmorei</i>	Pulya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.067				
110		<i>Lepidocephalus guntree</i>	Gutum	1.064	1.926	1.975	3.077	1.314	4.835	5.843	13.343	12.806	2.325	0.088	6.120	0.208	0.877	1.272	3.293	4.128	1.900	0.698	0.698	646.175	3.305				
111		<i>Lepidocephalus litorea</i>	Pulya	-	-	-	-	0.176	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.067				
9		<i>Aplocheilichthys panchax</i>	Karpoua	0.368	-	-	0.246	0.047	0.403	-	0.042	-	-	-	0.127	0.420	-	-	0.085	-	-	-	-	-	6.763				
40		<i>Chauna orientalis</i>	Cheng	-	-	-	-	0.696	-	-	-	-	-	-	-	-	-	-	0.124	-	-	-	-	-	8.060				
41		<i>Chauna punctatus</i>	Taki	3.315	17.211	16.209	10.141	16.421	14.774	16.743	10.575	3.734	5.371	-	9.179	4.805	2.285	2.472	2.602	17.733	45.916	28.670	28.670	2979.643	0.041				
																									15.238				

— denotes a zero catch

(Cont.)

Note: - denotes a zero catch

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Appendix 6 Table P Monthly catch composition from low elevation floodplain/beel (% by weight): outside PCDI (site NC23)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
42	Bengal	<i>Channa striatus</i>	Shol	0.234	-	0.770	1.224	5.018	-	-	-	-	-	-	-	-	-	-	0.265	1.572	9.228	14.068	279.825	1.431							
49		<i>Clarias batrachus</i>	Magur	-	-	0.209	0.222	0.574	21.969	-	2.339	-	-	-	-	-	-	-	0.036	1.611	5.842	2.034	307.235	1.571							
150		<i>Oreochromis mossambica</i>	Tilapia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.074	0.191	-	-	22.594	0.116							
151		<i>Oreochromis nilotica</i>	Nilotika	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.278	0.017							
88		<i>Oreochromis nilotica</i>	Shingil	0.076	0.250	2.347	3.371	4.396	-	8.711	12.110	22.552	37.030	8.194	11.579	0.943	0.369	2.771	3.874	14.841	10.947	16.314	1143.861	5.850							
121		<i>Heteropneustes fossilis</i>	Tara balin	1.715	1.493	0.274	0.315	0.243	-	3.396	0.651	10.227	8.300	12.403	7.595	2.080	0.434	0.509	1.472	1.604	1.738	0.088	0.098	254.607	1.302						
122		<i>Macrognathus aculeatus</i>	Guchl	1.911	0.063	1.627	1.475	1.454	-	3.396	0.651	10.227	8.300	12.403	2.054	0.681	3.298	2.661	4.484	9.039	2.751	1.459	1.551	999.113	5.110						
123		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
122		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
122		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
122		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
122		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
122		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
122		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
122		<i>Macrognathus paucicaudus</i>	Barn/balin	-	-	0.283	-	0.094	0.094	0.237	-	-	-	-	13.798	-	1.007	0.687	0.101	0.117	0.291	0.641	0.411	61.987	0.317						
138		<i>Nandus nandus</i>	Bheda	-	-	-	-	0.011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
15		<i>Basilichthys</i>	Najit kol	-	-	0.519	0.595	0.665	0.216	-	0.211	-	-	0.344	1.042	0.342	0.098	0.740	0.100	0.051	0.160	0.118	65.810	0.337							
145		<i>Notopterus notopterus</i>	Foll	-	-	-	-	0.273	-	-	-	-	-	-	-	0.195	-	-	0.109	-	0.242	0.529	14.378	0.074							
203		<i>Tetraodon lineatus</i>	Pokla	-	-	0.029	0.004	0.346	-	-	-	-	-	-	-	-	0.262	2.265	-	-	0.091	-	152.402	0.779							
33		<i>Channa chaca</i>	Chaka	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.025	0.0001							
35		<i>Channa baculis</i>	Chanda	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.296	0.022							
36		<i>Chanda nama</i>	Nama chanda	1.152	1.245	0.078	0.070	0.364	-	-	0.116	-	-	-	1.125	1.048	0.282	1.326	0.047	0.057	-	-	105.575	0.540							
37		<i>Chanda ranga</i>	Lal chanda	5.389	4.536	1.071	1.605	0.575	0.040	0.295	0.301	0.049	2.619	0.920	3.606	11.653	2.512	2.559	0.189	0.171	0.016	-	320.295	1.638							
	Subtotal			75.773	71.733	95.602	92.966	86.697	91.368	82.235	80.765	77.897	47.692	86.201	89.427	61.696	31.954	54.519	83.576	95.089	89.764	85.092	14054.980	71.880							
117	Others	<i>Macrobrychium sylferus</i>	Gura icha	-	-	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
931		Prawn spp.	Chingrit/icha	5.115	8.818	3.661	6.790	4.014	3.596	17.765	19.235	22.103	52.308	13.798	3.251	22.508	54.616	41.841	14.361	3.111	1.403	8.602	4609.171	23.572							
	Subtotal			5.115	8.818	3.666	6.790	4.014	3.596	17.765	19.235	22.103	52.308	13.798	3.251	22.508	54.616	41.841	14.361	3.111	1.403	8.602	4609.171	23.572							
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100						

Note: - denotes zero catch









Appendix 6 Table H Monthly catch composition from low elevation floodplain/beel (% by weight): outside FCDI (site NC31)

Appendix 6 Table H. Monthly catch composition from low elevation floodplain/bee! (% by weight): outside FCDI (site NC31)																															
Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)	
				Aug	Sep	Oct	Nov	Dec	Jan	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%								
180		<i>Puntius sophore</i>	Bengali	4.823	2.301	6.909	8.913	23.204	4.647	26.770	9.495	23.684	6.221	12.413	7.170	5.059	10.352	12.807	28.110	10.865	17.696	1685.397	15.722								
181		<i>Puntius terio</i>	Puti	1.568																											
212		<i>Puntius ticto</i>	Teri puti		2.006		2.874	0.525	0.076		0.951	18.444	1.214	0.508	0.645	0.097	0.462	0.326		1.714	1.921	63.096	0.589								
5		<i>Amblypharyngodon mola</i>	Tril puti	1.024	0.764		0.022		0.105	2.752		3.142	0.489	1.568	1.068	0.177	0.061					18.994	0.177								
68		<i>Danio devario</i>	Mola		0.791		0.018		0.231						0.314	0.073		0.019				2.424	0.023								
75		<i>Esomus daniconius</i>	Chebi		0.791		0.018		0.231						0.314	0.073		0.019				2.424	0.023								
182		<i>Rasbora daniconius</i>	Darkina	0.624	0.033	0.215	11.611	0.238	0.185	3.960	7.214	0.838	0.349	0.359	0.071		0.492	0.222	1.182	0.312	0.332	57.703	0.538								
83		<i>Glossogobius giuris</i>	Drnkina																												
82		<i>Glossogobius giuris</i>	Balla	8.678	2.198	2.418	1.432	1.016	3.271	4.136	1.584		5.480	3.573	3.485	1.693	0.212	0.053	0.729	1.323	2.625	121.230	1.131								
91		<i>Hypophthalmichthys molitrix</i>	Silver carp																												
43		<i>Chela cachius</i>	Chep chela	1.793																											
110		<i>Lepidocephalus guntea</i>	Gutum	0.202	0.310		2.182	2.670	2.355	3.413	4.901	6.705		0.035	0.591	0.021	0.707	1.905	2.203	0.920	1.911	147.124	1.372								
9		<i>Aplocheilichthys panchax</i>	Kanpota				0.004				0.317										0.053	0.208	0.002								
38		<i>Channa barca</i>	Tila shol																												
39		<i>Channa marulius</i>	Gajar	2.378	2.366	5.280	0.012	0.214	0.467				0.171	0.016	2.197	18.780	1.572		2.326	1.743	0.895	295.636	2.758								
40		<i>Channa orientalis</i>	Cheng												0.015		1.966					34.687	0.324								
41		<i>Channa punctatus</i>	Taki	3.223	2.490	18.356	39.546	32.612	38.429	30.537		5.858	5.988	5.953	21.025	5.573	10.217	29.938	10.916	21.837	19.292	1720.895	16.054								
42		<i>Channa striatus</i>	Shol		1.315	8.343	0.562	2.633	2.726				0.114	0.725	1.913	14.586	11.363	15.871	6.350	5.804	9.930	100.070	9.348								
49		<i>Clarias batrachus</i>	Magur					0.411									0.323	0.078		2.485	3.964	85.456	0.797								
151		<i>Oreochromis nilotica</i>	Nilotica												0.101							0.450	0.004								
88		<i>Heteropneustes fossilis</i>	Shingi	0.044	0.080	28.832	3.312	2.866	1.197	3.693			7.372	0.768	1.414	0.854	3.289	2.622	3.473	4.415	2.328	304.762	2.843								
121		<i>Macrognathus aculeatus</i>	Tara baum	4.039	3.840	1.657	0.229	1.444	0.882		2.227	11.898	3.780	1.416	0.478	2.192	0.232	0.243	0.704	1.359	112.144	1.046									
123		<i>Macrognathus panchax</i>	Guchi	0.271	0.202	1.064	0.691	2.658	1.806		4.612	10.854	3.186	1.721	0.216	14.180	0.512	1.065	4.739	8.063	4.739	453.090	4.227								
122		<i>Mastomembelus armatus</i>	Bural baum	1.350	1.292	1.893	0.012	0.537				1.041	0.139	0.409	0.280	1.523			7.019	3.200	2.805	289.697	2.702								
15		<i>Badis badis</i>	Napit koi	0.060	0.059		0.016	0.093	0.042		0.211		0.521	0.048	0.063	0.009	0.152	0.241	0.389	0.601	0.081	27.068	0.253								
124		<i>Monopterus albus</i>	Kuchin												3.503							15.563	0.145								
147		<i>Ompok bimaculatus</i>	Kani pabda												0.088							0.393	0.004								
145		<i>Notopterus notopterus</i>	Foli			0.089	0.049		0.777							0.408	0.374		0.176	0.404	0.404	15.794	0.147								
203		<i>Tetraodon cutcula</i>	Poika	0.483	0.335	2.853	0.047	0.241	0.567						0.219	0.030	0.501	0.146	0.075		0.275	2.468	0.023								
33		<i>Channa chana</i>	Cheka																			1.477	0.014								
35		<i>Chanda baculis</i>	Chanda		0.011								4.019	0.966	0.271	0.031						30.674	0.286								
36		<i>Chanda nama</i>	Nama chanda	2.510	0.920		0.010	0.007	0.651												0.259	0.801	0.081								
37		<i>Chanda ranga</i>	Lal chanda	1.647	2.115	0.215	0.102	0.154	0.676	1.000			5.523	0.662	2.487	0.441	0.270	0.272	0.321	1.009	1.085	65.113	0.607								
	Subtotal			42.569	41.850	99.232	97.165	98.832	75.275	95.892	63.012	79.764	70.376	53.922	80.226	73.254	81.647	91.918	84.118	77.342	89.504	8802.512	82.115								
931	Other	Prawn spp.	Chingrit/cha	13.332	2.180		1.706	0.960	22.885	4.108	16.624	18.866	10.648	1.237	1.061	13.142	16.655	8.074	11.540	10.666	2.038	1063.480	9.921								
	Subtotal			13.332	2.180		1.706	0.960	22.885	4.108	16.624	18.866	10.648	1.237	1.061	13.142	16.655	8.074	11.540	10.666	2.038	1063.480	9.921								
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	10719.703	100							

Notes: 1. No fishing activities were observed in February 1993.

2. - denotes zero catch



Appendix 6 Table 1 Monthly catch composition from combined floodplains/bed (%) by weight): outside PCDI (sites NC23+NC27+NC28+NC31)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Year: 1994	Year: 1994	Kg	%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
13	Rivine	<i>Aspidopteryx morar</i>	Bergali																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					

Note: - denotes zero catch

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(Cont)



Appendix 6 Table I Monthly catch composition from combined floodplains/beel (% by weight): outside FCDI (sites NC23+NC27+NC28+NC31)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 – Feb'94)	
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%							
83		<i>Glossogobius giuris</i>	Bailla	3.292	1.437	0.588	1.647	2.077	1.924	0.236	1.102	4.452	2.167	8.125	2.647	2.096	2.067	1.310	2.681	0.519	0.734	2.268	555.540	1.665							
91		<i>Hypophthalmichthys molitrix</i>	Silver carp																												
43		<i>Chela chachus</i>	Chop chela	0.662												1.116	0.159													0.058	
109		<i>Lepidocyphalus berdmorei</i>	Puiba									0.051																		0.067	
110		<i>Lepidocyphalus guinea</i>	Gurum	0.639	0.522	1.850	2.800	2.312	3.746	0.272	7.995	9.660	2.844	3.389	0.081	0.739	0.599	2.673	3.536	2.863	1.615	1.738	847.195	2.540						0.0002	
111		<i>Lepidocyphalus ferox</i>	Puiba					0.075																							
9		<i>Lepidocyphalus ferox</i>	Kanpura	0.195		0.216	0.027	0.183			0.023	0.023		0.071	0.115			0.063													
38		<i>Aplocheilichthys punctatus</i>	Tila shol																												
39		<i>Chama bacca</i>	Gajar	0.865	1.481	0.484	0.027	0.079	0.117					0.072	0.011																
40		<i>Chama marulius</i>	Cheng					0.296																						0.208	
41		<i>Chama orientalis</i>	Cheng																											0.886	
42		<i>Chama punctatus</i>	Taki	2.970	4.569	16.028	19.904	24.692	18.654	0.806	14.922	2.158	3.315	7.603	6.024	9.713	3.393	4.110	20.773	19.036	34.830	19.281	4919.852	14.749						0.128	
42		<i>Chama striatus</i>	Sbol	0.124	0.820	1.433	0.874	3.100	0.756					0.048	0.495	0.632	4.882	2.260	4.444	3.601	7.466	9.614	1313.568	3.943						0.128	
49		<i>Chorus barinichus</i>	Magur																											1.267	
150		<i>Chorus barinichus</i>	Thilapia					0.184	0.123	0.395	1.258			0.090	0.398	0.483	0.091	1.166	2.691	2.095	3.989	22.594	0.968							0.068	
151		<i>Oreochromis nilotica</i>	Thilapia																											0.068	
88		<i>Oreochromis nilotica</i>	Nilotica																											0.011	
121		<i>Heterogaster fossilis</i>	Shingi	0.056	0.094	4.678	3.036	3.109	6.160	0.540	12.539	21.403	3.550	9.514	0.886	1.571	0.444	2.874	3.500	8.149	7.937	6.643	1519.193	4.554						0.011	
121		<i>Macrognathus aculeatus</i>	Tara batn	2.381	2.652	0.391	0.255	0.634	0.200			0.681	0.376	9.213	3.246	0.737	0.381	1.601	1.201	1.218	0.312	0.696	397.565	1.192						0.011	
123		<i>Macrognathus punctatus</i>	Guchi	1.157	0.225	1.669	1.477	2.155	2.849	0.085	5.973	5.891	11.606	5.705	2.469	2.732	1.389	6.945	6.715	1.803	2.701	5.693	1590.039	4.767						0.011	
122		<i>Mastacembelus armatus</i>	Bura batn	0.516	0.858	0.459	0.117	0.238	0.178			6.267		8.079	0.095	0.759	0.860	0.449	0.093	3.416	1.706	1.489	387.327	1.161						0.011	
138		<i>Nandus nandus</i>	Bheda					0.005																						0.011	
15		<i>Budis badis</i>	Nagit kol	0.022	0.036	0.456	0.335	0.331	0.152	0.004	0.134	0.015		0.410	0.318	0.233	0.052	0.594	0.161	0.310	0.370	0.132	106.236	0.318						0.011	
124		<i>Monopterus albus</i>	Kuchla													1.157														0.011	
147		<i>Ompok bimaculatus</i>	Kaul pabla													0.029														0.011	
145		<i>Notogaster notogaster</i>	Foll			0.008	0.017	0.167	0.176							0.121	0.135	0.074	0.077		0.205	0.331	30.172	0.090						0.011	
203		<i>Tetraodon lineatus</i>	Poika	0.176	0.209	0.284	0.018	0.281	0.128							0.072	0.125	1.768	0.042	0.044	0.052	0.108	170.410	0.511						0.011	
33		<i>Channa argus</i>	Choka													0.002														0.011	
35		<i>Channa argus</i>	Choka													0.002														0.011	
36		<i>Chanda baiculis</i>	Chanda	1.617	0.969	0.069	0.069	0.598	0.147		0.197	1.094	1.817	1.737	1.290	1.300	0.262	0.977	0.070	0.031	0.096	0.767	153.900	0.461						0.011	
37		<i>Chanda nama</i>	Nama chanda	3.620	2.415	0.965	0.973	0.676	0.195	0.046	0.645	1.621	2.004	2.914	1.816	8.071	1.296	2.180	0.309	0.302	0.454	1.426	446.174	1.338						0.011	
		<i>Chanda ranga</i>	Lal chanda	56.402	39.888	93.828	88.780	85.170	83.380	4.614	66.633	68.104	50.817	79.871	64.914	67.801	43.518	59.561	85.199	87.047	82.717	85.488	245.7221	73.529						0.011	
117	Subtotal	<i>Macrobrachium styliferus</i>	Gura kha																												
931	Others	Prawn spp.	Chingiricha	7.734	3.208	4.364	9.465	10.287	10.499	6.953	33.276	24.164	36.725	12.144	1.950	14.299	45.802	36.325	13.244	10.197	7.740	5.920	6869.707	20.594						0.011	
	Subtotal			7.734	3.208	4.368	9.465	10.287	10.499	6.953	33.276	24.164	36.725	12.144	1.950	14.299	45.802	36.325	13.244	10.197	7.740	5.920	6869.707	20.594						0.011	
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	33357.156	100						0.011

Note: - denotes zero catch



VL17

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Appendix 6 Table J Monthly catch composition from high elevation floodplain/beel (% by weight): inside FCDI (site NW22)

Species Code	Habitat Preference	Species name		Year: 1992				Year: 1993				Year: 1994		Total annual catch (Mar'93 – Feb'94)			
				Oct	Nov	Dec	June	July	Aug	Sep	Nov	Dec	Jan	Feb	Kg	%	
139	Riverine	Scientific	Bengali													1.656	0.055
52		<i>Nemacheilus botia</i>	Balichata													26.505	0.881
		<i>Clupisoma naziri</i>	Muri Bacha													28.161	0.936
189	Subtotal															2.927	0.097
	Migratory	<i>Salmostoma phulo</i>	Fulchela					0.463	1.336				0.085			2.927	0.097
	Subtotal							0.463	1.336				0.085			2.927	0.097
6	Floodplain	<i>Anabas testudineus</i>	Koi		0.508	0.225				1.769		0.101	1.544		14.569	0.484	
137	Resident	<i>Mystus vittatus</i>	Tengra		0.112	0.073	1.207	4.764	0.182		0.453				5.415	0.180	
55		<i>Colisa fasciatus</i>	Khalisha		0.188	4.276		0.757	2.911		0.414	0.160	6.794		55.262	1.837	
211		<i>Colisa labiosus</i>	Khalisha					1.900	0.446						1.315	0.044	
56		<i>Colisa lalia</i>	Lal Khalisha		0.058				3.269						5.425	0.180	
57		<i>Colisa sota</i>	Khalisha	3.185	4.265	26.789		0.307	2.708			3.296	0.883		51.338	1.707	
210		<i>Xenentodon cancula</i>	Kaikka		0.058			9.547	16.072				1.185		44.144	1.467	
175		<i>Puntius conchoniuis</i>	Canchan puti		0.695		27.945	12.755	21.761	3.952	10.661	0.470			131.863	4.383	
176		<i>Puntius gelius</i>	Giliputi		0.116			0.093			0.580	0.257	0.851		12.771	0.425	
178		<i>Puntius phutunio</i>	Phutani puti		0.202				1.784	3.600	0.830	0.183			16.827	0.559	
180		<i>Puntius sophore</i>	Puti		6.386	7.427		8.428	7.849	18.424	4.101	1.757	8.781	25.348	158.353	5.264	
212		<i>Puntius ticto</i>	Tit puti	7.724	0.048	0.271			1.857	7.997	0.913	0.596	2.337		45.648	1.517	
5		<i>Amblypharyngodon mola</i>	Mola					0.614							0.186	0.006	
69		<i>Brachydanio rerio</i>	Anju								1.162		0.007		7.782	0.259	
75		<i>Esomus danricus</i>	Darkina	50.000	2.498	0.289		0.400			6.140	0.352	2.558		62.492	2.077	
182		<i>Rashora daniconius</i>	Darkina		0.003	0.242											
83		<i>Glossogobius giuris</i>	Bailla	9.999	1.022	0.862	9.880	20.466		0.639	0.302	0.588	1.278		30.449	1.012	
110		<i>Lepidoccephalus guntea</i>	Gutum	3.185	0.046	2.177		0.664	1.032	0.797	3.567	0.303	0.417	9.613	35.042	1.165	
9		<i>Aplocheiluis panchax</i>	Kanpowa	6.814	0.853	7.260		1.143	4.931	0.322	9.790	0.298	1.727		89.520	2.976	
39		<i>Channa marulius</i>	Gajar				6.349								3.425	0.114	
40		<i>Channa orientalis</i>	Cheng		36.292	2.116	3.362	9.855							4.797	0.159	
41		<i>Channa punctatus</i>	Taki	0.463	40.038	42.254	46.674	3.049	3.507	12.119	58.347	9.839	23.146	27.538	721.946	23.998	
42		<i>Channa striatus</i>	Shol		1.914	1.546			6.401	9.587		62.414	35.056		1034.805	34.398	
49		<i>Clarias batrachus</i>	Magur									0.240	1.946		15.996	0.532	
88		<i>Heteropneustes fossilis</i>	Shingi		0.239					1.907		0.708	0.108	4.470	13.394	0.445	
121		<i>Macrognathus aculeatus</i>	Tara baim	8.185	0.800	0.249	4.584		5.139	0.697					12.175	0.405	
123		<i>Macrognathus pancalus</i>	Guchi	4.539	1.462	2.131		0.614	5.587	6.974		0.143	0.757	28.004	32.362	1.076	
122		<i>Mastacembelus armatus</i>	Baral baim							1.467					2.470	0.082	
15		<i>Badis badis</i>	Napit koi	1.815	0.485	1.363		0.572	2.675	0.567	0.497	0.533	7.351		64.660	2.149	
203		<i>Tetraodon cutcutia</i>	Polka						0.446			0.615			8.366	0.278	
37		<i>Chanda ranga</i>	Lal chanda	1.815	1.162	0.007		0.400	0.446	0.567					1.816	0.060	
	Subtotal			97.722	99.448	99.555	100.000	76.326	89.005	71.385	97.760	82.852	96.727	94.973	2684.613	89.240	
931	Other	Prawn spp.	Chingri/Icha	2.278	0.551	0.445		23.211	9.659	28.615	1.991	15.009	3.188	5.027	292.619	9.727	
	Subtotal			2.278	0.551	0.445		23.211	9.659	28.615	1.991	15.009	3.188	5.027	292.619	9.727	
	Grand total			100	100	100	100	100	100	100	100	100	100	100	3008.320	100	

Notes: 1. No fishing activities were observed from January to May and October 1993

2. - denotes zero catch



Appendix 6 Table K Monthly catch composition from high elevation floodplain/beel (% by weight):inside FCDI (site NW23)

Species Code		Habitat Preference	Species name		Year: 1993												Year: 1994		Total annual catch	
			Scientific	Bengali	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Kg	%						
185	Riverine		<i>Rhinomugil corsula</i>	<i>Khorsula</i>	-	-	-	0.030	-	-	-	-	0.360	0.012						
	Subtotal				-	-	-	0.030	-	-	-	-	0.360	0.012						
47	Migratory		<i>Cirrhinus mrigala</i>	<i>Mrigel</i>	-	-	-	0.032	-	-	-	-	0.384	0.013						
	Subtotal				-	-	-	0.032	-	-	-	-	0.384	0.013						
6	Floodplain		<i>Anabas testudineus</i>	<i>Koi</i>	-	-	1.007	0.109	-	-	-	-	2.757	0.094						
55	Resident		<i>Colisa fasciatus</i>	<i>Khalisha</i>	12.110	11.591	2.184	23.129	20.241	8.097	-	1.553	546.852	18.723						
211			<i>Colisa labiosus</i>	<i>Khalisha</i>	12.110	4.427	1.749	3.163	3.864	-	-	-	102.609	3.513						
57			<i>Colisa sota</i>	<i>Khalisha</i>	2.074	10.132	-	-	4.217	-	0.939	-	57.341	1.963						
210			<i>Xenentodon cancella</i>	<i>Kaikka</i>	25.954	0.351	1.483	0.245	0.049	0.296	-	-	37.520	1.285						
187			<i>Osteobrama cotio cotio</i>	<i>Keti</i>	-	-	-	-	1.008	-	-	-	11.975	0.410						
175			<i>Puntius conchoniis</i>	<i>Canchan puti</i>	0.688	1.571	0.222	0.645	5.389	5.174	2.349	-	80.716	2.763						
176			<i>Puntius gelius</i>	<i>Giliputi</i>	0.688	1.166	1.980	1.106	0.014	1.445	-	-	18.709	0.641						
178			<i>Puntius phutunio</i>	<i>Phutani puti</i>	1.386	-	3.844	0.793	1.650	-	-	0.582	36.457	1.248						
180			<i>Puntius sophore</i>	<i>Puti</i>	1.734	0.467	5.790	2.012	17.824	10.774	6.498	0.971	263.915	9.036						
212			<i>Puntius ticto</i>	<i>Tit puti</i>	1.386	-	0.906	2.098	-	2.412	-	-	30.122	1.031						
69			<i>Brachydanio rerio</i>	<i>Anju</i>	-	-	0.431	0.908	-	-	-	-	11.519	0.394						
75			<i>Esomus danricus</i>	<i>Darkina</i>	19.027	9.086	9.520	9.623	8.316	1.932	0.626	9.698	258.689	8.857						
83			<i>Glossogobius giuris</i>	<i>Bailla</i>	1.734	2.853	3.400	1.360	2.694	2.308	6.095	-	66.122	2.264						
110			<i>Lepidocephalus guntea</i>	<i>Gutum</i>	2.422	0.351	-	0.605	0.539	2.171	4.885	9.407	26.859	0.920						
9			<i>Aplocheilurus panchax</i>	<i>Kanpona</i>	1.036	4.427	3.054	3.935	1.534	0.967	1.958	4.847	77.001	2.636						
40			<i>Channa orientalis</i>	<i>Cheng</i>	-	5.242	11.991	3.176	2.963	4.840	4.531	-	102.212	3.499						
41			<i>Channa punctatus</i>	<i>Taki</i>	-	6.349	6.986	3.133	14.093	37.266	19.013	16.801	275.844	9.444						
42			<i>Channa striatus</i>	<i>Shol</i>	-	-	0.366	0.950	0.043	-	-	-	12.433	0.426						
49			<i>Clarias batrachus</i>	<i>Magur</i>	-	-	-	0.366	-	-	-	-	4.392	0.150						
88			<i>Heteropneustes fossilis</i>	<i>Shingi</i>	-	-	4.439	0.544	0.492	-	19.639	-	44.329	1.518						
121			<i>Macrognathus aculeatus</i>	<i>Tara baim</i>	2.771	4.543	-	2.502	-	-	18.593	-	59.175	2.026						
123			<i>Macrognathus pancalus</i>	<i>Guchi</i>	6.918	3.844	4.847	5.532	5.830	11.468	14.874	13.090	183.815	6.293						
15			<i>Badis badis</i>	<i>Napit koi</i>	1.386	0.232	0.222	4.488	0.868	5.550	-	1.938	71.181	2.437						
36			<i>Chanda nama</i>	<i>Nama Chanda</i>	0.348	-	-	-	-	-	-	-	0.423	0.014						
37			<i>Chanda ranga</i>	<i>Lal chanda</i>	6.230	0.116	1.802	2.453	1.587	-	-	0.389	58.574	2.005						
214			<i>Oryzias melastigma</i>	<i>Kanpona</i>	-	-	-	0.397	-	-	-	-	4.761	0.163						
	Subtotal				99.999	66.747	66.222	73.270	93.215	94.699	99.999	59.275	2446.302	83.754						
931	Others		<i>Prawn spp.</i>	<i>Chingrit/icha</i>	-	33.253	33.778	26.667	6.786	5.302	-	40.724	473.763	16.220						
	Subtotal				-	33.253	33.778	26.667	6.786	5.302	-	40.724	473.763	16.220						
	Grand total				100	100	100	100	100	100	100	100	2920.809	100						

Notes 1. No catch rates were monitored from October to December 1993

2. No fishing activities were observed from October 1992 to May 1993 and February 1994

3. - denotes zero catch



Appendix 6 Table 1. Monthly catch composition from combined high elevation floodplains/beel (% by weight): inside FCDI (sites NW22+NW23)

Species Code	Habitat Preference	Scientific	Species name	Year : 1992				Year : 1993				Year : 1994		Total annual catch (Mar'93 – Feb'94)				
				Oct	Nov	Dec	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
139	Riverine	Nemacheilus botia	Bengali													1.656	0.028	
185		Rhinomugil corsula														0.360	0.006	
52		Clupisoma naziri											1.935			26.505	0.447	
	Subtotal															28.521	0.481	
47	Migratory	Cyrrhinus virgata														0.384	0.006	
189		Salmostoma phulo					0.216	0.716						0.083		2.927	0.049	
	Subtotal						0.216	0.716	0.028				0.083		3.311	0.056		
6	Floodplain Resident	Anabas testudineus			0.508	0.225				0.468	0.313			0.092	1.497	17.326	0.292	
137		Mystus vittatus			0.112	0.073		0.371	2.227	0.097						5.415	0.091	
55		Colisa fasciatus			0.188	4.276		8.384	6.527	2.574	20.283	20.241		0.404	6.633	602.114	10.155	
211		Colisa labiosus						8.384	3.246	1.051	2.773	3.864		1.249		103.924	1.753	
56		Colisa lalia								1.751						5.425	0.091	
57		Colisa sota		3.185	4.265	26.789		1.436	5.540	1.451			4.217		0.856	108.679	1.833	
210		Xenotodon cancella						17.968	4.649	9.297	0.701			0.032	1.148	81.664	1.377	
187		Osteobrama cotio cotio			0.058								1.008			11.975	0.202	
175		Puntius conchanius			0.695			9.075	6.799	11.758	0.565		10.065			212.579	3.585	
176		Puntius gelius			0.116			0.476	0.664	0.919	0.970	0.014	0.674		0.825	31.480	0.531	
178		Puntius phutunio			0.202			0.959		2.740	1.139	1.650	0.740		0.018	53.284	0.899	
180		Puntius sophore			6.386	7.427		1.201	4.188	6.893	4.031	17.824	4.826		8.540	422.268	7.122	
212		Puntius ticto			7.724	0.048	0.271	0.959		1.415	2.824		1.076		2.265	75.770	1.278	
5		Amblypharyngodon mola							0.287							0.186	0.003	
69		Brachydanio rerio								0.200	0.796		1.036		0.006	19.301	0.326	
75		Esomus danricus			50.000	2.498	0.289	13.173	5.026	4.421	8.439	8.316	5.683		2.779	321.181	5.417	
182		Rasbora daniconius				0.003	0.242											
83		Glossogobius giuris			9.999	1.022	0.862	4.240	11.085	1.579	1.271	2.694	0.520		1.239	96.571	1.629	
110		Lepidocephalus guntea			3.185	0.046	2.177	1.677	0.497	0.553	0.629	0.539	3.416		0.695	61.901	1.044	
9		Aplocheilichthys panchax			6.814	0.853	7.260	0.717	2.892	4.060	3.490	1.534	8.832		1.823	166.521	2.809	
39		Channa marulius						1.953								3.425	0.058	
40		Channa orientalis				36.292	2.116	1.035	7.398	5.568	2.786	2.963	0.525			107.009	1.805	
41		Channa punctatus			0.463	40.038	42.254	14.361	4.807	5.123	4.239	14.093	56.058		22.950	997.790	16.829	
42	Channa striatus				1.914	1.546			3.599	2.013	0.043				1047.238	17.663		
49	Clarias batrachus									0.321				1.886	20.388	0.344		
88	Heteropneustes fossilis				0.239				2.062	0.711	0.492			0.105	57.723	0.974		
121	Macrognaathus aculeatus			8.185	0.800	0.249	3.328	2.420	2.753	2.280					71.350	1.203		
123	Macrognaathus pancalus			4.539	1.462	2.131	4.789	2.335	5.244	5.709	5.830	1.245		1.138	216.177	3.646		
122	Mastacembelus armatus									0.180						2.470	0.042	
15	Badis badis			1.815	0.485	1.363	0.959	0.391	1.536	4.006	0.868	1.046		7.184	135.841	2.291		
203	Tetraodon cucutia								0.239					0.557	8.366	0.141		
36	Chanda nama						0.241								0.423	0.007		
37	Chanda ranga			1.815	1.162	0.007	4.313	0.249	1.076	2.221	1.587			0.012	60.390	1.019		
214	Oryzias melastigma									0.348					4.761	0.080		
	Subtotal			97.722	99.448	99.555	100.000	71.224	78.424	73.038	93.215	97.427	84.481	95.570	94.973	5130.915	86.537	
931		Prawn spp.		2.278	0.551	0.445		28.560	20.860	26.907	6.786	2.350	13.582	4.347	5.027	766.382	12.926	
	Subtotal			2.278	0.551	0.445		28.560	20.860	26.907	6.786	2.350	13.582	4.347	5.027	766.382	12.926	
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	5929.129	100	

Notes: - 1. No fishing activities were observed from January to May 1993

2. - denotes zero catch



Appendix 6 Table M Monthly catch composition from high elevation floodplain/beel (% by weight) : outside FCDI (site NC04)

Appendix 6 Table M. Monthly catch composition from high elevation floodplain/beel (% by weight) : outside FCDDI (site NC04)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
Species Code	Habitat Preference	Scientific	Species name	Year: 1992					Year: 1993					Year: 1994			Total annual catch (Mar'93 - Feb'94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
				Aug	Sep	Oct	Nov	Dec	Jan	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
18	Riverine	<i>Basilus barna</i>	Bengali	0.052	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-</

Notes: 1. No fishing activities were observed from February to March 1993  
2. - denotes zero catch

Appendix 6 Table M Monthly catch composition from high elevation floodplain/beel (% by weight) : outside FCDI (site NC04)

Species Code	Habitat Preference	Scientific	Species name	Year: 1992												Year: 1993												Year: 1994		Total annual catch (Mar'93 - Feb'94)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
				Bengali	Aug	Sep	Oct	Nov	Dec	Jan	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
939		<i>Puntius</i> sp.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	

Notes: 1. No fishing activities were observed from February to March 1993

2. - denotes zero catch



Appendix 6 Table N Monthly catch composition from high elevation floodplains/beel (% by weight): outside FCDI (sites NC08+NC09)

Species Code	Habitat Preference	Scientific	Species name	Year : 1992					Year : 1993					Total annual catch (Mar'93 – Feb'94)			
				Bengali	Aug	Sep	Oct	May	June	July	Aug	Sep	Oct	Nov	Dec	Kg	%
13	Riverine	<i>Aspidoparia morar</i>	Piali							9.519		0.199			153.413	3.885	
59		<i>Crossocheilus latius</i>	Kalabata							0.714			0.066		11.895	0.301	
139		<i>Nemacheilus botia</i>	Balichata			0.182							0.086		0.703	0.018	
28		<i>Botia dario</i>	Rani			1.014					0.434	1.379	0.076		10.915	0.276	
58		<i>Corica soborna</i>	Kachki										0.066		0.661	0.017	
185		<i>Rhinomugil corsula</i>	Khorsula														
2		<i>Ailia coila</i>	Kajuli		0.182					0.040			0.155		2.191	0.055	
51		<i>Clupisoma garua</i>	Ghaura								0.725		0.554		5.544	0.140	
81		<i>Gagata youssoufi</i>	Gang tengra												11.534	0.292	
	Subtotal				1.378					11.431	1.379	1.049	0.152		196.856	4.985	
131	Migratory	<i>Mystus bleekeri</i>	Golsa tengra												3.534	0.089	
132		<i>Mystus cavasius</i>	Kabashi								0.142	1.494			2.265	0.057	
32		<i>Catla catla</i>	Catla								0.234	0.347	2.879		33.368	0.845	
47		<i>Cirrhinus mirigala</i>	Mrigel									3.037	5.166		58.910	1.492	
48		<i>Cirrhinus reba</i>	Raik			12.065	0.056					2.558	2.708		33.171	0.840	
100		<i>Labeo bata</i>	Bata			23.204	0.378						0.150	0.289	3.855	0.098	
101		<i>Labeo boga</i>	Bhangan				0.056				1.356		0.576		27.339	0.692	
102		<i>Labeo calbasu</i>	Kabaus								0.609	0.376	0.933		19.928	0.505	
104		<i>Labeo gonius</i>	Goni								0.468				7.440	0.188	
107		<i>Labeo rohita</i>	Rui			0.036				1.673	7.627	1.720	2.049		145.910	3.695	
188		<i>Salmostoma bacaila</i>	Katari								1.439				23.494	0.595	
189		<i>Salmostoma phulo</i>	Fulchela			8.233	0.074				10.611		11.167	1.864	297.330	7.530	
86		<i>Gudusia chapra</i>	Chapila			1.640					3.979	0.334	0.119		65.275	1.653	
209		<i>Wallagu attu</i>	Boal									0.435	6.611	0.176	68.665	1.739	
144		<i>Notopterus chitala</i>	Chital										1.993		19.956	0.505	
		Subtotal				2.213	45.177	0.564		1.673	26.465	10.302	34.351	2.329	810.440	20.525	
136	Floodplain Resident	<i>Mystus tengra</i>	Bajari tengra			0.182	0.187			0.035	0.360	2.548	0.215		28.684	0.726	
137		<i>Mystus vittatus</i>	Tengra		2.330	1.313					1.356	0.782	0.928	1.183	1.497	43.735	1.108
55		<i>Colisa fasciatus</i>	Khalisha		1.123	0.003	2.274		10.000	15.354	2.323	0.435	0.404	3.962	13.705	105.372	2.669
211		<i>Colisa labiosus</i>	Khalisha							25.910	0.529	0.261	1.059	0.641		34.157	0.865
56		<i>Colisa lalia</i>	Lal khalisha			0.002	0.068		20.000	25.093	0.541	9.188	3.662	3.303	2.320	105.429	2.670
57		<i>Colisa sota</i>	Khalisha			0.121	0.095										
210		<i>Xenentodon cancila</i>	Kaikka			0.121					0.107	0.202	0.407	0.905		13.623	0.345
187		<i>Osteobrama cotio cotio</i>	Keti		0.578												
174		<i>Puntius chola</i>	Chala puti				0.254										
175		<i>Puntius conchonus</i>	Canchan puti			2.958	23.846				9.507	0.511	0.271	9.035	10.398	239.311	6.061
176		<i>Puntius gelius</i>	Giliputi							0.521			0.280			2.988	0.076
178		<i>Puntius phutunio</i>	Phutani puti				0.056			2.657	0.704	1.866	0.043	0.018		17.141	0.434
180		<i>Puntius sophore</i>	Puti		9.926	34.784	55.698				4.200	9.503	8.602	24.260	38.528	424.218	10.743
181		<i>Puntius terio</i>	Teri puni		8.213	0.651	2.758										

Notes: - 1. No fishing activities were observed from November to December 1992, from January to April 1993 and from January to February 1994

2. - denotes zero catch

Appendix 6 Table N Monthly catch composition from high elevation floodplains/beel (% by weight): outside FCDI (sites NC08 + NC09)

Species Code	Habitat Preference	Scientific	Species name	Year : 1992					Year : 1993					Total annual catch (Mar'93 – Feb'94)		
				Aug	Sep	Oct	May	June	July	Aug	Sep	Oct	Nov	Dec	Kg	%
212		<i>Puntius ticto</i>	Bengali	0.246	0.270	6.450	—	0.781	—	0.661	2.719	1.377	1.690	1.404	44.303	1.122
5		<i>Amblypharyngodon mola</i>	<i>Tit puti</i>	—	0.742	0.292	—	1.673	—	—	3.882	0.215	—	0.096	41.397	1.048
75		<i>Esomus danricus</i>	<i>Darkina</i>	19.446	0.789	0.573	70.000	3.756	1.513	1.093	0.471	2.712	5.372	2.746	65.887	1.669
182		<i>Rashora daniconius</i>	<i>Darkina</i>	—	—	0.019	—	—	—	—	—	—	—	—	—	—
83		<i>Glossogobius giuris</i>	<i>Bailla</i>	0.983	0.729	1.114	—	2.863	0.780	7.794	2.544	3.582	6.048	5.766	102.208	2.588
43		<i>Chela cachius</i>	<i>Chep chela</i>	24.035	—	—	—	—	—	—	—	—	—	—	—	—
109		<i>Lepidocephalus berdmorei</i>	<i>Puiya</i>	—	—	—	—	—	0.054	—	—	—	—	—	0.852	0.022
110		<i>Lepidocephalus guntea</i>	<i>Gutum</i>	—	1.683	1.122	—	2.509	0.264	—	1.587	0.836	0.219	15.214	54.676	1.385
9		<i>Aplocheilichthys panchax</i>	<i>Kanpona</i>	—	—	0.019	—	0.259	0.035	0.435	—	0.054	0.102	—	2.217	0.056
41		<i>Channa punctatus</i>	<i>Taki</i>	2.913	0.596	3.193	—	0.836	0.447	8.617	0.193	19.323	16.520	8.834	217.864	5.517
88		<i>Heteropneustes fossilis</i>	<i>Shingi</i>	2.330	—	—	—	—	0.270	—	0.053	0.289	—	—	7.185	0.182
121		<i>Macrogna thus aculeatus</i>	<i>Tara baim</i>	—	0.389	0.453	—	—	—	3.172	0.376	0.192	—	—	53.262	1.349
123		<i>Macrogna thus pancalus</i>	<i>Guchi</i>	3.511	1.765	0.317	—	3.644	5.193	7.029	3.636	4.226	0.794	41.831	245.445	6.216
122		<i>Mastacembelus armatus</i>	<i>Baral baim</i>	—	0.888	—	—	—	—	0.483	0.261	—	0.180	—	9.759	0.247
15	<i>Badis badis</i>	<i>Napit koi</i>	—	—	—	—	—	—	0.052	1.027	0.050	0.126	—	4.778	0.121	
145	<i>Notopterus notopterus</i>	<i>Foli</i>	—	—	—	—	—	—	—	—	—	0.820	—	6.676	0.169	
203	<i>Tetraodon cutcutia</i>	<i>Potka</i>	—	—	—	—	—	—	—	—	0.053	0.116	—	1.477	0.037	
36	<i>Chanda nama</i>	<i>Nama chanda</i>	5.900	0.831	0.187	—	1.932	10.311	—	—	0.739	1.197	—	183.113	4.637	
37	<i>Chanda ranga</i>	<i>Lal chanda</i>	3.688	3.036	0.287	—	2.713	13.539	2.737	—	4.518	1.670	0.520	282.349	7.151	
214	<i>Oryzias melastigma</i>	<i>Kanpona</i>	—	—	0.019	—	—	—	—	—	—	—	—	—	—	—
	Subtotal			85.222	51.853	99.280	100.000	90.501	55.415	53.135	38.839	80.243	97.712	93.432	2338.106	59.213
931	Other	Prawn spp.	<i>Chingri/Icha</i>	12.566	1.591	0.154	—	7.826	6.689	35.183	25.760	17.276	2.287	5.690	603.213	15.277
	Subtotal			12.566	1.591	0.154	—	7.826	6.689	35.183	25.760	17.276	2.287	5.690	603.213	15.277
	Grand total			100	100	100	100	100	100	100	100	100	100	100	3948.615	100

Notes :- 1. No fishing activities were observed from November to December 1992, from January to April 1993 and from January to February 1994

2. - denotes zero catch







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Appendix 6 Table O Monthly catch composition from high elevation floodplains/outside (% by weight): outside FCDI (sites NC18+NC19)

Appendix 6 Table 6: Monthly catch composition (in % of weight), outside T-101 (and T-101+T-102)																									
Species Code	Habitat Preference	Scientific	Species name	Year: 1992						Year: 1993						Year: 1994						Total annual catch (Mar'93 – Feb'94)			
				Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Kg	%	
83		<i>Glossogobius giuris</i>	Bailla	6.059	0.981	2.706	0.303	1.354	1.235	0.857	0.637	2.983	3.886	0.897	0.574	1.337	2.090	7.379	0.805	0.903	3.592	6.008	509.837	3.550	
43		<i>Chela cachius</i>	Chep cheh							0.050															
109		<i>Lepidocephalus berdmorei</i>	Pulya									0.201											0.055	0.0004	
110		<i>Lepidocephalus guntea</i>	Gutum	0.066	0.091	8.371	2.056	4.479	3.747	2.846	6.125	8.343	3.560	0.955	1.680	2.772	3.305	4.127	4.466	2.473	4.172	2.645	503.161	3.503	
9		<i>Aplocheilichthys punctatus</i>	Kanpoua				0.424	0.133		0.051	0.079	0.102		0.676	0.646	0.027	0.026	0.095				0.006	7.395	0.051	
39		<i>Channa marulius</i>	Gajar			0.699					1.316		20.751	9.985	4.020	0.081						1.924	52.632	0.366	
40		<i>Channa orientalis</i>	Cheng				0.033								3.321	2.886		2.743	0.414				125.393	0.873	
41		<i>Channa punctatus</i>	Taki	0.927	17.544	12.258	5.520	14.498	3.088	4.114	5.496	10.302	6.984	30.631	7.256	13.774	1.431	14.547	23.582	31.221	14.455	6.496	1639.132	11.413	
42		<i>Channa striata</i>	Shol			21.507	0.280			0.549	1.175								0.621	3.862		1.944	85.741	0.597	
49		<i>Clarias batrachus</i>	Magur			1.436	0.295		0.915		1.647					0.243			7.041	8.047		1.674	193.512	1.347	
88		<i>Heteropneustes fossilis</i>	Shingl	2.052	0.161	1.627	0.883	1.188	0.630	3.774	8.285		0.900	0.966		1.566	0.088	0.146	11.749	6.123	0.332	1.724	245.231	1.707	
121		<i>Macrognathus aculeatus</i>	Tara ba lin	1.478	0.450	0.306	0.260	1.157	0.024		1.035	3.309	0.728	0.828	0.383	0.185	1.947	0.743	0.528	0.764	0.174	0.565	158.905	1.106	
123		<i>Macrognathus punctatus</i>	Guchi	1.377	0.638	3.037	0.988	4.516	0.632	0.778	10.204	8.928	3.730	3.251	3.879	3.820	6.775	1.980	3.707	2.737	8.178	2.478	667.153	4.645	
122		<i>Mastacembelus armatus</i>	Burai ba lin	17.225	0.272	5.257	0.704	4.760	1.970	0.396	7.520					0.487	1.115	7.136	0.162	0.609	0.349	3.466	391.022	2.723	
138		<i>Nandus nandus</i>	Bheda							0.009															
15		<i>Budis badi</i>	Napit kol			1.096	0.643	0.598	0.430	0.323	0.860	0.585	1.118	1.561	7.406	0.742	0.748	0.788	0.720	0.089	3.907	0.521	142.013	0.989	
147		<i>Onipok bimaculatus</i>	Kani pa bda														0.009	1.196				0.092	45.854	0.319	
148		<i>Onipok pa bda</i>	Madhu pa bda	0.281	6.631	0.618	0.345	0.088	0.221		0.118						0.329		0.287	0.114		0.029	23.475	0.163	
145		<i>Notopterus notopterus</i>	Foli		0.594					0.305	0.501					1.022		0.067		0.470		0.433	20.362	0.142	
203		<i>Tetraodon lineatus</i>	Porka				0.057	0.101	2.095							0.133	1.100	0.723	0.175	0.081	0.924	0.119	98.540	0.686	
35		<i>Chanda baculis</i>	Chanda															0.022					0.811	0.006	
36		<i>Chanda nama</i>	Nama chanda	0.867	0.059	1.666	0.130	0.082	4.145	1.918	0.471	4.197	0.090	0.659	0.215	0.400	0.101	0.115	0.312	0.047	0.851	0.702	33.714	0.235	
37		<i>Chanda ranga</i>	Lal chanda	1.507	2.277	1.445	0.596	0.962	3.501	2.577	0.841	2.073	0.183	2.511	2.486	1.394	1.326	0.489	0.333	0.206	1.704	0.814	136.435	0.950	
214	Subtotal	<i>Oryzias latipes</i>	Kanpoua	36.152	43.730	84.391	35.709	92.296	65.344	45.258	61.950	73.501	73.400	91.534	81.161	51.904	29.162	59.236	88.260	93.242	82.619	67.438	8064.902	56.153	
120	Others	<i>Macrobrachium rosenbergii</i>	Golda						0.091																
931	Subtotal	Prawa spp.	Chinglitcha	13.528	1.155	7.148	6.512	6.736	33.344	22.753	19.685	13.794	13.865	8.408	18.838	45.540	42.249	19.782	9.181	3.628	16.725	8.340	3659.374	25.479	
	Grand total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	14362.425	100

Note: - denotes zero catch









## APPENDIX 7

6025

**Legend**

Peak season > 50% fish ripe, ripe running, spent

20-50% fish ripe, ripe running, spent

< 20% fish ripe, ripe running, spent

0% fish ripe, running, spent

No data

Note: Numbers quoted are numbers of fish examined

**Appendix 7 Breeding seasons of selected fish, inside and outside the PIRDP**  
**October 1992 - February 1994**

Habitat Preference	Species name	Bengali	Habitat	Inside/Outside	Year: 1992												Year: 1993												Year: 1994																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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622

Legend  
 Peak season > 50% fish ripe, ripe running, spent  
 20-50% fish ripe, ripe running, spent  
 <20% fish ripe, ripe running, spent  
 0% fish ripe, running, spent  
 No data

Note: Numbers quoted are numbers of fish examined

Appendix 7 Breeding seasons of selected fish, inside and outside the PIRDP  
 October 1992 - February 1994

Habitat Preference	Scientific	Species name	Habitat	Inside/Outside	Year: 1992												Year: 1993												Year: 1994																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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Legend  
 Peak season > 50% fish ripe, ripe running, spent  
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 <20% fish ripe, ripe running, spent  
 0% fish ripe, running, spent  
 No data  
 Note: Numbers quoted are numbers of fish examined

Appendix 7 Breeding seasons of selected fish, inside and outside the PIRDP  
 October 1992 - February 1994

Habitat Preference	Scientific	Species name	Bengali	Habitat	Inside/ Outside	Year: 1992												Year: 1993												Year: 1994																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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**APPENDIX 8**



Appendix 8 List of fishing gears recorded during FAP 17 surveys in Bangladesh

Gear Type	Name	Code	Description
Gill Net	Current jal (Stationary)	88	Monofilament fixed gill net, usually small mesh
	Current jal (Drifting)	282	Monofilament drifting gill net, usually top set, any mesh size
	Koi jal	123	Multifilament fixed gill net, usually small mesh
	Chandi jal	65	Multifilament drifting gill net, usually top set, any mesh size
	Par jal	315	Multifilament drifting gill net, usually bottom set, large mesh
	Kajuli jal	316	Multifilament drifting gill net, usually bottom set, small mesh
	Awo jal	324	Multifilament fixed gill net set in zig-zag pattern to catch large fish
	Foot jal	327	Very small gill set horizontally at surface in shallow water
	Gai Dasem	132	Drifting net used in rivers, has pockets at base
Seine Net	Ber jal	45	Seine net: small, medium or large size
	Baoli jal	306	Medium sized seine net pulled by 2 ropes
	Moi jal	202	Small drag net with pockets at base
	Dora jal	325	Similar to moi jal but pulled by 2 long ropes
	Konaber jal	268	Seine net with pocket at one end
	Dhor jal	89	Small seine usually pulled by 2 men by sticks on each end of net
	Horhori	297	Seine net with a series of large pockets along net
	Kathi jal	175	Seine net with a series of vertical sticks along net
	Chabi jal	293	Seine/gill net pulled to shore, often used with polo traps
	Hat panch	276	Medium size seine pulled at each end by one man while man in boat beats water to drive fish into net
	Satiber jal	304	Seine net with a series of pockets at base
	Kachitana	277	Type of lift net hung from boat on floodplain or beel. Net used with drag rope to drive fish into net.
Bag Net	Ferra jal	126	Drag rope used to drive fish into gill net/seine net
	Thaga	285	Barrier across river with bag nets set perpendicular to it
	Suti jal	271	Single bag net staked to river bed
	Ghori jal	320	Barricade/fence with nets set in gaps to trap fish
	Bhuti jal	328	Clap net on bamboo frame hung from boat anchored in a gap of barrier fence
Lift Net	Veshal	266	Triangular lift net on large bamboo frame
	Dharma jal	105	Square or round lift nets on bamboo pole
	Jhali jal	160	Small veshal used on main rivers at night for prawns
	Jhap jal	319	Boat lift net: lifted at 4 corners by men in boats
	Chota jal	323	Gill net fixed horizontally on bottom to catch fish by spines
	Dara jal	329	Lift net and barrier used in canals or small rivers
Scoop Net	Hat Tana	287	Oval or triangular scoop nets used with pole and rope or by hand
	Ucha	263	Basket scoop on pole used by hand
	Tukri	296	Small basket scoop used by hand
	Afa/Hat bauli	321	Large thella jal, large mesh, used on boat
	Uttar jal	68	Like a cast net but hung from a boat drifting along river and lifted to catch fish
Clap Net	Shangla jal	234	Multifilament drifting bag net on bamboo frame boat used for hilsa fishing
FAD	Katha	270	Submerged brush shelter used to attract fish
	Boat Katha	314	Submerged boat filled with branches used to attract fish
	Horgra	149	Submerged basket filled with branches used to attract fish
	Kua	302	Fish pit on floodplain, invariably contains brush shelter



# Appendix 8 Continued

Gear Type	Name	Code	Description
Traps	Polo	222	Bell-shaped trap used to catch fish by hand
	Doiar trap	95	Small, oval or box traps used for prawns or small fish
	Deal	286	Larger trap, bilaterally divided to catch fish on 2 sides of bank
	Kadum trap	311	Large box traps used to catch larger fish e.g. Koi, Taki
	Kakila bana	310	Bamboo fence pulled downstream to trap fish in small area
	Katra	326	Active trap: fish speared after entering trap
	Kalsi pata	299	Clay pot used to trap fish set in bank side.
	Kotta	318	Bunded area on floodplain used to trap fish as water recedes
	Char jal	322	Tidal fence trap
	Kharia/Kore	330	Fence trap used on floodplain during flood recession
	Malai pata	331	Coconut shell drilled with holes and baited to catch small fish
	Patar savar	332	Large active fence trap used to surround fish on floodplain
Hook/Lines	Tui	334	Small polo-type trap used to catch fish in mud on floodplain
	Daun	272	Long line: many hooks set at intervals on one line
	Sip	30	Rod and line : usually one hook per line
	Nol barsi	278	Hook & line attached to bamboo floats. Many floats/hooks may be joined along line
Spear	Tana barsi	152	Hand line (no rod) from bank or boat with or without groundbait
	Juti	170	Spears of various types: fixed or detachable barbs
Other	Jhaki jal	164	Multifilament circular net thrown by hand
	Thella jal	255	Small triangular push net set on bamboo frame
	Urani	291	Various barrier nets/fences used to catch jumping fish.
	Akra	298	Pole with metal hooks used to catch mud-dwelling fish e.g. baim
	Chunga	301	Hollow bamboo rod shelter used to attract baim
	Thushi	317	Cloth/basket traps used to drive baim into them
	Hand fishing	307	Picking fish by hand but without dewatering
	By hand/Dewatering	97	Empty water and catch fish by hand in mud
	Net/Basket+Dewatering	98	Empty water through an outlet where net or basket used to trap fish
	Nimbaich	335	Large scale fishing by whole village using many different gears
	Canal dewatering	336	Large section of canal isolated by cross dams and emptied by pumping by other means to catch fish by various methods

## Notes:

1. Local names of gears vary between different districts and regions in Bangladesh. Those listed in the table above are generally used in the North Central Region. If gears were not found in this region, then the name from the region in which the gear was most recorded was used.
2. Some names e.g. juti (spear) doiar traps and hat tana were used to denote a group of similar gears. A more detailed list and description of individual gears is provided in the FAP 17 database.
3. FAD = Fish Aggregation Device.





