Report

Fish species composition caught by gillnets: Case study from Chi River, Mahasarakham province, Thailand

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Abstract: The aim of this study is to provide information about fish species composition, catch per unit effort (CPUE) and percentage index of relative importance (% IRI) of fish species caught by gillnets (mesh size range 35-55 mm) from Chi River, Mahasarakham province, Thailand. The data was collected during June-August 2011 from 3 sampling stations: Tah-songkhon, Din-dum and Bung-kla. Fifty-four fish species were found within 36 genera and 18 families. Fish in the Family Cyprinidae were the dominant group with 24 fish species (44.4%). Silver barb (*Barbonymus gonionotus*) was the most abundant species (16.9 % IRI), followed by common siamese barb (*Henicorhynchus siamensis*) (15.0% IRI) and white lady carp (*Thynnichthys thynnoides*) (12.8% IRI). The average of CPUE throughout the study was 2.1 $\pm$0.4 kg fisher^{-1} day^{-1}. Statistical differences among sampling sites were found and the highest CPUE, 3.8$\pm$0.6 kg fisher^{-1} day^{-1}, was at Ban Tah-songkhon.

Keywords: fish species composition, catch per unit effort, percentage index of relative importance, gillnets, Chi River

INTRODUCTION

The Chi River is the longest river in Thailand (765 km). It originates in the Phetchabun mountains, Chiyaphum province and flows through the central part of the north-eastern region of Thailand, passing Khonkaen, Mahasarakham, Kalasin, Roi-et and Yasothon, and then merges with Mun River in Warinchamrab district, Ubon Ratchathani province before joining the Mekong River. People living along the Chi River use it for domestic, agricultural, transport, industrial and, most important, fishery purposes. Local fishermen have a long development in fisheries. Importantly, the Chi River is known as one of the most important fishery resources in the north-eastern region. Fish

are the cheapest source of protein and generate incomes for the local people along the river. Leeraputhana [1] surveyed the fish species diversity and reported that about 110 species in 22 families were found, with Cyprinidae as the dominant group. Aengwanich, et al. [2] surveyed the fish species and studied the way of life for fishermen in Mahasarakram province and reported that 85 species in 8 genera and 20 families were found, and that for most people along the river, catching fish was the occupation supplementary to rice farming. The main fishing gear was gillnets (37%), lift nets (26%), long line hooks (23%), traps (11%) and surrounding nets (2%). The average of catch per unit effort (CPUE) was about 1-3 kg fisherman^{-1} day^{-1}, with March -April being the most productive period. Nachaiperm et al. [3] surveyed fish species in Pong, Chi and Mun Rivers caught by seine nets, electro-fishing gear and gillnets, and reported that in the Chi River there were about 88 species in 24 families, with the Cyprinidae group being the one with the greatest number of species (42). Pilasemorn et al. [4] studied the fish community structure and distribution in Chi River by electro-fishing and gillnets, and reported that about 88 species in 23 families were found. *Rasbora dusonensis* and *Channa striata* were the species with the highest abundance by number and weight respectively [4].

The objective of this study is to obtain the basic information on the current status of native fish species that were caught by gillnet in the Chi River, Mahasarakham province through the study of fish species composition and dominant catches. The result of this study will provide useful information on the fishery resources to support data related to sustainable management.

MATERIALS AND METHODS

Sampling Sites and Techniques

The study was carried out on a weekly basis between June-August 2011. The sampling sites were at Ban Tah-songkhon (S1), Ban Din-dum (S2) and Ban Bung-kla (S3) (Figure 1). Fish specimens were taken by local fishermen from each site with gillnets of mesh sizes 35, 45 and 55 mm, which are often used in this area. The fishermen were explained about the purpose of the study and were free to decide when to fish on each appointed night. The fishing gear was set during 3-6 p.m. and the fishermen came back the next day at 5-7 a.m. to their fishing gear to take the fish sample from each set of gillnets. Fish samples were taxonomically classified and identified [5-6] into species. The total length was measured to the nearest centimetre and body weight taken to the nearest gramme.

Data analysis

The percentage index of relative importance (%IRI) [7] was used to identify the main catches according to:

$$\%\text{IRI} = \left(\frac{\left(\%W_i + \%N_i\right) \times \%F_i}{\sum\limits_{i-1}^{n}\left(\%W_i + \%N_i\right) \times \%F_i} \right) \times 100$$

where $\%W_i$ and $\%N_i$ are the percentage weight and number of the ith species in the total catch and $\%F_i$ is the percentage frequency of occurrence of each species in the total number of species.

The catch per unit effort (CPUE) was expressed as kg fisherman^{-1} day^{-1}. Weekly CPUE values were transformed to ln(1+CPUE) [8], which allows zero catches to be used and makes the

values suitable for one-way analysis of variance (ANOVA) [9]. ANOVA and Duncan's new multiple range test were used to analyse the difference between sites.
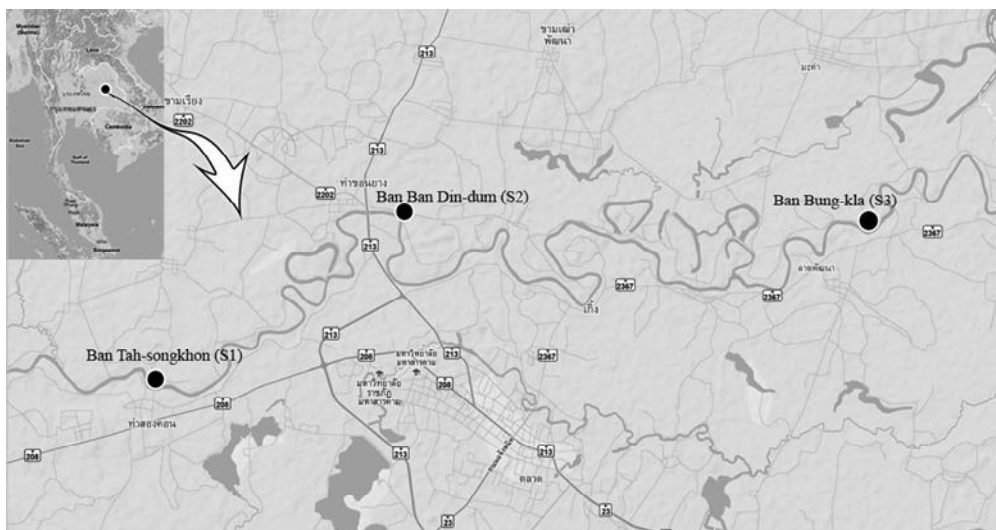

Figure 1. Location of sampling sites along Chi River, Mahasarakham province

RESULTS AND DISCUSSION

Composition of Fish Taxa

In total, during the survey with gillnets, 1,902 fish were caught comprising 54 species within 38 genera and 18 families (Table 1), which is fewer than previous findings with 85-110 species [1-4]. This might be due to the change of ecology, although the different sampling methods and locations might also account for the variation observed.

The family with the most frequent occurrence in this study was Cyprinidae, which comprised 24 species (44.4%), followed by Bagridae (14.8%), Cobitidae (5.6%), Siluridae (5.6%) and Pangasiidae (5.6%) (Figure 2). These findings are in agreement with the observation of Aengwanich et al. [10], who reported that the Cyprinidae group was the dominant group in catches from the Chi River. Among all the sites, 21 species were found belonging to the Cyprinidae. *Henicorhynchus siamensis* was the most frequently encountered species (13.4%), followed by *Labiobarbus leptocheila* (12.2%), *Thynnichthys thynnoides* (12.2%) and *Puntioplites falcifer* (10.7%) (Table 1). The body size seemed to influence catching efficiency and selectivity of gillnets more than species. The catching efficiency and selectivity of gillnets were found to be related to body shape; particularly, diamond-shaped fish were caught more often than torpedo-shaped fish [11]. The Cyprinidae is in the diamond-shaped group and the Cyprinid fish are also the dominant species and widely distributed in Thai reservoirs⁻ more than 50% of the fish assemblage are in this fish group [12].

The most abundance was found at S2 (1,095 fish), followed by S1 (601 fish) and S3 (206 fish). In terms of the number of families at each site, S1 had the greatest number with 14 families, followed by S2 and S3 with 12 and 11 families respectively. In terms of species, S1 ranked first with 38 species, followed by S2 and S3 with 37 and 31 species respectively. In terms of yield or weight per species, that from *Barbonymus gonionotus* was the highest (19.5%), followed by *H. siamensis* (13.5%) and *T. thynnoides* (10.6%) (Table 1).

Table 1. Species and total number of individuals of each species caught at each site from June-August

Family/Scientific name	S1	S2	S3	Total	% Number of individuals	% Weight
Family Notopteridae						
Notopterus notopterus	12	-	22	34	1.8	1.4
Family Cyprinidae						
Luciosoma bleekeri	-	1	-	1	0.1	0.01
Rasbora aurotaenia	1	4	-	5	0.3	0.1
Paralaubuca harmandi	2	9	1	12	0.6	0.3
Cyclocheilichthys apogon	-	21	-	21	1.1	0.5
Cyclocheilichthys armatus	14	-	4	18	1.0	0.6
Cyclocheilichthys enoplos	15	12	2	29	1.5	2.1
Cyclocheilichthys repasson	12	97	9	118	6.2	2.9
Puntioplites falcifer	143	36	25	204	10.7	8.8
Puntioplites proctozysron	45	91	11	147	7.7	9.4
Barbonymus altus	26	46	15	87	4.6	4.3
Barbodes gonionotus	112	9	29	150	7.9	19.5
Barbonymus schwanenfeldii	-	-	3	3	0.2	0.2
Hampala dispar	3	1	1	5	0.3	0.7
Hampala macrolepidota	2	-	-	2	0.1	0.2
Puntius brevis	4	24	-	28	1.5	0.5
Thynnichthys thynnoides	12	218	2	232	12.2	10.6
Labiobarbus leptocheila	77	142	13	232	12.2	7.8
Henicorhynchus ornatipinnis	-	5	-	5	0.3	0.1
Henicorhynchus siamensis	59	184	12	255	13.4	13.5
Morulius chrysophekadian	5	3	1	9	0.5	1.7
Osteochilus hasseltii	13	41	6	70	3.2	2.9
Osteochilus lini	2	5	-	7	0.4	0.3
Osteochilus melanopleura	1	7	1	9	0.5	0.7
Osteochilus microcephalus	1	4	1	6	0.3	0.2
Family Cobitidae						
Syncrossus helodes	1	-	-	1	0.1	0.1
Yasuhikotakia modesta	-	2	-	2	0.1	0.1
Yasuhikotakia eos	-	2	1	3	0.2	0.2
Family Loricariidae						
Hypostomus plecostomus	1	-	-	1	0.1	0.1
Family Bagridae						
Mystus sp.	-	3	-	3		
Leiocassis siamensis	-	1	-	1	0.1	0.02
Mystus atrifisciatus	2	4	1	7	0.4	0.2
Hemibagrus filamentus	4	-	12	16	0.8	1.4
Mystus singaringan	3	-	7	10	0.5	0.5
Mystus multiradiatus	-	23	-	23	1.2	0.5
Mystus wycki	-	-	1	1	0.1	0.1
Hemibagrus wyckioides	-	1	-	1	0.1	0.03
Family Siluridae						
Kryptopterus cheveyi	2	1	2	5	0.3	0.1
Micronema bleekeri	4	-	-	4	0.2	0.9
Ompok krattensis	7	1	-	8	0.4	0.9
Family Pangasiidae						
Helicophagus leptorhynchus	2	2	1	5	0.3	1.1
Pangasius macronema	-	-	1	1	0.1	0.1
Pteropangasius pleurotaenia	1	-	-	1	0.1	0.01
Family Synbranchidae						
Monopterus albus	-	1	-	1	0.1	0.03
Family Belonidae						
Mastacembelus armatus	2	2	-	4	0.2	0.8
Family Ambassidae						
Parambassis siamensis	1	47	1	49	2.6	0.3
Family Nandidae						
Pristolepis fasciatus	5	24	13	42	1.4	2.2
Family Cichlidae						
Pterophyllum sp.	1	-	-	1	0.1	0.02
Family Eleotrididae						
Oxyeleotris marmorata	2	15	6	23	1.2	1.4
Family Anabantidae						
Anabas testudineus	-	1	1	2	0.1	0.1

Table 1. (continued)

Family/Scientific name	S1	S2	S3	Total	% Number of individuals	% Weight
Family Belontiidae						
Trichogaster trichopterus	1	3	-	4	0.2	0.1
Family Channidae						
Channa striata	-	-	1	1	0.1	0.1
Family Soleidae						
Euryglossa harmandi	-	1	-	1	0.1	0.04
Family Tetraodontidae						
Monotreta suvattii	1	-	-	1	0.1	0.1
Total no. of individuals	601	1,095	206	1,902		
Total no. of families	14	12	11	18		
Total no. of species	38	39	31	54		
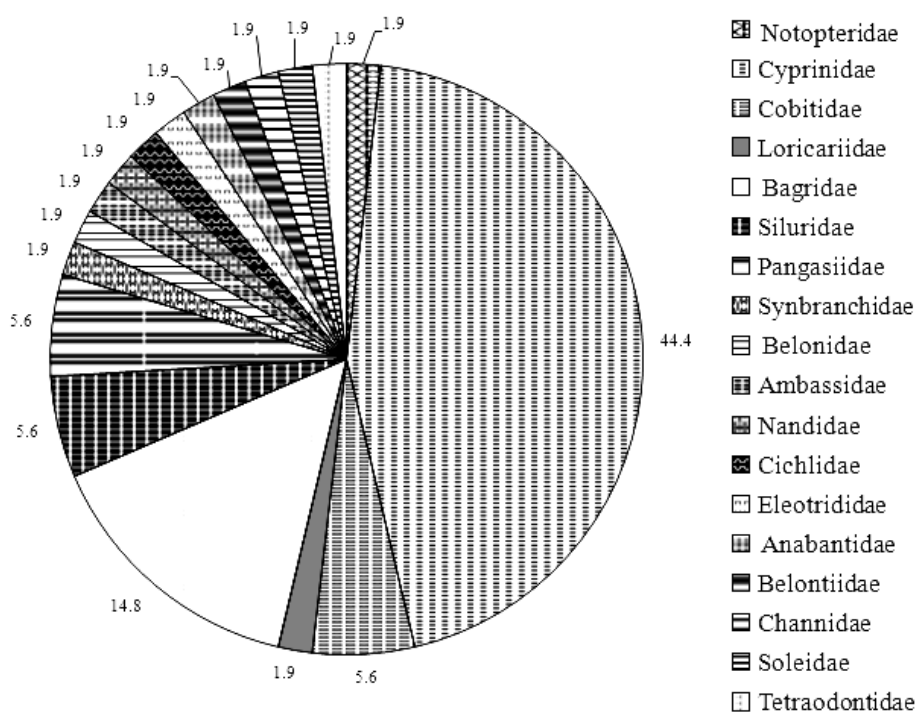
Figure 2. Percentage of fish species in each family caught by gillnets

Dominant Fish Species

According to % IRI (Figure 3), *Barbodes gonionotus, Puntioplites falcifer* and *Puntioplites proctozysron* were the dominant species at 15.1%, 11.6% and 9.6% respectively in the catch at S1. *Thynnichthys thynnoides*, *Henicorhynchus siamensis* and *P. proctozysron* were the dominant species with 13.8%, 13.2% and 9.5% respectively at S2. *B. gonionotus*, *Labiobarbus leptocheila* and *Cyclocheilichthys repasson* were the dominant species with 12.3%, 5.9% and 5.6% respectively at S3. *B. gonionotus*, *P. falcifer* and *Barbonymus altus* were caught at all sampling sites. In terms of the most frequently caught at each site, *B. gonionotus*, *P. falcifer* and *B. altus* were found throughout the sampling period at S1. *T. thynnoides*, *H. siamensis*, *L. leptocheila*, *C. repasson*, *B. altus* and *P. falcifer* were found throughout the sampling period at S2. *B. gonionotus*, *P. falcifer*, *Notopterus notopterus* and *H. siamensis* were also commonly found at S3. Additionally, the three most dominant species in the total catch throughout the study period were *B. gonionotus* (16.9%),

H. siamensis (15.0%) and *T. thynnoides* (12.7%) (Figure 3). These results disagree with the previous study by Pilasemorn, et al. [4], who surveyed the fish species from upstream to downstream along the Chi River using electro-fishing and gillnets during 2003-2005. They found that *Rasbora dusonensis* and *Channa striata* were the dominant species.

Catch per Unit Effort (CPUE)

The highest CPUE, 3.8 ± 0.6 kg fisherman^{-1}day^{-1} was at S1, followed by S2 and S3 with $1.5\pm$ 0.5 and 1.0 ± 0.2 kg fisherman^{-1}day^{-1} respectively. The average of CPUE throughout the study was 2.1 ± 0.4 kg fisherman^{-1}day^{-1} (ranging between 0.3-6.3 kg fisherman^{-1}day^{-1}). From ANOVA analysis, there were statistical differences in the ln(1+CPUE) among sampling sites (Figure 4).

The differences in CPUE between the sites were probably caused by differences in the size of fish species and topological characteristics of the fishing area. S1 was higher than the other two sites and it was observed that S1 mainly gave large fish species as indicated by the weight of the catch, whereas S2 and S3, with many aquatic plants which may serve as spawning and nursing grounds for small fish, mainly gave smaller fish species.
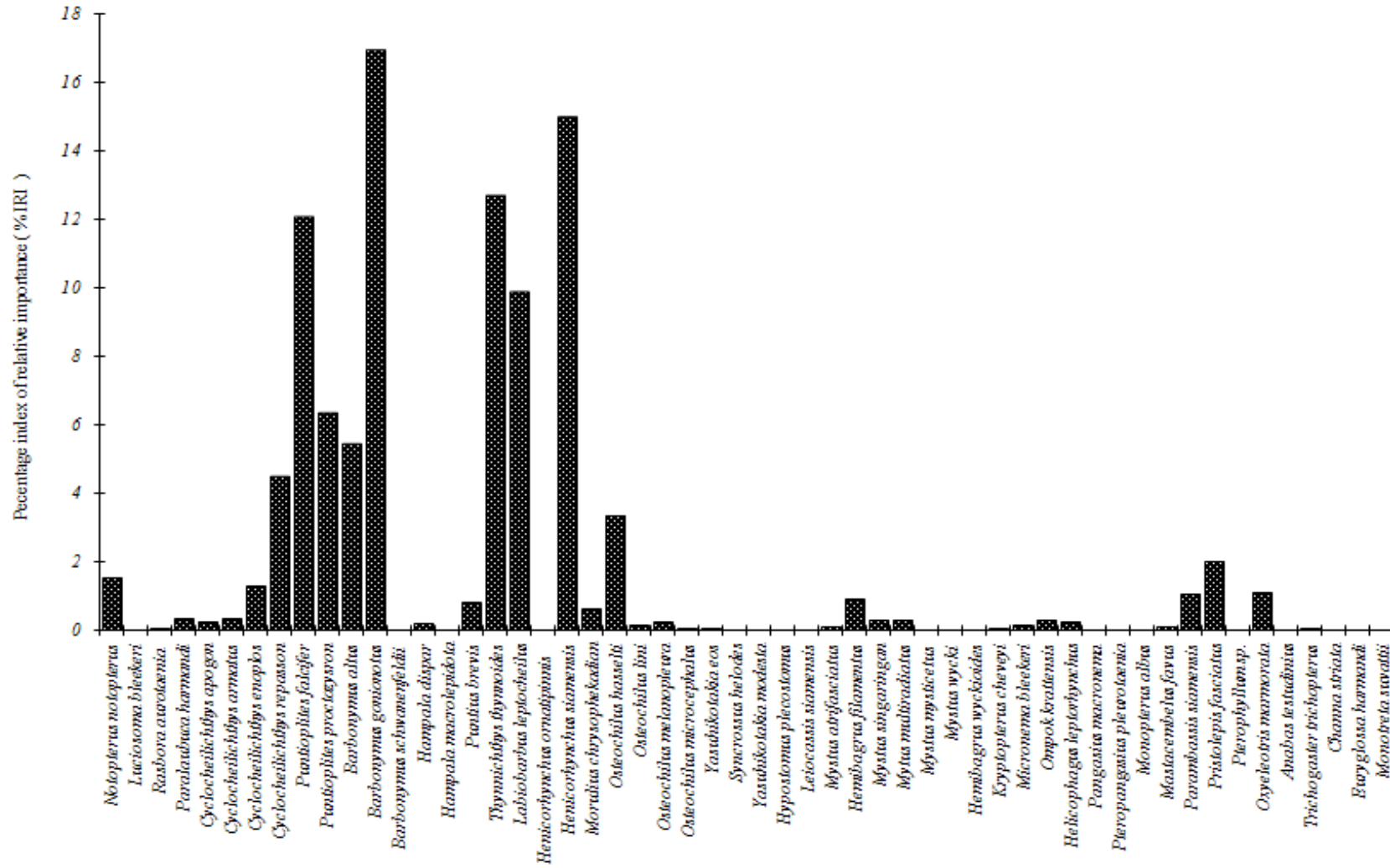
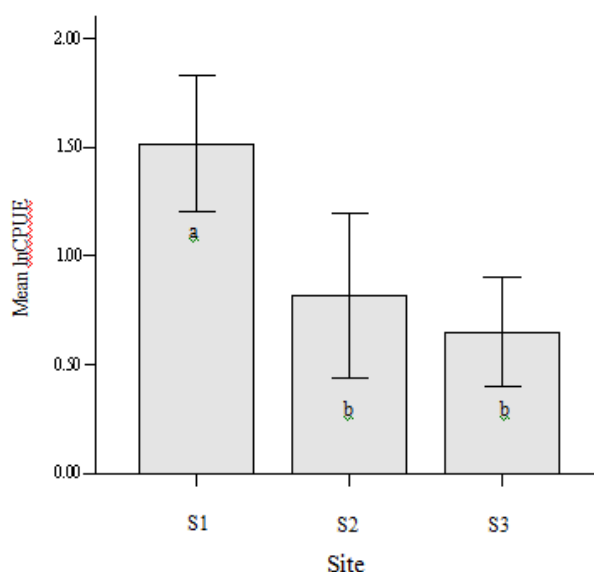**Figure 3.** Percentage index of relative importance (% IRI) for each species

Figure 4. Summary of statistical testing of ln(1+CPUE) at each sampling site (The same letter in box indicates that the values are not statistically different ($\propto$ = 0.05).)

CONCLUSIONS

Fifty-four fish species were found in the Chi River, Mahasarakham province in this survey, considerably fewer than previous findings. Fish in the Family Cyprinidae were the dominant group with 24 species (45.28%), and *Barbodes gonionotus* was the dominant species in catches by gillnets (16.91 % IRI). The average CPUE throughout the study was 2.1±0.4 kg fisherman^{-1}day^{-1} and S1 (Ban Tah-songkhon) was the site with the highest CPUE, 3.8±0.6 kg fisherman^{-1} day^{-1}.

ACKNOWLEDGEMENTS

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