Research Article

Fish And Fisheries in Flood Plain Swamp in Middle Part of Musi River

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ABSTRACT

Floodplain area is a very dynamic water system where the influence from terrestrial and river is high. This area is recognized as feeding, nursery and spawning ground of some fishes. Capture fisheries in this area is frequently occurred by using some of specific fishing gears which related to dynamic pattern of aquatic environment, such as water level, current, and physical-chemical aspects of water. The research was conducted in order to evaluate fish caught composition and fishing activity in floodplain swamp in middle part of Musi River by survey method. The result showed that 45 species of fish were caught and nine kinds of fishing gears were used by fishers. Gill nets were used in whole year, while seine were used only in the peak of dry season. Intra-annual variations of swamp water flow can modify the distribution and migratory pattern of fish species, with direct effects on fish catches.

Keywords: Fish Caught Composition, Fishing Gears, Floodplain Swamp

1. INTRODUCTION

River and its floodplain were considered as complex and dynamic aquatic ecosystem where alternately and periodically changes from aquatic to terrestrial ecosystem [1]. Main sources of nutrients come from decomposed plant litter of macrophytes gave high fertility of aquatic ecosystem. Many kinds of invertebrate organisms were involved in decomposition processes would provide natural food for fish [2].

In Indonesia, inland swamp is around 14 million hectares found in all big islands such as Sumatra, Kalimantan, Sulawesi and Irian. Floodplain swamps are found in South Sumatra Province as lowland area. The characteristic of lowland area is in wet season inundated by water from the adjacent Musi river forming any kinds of water bodies. Floodplain swamps play a vital role in providing abundant fish food, and one of the most important characteristics of floodplain swamps are their combination of shallow water and thick vegetation, which provides nursery habitat for young fish [3]. Together with phytoplankton and benthic algae, organic matter from the emergent vegetation is the source of primary production in floodplain swamps [4]. Association of aquatic vegetation and invertebrate animals provide food and shelter for many species of fish [5]. The local people who live surrounding the area engaged primarily in fishing during wet season and farming during dry season.

The previous study in Sekayu District South Sumatra Province focused on the fish diversity found 20 [6] species in the mainstream and 35species in the floodplain, while there were 233 species of freshwater fishes in South Sumatra waters [7-9]. During the wet season, the lowland swamp water becomes a productive fishing ground. Capture fishery range from small subsistence efforts to commercial one, using any form of fishing gears and multi species target. Fisheries activities start at the beginning of rainy season when fish habitually migrate from the main river either for grazing and for`spawning and finish at the mid of dry season when the fish already going back to the main river and the rest have been totally caught out [10].

This paper provides a description of the small-scale fisheries of floodplain swamp in middle part of Musi river, with emphasis on fish diversity and fishing activity.

2. EXPERIMENTAL SECTION

Research was carried out in survey descriptive method by direct observation on fishing activity in a selected area in middle part of Musi River of Sekayu sub district (103⁰:50':04" to 103°:51':56,8" E and 02°:53':59,7" to 02°:55':05,8" S). Direct observations were done to find out informations on fishing practices and species diversity of fish cought by different types of gears. Fishing gears recorded base on its size, form, materials, and how to operate [11,12]. Schedule of operation of each kind of fishing was recorded from Agustus 2015 to July 2016. Fish cought by each type of gears were identified base on morphometric and meristic data and comparing to reference books [13,14]. Hydrological characteristics such as water flow and water level were directly measure during survey time.

3. RESULTS AND DISCUSSION

3.1. Fish diversity

Fish caught during one year in research location composed of 45 species, where family of Cyprinidae have the highest diversity of 17 species, while Bagridae, Channidae and Anabantidae have four species respectively. Beside using as human food there were two species of fish considered as ornamental fish, *Balantiocheilus melapterus* and *Chromobotia macracanthus* as listed in Table 1. Fishing intensity in a water body was depend on natural productivity which are related to environmental conditions and human activity around the water body [15].

Tabel 1. Composition of fish caught in Floodplain swamp of Musi River

No	Family	Species	Common Name	Local name
1	Cyprinidae	Osteochilus vittatus	Bonylip barb	Palau
2		Cyclocheilichthys apogon	Beardless barb	Seberas
3		Leptobarbus hoevenii	Hoven's carp	Jelawat
4		Barbonymus schwanenfeldii	Tinfoil barb	Lampam
5		Puntioplites bulu		Tebengalan
6		Puntigrus tetrazona	Sumatra Barb	Pirik elang
7		Osteochilus melanopleura		Aro
8		Barbichthys laevis	Sucker barb	Bentulu
9		Osteochilus microcephalus		Buing
10		Thynnichthys thynnoides		Damaian
11		Labiobarbus ocellatus		Lambak Usang
12		Hampala macrolepidota	Hampala barb	Sebarau
13		Balantocheilus melapterus	Tricolor sharkminnow	Puntung hanyut
14		Rasbora sp		Seluang
15		Haludaria fasciata	Melon barb	Semuringan
16		Labiobarbus festivus	Signal barn	Siumbut
17		Labeo chrysophekadion	Blackshark minnow	Sihitam
18	Channidae	Channa pleurophthalmus	Snakehead	Bujuk
19		Channa striatus	Striped snakehead	Gabus
20		Channa micropeltes	Indonesian snakehead	Toman
21		Channa melasoma	Black snakehead	Serkoh
22	Anabantidae	Anabas testudineus	Climbing perch	Betok
23		Trichopodus pectoralis	Snakeskin gourami	Sepat siam
24		Trichopodus trichopterus	Three spot gourami	Sepat Mato Merah
25		Trichopodus leerii	Pearl gourami	Sepat Daun Buluh
26	Helostomatidae	Helostoma temminkii	Kissing gourami	Tembakang
27	Belontidae	Belontia hasselti	Malay combtail	Selincah
28	Bagridae	Mystus gulio	Long whiskers catfish	Lundu
29		Mystus micracanthus		Biran
30		Hemibagrus nemurus	Asian redtail catfish	Baung
31		Mystus nigriceps	Twospot catfish	Beringit
32	Clariidae	Clarias macrocephalus	Bighead catfish	Lele
33	Silurudae	Wallago leerii		Tapah
34		Kryptopterus schilbeides		Lais kocor
35		Kryptoperus cryptopterus		Lais tapah
36	Pangasidae	Pangasius macronema		Riu-riu
37		Pangasius polyuranodon		Juaro
38	Cobitidae	Chromobotia macracanthus	Clown loach	Kejublang
39	Pristolepididae	Pristolepis grootii	Indonesian leaffish	Kepor/Sepatung
40	Nandidae	Nandus nebulosus	Bornean leaffish	Setambun
41	Mastacembelidae	Mastacembelus unicolor	Spinny eel	Tilan
42	Cynoglossidae	Cynoglossus feldmanni	River tonguesole	Lidah
43	Tetraodontidae	Tetraodon sp		Buntal
44	Chandidae	Parambassis wolffii	Duskyfin glassy perchlet	Sepengkah
45	Eleotridae	Oxyleotris marmorata	Marble goby	Betutu

3.2. Fisheries activity

3.2.1. Fishers

There are two types of fishers, individual fisher who work individually using simple fishing gears, and grouped fishers who work in team of 3 to 10 people using more complex fishing gears. Individual fisher usually the native inhabitant and did not need any license for fishing activity, while grouped fishers not only the native inhabitant but also migrate fishers and to exploit a water body they should have a "license" from local government. The license could be found through auction system which is conducted by village major on early January every year.

In the research location, 6 fishers were individually work using pot traps, long lines, gill nets and pole and line, they work as fishers only during rainy season. A group of 10 fishers was working together using more complicated fishing gear such as

Table 2. Kinds of fishing gears operated in Musi Floodplain

No	Fishing gear	Mode of work	Category
1	Hook and line (*Tajur*)	Passive, bait, Selective, set in night time.	Set and wait
	Set longlines		
2	(*Rawai*)	Passive, Bait, Selective, with many hook,	Set and wait
	Gillnets	set in day a and night time.	
3	(*Jaring*)	Passive, selective according to mesh size.	Set and wait
	Filtering funel (*Corong*)		
4	Silindric pot traps (*Bubu*)	Passive, filtring fish in fast water current, non selective.	Set and wait
	Rectangular pot traps (*Bengkirai*)	Passive, traping fish in grazing area, selective, usually with bait.	
5	Cast net (*Jala*)	Passive, trap, selective.	Set and wait
6	Barrier traps (*Empang*)	Active, non selective, operated in open area, supported by canoe.	Set and wait
	Seine	Passive, fence barrier 50 - 100 m long with box traps, non selective.	
7	(*Kerakat*)w	Active, moved by 3 - 5 people to make a small circle as fish room, nonselective.	Chasing
8			Barrier
9			Hoovering

funnel filtering device, barrier traps, fence and traps, and seine, they work as full time fishers.

3.2.2. Fishing gears

Floodplain fisheries are known as multispecies and multi gears fishery, where there are no specified fish target and fishers use many kinds of fishing gears, commonly traditional and self made gears [16]. Fishing gears operated in Musi floodplain along year round were practiced in a squence according to water level fluctuations. During the early of flooding season and at the end wet season the main fishing gears is fence barrier traps, a static trap filtering fishes in lateral migration from the plain to river and vice versa. During high water level with slow current, fishes moving inside the swamp for feeding, the main gears are the "set and wait gears" such as gill nets, pot traps, and long lines. In dry season where only some water pools still exist and almost all of fishes crowded in relatively small area of pool, fishing activity were use chasing gears such lift nets and push nets or hoovering by seine net.

Type and operating method of fishing gears used in Musi Flood plain was showed in Table 2. These four basic categories of floodplain river gear types have the following characteristics [17]:

Set-and-wait fishing gears include *gill nets*, *long lines* and *individual fish traps*. These are usually used in open waters where they are not entangled by weed or disturbed by strong flows. Such gears generally take a small catch per unit of effort but require relatively little effort, and can be used over a long season or even continue to be effective throughout the whole year.

Chasing gears such as *lift nets, push nets*, and *spears* are mainly used in the flood season, and involve more active pursuit of the fish by fishers, preventing their involvement in other part-time activities. They are a relatively inefficient fishing method at this time, due to the wide dispersal of the fish in the open floodplain waters.

Barrier gears are used on fish migration routes, particularly where water flows off the floodplain into the rivers or permanent pools of the dry season. Fish are trapped along such routes in some type of *fyke chamber* which is easy to enter but then difficult to escape from. Such fykes may be fished in various ways: several small *box traps* may be placed along a channel for example, or *long fences* may be used to direct fish into one central holding chamber.

Hoovering gears are used in the dry season to extract or 'hoover' those fish stranded in dry season water bodies. At this time of year, fishing waters may either be *seine-netted* in one or more wide sweeps, or even completely *drying* so that the fish can be collected by hand.

Proportion of fish catch by each kind of fishing gears was shown in Figure 1. Barrier trap was the most effective gears which is yielding 40% of total catch, while long lines yields only 3% of total catch. Gillnets which were operated from February to October yields 32% of total catch and set pole and line yields 21 of total catch. Freshwater swamp which are inundated by nutrient-rich water from river resulting in high productivity [18].

3.3. Relationship of water level fluctuation and operated Fishing gears

Figure 2 shows the sequence of fishing gears operated according to water level fluctuation. Any type of fishing gear was operated according to dynamic of water level or water flow which is influence to fish movement. During the initial of flooding the fish tend to migrate laterally from river to plain and at the end of rainy season they move from flood plain to river.

Set longlines, gilnets, funnel filtering device were operated during high water level while seine operated only during low water level with water depth less than 2 meters. Cast net and pole and line were used within whole year.

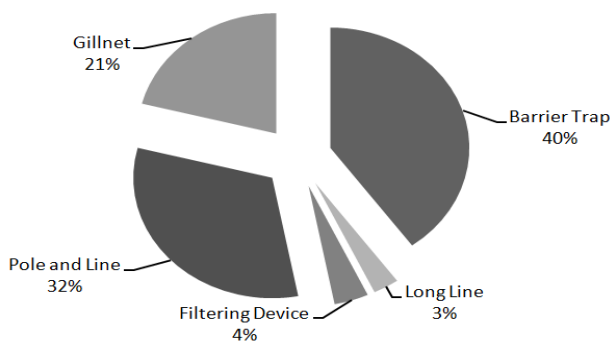Gill nets with different mesh size could operated within a

Figure 1. Proportion of fish yield by each kind of fishing gear in Floodplain Swamp of Musi River
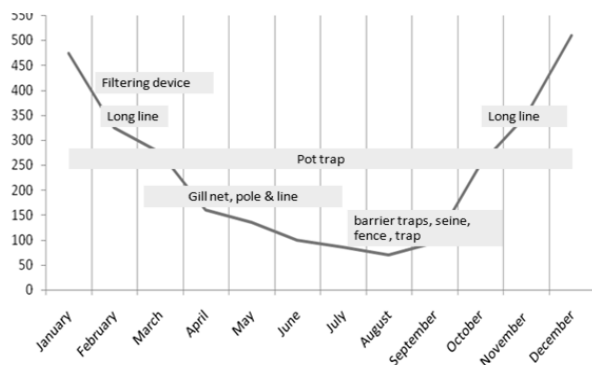

Figure 2. Relationship of type of gears to water level in Floodplain swamp in middle part of Musi River.

whole year (January – December), in flowing water or in stagnant water. Long lines were operated only during high water (March – June), while set pole and line (*tajur*) were operated during the end of wet season (April – August) in slow flowing water. Funel filtering device was used in fast flow water, filtering fish which are swing against water current, during wet season (February – March and November December). Barrier trap was used to catch migrating fish from plain to river during the initial of dry season (June – July) and Seine was used during low water level (July – August).

Recent studies also found that the fishers using different fishing gears related to fluctuation in water depth [19, 20]. During high water level, pole and line, long line, gill nets are favorable fishing gears in swamp forest, while during low water level seine, cast net, lift net and drag net are the favorable gears. Barrier trap and fence are favorable during period with drastic change of water level when fishes move out and enter the swamp.

Pot traps with some different shapes and different materials were used in a whole year. At the beginning of dry season (March to July) when water depth was around 1.5 to 2.0 m, the main gears are pole and line ("tajur"), long lines, and gill nets. From July to mid of October with water depth only around 1.0 m the principal fishing gears used were barrier traps, fence and trap, and seine. Long lines were used during high water level (February – March and October – December). Funnel filtering device only used during high water with fast flow (February – April).

Similar fishing activities were also seen in floodplain around Lempuing River channel. River barier with funnel trap use for fishing migratory fishes along the Lempuing River especially during the fast flowing water in early flood season. Significant catches were also observed during the June/July early reflooding at the upstream sites, but less so at the downstream savanna river sites. After this time, very few fish were caught in the riverine barriers during the second drawdown period, and over the dry season. In the subsequent early flood season, longitudinal migrants were again caught in riverine barriers though in smaller numbers, re-

flecting the catches taken over the dry season. The catches taken during this flood season confirm the ability of these barrier gears to catch whitefish on their spawning migrations.

The mesh sizes used in fishing gears determine their selectivity towards small sizes of fish, and hence have a profound effect on the overall levels of exploitation of fish stocks [21]. On the positive side, the use of small meshed gears increases the number of small fish species which are accessible to the fishery: on the negative side, they also take the small fry of other larger fish species. The different gillnet mesh sizes caught great variation in their size class catch distribution of fish [22]. While a fishery with small meshed gears may be sustained by the smaller fish species, there is an associated danger that the larger fish will become overexploited and decline.

4. CONCLUSION

Flood plain swamp is a dynamic ecosystem where it is become terrestrial habitat during dry season and aquatic habitat during rainy season. The swamp has the high fish diversity and has been utilized as fishing ground. Hydrological variations can affect fish at their distribution and temporal scales. Intra-annual variations of swamp water flow can modify the distribution and migratory pattern of fish species, with direct effects on fish catches. In the long term, variations in the hydrological fluctuation can influence the population dynamics of fish by acting on their reproductive and recruitment processes, changing the relative abundance of the affected species.

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