Capture Fishery Resources of Citanduy River, West Java

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Abstract. Citanduy river is one of the priority watersheds in West Java. Information on capture fisheries resources in Citanduy, however, river is limited. The aim of this study was to assess the information of capture fisheries resources in that river. The method used in this study was a survey method, by collecting data in the field, and then analyzed it in the laboratory. This research was conducted in 2018. Samples of fish were collected through the active participation of fishers with various types of fishing gear. The identification of fish and fishing gear used some references. Some fish caught were preserved in formalin solution and identified. The dominant catch in Citanduy River is Mystacoleucus marginatus and Cyprinus carpio. Other economic fishes catch in Citanduy river are Oreochromis niloticus, Osteochilus vittatus, O. mossambicus, Trichogaster trichopterus, Hemibagrus nemurus, Hampala macrolepidota, Channa striata, Moolgarda seheli, and Glossogobius giurus. The fishing gears used by fishers are hooks and lines, cast nets, scope nets, traps, and gill nets. The inland capture fishery in Citanduy river is still a secondary sector for the interests of local government. The current condition of capture fisheries in Citanduy is not the main livelihood for fishers. The inland capture fisheries in Citanduy is still using a simple fishing gear and do not have more complex tools. Citanduy river has potential source of economic and protein food, particularly for local community. Regarding in these potential, management of environment could be the major domains in fisheries management. The policy of local government in handling non-selective fishing gear and restocking activity could be maintain the sustainable fish resources in Citanduy river.

1. Introduction
River is one of inland water resources which has an important role as a source of protein and food security, a source of community and supporting livelihoods, employment, a source of foreign exchange and local government earning [1], [2], [3], [4], [5]. In the other hand, the multipurpose use of river makes it vulnerable to water pollution [6]. Moreover, the inland water management is often neglected. This phenomenon causes decreasing of potential for fish species diversity, fish production, area of fishing ground, and local government earning [7], [8], [9], [10], [11], [12]. The human activities around the river are one of the problems in the inland fisheries sector [1], [13], [14], [15], [16].

Citanduy river which is a part of Citanduy watershed is one of the priority watersheds in West Java. This is because Citanduy gets priority for handling erosion, sedimentation, and waste. Sedimentation of the Citanduy river is the main cause (70%) of the narrowing of the Segara Anakan lagoon, while the erosion rate reaches 19.15 mm/year. Some of the diversity of fish species reported in the Citanduy river includes nilem, tawes, balar, catfish, majaer, and milkfish [17]. Population of these fish will decrease due to changes in natural habitat, such as the construction of a pier in Segara Anakan,
clearing of mangrove forests, increasingly water transportation, environmental pollution, and sedimentation [18].

The Citanduy river has an important role in sustainable development ecosystem of the Segara Anakan estuary. This river supplies fresh water which at the same time contains a large amount of eroded sediment and other pollutants from households and agriculture. Land degradation also causes high erosion rates and the amount of suspended colloids. Compared to other rivers, the amount of erosion of Citanduy is the largest contributor to mud deposited in Segara Anakan [19]. The degradation of Citanduy river ecosystem are currently affecting the lives of animal populations in that area. The better management of inland fishery will affect to increase the production and ecological functions, so that inland water fisheries can be used as a based economic development of peoples [1, 8]. Information related to fishery resources in Citanduy river, especially capture inland fisheries, is limited. It is important to assess the information of capture fisheries resources in Citanduy river. This information was expected to provide the materials or suggestions for developing fisheries’ potential in Citanduy river.

2. Materials and Methods

The study was conducted in Citanduy river, West Java in 2018. Sample of fish was taken from three collection points, i.e. Tasikmalaya, Ciamis, and Cilacap (Figure 1). Tasikmalaya represented the upstream of Citanduy river. This area has characteristic as a rocky area. Then, Ciamis represented the middle of Citanduy river. While Cilacap represented the downstream of Citanduy river. This area still affected by the tides.

![Citanduy river](image)

**Figure 1.** Citanduy river.

The method of this study was a survey method by collecting data in the field and analyzing it in laboratory. Samples of fish were collected through the active participation of fishers with various types of fishing gear. The identification of fish and fishing gear used some references [20], [21]. Some fish caught were preserved in 10% formalin solution and grouped according to its fishing ground. Furthermore, those fish were identified at the Research Institute for Inland Fisheries and Extension, Palembang.
3. Result and Discussion

There are three main components related on fishing activities i.e., fisher as an actors, fishing gear as a tool to achieve goals, and catches both the number and value of the catch as the goal [22]. The fishing activities in Citanduy river consist of capture fisheries and aquaculture. Based on fishery sector, the potential of Citanduy inland fishery resources plays an important role as a source of protein. However, the capture fisheries activities in Citanduy are a secondary sector for the interests of local government. The current condition of capture fisheries in Citanduy is not the main livelihood for fishers. Usually, the fish catch is only used for personal consumption and/or directly sold to middlemen or restaurants. The changes in fisher’s livelihoods can be seen from changes in the number of households that depend on their livelihoods and income from capture fisheries in Citanduy river. Based on personal communication, the dynamics of the number of fishers are caused by them turning to other employment such as aquaculture, plantations, laborers, and others. This is also influenced by local government policies that still took the marine capture fisheries and aquaculture above inland fisheries.

The low profile of inland water ecosystems (including their fisheries) is some region exemplifies their marginalized status in major policy arenas [4]. A view prominent throughout the tropics and widely held by aid agencies that aquaculture is promoted as the means to maintain fisheries production [23]. The second component of fishing activities is fishing gear. Fishing gear is the main instrument in the utilization of fish resources. The type and method of catching on each type of fishing gear is depends on the characteristics of operational location, fish habits, and the main catch target (target species). Fishing gear is divided into two, namely selective and non-selective fishing gear. The selective fishing gear is a group of fishing gear that gets a small number, type, and size of certain fish. While the non-selective fishing gear is a group of fishing gear that gets large numbers, types and sizes of fish that various [22]. The management of fish resources is closely related to the management of fishing operations and fishing targets [24], [25].

The characteristics of fishing grounds and activities in Citanduy can be divided based on zoning, i.e. upstream, middle-stream, and downstream zone. The status of inland capture fisheries in Citanduy is still using a simple fishing gear, namely: hook line, sair (sieve net), cast net, gill net, and ngesar (active seine). The dominant fishing gear used by the fisher around Citanduy is hook and line. This tool is operated throughout the season and the price is relatively affordable. Nevertheless, there is also the occurrence of environmentally unfriendly fishing practice using setrum (electric fishing gears). The electric fishing gears could be directly causes the decline of fish stock in Citanduy river. The policy of local government in handling non-selective fishing gear (electric fishing gear) is one of the main factors influencing sustainable fisheries in the river. Furthermore, there is not much modification of fishing gears in upstream until middle stream of Citanduy river. The fishing activities in Citanduy river do not have more complex fishing gears, such as tuguk (filtering device), hampang (barrier traps), selambau or kilung (filtering net), ngesesek (active barrier), mangumppe (seine with aggregating device), and beje (pond traps). These fishing gears can catch on large quantities during the fishing season [24], [26], [27].

| No. | Fishing Gear          | Description                                                                                                                                 |
|-----|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Hook and line        | Hook and line is a passive and selective fishing gear. The fish will catch by natural or artificial bait that was put on hook. This tool is installed by holding the stick and the end of the fishing line containing natural bait (worms) on the hook is placed on the surface of the water between aquatic plants [28]. Hook and line operational time is around 2 until 4 hours per day. The composition of fish species caught by hook and line consist of Hemibagrus mumurus, Oreochromis mossambicus, Channa striata, and Barbonymus gonionotus. |
| 2.  | Sair (Sieve net)     | Sair or sieve is a traditional tool in a circular sieve made of woven bamboo rope. Sieve besides being used for sifting in the household, it is also commonly used to catch fish. Fisher usually used this tool in area where the water does not flow too fast. Then, the fisher descends and scoops up sair into the river or riverside [29]. The composition of fish |
species caught by sair was dominated by Mystacoleucus marginatus, Hemibragus nemurus, Osteochilus vittatus and Hampala macrolepidota. Cast net is an active and selective fishing gear. The operation of this fishing gear is spread in certain places. Cast net operational time is around 8 hours per day. The cast net sizes range from 3 to 6 meters. The composition of fish species caught by cast nets was dominated by Hemibragus mumurus, Mystacoleucus marginatus, Osteochilus vittatus, and Hampala macrolepidota [28].

Gill net is a passive and selective fishing gear. It is made from single or double nylon which has been woven into rectangular form. At the top and bottom there is a rope that serves to put a buoy and ballast. The mesh size is the same size for all nets. The number of meshes in the wide direction is less than the number of meshes in the long section. By using two opposing forces, namely the buoyancy of the buoy moves up and the weight and weight of the net moving downwards, the net will stretch [28]. Gill net operational time is around 8 hours per day. The composition of fish species caught by gill net consist of Oreochromis mossambicus, Osteochilus vittatus, Hampala macrolepidota, Mystacoleucus marginatus, Hemibragus nemurus, and Moolgarda seheli. Ngesar is an activity of fishing, which the fisher took fish using seine nets and bamboo. This fishing gear can catch different kinds of fish and in various sizes. Fishing activity of this tool usually conducted during dry season, where the water level is at the lowest level. Ngesar is usually done in some lake or situ. The composition of fish species caught by ngesar was dominated by Oreochromis mossambicus, Barbonymus gonionotus, and Channa striata [28].

During the study, the fish collection was recorded 11 species belongs to 6 families and 10 genera. Cyprinidae was dominant family with 5 species, than Cichlidae with 2 species. Cyprinidae is common type in several freshwater ecosystems [28], [31], [32]. This family can adapt easily in freshwater condition. The Cyprinidae family is the largest freshwater fish species in Southeast Asia [30]. Almost, the catch fishes at this study are for consumption (economic fish).

| No | Familia     | Species                        | Local Name |
|----|-------------|--------------------------------|------------|
| 1  | Cyprinidae  | Osteochilus vittatus           | Nilem      |
| 2  | Cyprinidae  | Barbonymus gonionotus          | Tawes      |
| 3  | Cyprinidae  | Mystacoleucus marginatus       | Balar      |
| 4  | Cyprinidae  | Cyprinus carpio                | Mas        |
| 5  | Cyprinidae  | Hampala macrolepidota          | Hampal     |
| 6  | Cichlidae   | Oreochromis mossambicus        | Mujair     |
| 7  | Cichlidae   | Oreochromis niloticus          | Nila       |
| 8  | Channidae   | Channa striata                 | Gabus      |
| 9  | Bagridae    | Hemibragus nemurus             | Bebeong    |
| 10 | Mugilidae   | Moolgarda seheli               | Belanak    |
| 11 | Gobiidae    | Glossogobius giurus            | Boso       |

The upstream of Citanduy river has an area with steep mountainous land cover (topography variation with an average slope of 0.035). The characteristics of these waters are swift currents, rocky bottom, and surrounded by forests and plantations. The fisheries activities in these area are not improve. Mostly, it is carried out by individual fisher for their own needs and as a hobby or recreational fishing activity. The diversity of fishing gear in upstream is limited, which it is dominated by hook and line.
The composition of fish caught by hook and line in the upstream and middle rivers consist of *Cyprinus carpio*, *Oreochromis mossambicus*, *Oreochromis niloticus*, and *Osteochilus vittatus*. The middle stream of Citanduy river has an average topographic variation of 0.006 (medium). The characteristics of the water flow are heavy to moderate. The capture fisheries activity is more improve than in the upstream zone. The fisheries activities are carried out by individual fisher and groups. Fisher in the middle-stream of Citanduy river consists of permanent, seasonal, and recreational fishing. Seasonal fishing activities usually done in lakes or *situ*, while the permanent fisher in river. The diversity of fishing gear in this area is more diverse than the upstream. The fishing gear used in this area are hook and line, *sait*, cast nets, and gill nets.

The downstream of Citanduy river has more dynamic characteristics than upstream and middle. Fishery activity in downstream is still quite high and improve. This area was influenced by tides, daily water level fluctuations, and acid-alkaline water [33]. Around this area is tidal rice fields, mangrove forests, residential, and industrial activities [18]. The fishing activities are carried out by permanent and part-time fisher, with commercial purpose (sold as a source of income). The fishing gear and fish catches in this area is more various than the two previous area [33]. Usually, fisher prioritize the main catch as the target species, such as economically important fish species, crabs, shrimps, etc. The mullet (*Moolgarda seheli*) is an example of an economical fish caught using gill nets in this area.

Citanduy river has potential source of economic and protein food, particularly for local community. Recently, the inland capture fisheries of Citanduy have very little apparent room for expansion by better management. There are three major domains in fisheries management, i.e. management of the fish assemblages; management of the fishery; and management of the environment. Which of these domains predominates depends on the type and location of the fishery [23]. In case of Citanduy are predominantly managed through control of the environment.

Mostly rivers on Java island tend to have a higher degradation rate than another area due to human activities [34]. Citanduy is indicated to have degradation in all zone/part of its river. The condition of the upstream Citanduy is critical with the more less forested land and intensive exploitation land. This happened caused by inappropriate use of land and population pressure [35]. Moreover, one of the downstream degradations is caused by sedimentation. This condition will affect to the sustainability of the productivity of fish resources [18], [33], [36]. Based on this condition, the government and stakeholders (community) are expected to seek to limit damage to aquatic ecosystems and to promote rehabilitation activities.

Figure 2. Socialization of inland fish resource management (a) and restocking activity (b) in Citanduy river [37].

![Figure 2. Socialization of inland fish resource management (a) and restocking activity (b) in Citanduy river [37].](image)
In addition, a primary challenge to raising the profile of inland fisheries entails highlighting more the crucial food and nutrition and livelihood contributions of this sub-sector [4]. One of the efforts to increase and maintain fish resources in Citanduy is to carry out restocking activities for native fish. The restocking aims is to increase the size of local fish populations that have decreased due to fishing, habitat disturbance, pollution, or predation [28]. In addition to direct intervention on the fish populations/communities, fisheries are usually controlled by enforcement of various regulatory constraints to prevent the overexploitation of the resources and maintain a suitable stock structure [23]. Therefore, the government in collaboration with local communities and other sectors can monitor regulations with aimed at maintaining the Citanduy fish resources.

4. Conclusion
The inland capture fishery in Citanduy river is still a secondary sector for the interests of local government. The current condition of capture fisheries in Citanduy is not the main livelihood for fishers. Regarding in fishing gears, the status of inland capture fisheries in Citanduy is still using a simple fishing gear and do not have more complex tools. Hook and line are dominant fishing gear used by Citanduy’s fisher. Nevertheless, there is also the occurrence of environmentally unfriendly fishing practice using setrum (electric fishing gears) which could cause the decline of its fish stock. During the study, it was recorded 11 species belongs to 6 families and 10 genera. Cyprinidae was the dominant family. Citanduy river has potential source of economic and protein food, particularly for local community. Regarding in these potential, management of environment could be the major domains in fisheries management. Moreover, the policy of local government in handling non-selective fishing gear and restocking activity could be maintain the sustainable fish resources in Citanduy river.

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