Analysis of Crayfish Catches Using Bubu Wau in Laut Tawar Lake, Central Aceh, Aceh

R M Aprilla1,2*, N Artelin1, M Muklis1, E Miswar1,2, M A Chaliluddin1, I Agustina1, K Melanie3

1Department of Fisheries Resources Utilization, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia
2Center of Marine and Fisheries Research, Universitas Syiah Kuala, Banda Aceh, 23111 Indonesia
3Department of Aquaculture, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia

*Corresponding author: ratnamutia@unsyiah.ac.id

Abstract. Laut Tawar Lake is located in the town of Takengon, Central Aceh district. Currently, Laut Tawar Lake has been utilized by the surrounding community as a fishing spot. One of the fishing gears used by fishermen is Bubu wau. One of the catches obtained by fishermen is crayfish. The crayfish has a high economic value, so the lack of control over the intensity of the catch also causes the average size of the crayfish caught, because catching crayfish is a transition from catching Rasbora tawarensis. One of the problems that frequently occur and research on crayfish has never been done before. Therefore, this research needs to be done. The purpose of this study was to determine fishing catch compositions of Bubu wau and the size distribution of crayfish carapace length of Bubu Wau fishermen in the Teluk One-one, Laut Tawar Lake. The research was carried out in about March 2021. The description of the fishing catch composition was analyzed by using the described method. The size distribution of crayfish carapace length was analyzed by the Sturgess rule. From the results of the study, it can be concluded that the catch compositions of Bubu wau in Teluk One-one are crayfish, suckermouth catfish, channeled apple snail and tilapia. The type of crayfish caught by fishermen’s Bubu wau was Cherax quadricarinatus amount of 4232 individuals (89% of the total catch), where the total length of the dominant crayfish carapace was 4.4-4.9 cm with a total number of 1403 and the least with a size of 8.6-9.1 cm was 1 crayfish from the total catch

1. Introduction
Laut Tawar Lake is located in Takengon town, Central Aceh District at an altitude of 1250 m above sea level. This lake has an area of 5472 ha and an average depth of 51.13 m. There are 25 surface water flows or rivers leading to Laut Tawar Lake originating from 18 upstream areas/catchment areas with water discharges varying from 11 to 2554 liters per second [1]. The central Aceh district has 14 sub-districts, one of which is the Laut Tawar sub-district. Fish resources found in Laut Tawar Lake such as carp, Mozambique tilapia, Rasbora tawarensis, and crayfish. Currently, the production of Rasbora tawarensis has decreased, because of the high intensity of catching activity, lack of management, and
the availability of *Rasbora tawarensis* stocks, so that many fishermen in Teluk One-one has changed the target to crayfish.

Crayfish is a freshwater organism that belongs to the genus *crustacea* and has a life cycle only in freshwater environments [2]. People from different places have different names for crayfish [3]. In Takengon, crayfish is known as red claws because it has red claws. Crayfish catching activities still use simple (traditional) fishing gear technology with small-scale fishing businesses. In general, the fishing gear used is a type of gill net in the form of a trap (*Bubu*). *Bubu* is a fishing gear in the form of a trap and is passive. *Bubu wau* is operated by using bait to attract the attention of crayfish.

The crayfish has a high economic value [4]. The existence of crayfish catching can improve the economy of fishing communities, but the increase in catching activity will have a negative impact on the crayfish resource. The average crayfish catch in Laut Tawar Lake reaches 2-4 kg/day in every 50 units of traps installed [5]. Based on the preliminary survey, the catch of crayfish in Teluk One-One is getting smaller and smaller, due to a large number of freshwater crayfish catching activities carried out by fishermen in Teluk One-One. This is in accordance with the research of Kurniawan et al [6] which states that the number of crayfish in Rawa Pening is decreasing from year to year, due to the increasing fishing rate. The catching crayfish in Laut Tawar Lake is a transition from *Rasbora tawarensis* catching. Therefore, it is needed for research on catch analysis using the *Bubu wau* fishing gear to be done Aceh.

2. Material and Methods

This research was conducted on March 2021 in Teluk One-one, Laut Tawar Lake, Central Aceh Regency.

The data collection method used was observation and interviews at the research site. Observations and interviews were conducted to obtain primary data. The primary data used in this study were the total composition of *Bubu wau* catching and the size distribution of crayfish carapace length. Sampling in this study was done using an accidental sampling technique so that the number of samples obtained in this study amounted to 4232 crayfish from the total *Bubu wau* fishermen in Teluk One-one, which are 8 fishermen as respondents.

The data analysis used in this study focused on analyzing the fishing catch composition and size distribution of crayfish carapace length of *Bubu wau* fishermen. The composition of the catch was analyzed by identifying the catches of *Bubu wau* fishermen with an identification book according to Faulkes [7], Reynolds [8], and Longshaw [9]. The size distribution of crayfish carapace length was analyzed by sorting the data from the smallest to the largest, determining the range, determining the number of class intervals, determining the length of the interval class, determining the value of the lower limit and upper limit, determining the class frequency and entering the frequency of each class by entering the crayfish carapace length. The determination of the amount classes is calculated by the Sturgess rule [10].

3. Results and Discussion

3.1. Fishing catch composition

Based on the results of the study, it was found that the catch compositions of *Bubu wau* with a mesh size of ¾ inches in Teluk One-one Laut Tawar Lake, the catches were crayfish (*Cherax quadricarinatus*) with a total of 4232 individuals and 3 other species as by-catch, namely suckermouth catfish (*Hypostomus sp.*) 48 individuals, channeled apple snail (*Pomacea canaliculata*) 384 individuals and tilapia (*Oreochromis niloticus*) 117 individuals. The total catches of fishermen *Bubu wau* in Teluk One-one, Laut Tawar Lake is 4781 individuals, it is presented in Table 1.

The composition of the catch is certain species that are the target of catching and species that are not the target of catching of the total number of catches from fishing gear. According to Iskandar [11]; Nofrizal et al [12]; Putri and Ilpah [13], the composition of the catch analyzed with descriptive, which is by distinguishing the main catch and bycatch. The main catch obtained by fishermen in Teluk One-one is crayfish (*Cherax quadricarinatus*) were the most caught catch with a total of 4232 individuals or
89% of the total catch. The type of the crayfish caught using the *Bubu wau* fishing gear in Teluk One-one during the study obtained 1 species as showed in Table 1.

**Table 1.** Fishing catch composition of *Bubu wau* in Teluk One-one, Laut Tawar Lake

| No | Common name        | Latin name                     | Amount (IND) | Percentage |
|----|--------------------|--------------------------------|--------------|------------|
| 1  | Crayfish           | *Cherax quadricarinatus*       | 4232         | 89%        |
| 2  | Suckermouth catfish| *Hypostomus* sp.               | 48           | 1%         |
| 3  | Channeled apple snail | *Pomacea canaliculata*       | 384          | 8%         |
| 4  | Tilapia            | *Oreochomis niloticus*         | 117          | 2%         |

Crayfish (*Cherax quadricarinatus*) are lives in swamps, rivers and lakes. The distinctive feature of crayfish is that there is a red stripe on the claws of the male crayfish, the body is bluish in color and the head has a rostrum consisting of 4 segments called *Carinae or carinatus*. Generally, crayfish are active at night (nocturnal) [14,15,16]. This is in accordance with the opinion of Wiyanto and Hartono [17]; Crandall [18], which state that crayfish are generally active at night (nocturnal). Therefore, fishermen in Teluk One-one Laut Tawar Lake setting fishing gear at night. The capture was carried out by setting *Bubu wau* at a depth of 12 m, and 8 m from the edge of the lake. Fishing ground is carried out in shallow areas with muddy substrates. This is in accordance with the opinion Kurniasih [19]; Zaky [20], which states that crayfish habitats are generally in shallow waters, with muddy substrates and many gaps and cavities to hide themselves. The catching arenaode 4 times a week, because the work as a fisherman is a side job and the rest is farming.

Besides of crayfish, fishermen also catch the bycatch, that were Suckermouth catfish (*Hypostomus* sp.) was 48 individuals (1%), Channeled catfish (*Pomacea canaliculata*) was 384 individuals (8%) and Tilapia (*Oreochomis niloticus*) was 117 individuals (2%). The suckermouth (*Hypostomus* sp.) Obtained is released immediately into the waters by fishermen because the fish are not consumed. The catch of the channeled catfish can be reused by *Bubu wau* fishermen as bait for catching lobsters. According to Subhan [21], the use of channels catfish as animal feed has also been widely developed in fresh form, channeled catfish are used as protein source feed for aquaculture such as catfish, snakehead, eel, shrimp, crab and crayfish. The Tilapia was a bycatch that can be utilized by fishermen such as for consumption, sale and tilapia breeding.

3.2. Size distribution of crayfish carapace length

The distribution of the catch size was grouped into two categories, namely the length of the carapace and the amount of the crayfish. The categories commonly used as indicators to determine the size of a species. Morphometric measurement of the catch was carried out after the fisherman has done hauling and crayfish separated from *Bubu wau*. Measuring the total length of the crayfish carapace was measured using a caliper. Meanwhile, the measurement of fish weight was carried out using digital scales. The frequency distribution of crayfish carapace length in Teluk One-one Laut Tawar Lake is presented in Figure 2. Based on Figure 2, showed that the frequency distribution of crayfish carapace length varies. The most caught crayfish were at intervals of 4.4-4.9 cm interval, while the least caught crayfish were between 8.6-9.1 cm.

The length of the carapace was measured from the end of the anterior of the carapace near the spine of the annular plate to the back edge of the carapace along the midline [22]. The research data was obtained based on samples of crayfish that using the *Bubu wau* fishing gear with a total of the sample was 4323 individuals with different carapace lengths. Based on Figure 2, showed that crayfish carapace length can be grouped into 12 groups. The grouping of carapace lengths starts from 2 cm to 9.1 cm. This is to ease the grouping of crayfish carapace lengths obtained at the time of the study. According to Aisah [23], that grouping the crayfish carapace width size range about from 3 cm to 16 cm, this makes it easier for grouping. The diagram in Figure 2, showed that the most caught crayfish were in the carapace length of 4.4-4.9 cm, as many as 1403 individuals.
The smallest group was 2-2.5 cm in the carapace length of crayfish, only 2 individuals were caught. The size of the carapace length of 2.6-3.1 cm as many as 13 individuals, the length of the carapace of 3.2-3.7 cm as many as 47 individuals, the size of the carapace length of 3.8-4.3 cm as many as 912 individuals, the size of 4.4-4.9 cm as many as 1403 individuals, when it reaches a carapace length of 5-5.5 cm the catch at that size decreases, which is the number of 848 individuals, the size of the carapace length is 5.6-6.1 cm as many as 661 individuals, the length of the carapace is 6.2-6.7 cm as many as 236 individuals, carapace length 6.8-7.3 cm as many as 82 individuals, carapace length 7.4-7.9 cm as many as 25 individuals, carapace length 8-8.5 cm as many as 2 individuals and a carapace length of 8.6-9.1 cm as many as 1 individual.

The largest number of crayfish caught was in the carapace length of 4.4-4.9 cm as many as 1430 individuals. The research results of Dina et al [24] showed different things, where the crayfish caught in Maninju Lake West Sumatra was 5.4 cm. This showed that crayfish size in Teluk One-one Laut Tawar Lake was relatively small, therefore special attention is needed in the management and utilization of crayfish resources, considering that crayfish have high economic value. The existence of crayfish in waters is influenced by the availability of feed and environmental conditions. According to Boyd [25], if there is food available in water and supported by normal air quality, the organisms will be able to survive.

4. Conclusion
The result of this study showed that the catch compositions of *Bubu wau* in Teluk One-one are crayfish, suckermouth catfish, channeled apple snail and tilapia. The type of crayfish caught by fishermen’s *Bubu wau* was *Cherax quadricarinatus* amount of 4232 individuals (89% of the total catch), where the total length of the dominant crayfish carapace was 4.4-4.9 cm with a total number of 1403 and the least with a size of 8.6-9.1 cm was 1 crayfish from the total catch.

References
[1] Bappeda Kabupaten Aceh Tengah 2004 Buku Laut Tawar Selayang Pandang (Karateristik Danau Laut Tawar) Takengon
[2] Lekatompessy H S and Da Costa G W 2019 Jurnal Perikanan Dan Kelautan 1 1 1-9
[3] Bobbie Kalman and Rebecca S 2006 The life Cycle of a Crayfish (Canada: Crabtree Pub Co)
[4] Putri D U 2019 Jurnal Penelitian 1 1 1-6
[5] Dinas Perikanan Kabupaten Aceh Tengah 2020 Ekonomi dan Bisnis Pegasing-Aceh Tengah
[6] Kurniawan W, Saputra A W and Solichin A 2016 Diponegoro Journal Of Maqueres 5 1
[7] Faulkes Z, Kawai T and Scholtz G 2016 Freshwater Craftish A Global Overview (United States:
CRC Press is an imprint of Taylor and Francis Group

[8] Reynolds J and Grosset C S 2012 Management of Freshwater Biodiversity (United Kingdom: Cambridge University Press)

[9] Longshaw M and Stebbing P 2016 Biology And Ecology of Crayfish (United States: CRC Press is an imprint of Taylor and Francis Group)

[10] Usman H and Akbar P S 2006 Pengantar statistika (Jakarta: Bumi Aksara)

[11] Iskandar D 2011 Jurnal Saintek Perikanan 6 2 31-37

[12] Nofrizal, Jhonnerie R, Yani A H and Alfin 2018 Marine Fisheries 9 2 221-233

[13] Putri D A and Ilpah I 2019 Barakuda 45 1 8-17

[14] Situmorang J, Darmawan D and Ilawati F 2021 Semah Jurnal Pengelolaan Sumberdaya Perairan 5 1 13-23

[15] Lengka K, Kolopita M and Asma S 2013 Budidaya Perairan 1 15-21

[16] Anggoro S, Subiyanto and Rahmawati Y A 2013 Journal Management of Aquatic Resources 2 3 128-137

[17] Wiyanto R H and Hartono R 2007 Merawat Lobster Hias di Akuarium (Jakarta: Penebar Swadaya)

[18] Crandall, K A 2016 Journal Of Crustacean Biology 36 761-766

[19] Kurniasih T 2008 Media akuakultur 3 1 31-35

[20] Zaky K A, Rahim A R and Aminin A 2020 Jurnal Perikanan Pantura (JPP) 3 1 23-30

[21] Subhan A 2016 Populasi Dan Potensi Keong Mas (Pomacea Canaliculata) Sebagai Sumber Bahan Pakan Itik Alabio (Anas Plathyrinchos Borneo) Di Kalimantan Selatan. In Prosiding Seminar Nasional Inovasi Teknologi Pertanian (pp. 1123-1131).

[22] Jamlean Y G, Bataragoa N E and Tombokan J L 2018 Jurnal Ilmiah Platax 6 1

[23] Aisyah and Triharyuni S 2010 Indonesia Fisheries Research Journal 16 1 15-24

[24] Dina R, Wowor D and Hamdani A 2013 LIMNOTEK 20 2 159-168

[25] Boyd C F 1979 Water Quality in Warm Water Fish Ponds (Alabama: Craftmaster Printera Inc. Opelice)