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# Morphometric and meristic characteristics of climbing perch fish (*Anabas testudineus*) in the sub-population of peat swamps agroecosystem

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## ABSTRACT

The environmental factor could change the morphometric and meristic characteristics of fish because of the natural adaptation. The climbing perch fish which originated from freshwater ecosystem was found in several peat-swamp area which has high diversity nutrients but at the same time potentially harm the species because of its low acidity level. However, there was no comprehensive report about the morphological characteristics of climbing perch fish caught in the Ogan KomeringIlir, South Sumatera Indonesia. The study aims to identify the morphometric and meristic characteristics of climbing perch fish from four different type of ecosystems using 33 morphometric characters and 12 meristic characters. The result was further analyzed using discriminant functional analysis and cluster analysis to see which caught fish had the similar characteristics among the sampling point. The results showed that there were seven morphometric characters having a significant difference where three of them differentiated the caught fish. The study proved that the water streams determined the size of fish. The fish caught in peat dome and oil palm plantation had a high similarity, but the fish caught in Teloko lake and another utilized area was slightly different. However, the study of meristic characteristics showed no significant difference indicating that the ecosystem characters only affected the morphometric characteristic of fish.

***Key words :*** *Peat swamps, Morphometric and meristic, Conservation, Climbing perch fish*

## Introduction

South Sumatera is a province located in the south part of Sumatera Island, Indonesia. South Sumatera is well known as the wetland province where approximately 38% of wetland reported in Indonesia located in this province only (Sulaeman and Minasny, 2019). The characteristic of wetland area was always interesting since the ecosystem has high diversity in a frame of high carbon content which could provide a nutrient but potentially harm the species due to low acidity level of water (Wijaya, 1986). In term of fish diversity, several fishes have been detected in the swamp ecosystem such as Climbing perch fish *(Anabas testudineus),Sepat Siam (Trichogaster pectoralis)*, Cork fish *(Channa striata)*, Kissing Gourami *(Helostomateminckii)*, *Selincah (Belontiahasseltii)*, *Sepatung (Pristolepissp)*, *Seluang (Rasbora sp)* and *Lais (Cryptopterussp)* (Nurmayani, 2017).

Among the fish detected in the swamp ecosystem, the climbing perch fish gained our because the fish is categorized as most favorite fish by local community and it reported having high economic value since the price was relatively cheap but providing high mineral, vitamin, lipid acid, protein, and amino acids (Paul *et al.,* 2017). The climbing perch fish contains high polyunsaturated fatty acid and essential amino acid needed by human body (Paul *et al.,* 2017). Comparing to most common freshwater fish, the climbing perch fish has high fat content which is 6-7 % of 100 grams of whole-body protein (Paul *et al.,* 2017). In term of meat quality, the fish has a good texture with tight meat, tasty, and categorized as the fish with high quality meat (Khairi *et al.,* 2018). The local community in South Sumatera put this fish for food security and the important species.

The climbing perch fish *(Anabas testunineus)* is reported as the native Asian fish which have a wide distribution in several countries such as India, China, Thailand, Pakistan, and Indonesia (United State of Fish and Wildlife Service, 2019). In Thailand, the climbing perch fish is known as "KOI" fish while in Indonesia, the fish is named as "Betok". To be specific in the distribution in Indonesia, the climbing perch distributed in most of Indonesia territory including the major five islands of Indonesia: Sumatera, Borneo, Papua, Java, and Sulawesi (Utomo *et al.,* 2010). In Sumatera, the climbing perch fish could be found in all part of island from north to south with a specific ecosystem with low water bodies such as swamp, lake, canal, pond, paddy field, pools, estuary, etc (Helmizuryani and Muslimin, 2016).

The climbing perch fish is a unique fish since it can live in the extreme condition because of its additional respirational system: labyrinth (Asyari, 2007). Hughes (1970) reported that the climbing perch fish could easily adapt its respirational system to the environment which made this fish known as the air-breathing fish. The adaptation of respiration system of the climbing perch fish has been well reported (Hughes and Singh, 1970). But the morphology of climbing perch fish found in the extreme ecosystem was new and interesting. Thus, the morphometric and metric characteristics of the climbing perch fish found in South Sumatera is interesting to investigate especially the fish which were found in the peat swamp ecosystem. The peat swamp has the blackish brown water which contain Ferro Sulphate (FeS) as the mineral which made the water has low acidity level. The result was expected to report the potential adaptation in morphological characteristics made by the peat swamp ecosystem. In addition, the sample of climbing perch fish was obtained from the peat swamp ecosystem of Ogan KomeringIlir (OKI) district. The reason choosing this location was because OKI is dominated by the low-lying water bodies where approximately 70% of the district areas were covered by water (Badan Pusat Statistika, 2020). There were two characteristics of ecosystem used which were the upstream and downstream area of peat swamp. The main different between the ecosystem was the water source where the upstream was depend on rainfall level and the downstream was relatively watered all year. The result was expected to provide an information about the fingerprint morphology characteristic of climbing perch fish found in the South Sumatera, Indonesia. As comparison, the other morphology characteristics reported in other location was conducted to see the possible adaptation of fish made the special and unique ecosystem of peat swamp ecosystem.

## Materials and Methods

### Collecting the fish sample

The fish was obtained from four sampling locations namely the peat dome area (I), the drainage of oil palm plantation (II), another utilize area (III), and the lake area of Teloko (IV). The area has been well known as the natural habitat of climbing perch fish by local communities. The collecting period was conducted for 10 months starting from February 2020 to December 2020.

The specimens of wild fish were caught using two traditional ways: Kemilar and Fishnet. The kemilar is a traditional fish snare shaped a box with the fishnet in all side and a small space in the front to provide a way for fish enter. The Kemilar was placed in the sampling point facing the opposite of water flow for couple of hours to catch the fish. The second method is using fishnets, 7 x 4 meters of size, and swept through the opposite flow of water. All the caught fished stored in the box container with a water from the sampling point to provide the similar condition of sampling point. All the sample was transferred to the Laboratory of Biology, University of Muhammadiyah, Palembang to do the further study. Figure 1 showed the detail location of sampling point which were categorized as peat swamps. After received in the laboratory, all the collected fish were kept in the water tank to keep them alive with the temperature was kept in room temperature and the water pH was set into 6-7. The fish was maintained for 24 hours without any food and ready to be observed. Before conducting the observation, the fish was measured in the cooler box which have been filled by the ice to perform the euthanasia.

### Sample Assessments

The collecting fishes, shown in Figure 2, were investigated using a digital caliper and measuring board. The morphometric characteristics were obtained using 33 characters which referred to method described by Tuscan (1990). The meristic characteristics were determined using 12 characters described by Gonzalez-Martinex (2020). Both morphometric and meristic characteristics were shown in detail in Table 1 and 2, respectively (Gonzales_Martinez et al. 2020).

### Statistical Analysis

The obtained morphometric characteristics data were standardized using the transformation formula as follows: T where: T = Transformation, M = Measurement and TL = Total length (Turan, 1999). The transformation results were analyzed for their correlation between 33 variables with ANOVA with significancy (p) $< 0.05$ to identify significant intraspecific fish size variations (Reist, 1985). In advanced, the analysis of morphometric diversity was conducted using multivariate tests, namely Discriminant Functional Analysis (DFA) and Cluster Analysis (CA).

The meristic analysis was analyzed descriptively by counting the number of body parts of the fish. The results of the study were compared with some

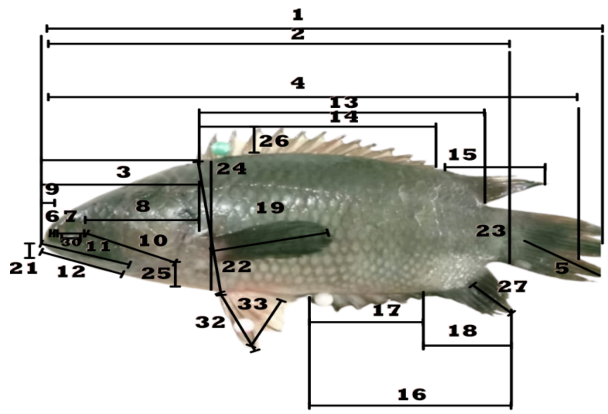
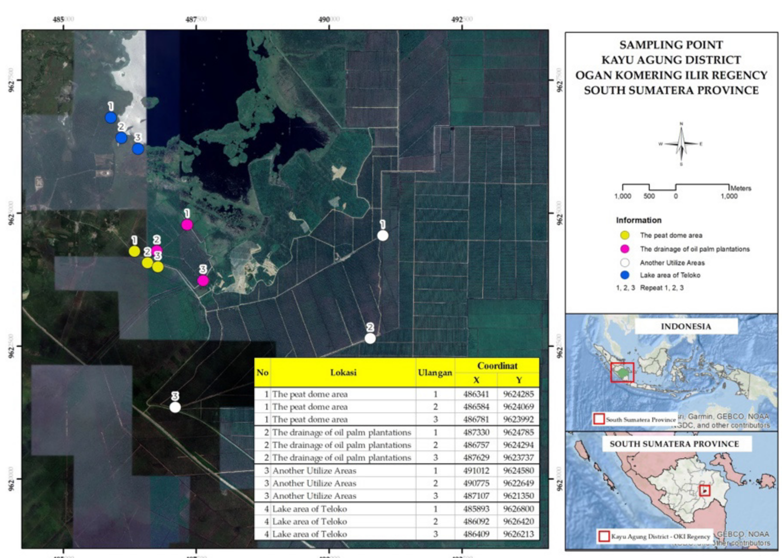


**Fig. 2.** The collecting climbing perch fish and the area of morphometric characteristics




| No | Lokasi | Ulangan | Coordinat | |
|---|---|---|---|---|
| | | | X | Y |
| 1 | The peat dome area | 1 | 486341 | 9624285 |
| 1 | The peat dome area | 2 | 486584 | 9624069 |
| 1 | The peat dome area | 3 | 486781 | 9623992 |
| 2 | The drainage of oil palm plantations | 1 | 487330 | 9624785 |
| 2 | The drainage of oil palm plantations | 2 | 486757 | 9624294 |
| 2 | The drainage of oil palm plantations | 3 | 487629 | 9623737 |
| 3 | Another Utilize Areas | 1 | 491012 | 9624580 |
| 3 | Another Utilize Areas | 2 | 490775 | 9622649 |
| 3 | Another Utilize Areas | 3 | 487107 | 9621350 |
| 4 | Lake area of Teloko | 1 | 485893 | 9626800 |
| 4 | Lake area of Teloko | 2 | 486092 | 9626420 |
| 4 | Lake area of Teloko | 3 | 486409 | 9626213 |

**Fig. 1.** The sampling points located in Ogan Komering Ilir Regency, South Sumatera, Indonesia

literature to calculate the range meristic characteristics.

## Results and Discussion

### Morphometric Characteristics

A total of 128 samples obtained using random sampling approach from four studied locations. The maximum and minimum size of morphometric characteristics shown in Table 3 confirmed that most of samples obtained from four sampling location did not performe any significancy different in size. In total length (TL), the proportion of growth in morphometric character changes positively along with the growth of fish indicating that the longer of TL meaning the longer of morphometric characteristics. The small difference of any value on the morphometric characteristics was because of the environmental aspect such as the presence of other fish such as *Shemaya fish* (*Alburnuschalcoides*), physicochemical properties of water bodies such as temperature, dissolved oxygen, depth of water, current

**Table 1.** The parameter of morphometric characteristics assessed to climbing perch fish

| No | Parameter | Acronyms | Description |
|---|---|---|---|
| 1 | Total length | TL | Tip of the front head to the caudal fin |
| 2 | Standard length | SL | Tip of the head to the crease base of caudal fin |
| 3 | Head length | HL | Tip from nose to back end of gill cap puck |
| 4 | Front dorsal fin length | FDFL | Tip of the nose to the base of first radius of dorsal fin |
| 5 | Tail stem length | TSL | Tip of fin base to middle radius base of caudal fin |
| 6 | Nose length | NL | Edge of nose to front side of eye socket |
| 7 | Eye diameter | ED | Distance between the edges of eye sockets |
| 8 | Head length behind eye | HLBE | The back edge of eye to gill cover membrane |
| 9 | Head length after eye | HLAE | The leading edge of eye to the edge of head |
| 10 | Length between eye and pre-operculum | LEAP | The distance between the eye socket to corner of pre-operculum |
| 11 | Maxillary length | MAL | The distance between the front end to back end of maxillary bone |
| 12 | Lower jaw length | LJL | The front end to the back edge of the jaw crease |
| 13 | Dorsal fin base length | DFBL | The base of the first radius to the membrane of dorsal fin of the final radius |
| 14 | Base length of dorsal hard fin radius | BLDHFR | Base of the first hard radius to the last dorsal fin |
| 15 | Base length of dorsal limp fin radius | BLDLFR | Base of the first weak radius to the last of dorsal fin |
| 16 | Anal fin base length dorsal | AFBL | Base of the first radius to the membrane of the fin of the last radius |
| 17 | Length of hard radius of anal fin | LHRAF | Base of first hard radius to the last anal fin |
| 18 | Length of weak radius of anal fin | LWRAF | Base of the first weak radius to the last anal fin |
| 19 | Pectoral fin length | PFL | Base of the fin to the longest end of pectoral fin |
| 20 | Ventral fin length | VFL | Base of the fin to the longest end of ventral fin |
| 21 | Height under the eye | HEH | The lower edge of eye with the upper jaw |
| 22 | Height | HE | The highest ventral part |
| 23 | Tail stem height | TSH | Stem tail at the lowest place |
| 24 | Head height | HH | The base central of head with the center of head down |
| 25 | Cheek height | CH | The eye cavity and the front edge of the pre-operculum |
| 26 | Dorsal fin height | DFH | Base to the tip of dorsal fin |
| 27 | Anal fin height | AFH | Base to the tip of anal fin |
| 28 | Width | WI | Distance between the sides of body |
| 29 | Head width | HW | Distance between the gill cover pieces on both side of head |
| 30 | Eye width | EW | Eye socket diameter |
| 31 | Mouth opening width | MOW | Both corners of maximum opened mouth |
| 32 | Base length of ventral fin hard radius | BLVFHR | Base of first hard radius to last ventral fin |
| 33 | Base length of ventral fin weak radius | BLVFWR | Base of first weak radius to last ventral fin |

velocity food source, etc (Cheng *et al.*, 2018; Muslimin *et al.*, 2020; Antonucci *et al.*, 2012). Furthermore, the homogeneity test of the transformed morphometric character dataset showed the data as the heterogeneous or unequal data.

The discriminant function was used to see the distribution of distinguish characters of morphometric characteristics were chosen based on the significancy different ($p<0.05$) shown in Table 4. They were seven (7) characters: HL, FDFL, AFBL, HE, HH, WI and BLVFHR. However, the seven characters was further chosen into three (3) most distinguish characters based on the smallest number of variance and the result showed that Height (HE), Body Width (WI), and Base Length of Ventral Fin Hard Radius (BLVFHR) as the most dominant characters used in the discriminant function.

In general, the climbing perch fish found in the ogankomeringilir (OKI) peat swamp have the similar result of HE, WI and BLVFHR in every sampling location, but some specific location provided a slightly different picture. For example, the fish from Teloko lake have a smaller in body width (WI) but having a longer in HE and BLVFHR compared to other fish caught in the other location. The most possibly reason was because the lake was an open area which had the strong stream passing by the lake. The stream made the fish move faster than any other sampling place and having a good maneuverability resulting in higher in HE and BLVFHR, but lower in WI [18]. The good mobility of fish in Teloko lake was also because the fish mostly migrate to other place during the wet season since the lake will be flooded and the migration needs a more energy compared to other caught fish in the other location. The fish was also reported to swim upstream during the wet season by swimming against the flow of flood water which made the fish spend more energy during the wet season (Bastoni, 2018). The more spending energy initiated the form of small in BW but having higher in HE. Moreover, the other sampling locations were the closed area in which most of fish would stay all year and stimulate the higher of WI (Helmizuryani *et al.*, 2020).

The environmental factors such as the proximity between locations and water sources also affected the different of, HE, WI and BLVFHR (Dwivedi and Kubey, 2012). The environmental aspect differentiated the food source due to affecting the presences of plankton for benthic insects, determining the water flow velocity and stream, temperature, and chemical properties affected the hunting behavior of the fish (Asriayana and Irawati, 2018). The season indirectly affected the characteristics of fish found in the sampling locations since the season influenced the water level and quality which then affected the fish movement and food sources (Cakmak, 2010). Furthermore, the availability and type of food source adjusted the mouth opening of fish and eating habits which results in the difference of shape and other physical conditions, especially for height and body width.

The further analysis using discriminant function based on centroid value would determine which fish was having the similar morphometric characteristics as the function of sampling location. Figure 3

**Table 2.** The parameters of meristic characteristics assessed to climbing perch fish

| No | Parameter | Description |
|---|---|---|
| 1 | Number of dorsal fin radii | Number of hard and weak radii of dorsal fin |
| 2 | Number of radius of anal fin | Number of hard and weak fingers of anal fin |
| 3 | Number of ventral fin radii | Number of hard and weak radii of ventral fin |
| 4 | Sum of vectoral fin radius | Number of pectoral fin radii |
| 5 | Number of caudal fin radius | Number of caudal fin radius |
| 6 | Number of scales on rib lane | Scale between the gill covers and the beginning of base of tail |
| 7 | Number of scales above rib lane | Scale between the beginning of dorsal fin tilt down to rib line |
| 8 | Number of scales below rib lane | Scale between the beginning of anal fin slant upward forward to lateral line |
| 9 | Number of scales on dorsal fin face | All scales traversed by line drawn from the beginning of dorsal fin to back of head |
| 10 | Number of scales on cheeks | Number of rows of scales traversed by line drawn from eye to peroperculum corner |
| 11 | Number of scales around body | All scales traversed by line around body |
| 12 | Number of scales around trunk of tail | Scales through the line around the tail stem passes |

showed that there were four (IV) quadrants divided into two function to see the correlation between each sample. The close value of canonical correlation and similarity index made the fish was identical to other fish based on morphometric characteristics (Matthews, 2017). The result showed that the samples were divided into three groups: Quadrant I-II, Quadrant IV, and Quadrant III. The fish caught in oil palm plantation canal had the similarities with the fish caught in the peat dome (The diagram with red oval circle). The fish caught in the Teloko Lake and Another Utilize Area had the most differentiated morphometric structure and placed in Quadrant III and IV, respectively. The kinship and grouping of the climbing perch fish showed the same results with the dendrogram in Figure 4 with the Euclidian line being assessed as 10.

The discriminant analysis proved that the types of ecosystem potentially changed the morphometric characteristics of fish where in this study, the open ecosystem such as lake made the fish more active to hunt and do the activity compared to the fish caught in the closed area where the rainfall level affected the main source of water. However, the change of morphometric characteristics would be more complex than just saying it was differentiated by the

**Table 3.** The maximum and minimum value of morphometric characteristics of climbing perch fish caught in OganKomeringIlir

| Morphometric characteristics Acronyms | Peat dome | | Palm canals | | Anther utilities areas | | Teloko lake | |
|---|---|---|---|---|---|---|---|---|
| | Min (cm) | Max (cm) | Min (cm) | Max (cm) | Min (cm) | Max (cm) | Min (cm) | Max (cm) |
| TL | 14.517 | 32.660 | 14.497 | 32.660 | 11.535 | 32.660 | 17.142 | 32.660 |
| SL | 0.387 | 0.869 | 0.387 | 0.904 | 0.739 | 0.904 | 0.691 | 0.836 |
| HL | 0.044 | 0.298 | 0.044 | 0.298 | 0.067 | 0.179 | 0.022 | 0.127 |
| FDFL | 0.157 | 0.307 | 0.152 | 0.307 | 0.128 | 0.278 | 0.043 | 0.260 |
| TSL | 0.020 | 0.311 | 0.020 | 0.311 | 0.047 | 0.244 | 0.054 | 0.269 |
| NL | 0.020 | 0.100 | 0.020 | 0.100 | 0.017 | 0.078 | 0.018 | 0.067 |
| ED | 0.025 | 0.156 | 0.025 | 0.156 | 0.027 | 0.103 | 0.031 | 0.089 |
| HLBE | 0.048 | 0.159 | 0.044 | 0.206 | 0.055 | 0.126 | 0.034 | 0.112 |
| HLAE | 0.015 | 0.181 | 0.015 | 0.181 | 0.021 | 0.089 | 0.034 | 0.109 |
| LEAP | 0.046 | 0.325 | 0.046 | 0.325 | 0.042 | 0.219 | 0.070 | 0.573 |
| MAL | 0.086 | 0.480 | 0.086 | 0.480 | 0.124 | 0.244 | 0.110 | 0.275 |
| LJL | 0.101 | 0.800 | 0.101 | 0.800 | 0.101 | 0.219 | 0.073 | 0.267 |
| DFBL | 0.145 | 0.731 | 0.145 | 0.731 | 0.057 | 0.634 | 0.352 | 0.677 |
| BLDHFR | 0.041 | 0.479 | 0.041 | 0.479 | 0.045 | 0.474 | 0.160 | 0.472 |
| BLDLFR | 0.077 | 0.728 | 0.077 | 0.728 | 0.080 | 0.222 | 0.107 | 0.297 |
| AFBL | 0.124 | 0.672 | 0.124 | 0.672 | 0.266 | 0.508 | 0.112 | 0.609 |
| LHRAF | 0.095 | 0.435 | 0.095 | 0.435 | 0.116 | 0.340 | 0.142 | 0.355 |
| LWRAF | 0.075 | 0.359 | 0.054 | 0.359 | 0.066 | 0.253 | 0.053 | 0.276 |
| PFL | 0.051 | 0.212 | 0.051 | 0.222 | 0.089 | 0.208 | 0.073 | 0.333 |
| VFL | 0.047 | 0.394 | 0.047 | 0.394 | 0.085 | 0.236 | 0.099 | 0.236 |
| HEH | 0.004 | 0.576 | 0.004 | 0.576 | 0.031 | 0.101 | 0.037 | 0.113 |
| HE | 0.111 | 0.415 | 0.111 | 0.431 | 0.210 | 0.403 | 0.241 | 0.427 |
| TSH | 0.087 | 0.252 | 0.076 | 0.252 | 0.089 | 0.178 | 0.077 | 0.168 |
| HH | 0.079 | 0.294 | 0.079 | 0.294 | 0.089 | 0.197 | 0.089 | 0.200 |
| CH | 0.035 | 0.274 | 0.035 | 0.274 | 0.142 | 0.263 | 0.138 | 0.267 |
| DFH | 0.038 | 0.588 | 0.038 | 0.588 | 0.044 | 0.107 | 0.043 | 0.100 |
| AFH | 0.037 | 0.865 | 0.034 | 0.865 | 0.038 | 0.138 | 0.033 | 0.103 |
| WI | 0.034 | 0.645 | 0.034 | 0.692 | 0.384 | 0.645 | 0.434 | 0.692 |
| HW | 0.000 | 0.338 | 0.000 | 0.338 | 0.138 | 0.285 | 0.164 | 0.321 |
| EW | 0.025 | 0.097 | 0.025 | 0.097 | 0.025 | 0.093 | 0.023 | 0.091 |
| MOW | 0.004 | 0.200 | 0.004 | 0.188 | 0.031 | 0.106 | 0.033 | 0.124 |
| BLVFHR | 0.063 | 0.188 | 0.063 | 0.188 | 0.084 | 0.184 | 0.071 | 0.188 |
| BLVFWR | 0.047 | 0.177 | 0.047 | 0.187 | 0.058 | 0.143 | 0.066 | 0.259 |

Acronym: cm = centimeters

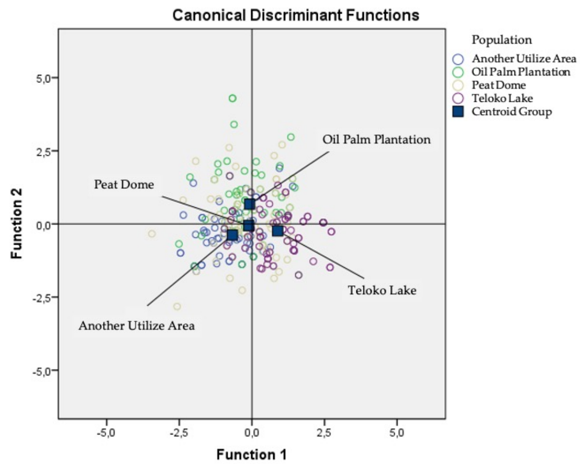



**Fig. 3.** The diagram of discriminant function based on centroid value

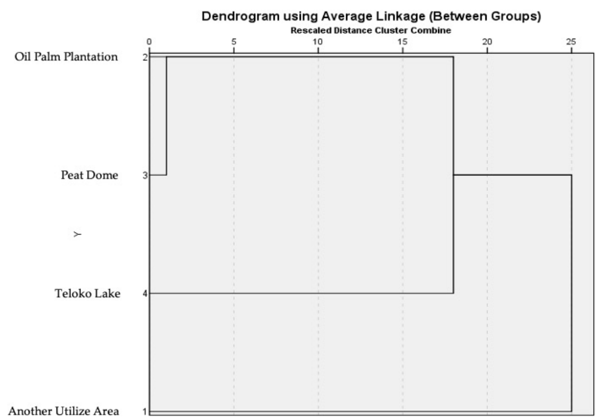



**Fig. 4.** The group of climbing perch fish using Dendrogram as function of morphometric characteristics centroid value in all sampling location

type of ecosystem. The further analysis should be made to check if genetically the fish caught in the studied area were same because the different of genetic genes would probably become the main reason of the different of morphometric characteristics. In the other possibility, the change made by the different characteristics of ecosystem such as the different between farming fish and wild fish could potentially inherit the morphometric characteristic of fish.

## Meristic Characteristics

In general, the meristic characteristics found that the characteristic of fish caught in all sampling point were quite similar since the number of dorsal fin hard and weak radii was completely same at all the locations. The total of dorsal fin hard and weak radii was 16 to 18 which in accordance with the one reported by Lestari (2019). The different number between hard and weak number of radii was only due to the different size of sample and the season of fishing period (Asiah *et al.*, 2019). The large fish normally have more fin radii compared to the one in small size.

**Table 4.** The discriminant test of morphometric characteristics function into three functions of 33 parameters

| Morphometric Acronyms | Function 1 | Function 2 | Function 3 |
|---|---|---|---|
| TL[b] | -0.107 | 0.158* | -0.063 |
| SL[b] | 0.100 | 0.125 | 0.056 |
| HL | -0.280 | 0.388 | **0.633*** |
| FDFL | **-0.506*** | 0.289 | 0.114 |
| TSL[b] | 0.102 | 0.049 | 0.198* |
| NL[b] | -0.030 | 0.249* | 0.069 |
| ED | -0.042 | 0.047 | 0.067 |
| HLBE[b] | -0.348 | 0.288 | 0.390* |
| HLAE[b] | 0.184* | 0.116 | -0.053 |
| LEAP[b] | -0.274* | 0.156 | 0.248 |
| MAL[b] | -0.073 | 0.316* | 0.193 |
| LJL[b] | -0.055 | 0.332* | 0.267 |
| DFBL[b] | 0.331* | -0.038 | -0.050 |
| BLDHFR[b] | 0.067 | 0.018 | 0.082* |
| BLDLFR[b] | 0.188 | 0.042 | 0.078 |
| AFBL | **0.736*** | 0.056 | 0.127 |
| LWRAF[b] | 0.503* | 0.085 | 0.092 |
| LHRAF[b] | 0.487* | 0.079 | 0.269 |
| VFLb | 0.082* | -0.011 | 0.023 |
| PFL[b] | -0.005 | -0.221* | -0.132 |
| HEH[b] | -0.078 | 0.074 | 0.273* |
| HE | **0.596*** | 0.195 | 0.277 |
| TSH | -0.126 | 0.042 | 0.141* |
| HH | -0.026 | **0.573*** | 0.354 |
| CH[b] | 0.221 | 0.035 | -0.303* |
| DFH[b] | -0.197* | -0.164 | 0.163 |
| AFH[b] | -0.110 | 0.135 | 0.246* |
| WI | 0.255 | 0.280 | **-0.472*** |
| HW[b] | 0.172* | 0.110 | -0.157 |
| EW[b] | 0.052 | 0.282* | 0.203 |
| MOW[b] | 0.018 | -0.016 | 0.070* |
| BLVFHR | -0.090 | **-0.494*** | -0.036 |
| BLVFWR[b] | 0.018 | -0.013 | 0.103* |
| Eigenvalue | 0.309 | 0.164 | 0.140 |
| % Variance | 50.3 | 26.8 | 22.9 |
| Canonical Correlation | 0.485 | 0.375 | 0.350 |

[b] Omitted characters
* Correlation value for characters which show a significant different

The number of anal fins was varying in every sampling location which was in range of 9-11 and 8-

**Table 5.** The cluster coefficients of sampling locations

| Stage | Combination | | Coefficient | Stage | | Next Stage |
|---|---|---|---|---|---|---|
| | Cluster 1 | Cluster 2 | | Cluster 1 | Cluster 2 | |
| 1 | Location II | Location I | 5.949 | **0** | **0** | **2** |
| 2 | Location II | Location IV | 5.999 | 1 | 0 | 3 |
| 3 | Location III | Location II | 6.018 | 0 | 2 | 0 |

**Table 6.** The result of meristic characteristics assessment located in Ogan KomeringIlir, South Sumatera, Indonesia

| Meristic Characteristics | Location | | | | Reference* | | | |
|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | a | b | c | d |
| Number of dorsal fin radii (hard) | 16-18 | 16-18 | 16-18 | 16-18 | 17-19 | 16-18 | 17 | 15-19 |
| Number of dorsal fin radii (weak) | 8 | 7-9 | 7-9 | 7-9 | 7-9 | 7-10 | 8-9 | 7-9 |
| Number of radius of anal fin (hard) | 9-11 | 9-11 | 9-11 | 9-11 | 9-10 | 7-10 | 11 | 9-11 |
| Number of radius of anal fin (weak) | 8-12 | 8-12 | 8-12 | 8-12 | 9-11 | 7-11 | 9-10 | 8-12 |
| Number of ventral fin radii (hard) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Number of ventral fin radii (weak) | 4-5 | 4-5 | 4-5 | 4-5 | 5 | 1-5 | 5 | 5 |
| Sum of pectoral fin radius | 13-16 | 12-16 | 13-16 | 14-16 | 13-15 | 10-14 | 14-15 | 14-16 |
| Number of caudal fin radius | 12-17 | 12-17 | 12-17 | 12-17 | 16-20 | 16-20 | 16 | - |
| Number of scales on rib lane | 31-34 | 24-31 | 22-31 | 28-31 | - | 30-34 | 30 | 26-31 |
| Number of scales above rib lane | 12-16 | 12-16 | 12-15 | 12-15 | 13-16 | 13-16 | 4 | - |
| Number of scales below rib lane | 13-16 | 12-16 | 12-16 | 13-16 | 13-16 | 13-16 | 10 | - |
| Number of scales on dorsal fin face | 8-12 | 7-12 | 7-12 | 7-12 | 7-10 | 5-18 | 5-6 | - |
| Number of scales on cheeks | 6-9 | 5-9 | 5-9 | 6-9 | 6-9 | 5-7 | 7-8 | - |
| Number of scales around body | 26-30 | 24-30 | 24-30 | 26-30 | 24-30 | 24-30 | 32 | - |
| Number of scales around trunk of tail | 25-31 | 22-34 | 23-32 | 25-32 | 24-28 | 24-28 | 34 | - |

[*a]Situmorang (2014); [b]Lestari (2019); [c]Azhmie (2016); [d]Kotelat (1993

12 but still in the range which reported by Kotelat (1993). The ventral fins of all the caught fish were in the range of the one reported by Situmorang (2014), Lestari (2019) Azhmie (2016) and Kotelat (1993) (Situmorang *et al.*, 2014; Lestari *et al.*, 2019; Kotellat *et al.*, 1993; Azhmie, 2016). The numbers of pectoral fin radii, scales on the rib line, scales below and above the rib line, scales on the cheeks, scales around the body, and scale around the tails were not showing any significant difference with the references (Situmorang *et al.*, 2014; Lestari *et al.*, 2019; Kotellat *et al.*, 1993). The detailed results of meristic characteristics are shown in Table 6.

The study of meristic characteristics proved that the climbing perch fish caught in the peat swamp ecosystem was not different compared to the characteristics caught in the canal, river, paddy field, and other freshwater ecosystems. The reason was because the meristic characteristics determined the characteristic of species which would be the same in all the ecosystems. The slight difference only found in minor number but it made by the experiencing of touch or friction during the observation process, and it could be negligible (Sonyenzellnd *et al.*, 2015).

## Conclusion

The study provided the information that the climbing perch fish caught in Ogan KomeringIlir (OKI), South Sumatera, Indonesia had the morphometric characteristics which depended on the total size of fish. The characteristics of environmental, to be specific in the water stream, close and open water systems, gave a significant effect on the height and length of fish which also correlated to the hunt behavior of fish, mouth opening size and food availability. The morphometric characteristics of climbing perch fish was only found in the fish caught in Teloko lake where in the peat dome, another utilized area, and oil palm plantation were relatively similar. Furthermore, the meristic characteristics of climbing perch fish caught in all sampling point was similar with the other climbing perch fish caught in the freshwater indicating that the ecosystem characteristics only affect the morphometric characteristics of fish.

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