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MORPHOLOGICAL CHARACTERIZATION OF ASANG FISH (*Osteochilus vittatus*, CYPRINIDAE) IN SINGKARAK LAKE, ANTOKAN RIVER AND KOTO PANJANG RESERVOIR WEST SUMATRA PROVINCE, INDONESIA

SYANDRI H.*, AZRITA AND JUNAIDI

Department of Aquaculture, Fisheries and Marine Science Faculty of Bung Hatta University, Padang West Sumatra, Indonesia.
*Corresponding Author: Email- hsyandri_bilih@yahoo.co.id

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Abstract- Research morphometric characters of *O. vittatus* conducted in 2014 in the waters of Singkarak Lake Solok Regency, the waters Antokan River Agam Regency and Koto Panjang Reservoir Lima Puluh Kota Regency, West Sumatra Province-Indonesia. The purpose of research is to analyze the morphometric characters, the main differentiating factor, determination of inter grouping of *O. vittatus* populations. Results showed that the average standard length of *O. vittatus* population in Singkarak Lake are 117.00±15.67 mm Antokan River are 139.67±13.16 mm and Koto Panjang Reservoir are 169.49±24.37 mm. The morphometric characteristics of fish population between habitats of *O. vittatus* proved significantly different (p<0,05). Character of the fish populations of *O. vittatus* of Singkarak Lake with a population of Antokan River as many as five different characters (25%), the character of the population morphometric *O. vittatus* of Singkarak Lake and populations Koto Panjang Reservoir as much as 16 different characters (80%), while the fish populations of *O. vittatus* of Antokan River and Koto Panjang Reservoir as much as 15 different characters (75%). The main differentiator of 20 morphometric characters are truss the tip of dorsal fin - the tip of the anal fin (C5) and truss the tip of upper mouth - the base of the dorsal fin (A4). *O. vittatus* populations are geographically separated from each habitat and genetic distance *O. vittatus* populations in waters Singkarak Lake closer with a population of Antokan River.

Keywords- Asang, *O. vittatus*, truss morphometric, standard length, habitats

Citation: Syandri H., Azrita and Junaidi (2014) Morphological Characterization of Asang Fish (*Osteochilus vittatus*, Cyprinidae) in Singkarak Lake, Antokan River and Koto Panjang Reservoir West Sumatra Province, Indonesia. Journal of Fisheries and Aquaculture, ISSN: 0976-9927 & E-ISSN: 0976-9935, Volume 5, Issue 1, pp.-158-162.

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Introduction

Fish Asang (*Osteochilus vittatus*, Cyprinidae) is an Indonesian native fish inland waters [1,2] have a strategic value that is (a) as a source of food non cholesterol for rural cummunity and urban [3], (b) as a source of income for rural community around the area Maninjau Lake [4], Singkarak Lake [5], Arang-Arang Lake [6] and Koto Panjang Reservoir [7], (c) has been successfully used as a biological agent to reduce the blooming of phytoplankton in Maninjau Lake [3], (d) can be applied to restocking and introduction to waters lakes and reservoirs that is experiencing blooming phytoplakton fish farming activities due to floating net cages and (e) in terms of socio-cultural, *O. vittatus* being mature gonad function as "indigenous fish" the wedding party in Minangkabau, specialy community in Agam Regency, Lima Puluh Kota Regency and Tanah Datar Regency, West Sumatra Province Indonesia.

The problems now is (a) there has been a scarcity of *O. vittatus* in Maninjau Lake [8,9], Singkarak Lake [10], Arang-Arang Lake [6], Koto Panjang Reservoir [7], (b) blocking of migration routes, sedimentation of spawning beds in Maninjau Lake [11], Loss of habitat, spawning and food supply due to fluctuating water level in Singkarak Lake [12], changes in running water into stagnant in the Kampar River for hydroelectric Koto Panjang [13], (c) Introduction of new species inadvertently among others *Oreochromis niloticus*, *Oxyeleotris marmorata, Channa lucius* so that elimination of native species.

The above conditions have resulted in the following (a) level of dominance fish asang (*O. vittatus*) in 1984 is on the order five [14] shifted on the order of 16 of the 17 species of fish that live in Maninjau Lake [9], (b) in Singkarak Lake were the order of 17 of 19 species of fish [10], (c) in Arang-Arang Lake Jambi Province is rarely caught when compared to the 13 species that live in these waters [6], (d) in Koto Panjang Reservoir composition of the catch is only 0.3% of the 26 species of fish that live in these waters [7].

Referring to the strategic value and the above problems, This research is important in order to determine the morphometric characteristics of *O. vittatus* originating from different aquatic habitats. The information obtained will into very important in the domestication and culture of *O. vittatus* future.

Materials and Methods

O. vittatus were collected by commercial fishing vessels from three fishing areas [Fig-1], comprising the Singkarak Lake Solok Regency elevation 361.0 meter above sea level, Antokan river which is the outlet of Maninjau Lake Agam Regency, elevation 400.0 meter

above sea level and Koto Panjang Reservoir Lima Puluh Kota Regency, elevation of 107.0 meter from sea level. Location sites determined by Garmin's GPSMAP type 60CSx Sensors and maps [Table -1], [Fig-1]. Following the capture, samples were placed individually into plastic bags and were kept deepfrozen (-20°C) until transportation to laboratory. Samples were collected from each site (15 individuals/site) and sex was determined macroscopically whenever possible [Table-1]. All the fishes were weighed (TW) with an electronic balance to the nearest 1.0 g. The standard length of each fish was measured with slide calipers to the nearest 01.0 mm. The truss network system described for fish body morphometrics [15] was used to construct a network on fish body, four landmarks determining 20 distances were produced and measured as illustrated in [Fig-2]. Distance measurements mark the points made by using electronic digital calipers to the nearest 0.10 mm. Data morphometric characters converted to standard length ratio divided character.

Water sampling using a Kemmerer water sampler volume of five liters at a depth of 50 cm from the surface of the water. Kemmener water sampler slowly lifted and opened the water faucets expenditure, then the water entered into the sample bottles of water and closed. Water samples were analyzed by the method is standard [16]. Water quality parameters analyzed were water temperature, pH, hardness, alkalinity, dissolved oxygen levels.

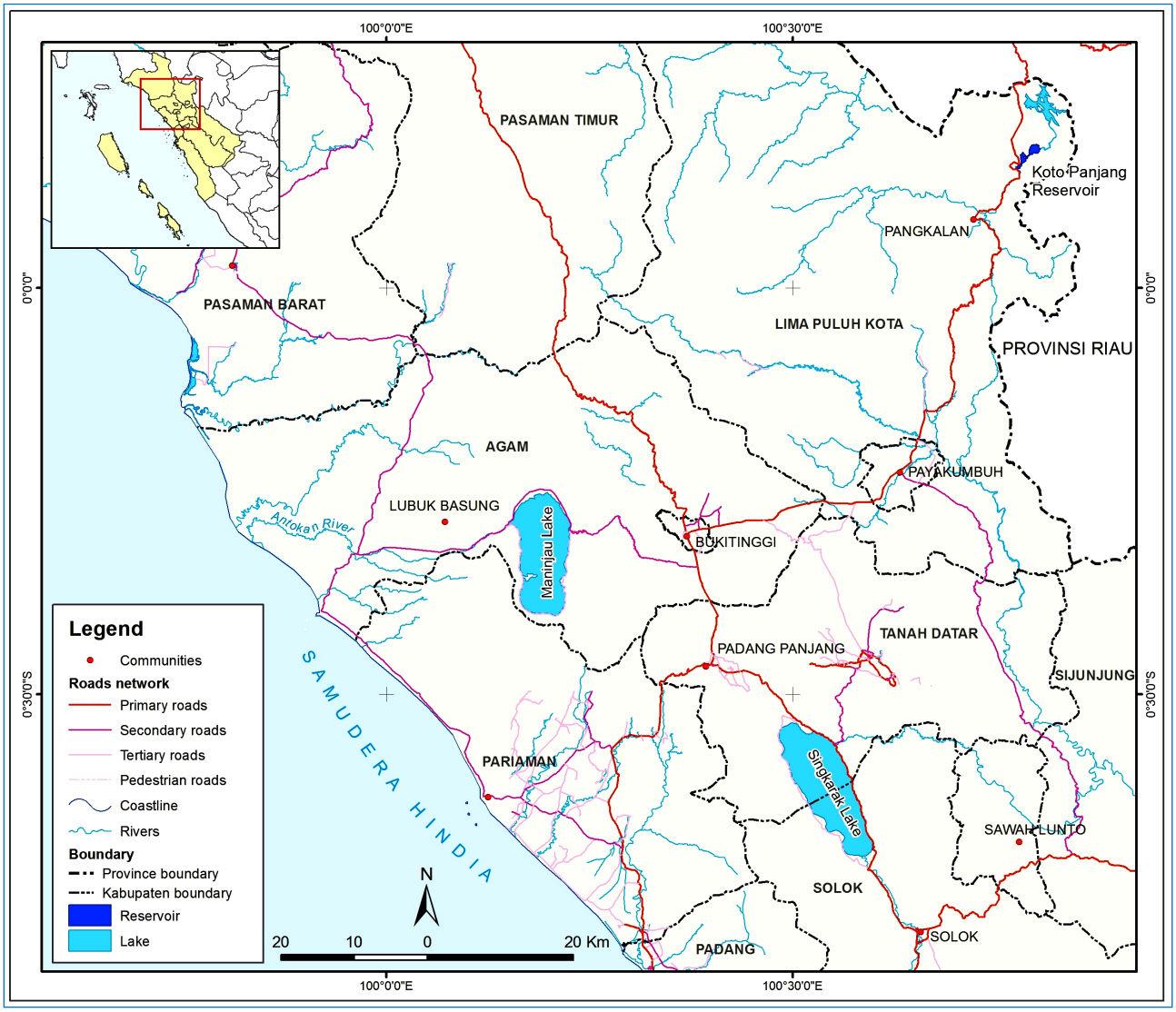

Fig. 1- Map of West Sumatra Province and locations of *O. vittatus* sampling

Table 1- Sampling details of *O. vittatus* used in this study in West Sumatra Province

Sampling area	Coordinate	Sample size	Sex (M-F)	Data of capture	MSL (SD)
Singkarak Lake Solok Regency	E:00°.31'.46"-00°.42'.20" S:100°.26'.15"-101°.31'.46"	15	06:09	Jan-14	117 (15.67)
Antokan river Agam Regency	E: 00°.16'.60"- 00°.27'.21" S: 100°.24'.20"-100°.25'.20"	15	08:07	Jan-14	139.67 (13.16)
Koto Panjang Reservoir Lima Puluh Kota Regency	E:00°.11'.13" - 00°.09'.32" S: 101°23'64" -101°.24'.13"	15	09:06	Feb-14	169.49 (24.37)
MSL : Mean Standart Length (mm); SD : Standart Deviasion of MSL					

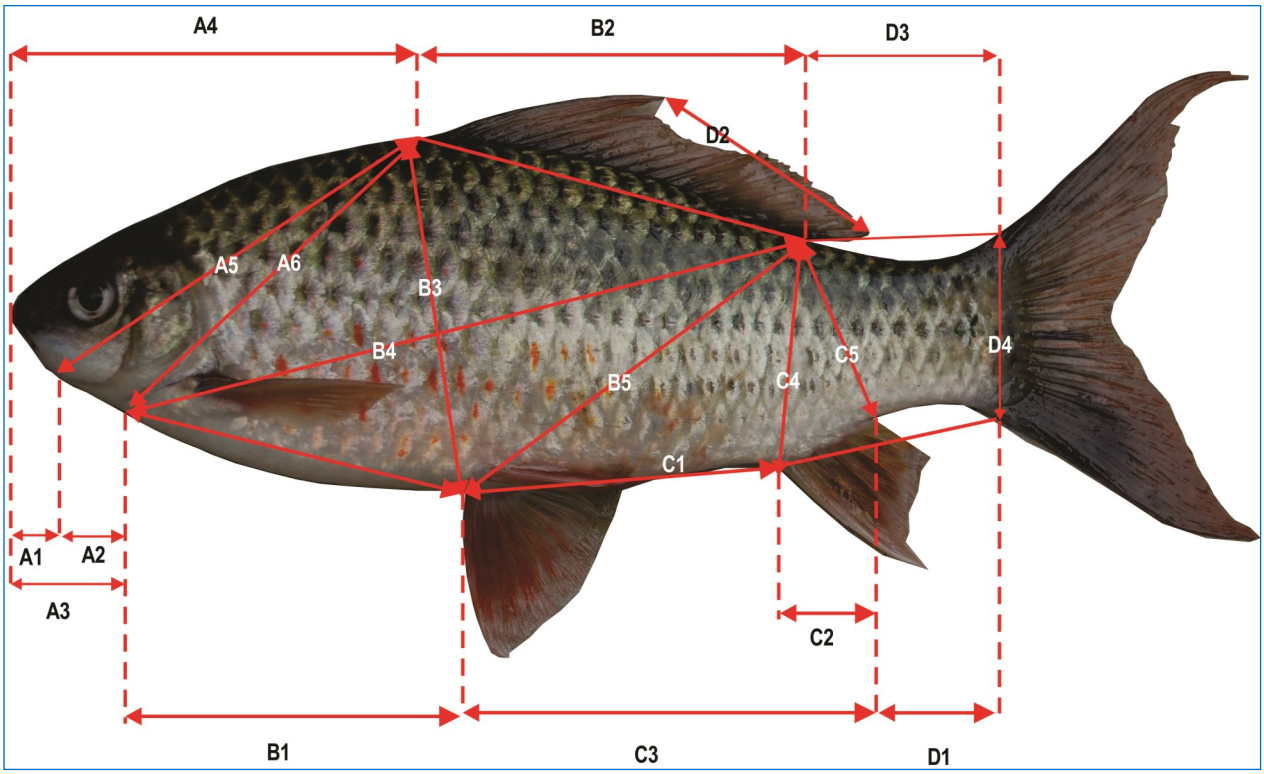

Fig. 2- Description truss morphometric size of *O. vittatus*

Character size ratio data were analyzed using SPSS version 13.0. Morphometric comparison of the magnitude of variability between populations were analyzed descriptively by comparing the average coefficient of variance with *One Way Anova* test. To know the key differentiating factor of morphometric characters used method of *Principal Component Analysis* (PCA) and to see the spread of characters between populations conducted by *Componen Canonical Analysis* (CCA), the genetic distance through hierarchical cluster analysis.

Results

Results One - Way ANOVA analysis of the morphometric characteristics of fish populations between habitats of *O. vittatus* proved significantly different (p< 0,05). Character of the fish populations of *O. vittatus* of Singkarak Lake with a population of Antokan River as many as five different characters (25%), the character of the populations morphometric *O. vittatus* of Singkarak Lake and populations Koto Panjang Reservoir as much as 16 different characters (80%), while the fish populations of *O. vittatus* of Antokan River and Koto Panjang Reservoir as much as 15 different characters (75%) [Table -2]. Test based *Principal Component Analysis* (PCA) to the data morphometric characters of *O. vittatus*, obtained the main distinguishing characteristics of populations *O. vittatus* sequentially between study sites listed in [Table-3]. Dominant morphometric characters are a key differentiator four of *O. vittatus* populations are respectively truss the tip of dorsal fin - the tip of the anal fin (C5), truss the tip of upper mouth - the base of the dorsal fin (A4), is'thmus- the tip of dorsal fin (B4) and mandible - the base of the dorsal fin (A5).

Based on the analysis of morphometric characters discriminant to 20 *O. vittatus*, then naturally there are three groups of fish populations are geographically separated *O. vittatus* [Fig-3]. *O. vittatus* from the waters of the Singkarak Lake and Antokan River closer together which should be in the negative sector in 2 function. It is because both of these habitats are geographically closer and and narrow waters, while the population *O. vittatus* originating from Koto Panjang Reservoir is located on the positive sector, because habitat far apart from Singkarak Lake and Antokan river and are in more open water area, because Koto Panjang Reservoir before drowned for hydroelectric power plant consists of several watersheds that long and wide.

Table 2- Data morphometric characteristics of *O. vittatus*

No	Variables (code)	Data Morphometric Character		
		Singkarak Lake	Antokan River	Koto Panjang Reservoir
1	A1	0.0573 (0.00961)^{a}	0.0693 (0.01033)^{b}	0.0947 (0.01356)^{c}
2	A2	0.0713 (0.00915)^{a}	0.0753 (0.01302)^{a}	0.0727 (0.02219)^{a}
3	A3	0.1287 (0.01125)^{a}	0.1493 (0.01223)^{b}	0.1400 (0.03982)^{c}
4	A4	0.4167 (0.02469)^{a}	0.4353 (0.01685)^{b}	0.4587 (0.07501)^{c}
5	A5	0.3813 (0.03159)^{a}	0.3973 (0.01751)^{a}	0.4387 (0.06696)^{c}
6	A6	0.3487 (0.01959)^{a}	0.3560 (0.01404)^{a}	0.3920 (0.06394)^{c}
7	B1	0.3300 (0.03946)^{a}	0.3353 (0.01922)^{a}	0.3947 (0.06728)^{c}
8	B2	0.2460 (0.01183)^{a}	0.2533 (0.02289)^{a}	0.2600 (0.04359)^{a}
9	B3	0.2700 (0.01813)^{a}	0.2760 (0.01805)^{a}	0.2960 (0.05448)^{c}
10	B4	0.5340 (0.02947)^{a}	0.5340 (0.01125)^{a}	0.5947 (0.10077)^{c}
11	B5	0.2800 (0.01604)^{a}	0.2893 (0.02120)^{a}	0.3027 (0.05325)^{a}
12	C1	0.2367 (0.01952)^{a}	0.2487 (0.01302)^{a}	0.2767 (0.03619)^{c}
13	C2	0.0760 (0.01183)^{a}	0.0773 (0.01033)^{a}	0.0940 (0.02131)^{c}
14	C3	0.3013 (0.02642)^{a}	0.3267 (0.02059)^{a}	0.3760 (0.06780)^{c}
15	C4	0.1840 (0.01595)^{a}	0.2060 (0.01121)^{b}	0.2360 (0.04453)^{c}
16	C5	0.1940 (0.01242)^{a}	0.2107 (0.01486)^{a}	0.3180 (0.06795)^{c}
17	D1	0.1573 (0.02576)^{a}	0.1447 (0.01246)^{a}	0.1693 (0.04061)^{c}
18	D2	0.2507 (0.03770)^{a}	0.2880 (0.01859)^{b}	0.2693 (0.04992)^{b}
19	D3	0.2993 (0.02374)^{a}	0.3160 (0.06057)^{a}	0.3253 (0.06739)^{a}
20	D4	0.1007 (0.00884)^{a}	0.1067 (0.01234)^{a}	0.1207 (0.02251)^{c}

Table 3- Principal component loadings and degree of divergence in quantitative traits among samples (Qst) for the morphometric characters

Variables	PC1	PC2	Qst
A1	0.604	-0.633	0.766
A2	0.626	0.508	0.65
A3	0.802	0.428	0.826
A4	0.937	0.115	0.892
A5	0.941	-0.04	0.887
A6	0.9	-0.115	0.824
B1	0.908	-0.171	0.854
B2	0.782	0.239	0.669
B3	0.919	0.072	0.85
B4	0.943	-0.034	0.89
B5	0.887	0.15	0.809
C1	0.858	-0.202	0.778
C2	0.499	-0.262	0.317
C3	0.869	-0.095	0.764
C4	0.767	-0.322	0.692
C5	0.872	-0.385	0.908
D1	0.794	0.219	0.679
D2	0.577	0.423	0.512
D3	0.727	0.29	0.612
D4	0.897	-0.115	0.818

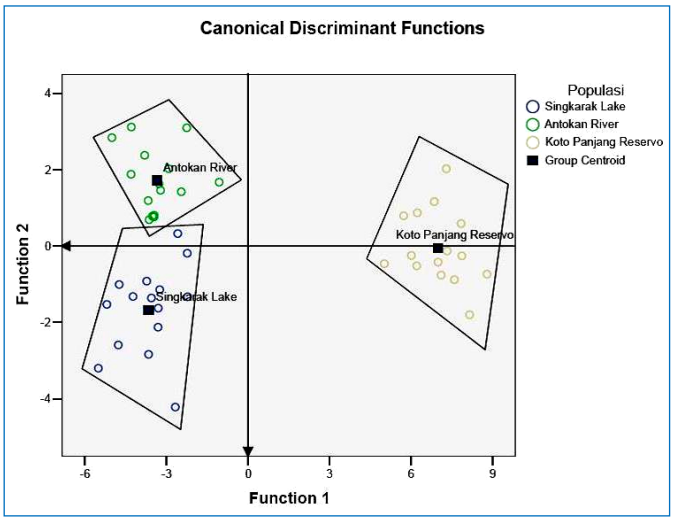

Fig. 3- Discriminant analysis result are grouped into three groups of *O. vittatus*

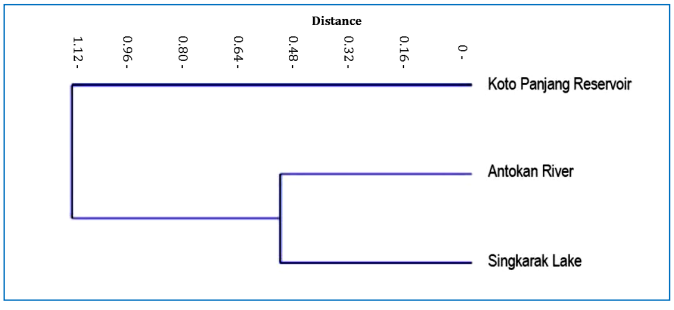

Fig. 4- Dendogram based on cluster analysis of morphometric characters mahalobis distance of *O. vittatus*

Dendogram formed morphologically based genetic distances between populations showed that *O. vittatus* from the waters of Singkarak Lake and Antokan river has a closer kinship than kinship *O. vittatus* of waters Koto Panjang Reservoir [Fig-4]. Proximity genetic distance between populations of aquatic *O. vittatus* Singkarak Lake with Antokan river *O. vittatus* indicate that fish from these waters is derived from a single population.

Discussion

In general, *O. vittatus* which are derived from the Singkarak Lake and Antokan river had levels morphometric relatively low diversity between habitats with different characters 25%. This phenomenon is caused *O. vittatus* fish populations of both habitats are live in narrow and confined waters of Singkarak Lake is an area of 11,200 ha [12] and Antokan River an area of 30,235.56 ha (21 km-length) which is the outlet of Maninjau Lake and the water empties into the Indian Ocean [17]. Furthermore, the level of diversity of characters morphometric between populations of *O. vittatus* from Singkarak Lake and Antokan River with Koto Panjang Reservoir relatively high, respectively 80% and 75%. This is possible due of *O. vittatus* live in open water and wide. Koto Panjang Reservoir is the place empties into six watershed is Mahat River, Kampar Kanan River, Mongan River, Labu Ompong River, Kapur River and Malagiri River that there are many natural food sources. Morphometric characters of high variation also indicates that this commodity is still used as a potential candidate for cultured fish. Genetic diversity and high morphometric will affect the ability of species to respond to environmental changes both natural and artificial [18,19]. Genetic and morphometric variation may be caused by environmental factors [20], declines in overall abundance of stocks, average fish size and change of sex-ratio [21].

Furthermore, the average standard length of *O. vittatus* native Singkarak Lake (117.00±15.67 mm) and Antokan River (139.67±13.16 mm) smaller than populations of *O. vittatus* native Koto Panjang Reservoir (169.49±24.37 mm). In Singkarak Lake population of *O. vittatus* size is smaller than of a standard length that have been reported by Uslichah and Syandri [22] which is an average 187.64±57.81 mm. This is presumably due to fishing pressure, water level fluctuations and isolated habitats. According to Azrita et al, [23] isolated habitats of fish live in a long time and the relatively small population size feared would increased the intensive inbreeding causing the smaller population size. whereas in the littoral zone, water level fluctuations play a major role with regard to the occurrence and distribution of emerse and submerse macrophytes [24]. That decreasing water level shortly after the spawning period was found to result in a total loss of the new roach year class [25]. Populations *O. vittatus* in Koto Panjang Reservoir found in freshwater habitats characterized by water temperature 28°C, pH 6.0, hardness 24,18 mg.l^{-1}, alkalinity 83,14 mg.l^{-1}, dissolved oxygen 6.20 mg.l^{-1}, whereas Antokan River with characterized by water temperature 26°C, pH 8.0, hardness 55.40 mg.l^{-1}, alkalinity 50.44 mg.l^{-1}, dissolved oxygen 8.10 mg.l^{-1} and Singkarak Lake with characterized by water temperature 27°C, pH 7.6, hardness 27,69 mg.l^{-1}, alkalinity 24,93 mg.l^{-1}, dissolved oxygen 4.29 mg.l^{-1}.

Morphometric characters main distinguishing of *O. vittatus* Cyprnidae is truss the tip of dorsal fin - the tip of the anal fin (C5), truss the tip of upper mouth - the base of the dorsal fin (A4), is'thmus- the tip of dorsal fin (B4) and mandible - the base of the dorsal fin (A5). However, each species has a main differentiator morfometric character. *Hemibagrus nemurus* who live in the Koto Panjang Reservoir and Kampar Kanan River Riau Province as a key differentiator from the character of the fish population is morfomotric long dorsal truss^{2} and long dorsal truss^{3} [18], *Channa lucius* who live in the Singkarak Lake West Sumatra Province, floodplain Kampar Kanan Riau Prov-

ince and floodplain Pematang Lindung Jambi Province as a key differentiator from the character of the fish populations are morfomotric snout length,A^1 [13] and *Notopterus notopterus* is snout length,A^1 [26].

From results of this study it can be stated that the isolation geografis had affected morphometric characters of *O. vittatus.* Some authors also stated that geographic isolation can lead to differences in morphometric characters, among others *Tor douronensis* from South Sumatra Province with different North Sumatra Province [27] (Makmur et al., 2008), *Channa lucius* from Singkarak Lake West Sumatra Province, floodplain Kampar Riau Province and floodplain Tanjung Jabung Timur Jambi Province [13], *Cithala lopis* from Tulang Bawang River Lampung Province, Kampar Kanan River Riau Province and Kapuas River West Kalimantan Province [28]. It turns out that the same fish species and collected from adjacent geographic areas will have a closer genetic relationship when compared to the same species in far apart area.

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