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MORPHOLOGICAL CHARACTERIZATION OF BAUNG FISH (*Hemibagrus nemurus*) AQUATIC HABITAT ON THE DIFFERENT METHOD BASED TRUSS MORFOMETRICS

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Abstract- Research morphometric characters of *H. nemurus* conducted in 2012 in the waters of Koto Panjang Reservoir Kampar Regency, the waters of Kampar River Langgam Village Kampar Regency and Kampar River Kampung Baru Village Pelalawan Regency Riau Province. The purpose of research is to analyze the morphometric characters, the main differentiating factor, determination of inter grouping of *H. nemurus* populations. Results showed that the average length of *H. nemurus* population standard Koto Panjang Reservoir Kampar Regency 281.33 ± 27.08 mm significantly different with populations Kampar river waters Langgam Village Kampar Regency 318.03 ± 32.07 mm and the water Kampar River Kampung Baru Village Pelalawan Regency 320.80 ± 32.03 mm. The main differentiator of 30 morphometric characters are long dorsal truss^2 (G^2) and long dorsal truss^3 (G^3) with a value of 0.940 respectively. *H. nemurus* populations are geographically separated from each habitat and genetic distance *H. nemurus* populations in waters Langgam village closer with a population of Kampung Baru village.

Keywords- *H. nemurus*, truss morphometric, habitats, and water quality

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Introduction

Identification of fish populations has now become an important part in the management of fisheries resources can be used to ensure the population structure [1-7], the breeding program with the ultimate goal to get a superior parent fish [8,9]. One important consideration in breeding programs is to identify the mechanism of stock that can be done by measuring phenotypic characters and the genitive of which can be done by measuring morphometric (*truss morphometrics*), because it is directly visible, easy to do, without any complicated facilities and less costly [4,9,10].

One of the economically important species have in Riau Province is *H. nemurus* for $ 7.5/kg [11,12]. *H. nemurus* habitat in watersheds Kampar river located in the Langgam Village Kampar regency and Kampung Baru Pelalawan regency [13], but it is also found in the waters of Koto Panjang reservoir [14,15]. *H. nemurus* populations in the area have started to decline due to the fisherman's boat continuously to meet market demand [16]. According Ruzafa, et al [17] fishing pressure on fish species can cause the size of the population that will spawn the smaller, reduced fecundity and loss of genetic variation. Habitat differences can also affect phenotypes fish populations, because of poor habitat will cover the genetic potential of an individual or population [18]. To determine fish population phenotype *H. nemurus* who has the best character as a prospective parent to do research on the characteristics of important cultivated *H. nemurus* morphometric in three different habitats.

Materials and Methods

H. nemurus [Fig-1] were collected by commercial fishing vessels from three fishing areas, comprising the Koto Panjang Reservoir Batu Bersurat Village Kampar Regency, elevation of 107 meter from sea level, Kampar River Langgam Village Kampar Regency, elevation 39 meter from sea level and (3) Kampar River Rantau Baru Village Pelalawan Regency Riau Province, elevation of 12 meter from sea level. Location sites determined by Garmin's GPSMAP type 60CSx Sensors and maps [Table-1], [Fig-2]. 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 fishes/site)

Fig. 1 *Hemibagrus nemurus*

Sex was determined macroscopically whenever possible [Table-1]. Sexual variation was analyzed first,

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using one-way ANOVA tests. The truss network system described for fish body morphometrics [19] was used to construct a network on fish body, 5 landmarks determining 30 distances were produced and measured as illustrated in [Fig-3]. After collection of samples from different areas digital images from de-frozen samples were taken within 1 month time. Therefore, times between death and freezing or duration of freezing before measurement were not different between samples that might

impact results of the study.

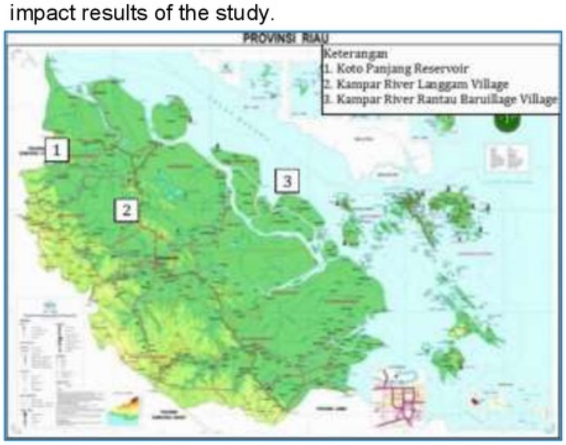

Fig. 2 Map of the sampling locations for *H. nemurus*

Table 1- Sampling details of H. nemurus used in this study

Sampling area	Coordinate	Sample size	Sex (M:F)	Date of capture	MSL (SD)
Koto Panjang Reservoir Batu Bersurat Kampar Regency	N: 00°09'03,2" E: 100°21'28,3"	15	07:08	Feb-12	281.33 (27.08)
Kampar River Langgam Village, Kampar Regency	S: 00°.12'.19,19" E: 101°.52'.43,47"	15	09:06	Mar-12	318.03 (32.07)
Kampar River Rantau Baru Village, Palalawan Regency	S: 00°41'47,21" E: 102°49'58,51"	15	07:08	Apr-12	320.80 (32.03)

MSL: Mean Standard Length (mm); SD: Standard Deviation of MSL

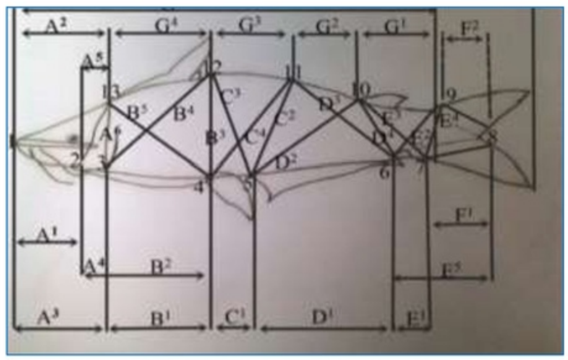

Fig. 3 Description truss morfometric size of *H. nemurus*

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. 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 and morphometric characters relationship with environmental analysis *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.

Result

Results One - Way ANOVA analysis of the morphometric characteristics of fish populations between habitats baung fish proved significantly different (p< 0,05). Character of the fish populations of *H. nemurus* of Koto Panjang Reservoir with a population of Kampar River Langgam village as many as 24 different characters (80%), the character of the population morphometric *H. nemurus* of Koto Panjang Reservoir and population Kampar River Rantau Baru Village as much as 24 different characters (80%), while the fish populations of *H. nemurus* of Kampar River Langgam Village and Kampar River Rantau Baru Village as much as 18 different characters (60%). Test based *Principal Component Analysis* (PCA) to the data morphometric characters baung fish, obtained the main distinguishing characteristics of populations *H. nemurus* sequentially between study sites listed in [Table-2]. Dominant morphometric characters are a key differentiator three baung fish populations are respectively dorsal truss length (G^{2}) and truss dorsal length (G^{3}) and Truss body width (C^{4}) [Table-3].

Table 2- Data morphometric characteristics of fish H. nemurus

No	Variables (Code)	Data Morphometric Characters: Koto Panjang Reservoir Village, Kampar Regency	Kampar River Langgam Village, Palalawan Regency	Kampar River Rantau Baru Kampar Regency
1	1-2 (A^{1})	0.24 (0.01)^{a}	0,22 (0,01)^{b}	0,23 (0,01)^{c}
2	1-13 (A^{2})	0.26 (0.01)^{a}	0,26 (0,01)^{a}	0,26 (0,01)^{a}
3	1-3 (A^{3})	0.27(0.02)^{a}	0,26 (0,02)^{b}	0,29 (0,02)^{c}
4	2-3 (A^{4})	0.03 (0.01)^{a}	0,05 (0,01)^{b}	0,06 (0,01)^{c}
5	2-13 (A^{5})	0.15 (0.02)^{a}	0,13 (0,02)^{b}	0,12 (0,012)^{c}
6	3-13 (A^{6})	0.15 (0.01)^{a}	0,14 (0,01)^{a}	0,12 (0,02)^{c}
7	3-4 (B^{1})	0.34 (0.01)^{a}	0,33 (0,02)^{a}	0,33 (0,01)^{a}
8	2-4 (B^{2})	0.34 (0.02)^{a}	0,30 (0,02)^{b}	0,28 (0,02)^{b}
9	4-12 (B^{3})	0.14 (0.01)^{a}	0,15 (0,01)^{b}	0,16 (0,01)^{c}
10	3-12 (B^{4})	0.36 (0.02)^{a}	0,34 (0,02)^{a}	0,32 (0,03)^{c}
11	4-13 (B^{5})	0.32 (0.02)^{a}	0,31 (0,01)^{b}	0,32 (0,01)^{c}
12	4-5 (C^{1})	0.21 (0.03)^{a}	0,19 (0,01)^{b}	0,17 (0,02)^{c}
13	5-11 (C^{2})	0.13 (0.02)^{a}	0,16 (0,01)^{b}	0,17 (0,01)^{b}
14	5-12 (C^{3})	0.18 (0.02)^{a}	0,21 (0,02)^{b}	0,22 (0,01)^{b}
15	4-11 (C^{4})	0.16 (0,01)^{a}	0,17 (0,01)^{b}	0,18 (0,01)^{c}
16	5-6 (D^{1})	0,10 (0,01)^{a}	0,10 (0,01)^{a}	0,11 (0,01)^{a}
17	5-10 (D^{2})	0,14 (0,02)^{a}	0,16 (0,01)^{b}	0,15±0,01)^{c}
18	6-11 (D^{3})	0,19 (0,01)^{a}	0,20 (0,02)^{b}	0,22 (0,02)^{c}
19	6-10 (D^{4})	0,15 (0,02)^{a}	0,15 (0,02)^{a}	0,16 (0,01)^{a}
20	6-7 (E^{1})	0,07 (0,02)^{a}	0,18 (0,02)^{b}	0,12 (0,01)^{c}
21	6-9 (E^{2})	0,20 (0,02)^{a}	0,18 (0,02)^{b}	0,18 (0,02)^{b}
22	7-10 (E^{3})	0,21 (0,03)^{a}	0,26 (0,02)^{b}	0,27 (0,01)^{c}
23	7-9 (E^{4})	0,14 (0,01)^{a}	0,13 (0,01)^{b}	0,14 (0,01)^{a}
24	6-8 (E^{5})	0,21 (0,02)^{a}	0,12 (0,02)^{b}	0,14 (0,02)^{b}
25	7-8 (F^{1})	0,12 (0,02)^{a}	0,10 (0,01)^{b}	0,11 (0,01)^{c}
26	9-8 (F^{2})	0,09 (0,02)^{a}	0,09 (0,01)^{a}	0,09 (0,01)^{a}
27	9-10 (G^{1})	0,29 (0,02)^{a}	0,26 (0,02)^{b}	0,26 (0,02)^{b}
28	10-11 (G^{2})	0,06 (0,01)^{a}	0,07 (0,01)^{b}	0,07(0,01)^{b}
29	11-12 (G^{3})	0,06 (0,01)^{a}	0,07 (0,01)^{b}	0,08 (0,01)^{c}
30	12-13 (G^{4})	0,32 (0,02)^{a}	0,30 (0,01)^{b}	0,31(0,04)^{c}

Different superscript letters behind std. dev. indicate significantly different (p <0,05)

Based on the analysis of morphometric characters discriminant to

30 *H. nemurus*, then naturally there are three groups of fish popula-

tions are geographically separated *H. nemurus* [Fig-4]. *H. nemurus* from the waters of the Kampar River Langgam Village Kampar Regency and Kampung Baru Pangkalan Kerinci Village Pelalawan Regency closer together which should be in the positive sector in 1 function, it is because the habitat more closely and are in the watershed, while the population *H. nemurus* originating from Koto Panjang Reservoir is located on the negative sector, because their habitat is remote and located in the narrow waters of the area.

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

Variables	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	Qst
1-2 (A^1)	-0.386	0.522	0.557	-0.328	-0.012	-0.022	0.104	-0.059	0.854
1-13 (A^2)	0.366	0.478	0.245	-0.039	.071	-0.444	0.026	0.185	0.661
1-3 (A^3)	0.311	0.027	0.62	-0.386	-0.014	-0.294	-0.258	-0.22	0.832
2-3 (A^4)	0.835	-0.208	0.122	-0.106	-0.011	-0.196	-0.058	-0.121	0.822
2-13 (A^5)	-0.088	0.808	-0.28	-0.077	-0.016	-0.154	0.213	-0.011	0.815
3-13 (A^6)	-0.129	0.55	-0.369	-0.28	-0.433	0.093	0.28	-0.113	0.821
3-4 (B^1)	0.207	0.506	-0.045	0.572	0.036	-0.064	-0.006	-0.405	0.798
2-4 (B^2)	-0.381	0.724	-0.21	0.338	0.013	-0.092	-0.094	-0.089	0.853
4-12 (B^3)	-0.117	0.688	-0.373	0.126	0.314	-0.263	0.052	-0.056	0.816
3-12 (B^4)	0.513	0.12	0.079	0.453	0.057	-0.006	0.333	0.218	0.651
4-13 (B^5)	0.721	0.105	0.081	-0.266	0.049	0.074	0.487	0.079	0.86
4-5 (C^1)	-0.43	0.468	-0.288	-0.252	-0.047	0.044	-0.012	0.288	0.637
5-11 (C^2)	0.729	0.03	0.111	-0.357	0.174	-0.028	0.374	0.139	0.862
5-12 (C^3)	0.85	0.124	-0.108	-0.052	0.006	-0.042	0.008	-0.262	0.823
4-11 (C^4)	0.875	-0.108	-0.081	0.211	-0.08	-0.014	-0.024	0.001	0.835
5-6 (D^1)	0.469	0.417	-0.201	-0.257	-0.154	0.331	-0.399	0.218	0.84
5-10 (D^2)	0.539	0.403	-0.047	-0.187	0.054	0.142	0.094	-0.016	0.522
6-11 (D^3)	0.57	0.085	0.228	0.114	0.43	0.333	0.02	-0.286	0.775
6-10 (D^4)	0.479	0.386	-0.099	-0.117	0.448	0.278	-0.281	0.33	0.868
6-7 (E^1)	0.798	-0.259	0.005	0.1	0.232	-0.009	0.08	-0.062	0.778
6-9 (E^2)	0.029	0.686	0.025	-0.04	-0.144	0.522	0.032	-0.254	0.832
7-10 (E^3),	0.571	-0.322	-0.548	-0.011	-0.014	0.041	-0.045	-0.07	0.739
7-9 (E^4)	-0.162	0.335	0.767	0.109	0.028	0.129	-0.051	0.277	0.836
6-8 (E^5)	0.294	0.61	0.319	-0.077	-0.114	0.016	-0.348	-0.315	0.8
7-8 (F^1)	-0.201	0.477	0.479	0.246	-0.313	0.021	0.316	-0.021	0.757
9-8 (F^2)	0.315	0.038	0.284	0.561	-0.141	0.274	-0.055	0.35	0.716
9-10 (G^1)	-0.021	0.619	-0.075	0.07	0.347	-0.462	-0.141	0.18	0.781
10-11 (G^2)	0.738	0.321	-0.092	0.064	-0.464	-0.157	-0.138	0.147	0.94
11-12 (G^3)	0.738	0.321	-0.092	0.064	-0.464	-0.157	-0.138	0.147	0.94
12-13 (G^4)	-0.201	0.803	-0.096	-0.049	0.323	0.196	0.016	0	0.84

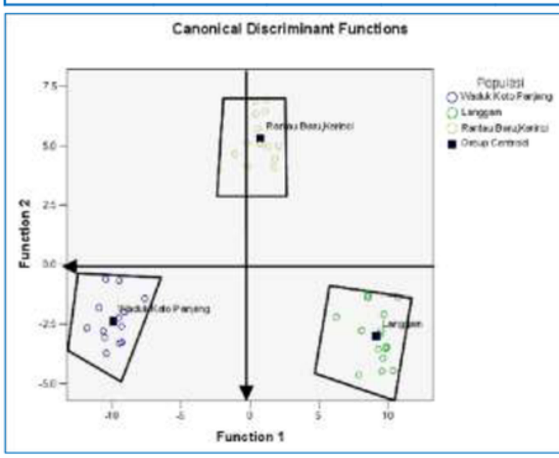

Fig. 4 Discriminant analysis result are grouped into three groups of *H. nemurus*

Dendogram formed morphologically based genetic distances between populations showed that *H. nemurus* from the waters of Kampar River Langgam Village and Kampung Baru village has a closer kinship than kinship *H. nemurus* of waters Koto Panjang Reservoir [Fig-5]. Proximity genetic distance between populations of aquatic *H. nemurus* Kampar River Langgam Village with Kampung Baru village *H. nemurus* indicate that fish from these waters is derived from a single population. This is presumably because the area is a habitat both Kampar River watershed.

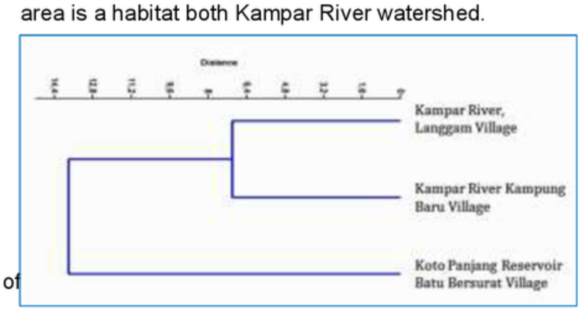

Fig. 5 Dendogram based on cluster analysis of morphometric characters mahalobis distance of *H. nemurus*

Discussion

In general, *H. nemurus* studied had levels morphometric relatively high diversity between habitats with different characters ranging from 60-80%. This phenomenon made possible because *H. nemurus* farming is still in its early stages in Riau Province (have not been widely developed) so that the reduced levels of diversity due morphometric 'inbreeding depression' which is common in freshwater fish is still relatively low compared to the commodity that has been extensively developed and old. Relatively high degree of variation morphometric character also shows that commodity is still used as a potential candidate farmed fish. Genetic diversity and high morphometric will affect the ability of species to respond to environmental changes both natural and artificial [20].

Furthermore, the average size of a standard length and size of fish morphometric character *H. nemurus* origin Koto Panjang Reservoir compared two populations of *H. nemurus* waters of Kampar River origin Langgam Village Kampar Regency and Kampung Baru Village Pelalawan Regency in Riau Province allegedly as a result of the different habitats. Populations *H. nemurus* in waters Koto Panjang Reservoir found in freshwater habitats characterized by water pH 7-8, clear water color, dissolved oxygen concentration of 8.01 mg/L, while the populations of *H. nemurus* Kampar River waters contained in river swamp habitat is characterized by a flood of waters pH of about 4, brownish water color, dissolved oxygen levels of 3.7 mg/L.

Each fish species has a morphometric characters as the main differentiator *Chitala* spp, Siluridae who live in the Tulang Bawang River Lampung Province, Kampar River Riau Province and Kapuas River in West Kalimantan Province, as a key differentiator from the character of the fish population is morfomotric snout length (A^1) and body height (B^3) [5], in *Notopterus notopterus* as a key differentiator of morphometric characters is snout lenght (A^1) [22] and in *Channa Lucius* major as a key differentiator of morphometric characters is snout lenght (A^1) [21]. While in *Oreochromis niloticus* is Truss dorsal length (F^1) [23].

Based on morphometric character study on populations *Tor douronensis* apparently separate from South Sumatra province with a population of North Sumatra Province in Indonesian [3]. Georafis isolation can affect morphometric characters and meristic fish, as it has been tested in *Notopterus notopterus* [22] and *Channa lucius* [21]. Morphometric character can be used as indicator species kinship. Species collected in the adjacent area will have a closer kinship than species that were collected from a remote area of the fish [24].

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Conflicts of Interest: None declared.

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