Original Article

MORPHOMETRIC CHARACTERS OF MARINE LOCAL FISH (*Harpodon* sp.) FROM TARAKAN, NORTHERN BORNEO

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ABSTRACT

Tarakan sea waters have geographical circumstances and landscapes that supported the existence richness of fishes that abundant and diverse. There is local fish called Pepija or Lembe-Lembe, but biological studies on this fish most poorly known. This research is aimed to identify the morphological characters of Nomei (*Harpodon* sp.). Based on specific caharcter, morphometric, and meristric characters. Morphometrics analysis can be used to clustering and understanding relationship of taxa. Each species represented 10% samples of male and female from each type we found and measured 35 characters (in mm). The canonical, clustering and similarity were used. Based on determinant morphological characters species (pectoral fin length reaches or exceeds the initial dorsal fin, dorsal fin earlier than ventral fins), dendogram morphological characters, meristic characters, PCA grouping proved that Nomei fish from Amal and Juata as *Harpodon* nehereus.

Keywords: *marine local fish, similarity, Harpodon sp., morphometrics, conservation*

INTRODUCTION

Tarakan is one of the islands in the North Kalimantan province with area 657.33 km2 ±, extensive coastal areas ± 70 km2 and sea area of about 406.53 km2 (61.85%). Geographical circumstances and the landscape support abundance and diverse of fish in the waters of the Tarakan city. One of the natural resources in Tarakan Island is Nomei fish. This fish is known locally Pepija or Lembe Lembe fish.

Nomei (*Harpodon* sp.) is a commercial fish marketed in dried fish form. Nomei fish become one of the major food commodities typical from Tarakan City. This fish have high economic potential, which is 10 tons per month form fresh fish or 3 tons of dried Nomei fish. Paradise (2010) mentioned that the target catch Nomei fish, value capture rate of 16.10 kg/h (playing catch) and 3.43 kg/h (HTS), with an average duration of 3.04 hour towing/trip. Catchment was made in one fishing season 3-4 days or within one month only 7-9 days. If the intensity of arrests continues to rise, it is feared Nomei fish populations will decrease.

The potential riches of local marine fish in Tarakan waters needed a conservation effort. When talking about the conservation of fish under PP 60/2007 section 21, the aimed are: (1) Protecting endangered fish species, (2) Maintaining the diversity of fish species, (3) Maintaining the balance and stability of the ecosystem, and (4) Make use of fish resources in a sustainable manner. Therefore, the first step that needs to be done is to study the taxonomic status of Nomei fish (*Harpodon* sp.) using morphology characteristics includes the early stages of identifying fish.

Morphological characters which observed were morphometric studies, meristic and special characters. A morphometric characteristic related to body size or body parts such as total length and standard length fish. This measure is one of the things that can be used as taxonomic characteristics when identifying fish. Meristic characters are related to the number of body parts of fish, for example, the number of scales in the lateral line, the number of fingers and weak on dorsal fin (Affandi et al., 1992).

Taxonomy data of Nomei fish (*Harpodon* sp.) is still lacking, so far limited research has been conducted on aspects of the catch, bioecology and its biology. Taxonomic studies of Nomei fish (*Harpodon* sp.) is limited to literature alone as Saanin (1984), DKP Tarakan City (2002), Astuti (2005) and Paradise (2010) which stated that Nomei fish including *Harpodon* nehereus Ham Buch, so that the necessary assessment significantly.

Morphological approach is expected can provide clear information on the status of Nomei fish (*Harpodon* sp.) taxonomy in a comprehensive manner, adding a data base of local marine fish in Indonesia waters, particularly in Tarakan waters and as supporting data for further research. The objective of this research is determining taxonomic status of Nomei fish from Tarakan based on morphological characters. The advantages of this research is to provide information about biodiversity of local marine fish in Indonesia, especially Tarakan City, the first step potential conservation of local marine fish, especially

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Nomei fish from Tarakan city, proving kindship Nomei fish with related fish species based on morphology.

METHODS

Observation toward of Nomei fish was done both of Amal and Juata. We are observed the special characteristics of Nomei fish for each sample and compared with keys identification Weber, M. & L. F. de Beaufort (1916) dan Carpenter, K. E. and V. H. (1999). Morphological characteristics include morphometric, meristic, and special characters.

The observation was conducted during May until July 2014. Thirty five measurements (in mm) of body characters were taken using digital caliper, represented by thirty five male and female of Nomei Fish. These characters are TL: total length, SL: standart lenght, HL: head length, HW: head width, HD: head depth, ED: eye diameter, SNL: snout length, IW: interorbital width, ML: mouth length, BD: body depth, BW: body width, CPL: caudal peduncle length, CPD: caudal peduncle depth, DBL: dorsal fin base length, DFH: dorsal fin height, PL: pectoral fin length, VBL: ventral fin base length, ABL: anal fin base length, PPL: pre pelvic length, PAL: pre anal length, PDL: pre dorsal length, SNBL: snout barbell length, MXBL: maxillary barbell length and median lobe lenght (Figure 1).

Each species represented 10 percent samples male and female from each type we found and measured 35 characters (in mm). To standardize the different body sizes among the sample, each measurement was divided by the SL (standard length) and converted to percentage. The converted data were transformed into log10 value before being subjected to principal component analysis and clustering analysis based on Euclidean distances using PAST software.
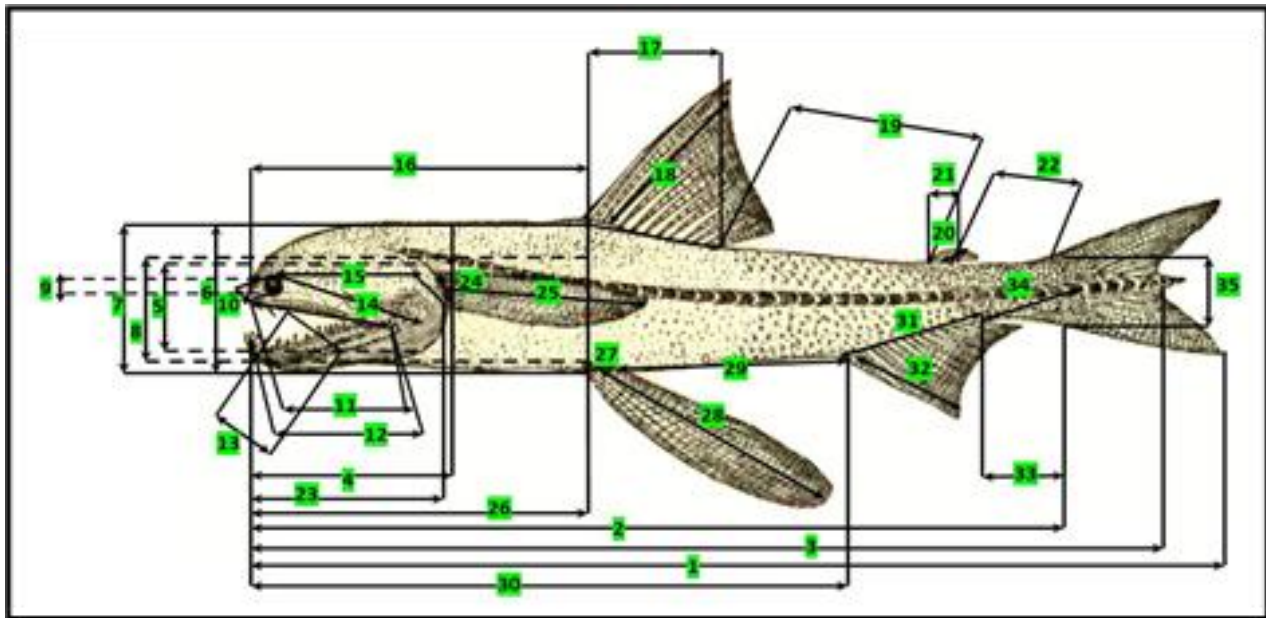
Figure 1. Figure 1. Morphometric Characters of Nomei Fish. Remarks: 1. Total length, 2. Standart length, 3. Fork Length, 4. Head Length, 5. Head Width, 6. Head depth, 7. Body Depth, 8. Body Weight, 9.Interorbital Eye, 10.Eye Diameter,11. Upper Jaw Lenght, 12. Lower Jaw Lenght, 13. Aperture Mouth Width, 14. Between Eye Lenght with Closed Gill, 15. Head Lenght Behind Eye, 16. Pre Dorsal Fin Lenght, 17. Primary Dorsal Fin Lenght, 18. Dorsal Fin Height, 19 .Post Dorsal Lenght with Early Fat Fin, 20. Fat Height Fin, 21. Fat Fin Lenght, 22. Post Dorsal Fin Lenght with Base Fat Tail, 23. Pre Pectoral Fin Lenght, 24. Pectoral Base Fin Lenght, 25. Pectoral Fin Height, 26. Pre Ventral Fin Lenght, 27. Ventral Base Fin Lenght, 28. Ventral Fin Height, 29. Post Ventral Fin with Early Anal Fin, 30. Pre Anal Fin Lenght, 31. Anal Fin Base Lenght, 32. Anal Fin Height, 33. Post Anal Fin Lenght, 34. Caudal Peduncle Lenght, 35. Caudal Peduncle Height.

RESULTS

Morphological characteristics of male and female Nomei fish (*Harpodon* sp.) in both of Amal and Juata waters in general characters are having a long body, like a torpedo, the eyes are small, the distance eye with the tip of a narrow nose, mouth wide and long, pointed teeth shapes, scales in the lateral line beyond the curve of the tail fin sheet, the beginning of the ventral fins behind the back, the type of superior mouth, has fins on the dorsal fat (fatty tissue that forms the fin), forming pectoral fin, anal fin concave shape, elongated tail fin 3 parts, which is a prolongation of the lineal lateral, short snout, there tentacle in the red mouth, have long pectoral fins (reaching or exceeding the dorsal fin), the concave shape of the dorsal, the shape of the pelvic fin rounded, mostly head covered in scales rather thin, and has a white body color somewhat reddish gray.

The special characters determinant of Nomei fish in both of Juata and Amal with reference species were long pectoral fins (reaching or exceeding the initial dorsal fin), the characters are owned *Harpodon* sp. Amal, *Harpodon* sp. Juata, and *Harpodon* nehereus. *Harpodon* microchir has a special character that is typical of the pectoral fin is less than 1/2 the distance of the snout to the beginning of the dorsal fin, while the pectoral fins character more than half the distance from the snout to the beginning of the dorsal fin, owned by *Harpodon* translucens, and *Harpo-*

don squamosus (Carpenter,1999). In addition, special characters that can distinguish between the dorsal fin of *Harpodon* genus is earlier than the ventral fins, this character is only owned by *Harpodon* nehereus, including

Nomei fish (*Harpodon* sp.) of Amal and Juata, while *Harpodon* translucens, *Harpodon* microchir and *Harpodon* squamosus) (Figure 2).

Table 1. The main morphometrics character

Characters	*Harpodon sp. Amal*	*Harpodon sp. Juata*
PSL **	4.33 ± 0.96	5.60 ± 1.33
PtSAdPE **	10.51 ± 0.33	14.31 ± 1.34
SL **	150.33 ± 0.34	170.35 ± 0.54
HD **	18.33 ± 1.45	16.23 ± 1.78
PtsLPE **	16.34 ± 0.95	20.23 ± 0.34
PsSP **	35.67 ± 0.35	36.45 ± 0.24
PDSP **	4.78 ± 0.47	4.34 ± 0.24

Table 2. The Meristric Characters of Nomei Fish

Meristric Characters	*Harpodon sp. Amal*	*Harpodon sp. Juata*	*Harpodon nehereus*	*Harpodon microchir*	*Harpodon squamosus*	*Harpodon transluscens*
Dorsal Fin Spines	D 12-13	D 12-13	D 12-13	D 14	D 12-14	D 13
Pectoral Fin Spines	P 11-12	P 11-12	P 11-12	P 12	P 10	P 12
Anal Fin Spines	A 14-15	A 14-15	A 14-15	A 14	A 13-15	A 14
Ventral Fin Spines	V9	V9	V9	V 9	V9	V 9

DISCUSSION

Special characters determinant Nomei fish in both of Amal and Juata with reference species were long pectoral fins (reaching or exceeding the initial dorsal fin), the characters are owned by *Harpodon* sp. Amal, *Harpodon* sp. Juata, and *Harpodon* nehereus. *Harpodon* microchir character has a special character that is typical of the pectoral fin is less than 1/2 the distance of the snout to the beginning of the dorsal fin, while the pectoral fins character more than half the distance from the snout to the beginning of the dorsal fin, owned by *Harpodon* translucens, and *Harpodon* squamosus (Carpenter,1999). In addition, special characters that can distinguish between the dorsal fin of *Harpodon* genus is earlier than the ventral fins, this character is species specific for *Harpodon* nehereus, including Nomei fish (*Harpodon* sp.) of Amal and Juata, while (*Harpodon* translucens, *Harpodon* microchir and *Harpodon* squamosus) (Figure 2). Based on Identification keys from Weber, M. & L. F. de Beaufort (1916) & Carpenter, K. E (1999) strong suggested that Nomei fish from Amal and Juata is belongs to *Harpodon* nehereus species.

Further analysis to strengthen the taxonomical status of Nomei fish measured morphometric measurements using 35 characters, including the size of standard length. The results of discriminant analysis of the data were done in two stages: stage 1 all of morphometric characters tested, who conducted the second phase of testing to determine the main distinguishing characteristics are most influential. Nomei fish from Amal and Juata grouping and differentiated based on seven main characters selected from the 35 characters that were tested using Wilks Lamda the significance value 0.000, which means significantly. Seventh character were a fat fin length (PSL), last long anal fin to the tail (PtSAdPE), standard length (SL),

high head (HD), long past the base of the tail fin fat (PtsLPE), long before the pectoral fins (USDP), and the length of the pectoral fin base (PDSP).
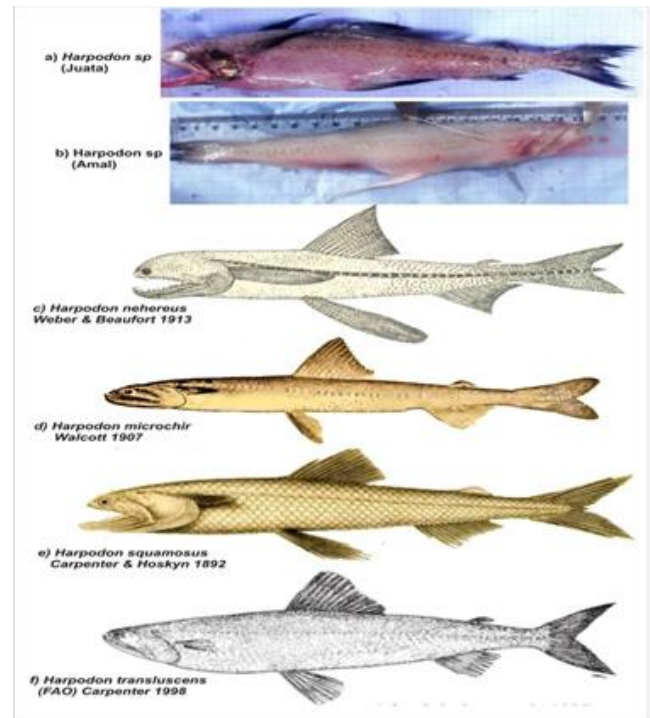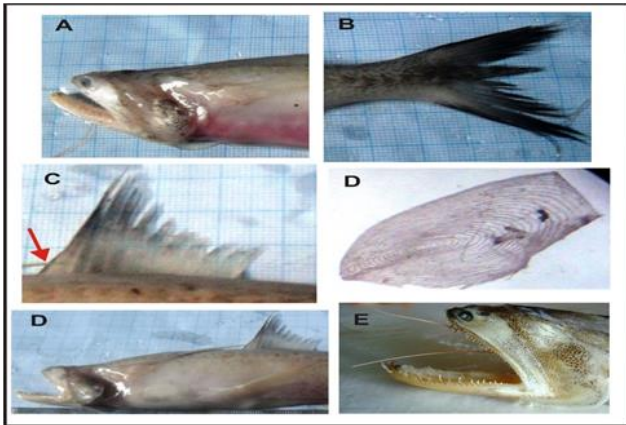

Figure 2. Special character of *Harpodon* Genus. A. *Harpodon sp*. Amal, B. *Harpodon sp*. Juata,C. *Harpodon nehereus*. D. *Harpodon transluscens*, E. *Harpodon microchir*, F. *Harpodon squamosus* (*Weber & Beaufort, 1913*).

Figure 3. A common morphology of Nomei fish (*Harpodon* sp.) Amal. A. mouth wide and long, B. Tail fin shape (forked), C. Hard first ray dorsal fin is unbranched, D.Cycloid scales, consists of radier line (purple arrows) and concentric (green arrows), E. Barbels in the mouth, F. Superior type mouth.
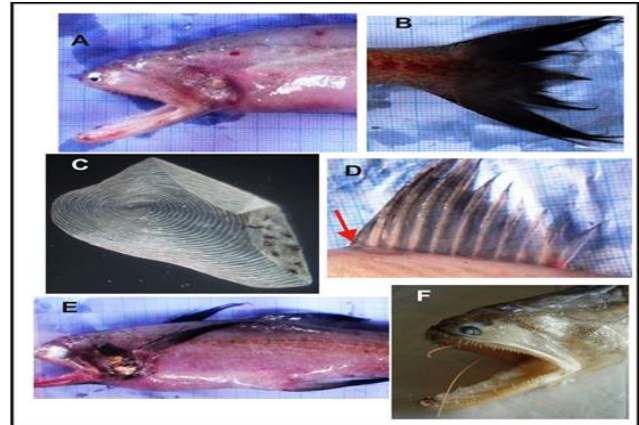
Figure 4. A common morphology of Nomei fish (*Harpodon* sp.) Juatal. A. mouth wide and long, B. Tail fin shape (forked), C. Hard first ray dorsal fin is unbranched, D.Cycloid scales, consists of radier line (purple arrows) and concentric (green arrows), E. Barbels in the mouth, F. Superior type mouth.

Besides using discriminant analysis, classification of Nomei fish with reference species followed by PCA analysis. PCA is the basic concept of grouping analysis, the same character will be grouped in one group and a different character separated into different groups (Ubaidillah & Sutrisno 2009).

Quadrant different between females and males both two locations is suspected because of differences in environmental and dietary factors in environmental habitat. This is indicated by the growth achieved of Nomei fish (Firdaus, 2013). It is due to the availability of food in the waters around selected as a feeding ground or one of the areas in searching of food, so the availability of food is enough to make Nomei fish can growth well. Brown and Gibson (1983); Haryono (2006) stated that each species has a specific geographic distribution is controlled by the physical condition of the environment. Therefore the distribution and morphometric variation that appears is a response to the physical environment where the species lives.

Determination of relationship was done by morphometric data analysis using Principle Component Analysis (PCA), as stated by Bengen (2000) that PCA can be used to study the data matric from the viewpoint of similarity between individuals. The greater similarity or distance near an individual, the closest family. Dendogram based on Euclidian distance analysis showed that two groupings based on morphometric characters of male and females. This is in accordance with the classification discriminant analysis selected seven main distinguishing character that indicated that Nomei fish from Amal and Juata closely related (Figure 5A and B).

The result of T-Test based on morphometric characters between the Nomei fish (*Harpodon* sp.) of males and females from Amal and Juata waters showed significant differences (α = 0.05). Morphometric characters male and female based on number thirty five characters from the Juata waters, there are 13 different morphometric characters. The different character are the standard length (SL), total length (TL),fork length (FL), head width (HW), head depth (HD), body depth (BD), the width of the body (DW), Eye diameter (ED), the length between the eyes

with a gill cover (PaM), the length of the head behind the eyes (CLC), high fat fin (TSL), long before the ventral fins (PsSV) and high caudal peduncle (TBE). Based on 13 different characters indicated that the female from Juata waters character is bigger than the male fish.
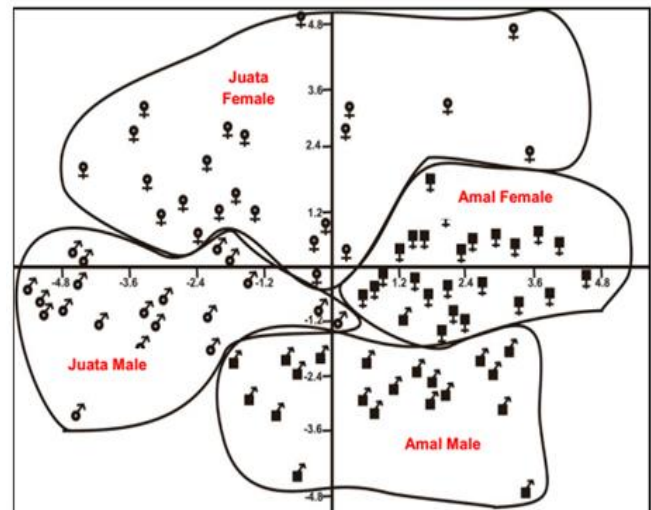
Figure 5. Grouping of male and female Nomei Fish based on Morphometric Analysis Principle Component Analysis Using PCA Software.

The result of T-Test based on male and female Nomei fish (*Harpodon* sp) Amal waters showed significant differences (α = 0.05). Based on 35 male and female morphometric characters were measured, there were 15 morphometric characters that show significant differences. The different character are the standard length (SL), total length (TL), head length (HL), head width (HW), high head (HD), height (BD), the width of the body (DW), the length of the space between eye (IW), the length between the eyes with a gill cover (PaM), the length of the head behind the eyes (CLC), high fat fin (TSL), long before the ventral fins (PsSV), high caudal peduncle (TBE), long before the dorsal fin (PSSD), and before long pectoral fins (USDP). 15 different characters indicate that the female character is bigger than the male fish.
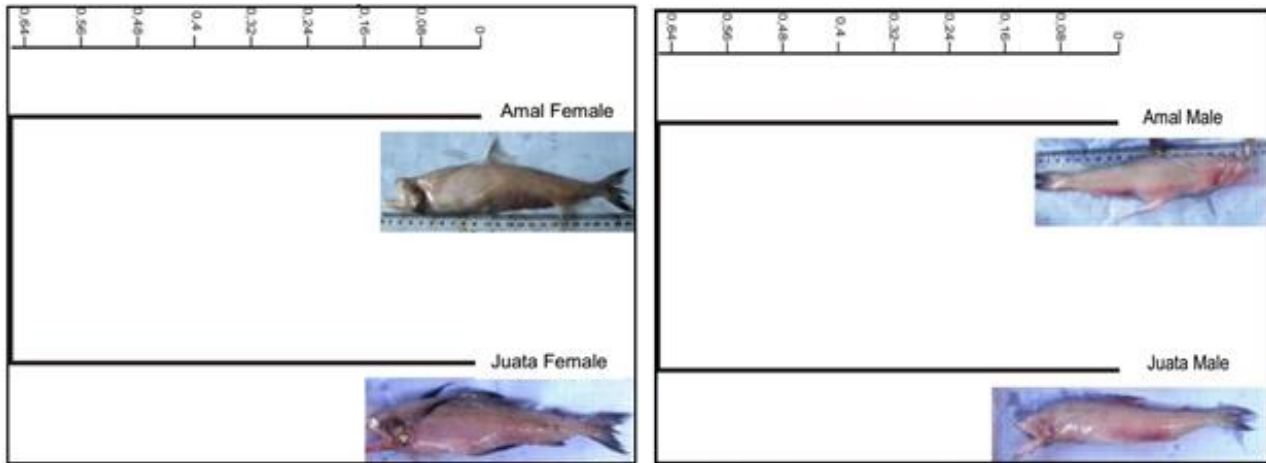
Figure 6. Dendogram of Morphometric Characters A. Amal and Juata Female, B. Amal and Juata Male Based on 7 main distinguising Morphometric Characters.

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