Morphological Study for Identification Improvement of Tambra Fish (Tor spp.: Cyprinidae) from Indonesia

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ABSTRACT

The identification improvement among species of Tor was conducted based on fish specimens in Museum Zoology Bogor. Each species represented 8 specimens and measured 22 characters (in mm) used digital caliper. The Canonical variate analysis (discriminant function analysis) was used. The results showed these four species different in morphology, and Tor tambroides 100% grouping from its congeners. Five characters were selected to separate species. Commonly, population of tambra fish in the world was critical therefore needed conservation.

Keywords: fish, Tor, morphology, character, species, conservation.

INTRODUCTION

Tambra fish or Mahseer also named Kings of the rivers was included to genera Tor and family Cyprinidae. Indonesia has four species of Tor viz., i.e: Tor tambroides Blkr, T. tamra (C.V.), T. douronensis (C.V.) and T. soro (C.V.). Kiat (2004) reported that currently, there are about 20 different species have been designated as species under the genus of Tor from all across Asia. Weber and Beaumont (1916) named its genera by Labeobarbus, and differentiated to species based on median fleshy lobe on lower lip; then Kottelat et al. (1993) stated that systematics of Tor are still chaotic. The while, mostly species of Tor are threatened especially by clear and over-fishing. Rachmatika (2005) reported that Tor spp. no founded at logged stations in the Seturan river of Melinau, East Kalimantan. Furthermore, Primack (1993) stated that a species with a low population density will tend to have only small population if its range fragmented by human activities.

Tamba are the largest fishes found within the upper reaches of large rivers where they rule supreme. They grow to enormous sizes of more than a hundreds pounds therefore potential as fish consume. These fish are active swimmers usually preferring to move among the faster flowing waters or rapids. Feeding on variety of foodstuff, including smaller fishes, they occupy the topmost echelons of the complex riverine community (Kiat, 2004; Anonymous, 2003). Then, Sulastri et al. (1985) stated that the algae was main diet of this fish, followed by detritus and insects. In Malaysia, Kiat (2004) reported that these species has price 180 RM per kg, moreover up to 300 RM (RM: Ringgit Malaysia). In North Sumatera, Tor soro used as substitution of batak fish (Neolissochilus thieenmanni) for cultural ceremony. Tor spp. also potential for game fishing like as salmon fish because has strong power. Unfortunately, population of Tor in native habitats is rare and its systematic still problem, also not yet success to domesticate.

MATERIALS AND METHODS

A total of 32 fish specimens in Museum Zoology Bogor (now Zoology Division, Research Center for Biology, Indonesian Institute of Sciences Bogor [LIPI] in Cibinong) were measured, each species represented by 8 specimens. Twenty-two measurements (in mm) of body characters were taken using digital caliper. These characters are TL: total length, 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, MXBL: maxillary barbell length. This methods main refer to Hubbs and Lagler (1974).

The canonical variate analysis (discriminant function analysis) were used study the morphological differences between species (Kendall, 1975; Morrison, 1978). The characters were transformed to percent of standard length; and all analyses were performed using SPSS.

RESULTS AND DISCUSSION

The sample size, mean and standard deviation of characters measurement are presented in Table 1. This table shows that Tor tambroides has larger average head.
length, head depth, mouth length, and pre pelvic length than others species. This result is important to compare among species of tamba fish.

Hitherto, among species of Tor separated based on median lobe on lower lip (Figure 1) that completed with compare between osseous of dorsal ray and head length, anal and dorsal fin (Weber and Beaufort, 1916; Kottelat et al., 1993; Inger and Chin, 1990; Kiat, 2004). Weber and Beaufort (1916) explained that Tor soro without lobe, anal less high than dorsal; T. tambroides with lobe that reaching a line connecting corners of mouth; T. douronensis with lobe but not reaching a line connecting corners of mouth, stiff portion of osseous dorsal ray about as long as head without snout; T. tambra with lobe as T. douronensis but stiff portion of osseous dorsal ray not quite half as long as the head.

The generally description of Tor are body elongate, moderately compressed. Snout more or less prominent; mouth inferior or subinferior, horseshoe shaped; upper jaw strongly protractile. Lips more or less thick, continuous, the lower with an uninterrupted transverse fold, the median part of which may be developed into a lobe. Four barbels: an anterior rostral pair, the other pair behind corner of mouth. Suborbital bone narrow. Dorsal with 8-9 bones branched rays and scaly sheath at its base; its origin somewhat before or opposite to origin of ventrals; last osseous dorsal ray enlarged and smooth. Anal with 5 branched rays. Scales large, with fine, longitudinal or converging, more or less undulated lines. Lateral line running in the middle of the tail, complete with 21-28 scales.

Specifically T. tambroides has body size larger than the others, Haryono (2003) reported caught its species in Bukit Batikap (Muller mountain region, Central Kalimantan) that 20 kg weights; moreover, local people informed was caught 80 kg. Smith (1945) also reported that the size of Tor reached 100 cm and weight > 30 kg. The while, size of T. douronensis from Kalayan Mentarak Nature Reserve, now National Park in East Kalimantan commonly 3-5 kg (Haryono, 2002). Similarly with T. douronensis, the size of T. soro < 10 kg weights. The last species protected by local people in Kuningan Regency West Java after hundreds years at swimming pool viz. Cubilan, Cigugur, Pasawahan and Darmaloka. The body color this species is different among swimming pool, therefore interesting for genetics study.

The morphometric data was examined by canonical discriminant analysis with two steps. First step was examined all characters, and second of them only examined selected characters (5 characters). The selection of characters following value of Wilk’s Lambda, and the result of main characters viz. IW, CPL, CPD, HW, and BD. The box plot first character (IW) represent at Figure 2 that showed range its character of Tor soro is widest, whereas Tor tambra is smallest. Then plotting of selected characters by function 1, 2, and 3 explained variation each 63.6%, 31.3% and 5.1% (Table 2.), and a joined these function explained 87.5%.

Figure 3 showed that Tor soro different from its congeners by 100% grouping, 12.5% of Tor tambra grouping with Tor tambroides, 12.5% of T. douronensis grouping with Tor tambroides; Tor tambroides grouping with Tor tambra and Tor douronensis eaches 12.5%. Tor soro strictly separated that assumed no median lobe at lower lip, while the others present but not similar.
The description was explained by Kiat (2004), Roberts (1989, 1993, 1999), Tweedie (1956), Zhou and Cui (1996), and Kottelat (2001) that Tambra or Mahseer have large of head and mouth. The head is somewhat elongated allowing it to easily swim headlong against fast flowing waters with minimal resistance. The snout is obtusely rounded, and prominent. The inter-orbital space between the eyes is flat and the snout is pointed while the jaws are of equal length. They have two pairs barbells, one near the snout and the other at the maxilla. The nostrils are close together and nearer to the eye than to the snout. The mouth which is both protrusive and sectorial. The mouth is slightly inferior, making it well adapted for feeding off the sub-stratum of fast flowing streams and rivers. Generally mature female have a more rounded belly as compared to males, which usually have a firmer and more keeled ventral surface. The large scales are descriptive of this group of fishes. The number of scales on the lateral line range from 20 to 30 usually. The cycloid scales, though large, are quite fine and can be eaten as a snack when fried or steamed. The coloration of Mahseer is also sought after by hobbyists for its beautiful coloration. Pigmented completely across the body, the coloration of the Mahseer is a rich matrix of yellow, red and blue.

The completely description four species of Tor from Indonesia were described by Weber and Beaufort (1916) based on morphological characters, these are:

**Tor somo**
Dorsal fin with 3 spines and.8-9 rays; anal fin with 3 spines and 5 rays; Pectoral fin with 1 spine and 14-16 rays; ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales. Height 3.4-3.8 in SL, 4.3-4.6 in length with caudal. Head about 4.3 in SL, 5.4 in length with caudal. Eye about 4, about 1/3 in somewhat prominent snout and nearly twice in interorbital space. Moutn inferior. Lips moderately thick, median part of lower lip without lobe, but fixed to the skin. Rostral barbels about as long as eye or longer, shorter than maxillary ones. Length of operculum 11/2-13/4 in its height. Origin of dorsal nearer to snout than to base of caudal, opposite 7th or 8th scale lateral line, somewhat before origin of ventrals, separated by 8 or 9 scales from occiput. Dorsal concave, its third spine ossified, strong, somewhat shorter than head, without its flexible part shorter than head without snout. Anal oblique, not reaching caudal when depressed, its longest ray somewhat less than dorsal spine. Ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales.

**Tor tambroides**
Dorsal fin with 3 spines and.8-9 rays; anal fin with 3 spines and 5 rays; Pectoral fin with 1 spine and 14-16 rays; ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales. Height 3.4-3.8 in SL, 4.3-4.6 in length with caudal. Head about 4.3 in SL, 5.4 in length with caudal. Eye about 4, about 1/3 in somewhat prominent snout and nearly twice in interorbital space. Moutn inferior. Lips moderately thick, median part of lower lip without lobe, but fixed to the skin. Rostral barbels about as long as eye or longer, shorter than maxillary ones. Length of operculum 11/2-13/4 in its height. Origin of dorsal nearer to snout than to base of caudal, opposite 7th or 8th scale lateral line, somewhat before origin of ventrals, separated by 8 or 9 scales from occiput. Dorsal concave, its third spine ossified, strong, somewhat shorter than head, without its flexible part shorter than head without snout. Anal oblique, not reaching caudal when depressed, its longest ray somewhat less than dorsal spine. Ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales.

**Tor tambra**
Dorsal fin with 3 spines and.8-9 rays; anal fin with 3 spines and 5 rays; Pectoral fin with 1 spine and 14-16 rays; ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales. Height 3.4-3.8 in SL, 4.3-4.6 in length with caudal. Eye about 4, about 1/3 in somewhat prominent snout and nearly twice in interorbital space. Moutn inferior. Lips moderately thick, median part of lower lip without lobe, but fixed to the skin. Rostral barbels about as long as eye or longer, shorter than maxillary ones. Length of operculum 11/2-13/4 in its height. Origin of dorsal nearer to snout than to base of caudal, opposite 7th or 8th scale lateral line, somewhat before origin of ventrals, separated by 8 or 9 scales from occiput. Dorsal concave, its third spine ossified, strong, somewhat shorter than head, without its flexible part shorter than head without snout. Anal oblique, not reaching caudal when depressed, its longest ray somewhat less than dorsal spine. Ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales.

**Tor douronensis**
Dorsal fin with 3 spines and.8-9 rays; anal fin with 3 spines and 5 rays; Pectoral fin with 1 spine and 14-16 rays; ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales. Height 3.4-3.8 in SL, 4.3-4.6 in length with caudal. Eye about 4, about 1/3 in somewhat prominent snout and nearly twice in interorbital space. Moutn inferior. Lips moderately thick, median part of lower lip without lobe, but fixed to the skin. Rostral barbels about as long as eye or longer, shorter than maxillary ones. Length of operculum 11/2-13/4 in its height. Origin of dorsal nearer to snout than to base of caudal, opposite 7th or 8th scale lateral line, somewhat before origin of ventrals, separated by 8 or 9 scales from occiput. Dorsal concave, its third spine ossified, strong, somewhat shorter than head, without its flexible part shorter than head without snout. Anal oblique, not reaching caudal when depressed, its longest ray somewhat less than dorsal spine. Ventral fin with 2 spines and 8 rays; linea lateralis with 24-26 scales.
caudal peduncle about 1 ½ times in its length, surrounded by 12 scales. Silvery, back dark, as also the fins.

Tor duoronensis
Dorsal fin with 3 spines and 9.9 rays; anal fin with 3 spines and 5 rays; pectoral fin with 1 spine and 16 rays; ventral fin with 2 spines and 8 rays; lineae lateralis with 21-24 scales Height 3.2-3.3, 4.1 in length with caudal. Head 4-4.2, 5-5.3 in length with caudal. Eye 4 ½ – 5, 1 ½ or more in snout, twice or somewhat more in interorbital space. Rostral barbels about 1 ½ times, maxillary barbels about twice in eye. Lips thick, continuous, the lower one with a median, more or less developed square lobe, the hindborder of which does not reach the line connecting the corners of the mouth. The blunt snout somewhat prominent, mouth inferior. Origin of dorsal opposite to 6th or 7th scale of lateral line and slightly before that of ventrals, separated by 8 scales from occiput, somewhat nearer to end of snout than to base of caudal. Dorsal concave, its third spine osseous, rather strong, slightly shorter than head, its stiff part about equal to head without snout. Anal truncate, slightly less high than dorsal, depressed not reaching caudal. Ventral separated by 2 scales from lateral line, their length about equal to height of anal, distant from anus. Pectoral slightly shorter than height of dorsal. Caudal deeply forked, its lobe pointed, about equal to head. Least height of caudal peduncle 1 ½ or more in its length, surrounded by 12 scales. Silvery, back darkish. Base of scales of back and sides darkish.

Therefore, conservation is needed such as by method of protection and rehabilitation of rivers.

CONCLUSION

Tor soro strictly separated from its congeners. Five morphology characters (IW, CPL, CPD, HW, and BD) most important for differentiated four species of Tor from Indonesia, beside median lobe on lower lips. Tor tambroides has body size larger than the others and interesting for continued study (domestication); Tor soro is important for genetics study. All species of Tor have economically potential and critical population so needed conservation.

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REFERENCES