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THE IDENTITY OF *BARBUS JOHORENSIS* DUNCKER, 1904 (TELEOSTEI: CYPRINIDAE)

Maurice Kottelat

ABSTRACT.- Examination of the holotype of *Barbus johorensis* Duncker, 1904, revealed that *Puntius eugrammus* Silas, 1956, is a junior subjective synonym. The valid name for the species often called *P. johorensis* in the literature is *P. hexazona* (Weber & de Beaufort, 1912).

INTRODUCTION

'Tiger barbs' of the genus *Puntius* are quite common and widely distributed in Southeast Asia. Their striking colour pattern of 4-6 black bars on a yellow or reddish background make them quite attractive to aquarists and one of them, *Puntius tetrazona* (Bleeker, 1855), is a common feature of most pet shops. Tiger barbs actually belong to at least two lineages which are not obviously related. One of them, characterized by a quite deep body, usually yellow background with deep black bars, and a lateral line complete or not, occurs in swamps, streams and along river banks (usually with muddy water) of Thailand, Cambodia, Vietnam, the Malay Peninsula, Borneo and Sumatra. The second lineage, with a shallower body, a reddish brown background with blackish brown bars, and complete lateral line, occurs in the same area but is unknown from Thailand; it is usually collected in acid water streams and peat swamps.

The tiger barbs have been last revised by Alfred (1963) whose nomenclature is still followed, except that his subspecies are now given species rank (see below). The first group includes three species: *P. anchisporus* (Vaillant, 1902) from Borneo, *P. tetrazona* (Bleeker, 1855) from Sumatra and *P. partipentazona* (Fowler, 1934) from Western Malaysia, Thailand, Cambodia, and Viet Nam. The second group includes *P. johorensis* (Duncker, 1904) from the Malay Peninsula, Sumatra, Borneo, and Cambodia, *P. pentazona* (Boulenger, 1894) from Borneo (Sarawak), *P. rhomboocellatus* Koumans, 1950, from Borneo (southern and western drainages), *P. foerschi* (Kottelat, 1982) from Borneo (Kalimantan Tengah), *P. endecanalis* Roberts, 1989 from Borneo (Kalimantan Barat).

Maurice Kottelat - Ichthyology Section, Zoologische Staatssammlung, Münchhausenstrasse 21, D-8000 München 60, Germany. Present address: Case postale 57, 2952 Cornol, Switzerland.

Puntius eugrammus Silas, 1956, is another species of this area which also exhibits a colour pattern of four vertical bars on body and one more or less distinct through the eye; this pattern is restricted to juveniles and it is replaced in subadults and adults by 3-5 longitudinal stripes (see Kottelat & Whitten, 1993, pl. 15; Taki *et al.*, 1978: 4c-e). *Puntius eugrammus* and *P. johorensis* apparently have somewhat similar habitat requirements and can often be collected together although *P. johorensis* definitively is much more common and abundant in all collections.

Puntius johorensis was described by Duncker (1904) on the basis of six specimens from the Muar River near "Tubing Tinggi". The illustration is of a specimen with four vertical bars on body, a colour pattern usual for what is presently called *P. johorensis*, but the specimen seems quite slender and the colour marks on the illustrated specimens do not agree well with what is called *P. johorensis* since Alfred (1963); it is more reminiscent of the colour pattern of the early stages of *P. eugrammus* as illustrated by Taki *et al.* (1978: fig. 3d; as *P. fasciatus*). Therefore a comparison of the two species with the type material of *P. johorensis* was needed.

Of Duncker's six syntypes, three are in ZMH (Ladiges *et al.*, 1958) and three had been in the Selangor Museum. One specimen from the second lot is now in the British Museum (Natural History) (Alfred, 1963) while the whereabouts of the remaining two specimens are unknown. The specimens illustrated in Duncker (1904) is the one which has been designated as lectotype by Ladiges *et al.* (1958). These authors did not discuss the specimens but merely designated lectotypes for every fish species represented by syntypes in ZMH. Although this practice is to be frowned upon, nevertheless it is valid.

The lectotype (Fig. 1) and the paralectotypes are all small to very small juveniles (25.8, 24.5 and 17.2 mm SL respectively) which have apparently been dried at some time and whose colour pattern is quite faded. My examination centered on the lectotype; the two paralectotypes are in a state which makes them more or less useless, except for recognizing that the smallest one might not be conspecific with the lectotype. My conclusion is that *P. johorensis* Duncker, 1904, is the valid name of the fish presently called *P. eugrammus* Silas, 1956, and that the present *P. johorensis* (Weber & de Beaufort, 1912) should be called *P. hexazona* instead. This modified nomenclature is used hereunder.

MATERIAL AND METHODS

Material examined.- *Puntius johorensis*: ZMH H 371, lectotype, 25.8 mm SL; Malaysia: Johor: Muar River at Tubing Tinggi; G. Duncker, 15 February 1902. - ZMH H 372, 2 paralectotypes, 17.2-24.5 mm SL; same data. - CMK 8163, 10 ex., 25.6-35.3 mm SL; Malaysia: Terengganu: North of Rantau Abang; M. Kottelat, P. K. L. Ng *et al.*, 18 March 1992. - CMK 7322, 3 ex., 24.5-30.6 mm SL; Sumatra: Riau: Sungei Siak Kecil; M. Kottelat, 13 February 1991. *Puntius hexazona*: CMK 8162, 54 ex., 14.1-26.0 mm SL; Malaysia: Terengganu: North of Rantau Abang; M. Kottelat, P. K. L. Ng *et al.*, 18 March 1992.

Material used for this work includes the type material preserved in Zoologisches Museum Hamburg (ZMH) and fresh material of sympatric *P. johorensis* and *P. hexazona* from the author's collections (CMK). The lectotype has being desiccated and, as a result, morphometric characters are not reliable; the following comparison is mostly based on pigment distribution and radiographs, both characters still usable despite the state of the specimen. Method and terminology for vertebrae counts follow Roberts (1989).

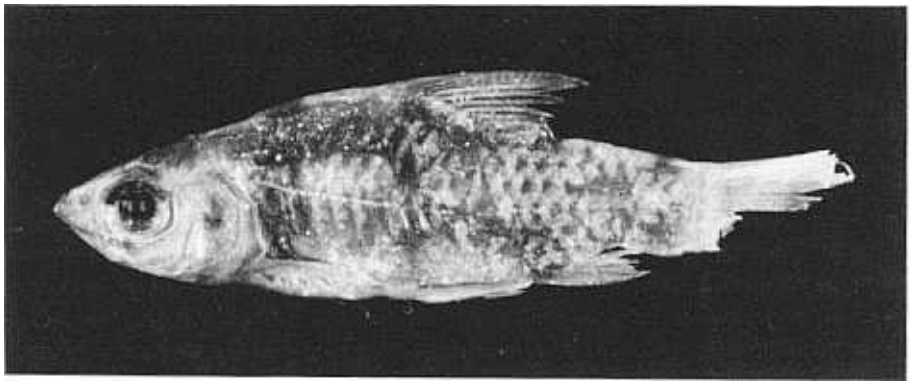

Fig. 1. *Puntius johorensis*, ZMH H 371, lectotype, 25.8 mm SL.

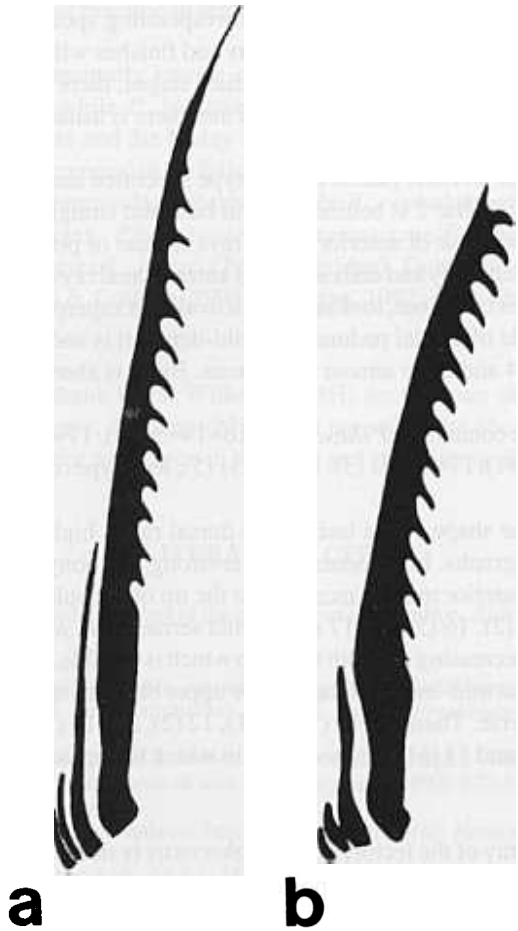

Fig. 2. Simple dorsal rays of: a, *Puntius johorensis*, CMK 8163, 31.7 mm SL; b, *P. hexazona*, CMK 8162, 24.7 mm SL. Tracing from radiographs. Scale bar 1 mm.

RESULTS

Colour pattern. - *Puntius hexazona*: Bar 1 runs through the eye and is always distinct. Bar 2 is more or less vertical, behind pectoral base, and is wider at mid-depth. Bar 3 runs between base of anterior dorsal rays to behind pelvic base; it is not straight but has a slight S-shape, with a backwards concavity in the upper half of body and a forwards concavity in the lower half; it is wider at mid-depth. Bar 4 starts somewhat behind dorsal base and runs slightly forwards to base of anterior anal rays; it is wider at mid-depth. Bar 5 is behind anal base on caudal peduncle and is almost vertical; it is somewhat wider at mid-depth. Bar 6 is a faint bar at posterior margin of the caudal peduncle.

Puntius johorensis: Bar 1 is faint in juveniles and absent in adults. Bar 2 is behind pectoral base and straight. Bar 3 is straight and runs from base of anterior dorsal rays to base of posterior pelvic rays. Bar 4 runs more or less vertically and ends at base of anterior anal rays. Bar 5 runs vertically at about middle of caudal peduncle. Bar 6 is absent. In small specimens (less than 20 mm SL), these bars are of equal width and quite regular. With age, they gradually split into three spots which extends longitudinally to meet the corresponding spots resulting from the other bars. This process starts with the posteriormost bars and finishes with the anterior ones and the midlateral stripe is formed first. At some intermediate stages, there is 2 or 1 anterior bars and 2 or 3 posterior stripes. In specimens larger than 40 mm there is usually no trace left of the bars.

Lectotype of *Puntius johorensis* (based on lectotype specimen and Duncker's original illustration): Bar 1 is very faint. Bar 2 is behind pectoral base and straight and of equal width. Bar 3 is straight and runs from base of anterior dorsal rays to base of posterior pelvic rays; it is of equal width. Bar 4 runs vertically and ends at base of anterior anal rays; at mid-depth, it suddenly is twice as wide as the rest of the bar, looking like an oval spot superposed to the bar. Bar 5 runs vertically at about middle of caudal peduncle; at mid-depth, it is suddenly much wider, as bar 4; the widening of bars 4 and 5 are almost contiguous. Bar 6 is absent.

Vertebrae. - Vertebrae counts are: *P. hexazona*: 16+14=30 (5), 17+13=30 (5), 17+14=31 (1); *P. johorensis*: 17+13=30 (1), 17+14=31 (3), 18+13=31 (5); lectotype of *P. johorensis*: 17+14=31.

Dorsal fin spine. - The shape of the last simple dorsal ray is highly diagnostic for the two species (Fig. 2) on radiographs. In *P. hexazona*, it is strong and bony, with a very broad base. Size of serrae along its anterior margin increases to the tip of the spine which is also tip of the fin. There are 14 (3), 15 (2), 16 (5) and 17 (1) distinct serrae. In *P. johorensis*, the ray is more slender and is regularly decreasing in width to the tip which is flexible. Lower serrae are smooth; they then increase to about mid-length of the ray; the upper ones are smoother again and the last 20 % of the ray has no serrae. There are 10 (1), 11 (1), 12 (2), and 13 (2) serrae in six specimens with intact ray, and 9, 10 and 11 in three specimens in which the tip is broken, apparently above the serrae.

The last simple dorsal ray of the lectotype of *P. johorensis* is slender and regularly decreases in width; it has 12 serrae along its middle posterior margin. The tip of the ray is flexible and smooth posteriorly.

DISCUSSION

In details of colour pattern and structure of the last simple dorsal ray, the lectotype of *P. johorensis* does not agree with specimens of *P. hexazona* (= *P. johorensis* aut.) while it agrees with what has been called *P. eugrammus*. Vertebrae counts agree with *P. johorensis* although a single specimen of *P. hexazona* had the same value. This supports the identification of the lectotype with the species formerly called *P. eugrammus*. *Puntius johorensis* (Duncker, 1904) being a senior synonym of *P. eugrammus* Silas, 1956, it is thus the valid name for this species. The *P. johorensis* of Alfred (1963) and subsequent authors has to be renamed *P. hexazona* (Weber & de Beaufort, 1912), the next available name for the species. *Puntius hexazona* is a name still used for the species, especially in popular literature.

Alfred (1963) distinguished *P. hexazona* from *P. pentazona* (both treated as subspecies) on the basis of the absence or presence of a round black spot at the posterior base of the dorsal fin. As long as no contrary evidence is available, I am considering them as distinct species. If future research shows them to be a single species, then, being the earliest available name, *P. pentazona* will be its valid name. I am treating them with species rank following the argument of Rosen (1979) and current practice in ichthyology of avoiding subspecies rank.

Puntius pentazona is apparently known only from central and northern Sarawak (Baram, Saribas and Akah rivers) while *P. hexazona* is known from the rest of Borneo (including southern Sarawak), Sumatra and the Malay Peninsula, a distribution pattern also encountered (sometimes with slight differences) in the following species pairs: *Hemirhamphodon kuekenthali*/*H. pogonognathus* (Hemiramphidae), *Rasbora tubbi*/*R. cephalotaenia* (Cyprinidae), *Pangio agma*/*P. kuhlii* (Cobitidae), *Phenacostethus trewavasae*/*P. smithi* (Phallostethidae), *Carinotetraodon*, new species/*C. lorteti* (Tetraodontidae), *Doryichthys heterosoma*/*D. boaja* (Syngnathidae) (Anderson & Collette, 1991; Burridge, 1992; pers. obs.).

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