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Differentiation of the Cyprinids, *Hampala macrolepidota* and *H. dispar*

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The cyprinid genus *Hampala* is represented by five Southeast Asian species: *H. macrolepidota* (Valenciennes), *H. ampalong* (Bleeker), *H. bimaculata* (Popta), *H. lopezi* Herre, and *H. dispar* Smith. Except for *H. lopezi*, which is endemic to Busuanga Island, Philippines and readily distinguishable by many of its characters (Fowler, 1941), these fishes are very close in meristic and proportional characters, and hence their discrimination has mostly been based on coloration (Weber and Beaufort, 1916; Smith, 1945). Yet their color patterns are subject to age and individual variations (e.g. Fowler, 1937), thus making their distinctions obscure.

The present study deals with two species of the genus known from the Indochinese Peninsula, *H. macrolepidota* and *H. dispar*, to examine their specificity and relationship.

Material

Hampala macrolepidota. Northern Laos: Nam Khan River at Luang Prabang, 2 specimens, 56.0 and 84.0 mm in standard length (SL), collected on June 13, 1970 (catalogue No. IBRP 4110) (Institute for Breeding Research, Tokyo University of Agriculture), 1, 59.0 mm SL, Dec. 14, 1970 (IBRP 5071).

Central Laos/Eastern Thailand: Nam Kem Stream at Tha Ngon, 15, 67.0～107.5 mm SL, Sept. 12, 1970 (IBRP 4643); Nam Khon R. at Tha Ngon, 2, 24.0 and 27.0 mm SL, July 18, 1970 (IBRP 4405), 4, 49.5～72.0 mm SL, Oct. 6, 1970 (IBRP 4730), 1, 59.5 mm SL, Oct. 9, 1970 (IBRP 4863); Mekong R. at mouth of Houei Mong R., near Tha Bo, 1, 22.5 mm SL, July 15, 1970 (IBRP 4319), 4, 27.0～41.0 mm SL, Oct. 8, 1970 (IBRP 4814), 6, 54.5～202.5 mm SL, Nov. 6, 1970 (IBRP 4953), 2, 64.5 and 123.5 mm SL, Dec. 10, 1970 (IBRP 5042); Mekong R. at Sithan Tay, 2, 86.0 and 90.0 mm SL, Jan. 7, 1971 (IBRP 5183).

Southern Vietnam: Bassac R. at Can Tho, 1, 104.0 mm SL, Mar. 7, 1974 (IBRP 6146); Bassac R., near Chau Doc, 2, 104.5 and 120.5 mm SL, Mar. 19, 1974 (IBRP 6191); Song Cai R. at Thanh Minh, near Nha Trang, 3, 66.5～69.5 mm SL, Sept. 2, 1975 (IBRP 6394).

IBRP 4319, 4405, and 4814 were used only for the observation of juvenile color pattern.

Hampala dispar. Northern Laos: Mekong R. at Luang Prabang, 1, 70.5 mm SL, June 13, 1970 (IBRP 4131); Nam Dong Stream, 5 km from Luang Prabang, 2, 66.0 and 114.0 mm SL, June 15, 1970 (IBRP 4150).

Central Laos/Eastern Thailand: Nam Ngum R. at Tha Ngon, 2, 73.0 and 81.0 mm SL, Oct. 7, 1970 (IBRP 4766); Mekong R. at Vientiane, 3, 111.5～153.0 mm SL, Nov. 24, 1969 (IBRP 3199), 1, 80.0 mm SL, July 16, 1970 (IBRP 4356); Nam Inh Stream at Houng Thong, near Tha Bo, 1, 84.0 mm SL, Oct. 8, 1970 (IBRP 4842).

Southern Laos: Mekong R. at Hatsalao, near Pakse, 1, 25.0 mm SL, June 26, 1970 (IBRP 4218); Mekong R. at Ban Lieng, 1, 116.0 mm SL, May 26, 1970 (IBRP 4020).

IBRP 4218 was used only for the observation of juvenile color pattern.

Intermediate forms. Central Laos: Mekong R. at Vientiane, 3, 92.5～110.0 mm SL, Nov. 24, 1969 (IBRP 3192).

Morphological observation

Measurements. *Hampala macrolepidota* and *H. dispar* show more or less complete overlaps in almost all principal proportional characters examined, clear difference being found only in the following points (measurements in parentheses are range and mean for *H. macrolepidota* based on 39 specimens, followed by those for *H. dispar*): In *H. macrolepidota* the maxillary barbels are distinctly longer (their length in percent of head length 15.9～26.0, 20.4; 7.0～11.3, 8.8) and the caudal fin is more deeply forked (length of middle caudal ray in percent of that of upper lobe 37.0～42.6, 40.2; 43.0～51.0, 46.7). The snout is generally longer in *H. dispar*, but the variation ranges overlap to a great extent (snout

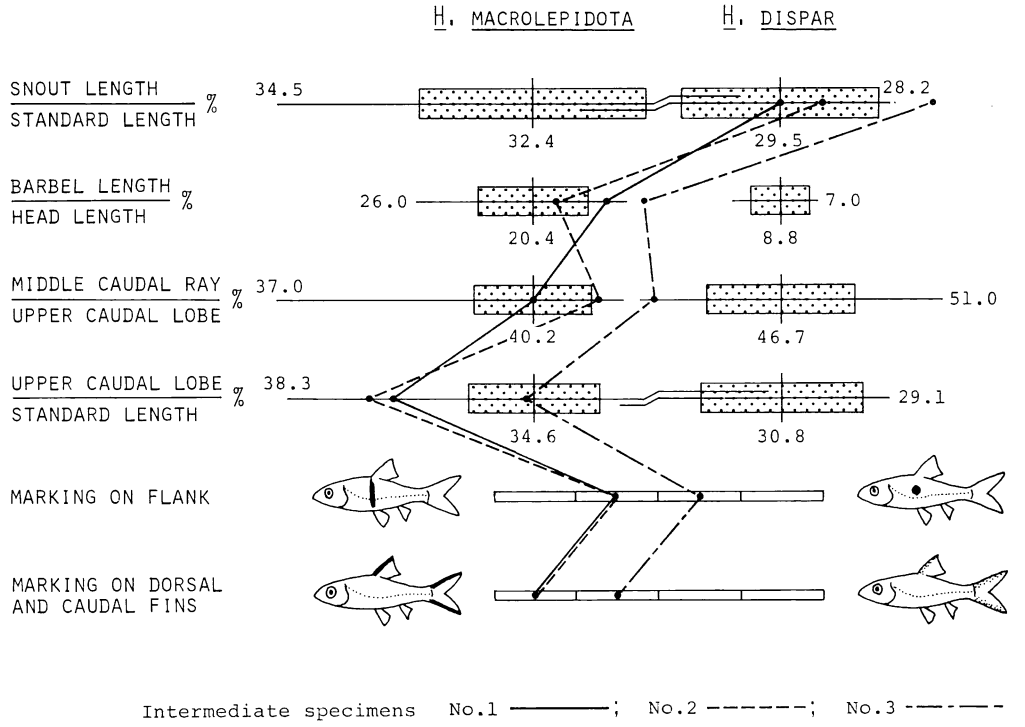

Fig. 1. Comparison of selected proportional measurements and color patterns in *H. macrolepidota*, *H. dispar*, and intermediate specimens. In each character the vertical line indicates mean; the horizontal line, range of variation; the stippled rectangle, one standard deviation on each side of the mean. The numerals are mean for each species, and maximum and minimum values for the two species are combined. The four-sectioned hollow horizontal bars represent the approximate divisions of color pattern. The delineations of fish show typical body markings of the two species.

length in percent of head length 30.3～34.5, 32.4; 28.2～31.8, 29.5) (Fig. 1). Smith (1934) indicates that in *H. dispar* the caudal fin is shorter, and the lower lobe is distinctly larger than the upper. In our material, both lobes of the fin are on the whole shorter in *H. dispar*, but the length of each lobe is subject to a great variation particularly in *H. macrolepidota*, and the variation ranges greatly overlap each other (length of upper lobe in percent of standard length 31.0～38.3, 34.6; 29.1～33.3, 30.8: length of lower lobe in percent of standard length 29.0～37.5, 33.4; 28.0～31.9, 30.3: all measured from the base of middle caudal ray) (Fig. 1). Also, in *H. dispar*, both lobes are not proportionate in size, the upper lobe being often larger than the lower.

Counts. Meristic counts shared in common by both species are: Dorsal rays iv, 8; anal rays iii, 5; total pelvic rays 9; principal caudal rays 19 (18 in one specimen of *H. dispar*); scales in transverse series to pelvic insertion 4.5/12.5; scales around caudal peduncle 12; total vertebrae 31 (32 in one specimen of *H. macrolepidota*). Other counts show some variations, but their ranges are greatly overlapped (In the following counts, range and in parentheses mean for *H. macrolepidota* are given first, followed by those for *H. dispar*.): total pectoral rays 15～18 (16.1), 14～16 (15.5); scales in transverse series between lateral line and anal origin 3.5～5.5 (4.5), 3.5～4.5 (4.1); predorsal scales 10～11 (10.2), 9～11 (10.0); postdorsal scales 13～16 (14.2), 13～14 (13.2); gill-rakers on upper limb 1～3 (1.9), 0～3 (2.2), on lower limb 7～9

(7.9), 7～9 (8.5), total 8～11 (9.8), 9～12 (10.6).

Pharyngeals and their teeth. In both species the pharyngeals are narrow, with greatly recurved dorsal limb. The teeth are 1·3·5—5·3·1, each tooth is slender, strongly pointed and slightly hooked. The tooth formula agrees with that given by Chevey (1932) for *H. macrolepidota*. No visible difference is recognized in the feature of the pharyngeals and their teeth between the two species.

Coloration. The ground color of the body in the two species of *Hampala* is brownish to orange yellow, with silvery to greenish metallic sheen. The orange tint is always stronger in *H. macrolepidota*. In this species each scale on the upper side has a dark base, which is not distinct in *H. dispar*. The vertical fins and pelvics are bright orange to blood red in *H. macrolepidota*, whereas the color is less bright and often dusky in *H. dispar*.

In adult *H. macrolepidota* there is a black cross band on the flank running nearly or

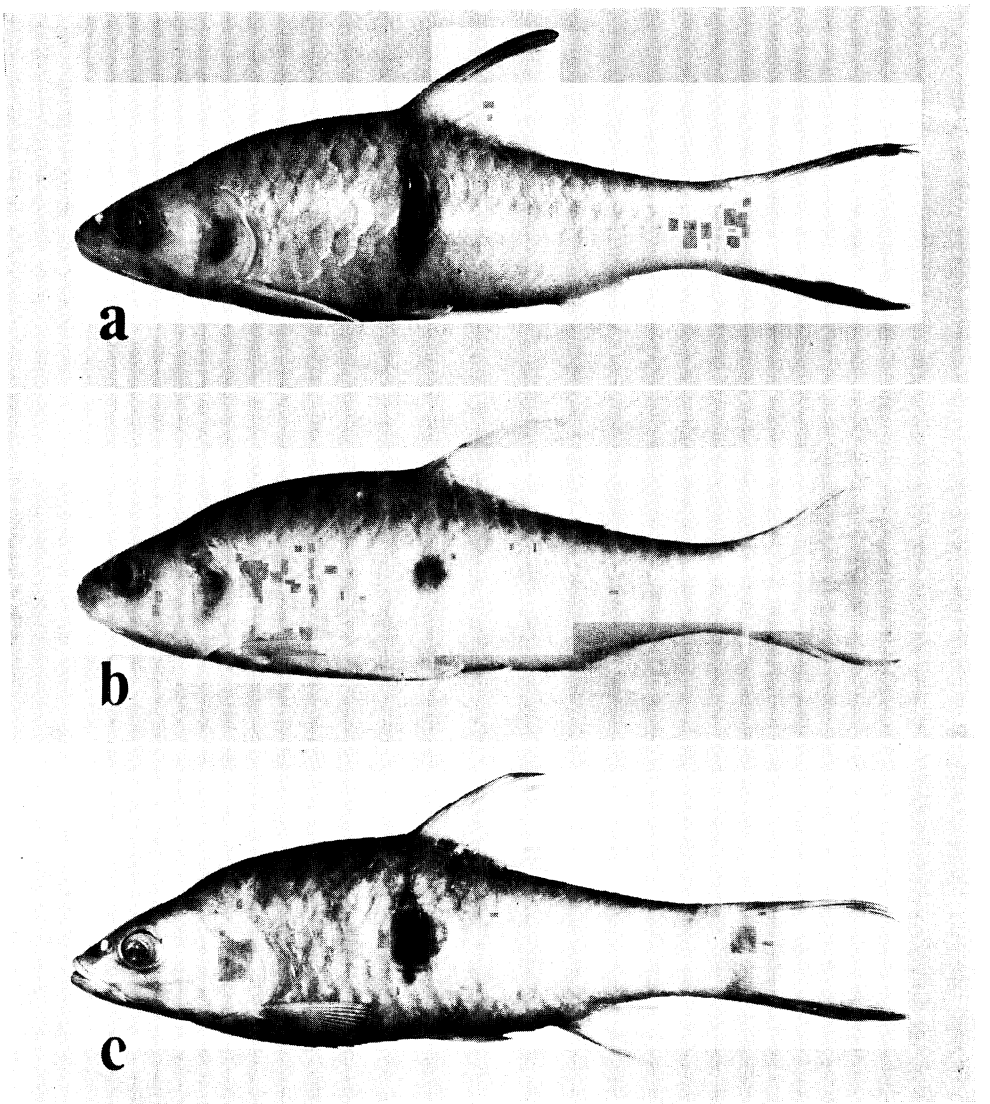

Fig. 2. a, *H. macrolepidota*, 90.0 mm SL (IBRP 5183); b, *H. dispar*, 114.0 mm SL (IBRP 4150); c, intermediate specimen No. 3, 110.0 mm SL (IBRP 3192).

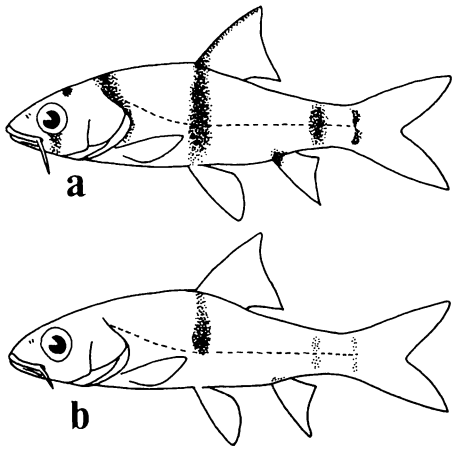

Fig. 3. Juvenile body markings: a, *H. macrolepidota*, 24.0 mm SL (IBRP 4405); b, *H. dispar*, 25.0 mm SL (IBRP 4218).

quite from the dorsal origin to below the lateral line, crossing the 9th and 10th lateral line scales and not extending to the pelvics. The band may be broadened ventrally or shortened into an elliptical blotch, but it always extends below the lateral line. There is a sharp-defined, black stripe along the anterior margin of the dorsal and along the upper and lower edge of the caudal. A typical color pattern of *H. macrolepidota* is shown in Fig. 2a. During juvenile stage the fish has, in addition to the cross band, a small spot above and below the eye, a bar from the nape down to the pelvic insertion along the gill-opening, a small spot at the anterior base of the anal, a broad, ill-defined band on the caudal pedancle, and a narrow cross band along the base of the caudal (Fig. 3a).

The marking on the flank in adult *H. dispar* is a roundish spot, located immediately above the 9th and 10th lateral line scales (Fig. 2b). The spot may be elongate vertically, but it does not extend below the lateral line. The dorsal and caudal are provided with marginal stripes, but the stripes are ill-defined and not intense. When juvenile the spot on the side is elongate vertically, extending to the dorsal origin dorsally and to the lateral line ventrally, thus approaching the juvenile color pattern of *H. macrolepidota*. However, the markings on the posterior half of the body are much less intense than in *H. macrolepidota*, and the anterior half of the body bears no markings (Fig. 3b).

Intermediate forms

One lot consisting of three specimens taken from the Mekong at Vientiane (IBRP 3192) shows intermediate characters between *H. macrolepidota* and *H. dispar*. Characters of each specimen are plotted in Fig. 1, and one of these specimens is illustrated in Fig. 2c. All of these three specimens are *dispar*-like in snout length, and *macrolepidota*-like in the length of barbel and upper caudal lobe. In the degree of incision of the caudal, the specimens No. 1 and No. 2 agree with *H. macrolepidota*, whereas No. 3 is closer to *H. dispar*. The specimens No. 1 and No. 2 have a *macrolepidota*-like cross bar on the flank, but the bar is considerably shorter than that of *H. macrolepidota*. The marking on the side in No. 3 is a diamond-shaped spot and resembles that of *H. dispar*. The spot extends to the lateral line.

It is unknown whether these specimens represent individual variation within one or two species or they are of hybrid origin.

Specific distinction

Though close in both meristic and morphometric characters, the difference between *H. macrolepidota* and *H. dispar* in their juvenile and adult color patterns demonstrated above seems to indicate that the two species are very close phylogenetically but distinct genetically, notwithstanding the occurrence of intermediate forms of unknown origin. The separation in the degree of development of the maxillary barbels and in the shape of the caudal is also in favor of the view that they are distinct specifically.

Fowler (1937) shows a series of color variations of *H. macrolepidota*, in which he included specimens from the Mekong referrable to *H. dispar*. In all of his color variants of *H. macrolepidota* proper, the band or spot on the side extends ventrally beyond the lateral line, while in two figures representing *H. dispar* the round spot is either separated from or extending to but not below the lateral line.

Habitat and distribution

Hampala macrolepidota is known to have a wide geographic range from Burma through to the Indochinese Peninsula and the Greater Sunda Islands, inhabiting various types of water from lowland rivers and lakes to hill-streams. According to Smith (1945), the fish goes even into the sea under the influence of freshets in coastal water.

H. dispar was originally recorded from the Mekong basin in eastern Thailand and Cambodia (Smith, 1934). Its range was extended upward to northern Laos by the sinior author (Taki, 1974), but his extensive collection in Vietnam and Thailand indicates its absence from the lowermost Mekong and the neighboring Menam Chao Phya basin. Like *H. macrolepidota*, this species shows wide habitat preference, occurring in both lowland and upland waters. One of our specimens (IBRP 4150) was collected in the Nam Dong, mountain stream forming a series of falls and rapids. *H. dispar* is thus restricted in distribution to the middle Mekong basin, where it is sympatric and syntopic with *H. macrolepidota*. Their ecological isolation is unknown.

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コイ科魚類 *Hampala macrolepidota* と *H. dispar* の分化

多紀 保彦・河本 新

東南アジア産のコイ科魚類 *H. macrolepidota* と *H. dispar* は形態的にきわめて類似している．しかし稚魚および成魚の斑紋，成魚における口ひげの発達程度や尾鰭の切れ込みの深さなどに明らかな差異があるところから，両者は別種と判断される．メコン河よりの標本中には両種の中間的特徴を示すものがあるが，これが両種間の雑種であるかどうかは不明である．

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