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Systematics and Distribution of Indochinese-Thai Clupeid Fishes in the Subfamily Pellonulinae

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Abstract Descriptive and distributional information is presented on three Indochinese-Thai clupeid species referrable to the subfamily Pellonulinae: *Clupeoides borneensis, Corica soborna* and *Clupeichthys goniognathus. Clupeoides borneensis* and *Corica soborna* show a close affinity, and are distinctive from *Clupeichthys goniognathus*, most remarkably in the jaw structure and the manner of opening the mouth. In the study area, *Corica soborna* is apparently confined in estuarine freshwaters; *Clupeoides borneensis* occurs a little further upstream in the Mekong; *Clupeichthys goniognathus* has a wide range in the Mekong as far upstream as central Laos.

The clupeid subfamily Pellonulinae is represented in Asian tropics by three freshwater genera, *Clupeoides, Corica* and *Clupeichthys*. From the Indochinese Peninsula (here referred to as including main part of Thailand) five nominal species have been recorded, however, little descriptive information is available on those forms, and their taxonomic affiliations are still not very clear. This study, based primarily on my fish collection made in the Mekong drainage, aims to elucidate morphological features and taxonomic status of Indochinese and Thai species belonging to the subfamily and present information on their distribution in the Indochinese Peninsula.

In the systematic account given below synonymy and references are restricted to original descriptions and citations pertaining to the study area. In the lists of material specimens are listed by locality, and data are arranged in the following order: number of specimens, standard length, collecting date and catalogue number. The abbreviations IBRP and ANSP denote the Institute for Breeding Research, Tokyo University of Agriculture and the Academy of Natural Sciences of Philadelphia, respectively.

Clupeoides borneensis Bleeker

Clupeoides borneensis Bleeker, 1851: 275 (original description, type locality, Bandjermassin, Borneo); Chevey and Le Poulain, 1940: 18 (Cambodia).

Material examined: From the Mekong River at Tan-Chau, South Vietnam—2, 45.2 and 49.0 mm, Oct. 14, 1974, IBRP 6504: from the Bassac River at Long-Xuyen, South Vietnam—1, 42.0 mm, Mar. 19, 1974, IBRP 6167: from the Bassac River at Can-Tho, South Vietnam—3, 56.0～57.9 mm, Mar. 1, 1974, IBRP 6129; 4, 38.0～52.8 mm, Aug. 12, 1974, IBRP 6312; 24, 40.8～51.2 mm, Oct. 12, 1974, IBRP 6434.

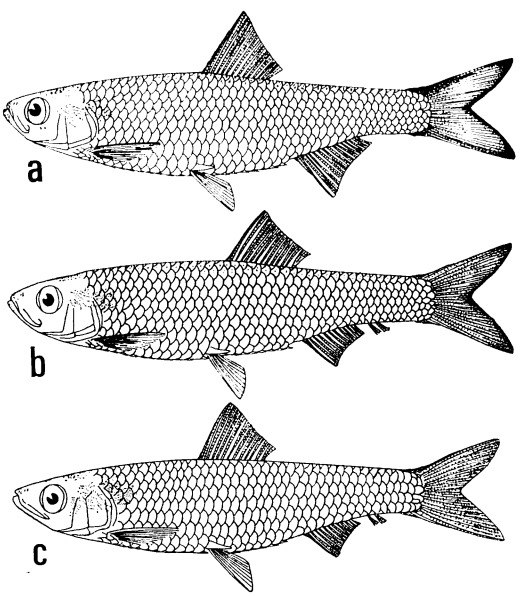

Fig. 1. Three clupeid species in the subfamily Pellonulinae inhabiting the Indochinese Peninsula. a, *Clupeoides borneensis*, 51.2 mm SL; b, *Corica soborna*, 50.7 mm SL; c, *Clupeichthys goniognathus*, 44.8 mm SL.

Descriptive note on Indochinese specimens: Selected counts and proportional measurements are presented in Table 1. The body shape is shown in Fig. 1a. The origin of the dorsal fin is opposite or slightly behind the insertion of the pelvic fins. The shape and configuration of the oral region are illustrated in Fig. 2a. The premaxillae are ventrolaterally elongate, with minute teeth. The maxillae are narrow above, broad below. The space between the premaxilla and maxilla is filled up by a membrane. The anterior margin of the membrane is thickened into a ligament-like structure connecting the two bones. Mesial portion of the dentaries is with short but sharp teeth.

When fresh the head and abdomen are silvery white; other part of body is semitransparent, milky white. The back of body is very sparsely covered with melanophores. The dorsal fin is pale yellow. The caudal fin is rich yellow, with

Table 1. Counts and proportional measurements in hundredths of standard length, for three pellonuline species in the Indochinese Peninsula. For *Corica soborna*, data from Mekong and Bangkok populations (paratypes of *C. laciniata*) are presented separately. Data listed are ranges (top line), means and in parentheses sample size (bottom line). Dorsal and anal ray counts for all species include 3 simple rays in each of the fins; anal ray counts for *Corica soborna* and *Clupeichthys goniognathus* include 2 branched rays in the detached anal finlet.

Character	*Clupeoides borneensis*	*Corica soborna*		*Clupeichthys goniognathus*
	Mekong R.	Mekong R.	Bangkok (paratypes of *C. laciniata*)	Mekong R.
Total dorsal rays	15～17	15～16	15～16	13～16
	15.8 (34)	15.6 (29)	15.8 (5)	14.1 (85)
Total anal rays	16～19	15～18	15～17	15～19
	17.1 (34)	16.5 (29)	16.4 (5)	16.6 (84)
Total pectoral rays	11～14	12～15	13～14	10～12
	12.3 (34)	13.4 (29)	13.6 (5)	11.4 (87)
Prepelvic abdominal scutes	9～11	10～12	11～12	8～11
	10.5 (34)	10.9 (29)	11.2 (5)	9.6 (87)
Postpelvic abdominal scutes	7～10	7～9	7	5～8
	8.2 (34)	8.1 (29)	7.0 (5)	6.7 (88)
Total abdominal scutes	17～20	18～20	18～19	14～18
	18.7 (34)	19.0 (29)	18.2 (5)	16.2 (87)
Total scales in lateral series	39～42	40～43	36～38	34～38
	40.6 (32)	41.2 (28)	36.7 (3)	35.8 (67)
Scales around caudal peduncle	16	16	16	12 or 14*
	16.0 (33)	16.0 (29)	16.0 (4)	12.1 (70)
Total vertebrae	39～41	39～41	39～40	37～40
	40.0 (34)	40.1 (29)	39.4 (5)	38.6 (88)
Standard length (mm)	38.0～57.9	37.3～50.7	39.5～42.0	35.0～53.0
	(34)	(29)	(5)	(40)
Body depth	23.2～26.9	23.2～27.1	21.3～25.2	22.6～27.1
	25.0 (34)	25.1 (29)	23.3 (4)	24.3 (40)
Head length	22.1～25.8	22.2～24.7	24.4～25.1	26.1～30.2
	23.9 (34)	23.3 (29)	24.8 (5)	27.9 (40)
Snout length	5.4～6.7	5.9～6.8	6.7～7.1	7.7～9.3
	6.0 (33)	6.4 (29)	6.9 (5)	8.2 (40)
Length of upper jaw	8.4～10.2	9.6～10.7	11.0～11.3	11.2～13.7
	9.2 (33)	10.1 (29)	11.2 (5)	12.4 (40)
Length of mandible	9.9～11.8	10.8～12.0	13.1～13.5	14.2～16.9
	10.9 (33)	11.4 (29)	13.2 (5)	15.5 (40)

* 14 scales in 2 specimen.

intensely black posterior margin and dark upper and lower margins. Other fins are hyaline.

Remarks: Comparison of the Indochinese population with the Bornean examples described by Weber and de Beaufort (1913) and Whitehead et al. (1966) shows almost complete overlap in range for both meristic and morphometric characters.

Corica soborna Hamilton-Buchanan

Corica soborna Hamilton-Buchanan, 1822: 253, 283 (original description; type locality, Mahanada River, India); Smith, 1933: 85 (Bangpakong River, Thailand); Suvatti, 1936: 9 (Ban Plasoi River, Thailand).

Corica pseudopterus, Chevey, 1932: 9 (Saigon River, South Vietnam).

Corica laciniata Fowler, 1935: 92 (in part) (Bangkok and Paknam, Thailand), 1937: 131 (Bangkok, Paknam and Tachin, Thailand).

Material examined: From the Bassac River at Can-Tho, South Vietnam—2, 47.0 and 50.7 mm, Mar. 7, 1974, IBRP 6156; 3, 46.3～50.2 mm, May 5, 1974, IBRP 6289; 24, 37.3～46.0 mm, Aug. 12, 1974, IBRP 6311: from Bangkok, Thailand—5, 39.5～42.0 mm, May, 1934, 5 of 42 paratypes (paratopotypes taken with the holotype) of *Corica laciniata* catalogued ANSP 61416～61457.

Descriptive note on Indochinese and Thai specimens: Selected counts and proportional measurements for the Indochinese and for the Thai samples are given in Table 1. The body shape is shown in Fig. 1b. The origin of the dorsal fin is behind the insertion of the pelvic fins, being over the first or second postpelvic abdominal scute. The shape and structure of the mouth region are similar to those of *Clupeoides borneensis* except for the following points: the jaws are slightly longer; the premaxillary teeth are vestigial; the dentary teeth are minute.

Coloration of fresh-caught specimens, based on the Indochinese samples, is similar to that of *Clupeoides borneensis* except for the less intensive black margin to the caudal fin.

Remarks: *Corica pseudopterus*, described from East Indies by Bleeker (1852) and Weber and Beaufort (1913), is distinguishable from the Indian *C. soborna* only in having 37～40 scales in lateral series instead of 40～42 scales as given by Day (1878) for *C. soborna*. This has led the undermentioned authors to consider *C. pseudopterus* synonymous with *C. soborna*: Day (1878), Fowler (1941), Whitehead et al. (1966), and Whitehead (1967). The last named author has also synonymized the Malayan *C. perakensis* Herre (scales in lateral series 38) and the Bornean *C. bleekeri* Hardenberg (scales in lateral series 35～36) with *C. soborna*.

Fowler (1935) proposed *C. laciniata*, differentiating it from *C. soborna* by its 32～34 total scales in lateral series. The paratypes of *C. laciniata* examined in the present study, however, had 36～38 total scales in lateral series (Table 1), which approach the scale count range for *C. soborna* of the present Mekong population. Although two populations differ in this regard, comparison of other meristic data on the Bangkok population paratypes of *C. laciniata* with those on the Mekong population of *C. soborna* exhibits complet overlap (Table 1). The paratypes, to the contrary, do not agree partly or totally with the description of *C. laciniata* by Fowler (1935) in the counts for the dorsal, anal and pectoral rays and abdominal scutes. Although the paratypes have a little longer jaws than the Mekong *C. soborna* (Table 1) and in this respect approach the types of the East Indian *C. pseudopterus* described by Whitehead et al. (1966), they show no significant specific segregation from *C. soborna*. Fowler's (1935) specimens of *C. laciniata* is at least partly assignable to *C. soborna*.

Clupeichthys goniognathus Bleeker

Clupeichthys goniognathus Bleeker, 1855: 275 (original description; type locality, Lahat, Sumatra).

Corica (*Clupeichthys*) *goniognathus*; Durand, 1940: 5 (Tonle Sap River, Cambodia); Chevey and Le Poulain, 1940: 18 (Cambodia).

Corica sp. Taki, 1974: 48 (Nam Ngum River and its tributaries at Tha Ngon, Laos, and Mekong River at Sai Fong, Pakse and Hatsalao, Laos, and at Tha Bo, Thailand).

Material examined: From the Nam Ngum River and its branches at Tha Ngon, Laos—2, 30.0 and 30.8 mm, Jun. 17, 1970, IBRP 4168; 5, 39.7～46.5 mm, Jul. 17, 1970, IBRP 4365; 4, 34.3～41.5 mm, Aug. 4, 1970, IBRP 4421; 2, 36.7 and 37.0 mm, Sep. 11, 1970, IBRP 4612; 7,

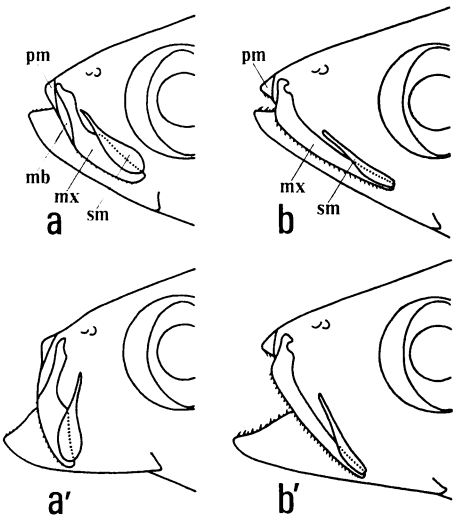

Fig. 2. Delineations of mouth of *Clupeoides borneensis* (a, nearly closed; a′, opened) and *Clupeichthys goniognathus* (b, nearly closed; b′, opened).

30.0～39.7 mm, Oct. 6, 1970, IBRP 4721; 1, 34.7 mm, Feb. 18, 1971, IBRP 5781: from the Mekong River at or near Tha Bo, Thailand—1, 27.0 mm, Jun. 11, 1970, IBRP 4065; 28, 26.4～40.5 mm, Oct. 8, 1970, IBRP 4805; 5, 30.4～37.0 mm, Dec. 9, 1970, IBRP 5010; 6, 25.0～39.2 mm, May 6, 1971, IBRP 5670: from the Mekong River at Hatsalao, Laos—4, 32.7～41.2 mm, Jun. 26, 1970, IBRP 4210; 5, 28.5～32.5 mm, Jul. 12, 1970, IBRP 4274; 15, 32.7～37.2 mm, Feb. 9, 1971, IBRP 5225: from the Mekong River near Phnom Penh, Cambodia—2, 45.5 and 53.0 mm, Aug., 1966, IBRP 3145: from the Bassac River at Long-Xuyen, South Vietnam—1, 44.8 mm, Mar. 19, 1974, IBRP 6166.

Descriptive note on Indochinese specimens: Selected counts for all specimens and proportional measurements of individuals 35.0 mm in standard length or larger are presented in Table 1. The general body appearance is shown in Fig. 1c. The origin of the dorsal fin is opposite or before the insertion of the pelvic fins. The shape and structure of the oral region are illustrated in Fig. 2b. The premaxillae are triangular, with a few long caniniform teeth directed backward. The maxillae are of about equal width throughout their length, their upper portions are greatly convex outward. There is no conspicuous membrane between the premaxilla and maxilla, and the two bones form a shallow incision of the upper jaw. About two rows of long, caniniform teeth are along the upper margin of the dentaries.

When fresh the body is uniformly silvery to amber white. The fins are hyaline; the vertical fins are very sparsely pigmented with melanophores.

Remarks: No statistically significant difference is recognized among the Mekong population in the characters employed in this study. The Mekong population as a whole differs slightly from Sumatran and Bornean examples in the possession of 34～38 total scales in lateral series against 39～40 scales as given for the insular population by Bleeker (1855) and Weber and de Beaufort (1913).

Relationship of the Indochinese-Thai pellonulines

Clupeoides borneensis and *Corica soborna*, while differing in presence (in the latter) or absence (in the former) of the anal finlet, have much the same counts for the dorsal rays, abdominal scutes, scales and vertebrae. They are also similar in the structure of the oral region, though *Corica soborna*, particularly the Bangkok specimens, have slightly longer jaws (Table 1). On the contrary, *Clupeichthys goniognathus* shares the feature of the anal fin with *Corica soborna*, but is quite different from the other two in the jaw structure (Table 1, Fig. 2). *Clupeichthys* was placed as a subgenus of *Corica* by Weber and Beaufort (1913), Durand (1940), Chevey and Le Poulain (1940) and Fowler (1941). This taxonomic assignment, however, is not sustainable in view of the decided gap in the jaw structure. Whitehead et al. (1966) considered *Clupeichthys* a distinct genus, and pointed out that the divided anal fin is shared by another and more distantly related genus and might not be of overriding importance.

The structural difference in the oral region is associated with difference in the manner of opening the mouth. In *Clupeoides borneensis* and *Corica soborna* the maxilla is connected with the mandible by a broad membrane. When the mandible is lowered, the maxilla swings forward, pulled by the membrane, to the extent that it

inclines backward (Fig. **2a**′). The ligament-like structure along the front margin of the upper jaw membrane appears to serve for suspending the maxilla. In *Clupeichthys goniognathus* the maxilla is connected with the mandible by a narrow membrane, which restricts forward movement of the maxilla. In consequence the maxilla can be moved much less forward, and the mandible, too, can be moved less downward (Fig. **2b**′). Nevertheless a mouth opening as wide as in the other two species is attained owing to its deep mouth cleft.

The above similarities and differences clearly indicate that *Clupeoides borneensis* and *Corica soborna* are closely related, and also suggest that the divided anal fin in the latter may have been derived from certain species kin to the former. The phylogenetic position of *Clupeichthys goniognathus* may probably be distant from the other two.

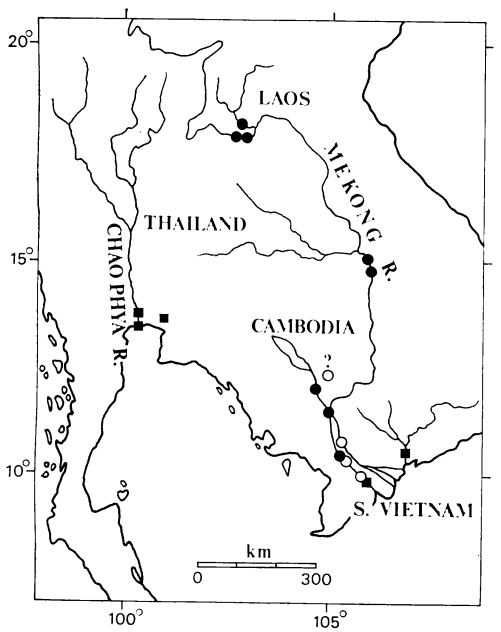

Fig. 3. Distribution of pellonuline fishes in the Indochinese Peninsula. Localities are represented by open circles (*Clupeoides borneensis*), solid circles (*Clupeichthys goniognathus*) and solid squares (*Corica soborna*). The open circle with ? indicates the record of *Clupeoides borneensis* from Cambodia without exact locality (Chevey and Le Poulain, 1940).

Distribution

The three pellonuline fishes show different, if not allopatric, distribution in the Indochinese Peninsula (Fig. 3). *Corica soborna* appears restricted to estuarine freshwaters. *Clupeoides borneensis* occupies the Vietnamese and Cambodian Mekong drainages, and apparently has not moved upstream any further than central Cambodia. My sizable fish collection from Laos contains only a single pellonuline species, *Clupeichthys goniognathus*. This species shows the most widespread dispersal in the Mekong, occurring as far upstream as Tha Ngon, central Laos, about 1,600 km above the river mouth.

Acknowledgments

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インドシナ半島産ニシン科 Pellonulinae 亜科魚類の分類と分布

多紀　保彦

インドシナ半島の淡水中に棲息する3種の Pellonulinae 亜科魚類を記載した．*Corica soborna* と *Clupeichthys goniognathus* は尾鰭に小離鰭をもつが，口部の形態を含む多くの形質において *Corica soborna* はむしろ *Clupeoides borneensis* と密接な共通性を有する．これら3種の河川中での分布は *Corica soborna*, *Clupeoides borneensis*, *Clupeichthys goniognathus* の順に下流部から上流部に広がっている．

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