

Table 3. *Noemacheilus chrysolaimos* and *N. fasciatus*. Morphometric and meristic data.

|                                   | <i>N. chrysolaimos</i> |            |           |           |                 |            |         |           | <i>N. fasciatus</i> |           |           |            |         |           |
|-----------------------------------|------------------------|------------|-----------|-----------|-----------------|------------|---------|-----------|---------------------|-----------|-----------|------------|---------|-----------|
|                                   | Para-lecto-type        | Lecto-type | Range     | $\bar{x}$ | Para-lecto-type | Lecto-type | Range   | $\bar{x}$ | Lecto-type          | Range     | $\bar{x}$ | Lecto-type | Range   | $\bar{x}$ |
|                                   | % of SL                |            |           |           | % of HL         |            |         |           | % of SL             |           |           | % of HL    |         |           |
| Lateral length of head            | 20.9                   | 20.2       | 19.7–24.9 | 22.0      | 121             | 119        | 107–133 | 120       | 22.0                | 19.6–23.8 | 21.6      | 109        | 107–126 | 117       |
| Dorsal length of head             | 17.3                   | 17.0       | 16.2–20.3 | 18.3      |                 |            |         |           | 20.2                | 16.9–20.3 | 18.5      |            |         |           |
| Predorsal length                  | 45.0                   | 47.4       | 44.8–51.0 | 48.3      |                 |            |         |           | 49.2                | 45.8–50.5 | 48.1      |            |         |           |
| Prepelvic length                  | 48.4                   | 49.9       | 46.8–53.1 | 50.3      |                 |            |         |           | 51.4                | 46.7–51.7 | 49.1      |            |         |           |
| Preal length                      | 76.2                   | 78.3       | 74.2–80.3 | 76.9      |                 |            |         |           | 76.9                | 73.6–78.6 | 75.9      |            |         |           |
| Pre-anus length                   | 66.4                   | 67.5       | 63.2–71.7 | 67.5      |                 |            |         |           | 69.2                | 66.5–71.1 | 68.6      |            |         |           |
| Head height (at eye)              | 9.5                    | 9.1        | 8.3–12.5  | 10.1      | 55              | 54         | 45–66   | 55        | 10.5                | 8.3–11.5  | 9.8       | 52         | 46–61   | 53        |
| Body height (at nape)             | 11.7                   | 10.2       | 10.2–13.6 | 12.1      | 68              | 60         | 59–80   | 66        | 11.4                | 9.8–13.0  | 11.5      | 56         | 54–69   | 62        |
| Body height (at dorsal origin)    | 13.9                   | 14.9       | 13.9–21.6 | 16.6      | 80              | 88         | 71–125  | 91        | 13.4                | 12.8–18.4 | 15.3      | 67         | 67–112  | 83        |
| Height of caudal peduncle         | 13.1                   | 12.3       | 10.2–13.1 | 11.8      | 76              | 73         | 54–76   | 64        | 10.5                | 9.2–11.3  | 10.3      | 52         | 48–64   | 56        |
| Length of caudal peduncle         | 16.3                   | 16.1       | 12.5–19.5 | 14.8      | 94              | 95         | 59–100  | 81        | 16.0                | 14.0–18.4 | 16.6      | 79         | 76–111  | 90        |
| Snout length                      | 7.1                    | 6.2        | 6.2–9.1   | 7.8       | 41              | 36         | 33–48   | 42        | 10.3                | 6.9–10.3  | 8.4       | 51         | 38–51   | 45        |
| Head width (at nares)             | 7.3                    | 7.6        | 7.1–10.8  | 8.6       | 42              | 45         | 37–55   | 47        | 9.4                 | 7.1–9.5   | 8.1       | 46         | 37–52   | 44        |
| Maximum head width                | —                      | 11.0       | 10.8–16.2 | 13.2      | —               | 60         | 58–88   | 72        | 14.1                | 10.2–14.1 | 12.8      | 70         | 60–82   | 69        |
| Body width (at dorsal origin)     | —                      | 9.6        | 9.6–15.5  | 11.5      | —               | 56         | 52–79   | 63        | 11.0                | 9.0–14.9  | 11.1      | 55         | 48–77   | 60        |
| Body width (at anal origin)       | —                      | 7.6        | 6.2–8.9   | 7.5       | —               | 45         | 32–52   | 41        | 5.9                 | 5.5–8.4   | 7.0       | 29         | 27–46   | 38        |
| Eye diameter                      | —                      | —          | 3.8–5.7   | 4.9       | —               | —          | 22–33   | 27        | 4.0                 | 3.2–5.2   | 4.0       | 20         | 19–26   | 22        |
| Interorbital width                | —                      | 6.4        | 5.6–8.2   | 6.8       | —               | 37         | 32–45   | 37        | 5.7                 | 5.2–7.0   | 6.0       | 28         | 27–40   | 33        |
| Height of dorsal fin              | —                      | —          | 14.0–21.6 | 17.2      | —               | —          | 77–116  | 93        | 19.3                | 11.4–19.7 | 16.2      | 96         | 74–109  | 87        |
| Length of upper caudal lobe       | —                      | —          | 21.4–29.9 | 26.0      | —               | —          | 124–164 | 141       | 28.3                | 22.8–29.6 | 26.1      | 140        | 122–165 | 141       |
| Length of lower caudal lobe       | —                      | —          | 21.5–28.5 | 24.7      | —               | —          | 113–155 | 133       | —                   | 12.3–29.3 | 26.0      | —          | 123–167 | 140       |
| Length of median caudal rays      | 17.5                   | —          | 14.2–20.4 | 18.6      | 101             | —          | 90–119  | 100       | 14.7                | 11.7–18.4 | 14.5      | 73         | 70–102  | 82        |
| Length of anal fin                | —                      | —          | 13.2–22.6 | 18.4      | —               | —          | 77–119  | 100       | 14.3                | 14.3–21.9 | 17.5      | 71         | 83–125  | 96        |
| Length of pelvic fin              | —                      | 13.2       | 13.2–19.2 | 17.0      | —               | 78         | 65–105  | 92        | 16.3                | 15.3–18.9 | 16.3      | 81         | 82–108  | 91        |
| Length of pectoral fin            | —                      | 14.9       | 14.9–25.2 | 19.3      | —               | 95         | 91–134  | 105       | 20.7                | 17.5–23.2 | 19.6      | 103        | 94–132  | 106       |
| Caudal peduncle: length/height    | 1.24                   | 1.31       | 1.07–1.50 | 1.26      |                 |            |         |           | 1.53                | 1.38–1.83 | 1.62      |            |         |           |
| Dorsal fin rays (simple/branched) | —                      | 4/9        | 4/8–9     |           |                 |            |         |           | 4/9                 | 4/9       |           |            |         |           |
| Caudal fin rays                   | 9+8                    | 9+8        | 9+8       |           |                 |            |         |           | 9+8                 | 9+8       |           |            |         |           |
| Anal fin rays (simple/branched)   | —                      | 3/5        | 3/5       |           |                 |            |         |           | 3/5                 | 3/5       |           |            |         |           |
| Ventral fin rays                  | —                      | 8          | 8         |           |                 |            |         |           | 8                   | 8         |           |            |         |           |
| Pectoral fin rays                 | —                      | 12         | 11–13     |           |                 |            |         |           | 12                  | 11–13     |           |            |         |           |
| Lateral-line pores                | —                      | —          | 87–101    | 93.8      |                 |            |         |           | 90                  | 93–116    | 101.6     |            |         |           |

Kotrelat: Revision of *Noemacheilus* Loaches

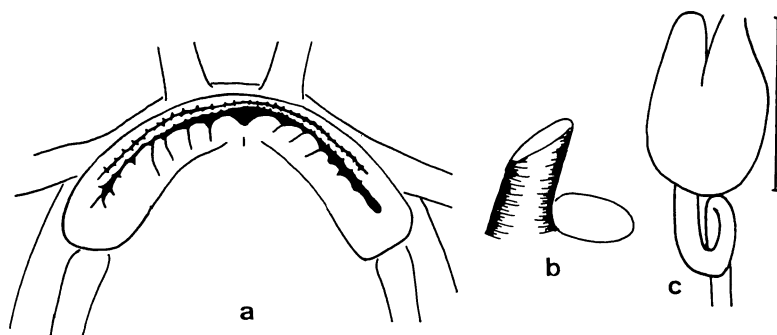


Fig. 15. *Noemacheilus chrysolaimos*, MZB 1374, 44.2 mm SL. a, mouth; b, left naris; c, stomach. Scale bar indicates 7 mm.

pectoral rays. Barbels and lips may be covered with uncili which usually are more developed in males.

**Colour pattern:** The body is light brown with 9–18 dark bars of irregular shape. The bars are generally wider than the interspaces in older specimens and as wide in young ones (smaller than approximately 35 mm SL). In very small specimens (approximately 25 mm SL), the colour pattern consists of pairs of thin bars. In older specimens, the median area of the bar is lighter, each bar thus tending to split into two bars. The bars are more or less vertical and are dorsally united. The width of the bars is not regular; it is greater dorsally and on the lateral line. The bars do not reach the mid-ventral line. In some specimens, the bars are of very irregular shape and occasionally dissociated (Fig. 14c). In others, they are very regular (Fig. 14b). The head is brown, lighter ventrally, with one large darker spot in the interorbital area and two other ones on each side of the fontanel. Darker markings are also present on snout and opercle.

The distal two-thirds of the last simple dorsal ray are dark; there is a dark spot on inferior part of that ray. There are two spots on each branched ray, arranged in two longitudinal rows (not always distinct, particularly in small specimens). The caudal fin has 2–3 <-shaped vertical rows of spots. The base and the first rays of the pectoral fins may be dark in some large specimens. The other fins are hyalin.

**Discussion.** Valenciennes (in Cuvier and Valenciennes, 1846) described three species of noemacheilines from Java. Two of them are

discussed under *N. fasciatus*. The third one, *Cobitis chrysolaimos*, was illustrated by a plate which clearly shows the distinctive colour pattern of the present species (Fig. 14a).

Several series of Sumatranese noemacheilines have been examined which possibly could be conspecific with *N. chrysolaimos*. General poor state of these specimens, collected in six widely spaced localities, and the existence of some differences (caudal rays, fin position, colour patterns) would make any decision very subjective. Moreover, several species may be present in a single series. For these reasons, I decided to discuss only the material from Java. An objective discussion of these Sumatranese specimens requires extensive collecting efforts.

**Distribution.** Western Java (Fig. 6), Sumatra (?). At some localities, it occurs sympatrically with *N. fasciatus*.

**Etymology.** *Ψρυσός* (*chrysos*) (Gr.): gold; *λαίμω* (*laimos*) (Gr.): mouth.

**Remark.** The stomach of a dissected male (MZB 1374) contains two Trichoptera and one Diptera larvae.

*Noemacheilus kapuasensis* sp. nov.

(Figs. 3b, 11, 16, 17)

**Material examined.** Borneo: Kalimantan Barat. MZB 4004, holotype, 46.0 mm SL; Kapuas, rocky channel in main stream of Sungai Pinoh at Nangu Saian, 45 km S of Nangapinoh (0° 43'S, 111°38'E); Roberts, 26 VII 1976. MZB 4005, 6 ex., paratypes, 42.0–53.8 mm SL; same data. CAS 47378, 20 ex., paratypes, 42.0–53.4 mm SL; same data. CMK 3187 3 ex., paratypes, 41.2–54.0 mm SL; same data. CMK 3188 2 ex., paratypes,

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49.8, 49.8 mm SL; same data; cleared, alizarin stained. Sarawak. FMNH 68180, 65 ex., 7.5–64.3 mm SL; Third Division: Baleh River; Inger, 8 VIII 1956. FMNH 68181, 1 ex., 53.7 mm SL; Third Division: Sungei Putai; Inger, 12 VIII 1956. FMNH 68182, 273 ex., 29.0–64.2 mm SL; Third Division: tributary between Sungai Entunan and Sungai Putai; Inger, 5 VIII 1956. FMNH 68184, 35 ex., 47.8–70.8 mm SL; Third Division: headwaters of Baleh River; Haile, VIII 1956. SMF 17014, 31 ex., 23.4–53.6 mm SL; Batang Rajang km 429, affluent of Belaga Rajang; Lelek, 6 VIII 1981.

**Diagnosis.** A new noemacheiline from Western Borneo characterized by the combination of the following characteristics: no acuminate scales on the caudal peduncle (present in *N. selangoricus* and *N. spiniferus*); 17 branched

caudal rays (15 in *N. phuketensis*, 16 in *N. obesus*, *N. saravacensis* and occasionally *N. chrysolaimos*); nostril valve not modified in a tube (as in *N. selangoricus*, *N. spiniferus*, *N. chrysolaimos*, *N. longipectoralis* and *N. saravacensis*) or in a barbel (as *N. obesus* and *N. olivaceus*); caudal peduncle 1.3–1.5 times longer than deep (1.5–1.9 in *N. fasciatus* and *N. masyai*); a complete lateral line (incomplete in *N. obesus*, *N. phuketensis* and occasionally *N. chrysolaimos*). It may be distinguished from the possibly related *N. fasciatus* by its greater lateral length of head (23–26% SL vs. 19–24), greater dorsal length of head (19–22% SL vs. 17–20), and colour pattern (see below).

**Description.** Morphometric and meristic data

Table 4. *Noemacheilus kapuasensis* sp. nov. Morphometric and meristic data.

|                                   | Holotype | Paratypes | $\bar{x}$ | Holotype | Paratypes | $\bar{x}$ |
|-----------------------------------|----------|-----------|-----------|----------|-----------|-----------|
|                                   |          | % of SL   |           |          | % of HL   |           |
| Lateral length of head            | 26.8     | 23.4–26.1 | 25.1      | 121      | 109–134   | 118       |
| Dorsal length of head             | 21.6     | 18.6–22.3 | 21.3      |          |           |           |
| Predorsal length                  | 48.9     | 48.0–51.8 | 49.9      |          |           |           |
| Prepelvic length                  | 51.5     | 49.4–54.4 | 51.4      |          |           |           |
| Preanal length                    | 77.6     | 75.5–79.8 | 77.4      |          |           |           |
| Pre-anus length                   | 67.2     | 65.9–70.9 | 68.5      |          |           |           |
| Head height (at eye)              | 10.8     | 10.1–11.4 | 8.9       | 50       | 47–53     | 50        |
| Body height (at nape)             | 12.1     | 12.0–13.4 | 10.7      | 56       | 55–66     | 59        |
| body height (at dorsal origin)    | 14.9     | 14.9–20.6 | 12.6      | 69       | 69–97     | 82        |
| Height of caudal peduncle         | 11.0     | 10.0–12.1 | 11.4      | 51       | 48–61     | 53        |
| Length of caudal peduncle         | 14.2     | 12.5–16.9 | 15.1      | 66       | 60–80     | 71        |
| Snout length                      | 9.1      | 8.4–9.9   | 9.3       | 42       | 39–51     | 43        |
| Head width (at nares)             | 8.4      | 7.6–9.8   | 8.6       | 39       | 36–46     | 41        |
| Maximum head width                | 12.5     | 12.5–14.8 | 13.4      | 58       | 57–69     | 63        |
| Body width (at dorsal origin)     | 10.6     | 10.6–15.6 | 12.3      | 49       | 49–71     | 58        |
| Body width (at anal origin)       | 7.1      | 6.2–8.6   | 7.3       | 33       | 29–41     | 35        |
| Eye diameter                      | 5.2      | 4.3–5.6   | 5.0       | 24       | 20–26     | 23        |
| Interorbital width                | 6.3      | 5.6–7.3   | 6.5       | 29       | 26–34     | 30        |
| Height of dorsal fin              | 19.4     | 15.9–21.3 | 18.6      | 90       | 77–101    | 87        |
| Length of upper caudal lobe       | 27.8     | 25.9–30.0 | 27.5      | 129      | 121–137   | 129       |
| Length of lower caudal lobe       | 27.4     | 25.2–31.1 | 28.1      | 127      | 117–148   | 132       |
| Length of median caudal ray       | 17.9     | 14.2–20.3 | 16.9      | 83       | 65–96     | 79        |
| Length of anal fin                | 16.6     | 12.7–18.0 | 16.2      | 77       | 59–84     | 76        |
| Length of pelvic fin              | 16.4     | 15.0–18.3 | 17.1      | 76       | 70–95     | 80        |
| Length of pectoral fin            | 20.5     | 19.5–23.0 | 20.9      | 95       | 91–117    | 98        |
| Caudal peduncle: length/height    | 1.29     | 1.05–1.49 | 1.34      |          |           |           |
| Dorsal fin rays (simple/branched) | 4/9      | 4/9       |           |          |           |           |
| Caudal fin rays                   | 9+8      | 9+8       |           |          |           |           |
| Anal fin rays (simple/branched)   | 3/5      | 3/5       |           |          |           |           |
| Ventral fin rays                  | 8        | 8         |           |          |           |           |
| Pectoral fin rays                 | 12       | 11–12     |           |          |           |           |
| Lateral-line pores                | 96       | 93–102    | 93.7      |          |           |           |

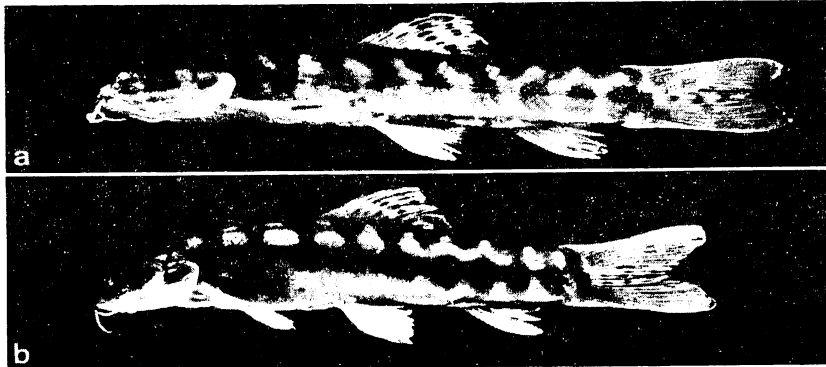


Fig. 16. *Noemacheilus kapuasensis* sp. nov. a, holotype, MZB 4004, 46.0 mm SL; b, paratype, MZB 4005, 41.9 mm SL.

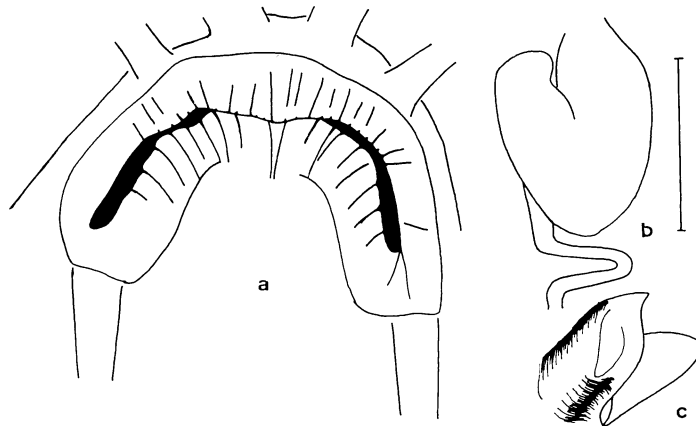


Fig. 17. *Noemacheilus kapuasensis* sp. nov. a, mouth of holotype; b, stomach of same; c, left naris of CMK 3187, 54.4 mm SL. Scale bar indicates 6 mm.

are given on Table 4. The body is elongated; its greatest height is somewhat in front of the dorsal fin; it is laterally slightly flattened. The pectoral fins do not reach the base of the pelvic ones. There is an axillary lobe at the base of the pelvic fins which are inserted under second to third branched dorsal rays; they just reach the anus which lies approximately two eye diameters in front of the anal fin. The anal fin does not reach the base of the caudal fin. There are small dorsal and ventral crests on the posterior part of the caudal peduncle. The caudal fin is forked, its lobes being subequal, the upper one being at least 1.5 times longer than the median caudal rays. The supero-posterior edge of the dorsal fin is straight. Vertebrae 35.

The body and the belly are completely scaled,

except between the bases of the pectoral fins. All scales have the same size and are embedded. They are obscurely ovoid with a small (less than one-fifth of scale diameter) eccentric focal area (Fig. 3b). The lateral line is complete. There are 9 mandibulo-opercular, 4+11 infra-orbital, 5 supra-orbital and 3 occipital pores on the head sensory canals.

The anterior naris is pierced in the front side of the valve (Fig. 17c). The mouth is arched, its gape being approximately two times wider than long (Fig. 17a). The anterior lip is slightly crenated in its anterior part. The posterior lip has 5-7 deep furrows on each side of a distinct median incision. The posterior area of both lips is smooth. The maxillary barbels reach underneath the middle of the postorbital

area of the head; the outer rostral ones reach beyond the hind border of the eye; the inner rostral ones reach underneath the middle of the eye. There is a loop in the digestive duct somewhat after stomachic dilatation (Fig. 17c).

**Sexual dimorphism:** Males have a sub-orbital flaplet, their first and second pectoral rays are thickened and the four first pectoral rays bear rows of tubercles. Males seem to be smaller than females.

**Colour pattern:** The body is greenish brown. On the smaller male specimens, there are 10–12 dark bars, slightly oblique, wider on the dorsum and on the lateral line. In larger specimens, these bars are broken and there is a series of saddles on the dorsal profile and a series of blotches along the course of the lateral line. Occasionally, blotches may fuse to form a kind of longitudinal stripe. The bars are approximately as wide as the interspaces. There is a black spot at the upper edge of the base of the caudal fin and a vertically elongated black blotch on the lower half of the caudal base. A dark band between the eyes is slightly continued below the eyes. There are other bands between the nares and on the nape; there is a dark area on the opercle. The upper half of the last simple dorsal ray is dark and there is a dark spot on its lower half. There are 2–4 rows of spots on the dorsal rays and three vertical rows on the caudal fin. The other fins are hyalin.

**Distribution.** The Kapuas drainage in Kalimantan Barat and the Rajang drainage in Sarawak (Fig. 11). In Batang Rajang, this species occurs sympatrically with *N. spiniferus*.

**Etymology.** *kapuasensis*: named after the

Kapuas River where the type specimens have been collected.

**Remarks.** A dissected female (54.5 mm SL) contained ovulae, 0.6 mm in diameter.

*Noemacheilus fasciatus* Kuhl et van Hasselt

(Figs 3a, 11, 18, 19)

*Noemacheilus fasciatus* Kuhl and van Hasselt in van Hasselt, 1823: 133 (in part; original description; type-locality: Buitenzorg); 1824: 377 (in part).

*Cobitis fasciata* Valenciennes in Cuvier and Valenciennes, 1846: 25 (redescription); Bleeker, 1854: 96 (in part); 1859: 303 (in part), 1860: 78 (in part).

*Cobitis suborbitalis* Valenciennes in Cuvier and Valenciennes, 1846: 26 (original description; type-locality: Java).

*Nemacheilus fasciatus*: Bleeker, 1863a: 366 (in part), 1863b: 41 (in part), 1863c: 7 (in part).

*Namachilus fasciatus*: Günther, 1868: 349 (in part); Weber and de Beaufort, 1916: 40 (in part).

*Noemacheilus fasciatus*: Banareescu and Nalbant, 1968: 329 (citation, synonymy).

**Material examined.** Java. MNHN B-2798, lectotype, 54.5 mm SL; Kuhl and van Hasselt. MNHN 3930, holotype of *Cobitis suborbitalis*, 58.2 mm SL; bought by Valenciennes in Amsterdam. ZMA 112.880, 1 ex., 50.1 mm SL; Situ Begendit, near Garut (7°03'S, 107°54'E); Weber, 1888. ZMA 112.881, 4 ex., 59.8–65.4 mm SL; River Sokartjo near Lawang (7°50'S, 112°40'E); de Beaufort, IX 1909. RMNH 16763, 3 ex., 56.9–64.0 mm SL; Tsjisoegan near Soekadaekoe; Koumans, 26 VII 1930. RMNH 17039, 6 ex., 51.0–70.7 mm SL; Kepandjen, Wonosari (7°55'S, 110°39'E); Civ. Serv. Inland Fisheries, Psoeroean, XI 1938. RMNH 28979, 1 ex., 67.0 mm SL; river by Buitenzorg (= Bogor) (6°34'S, 106°45'E); Buitendijk, III 1925–

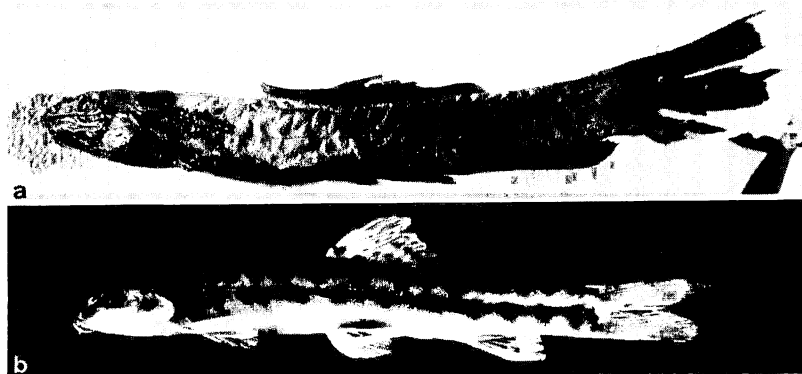


Fig. 18. *Noemacheilus fasciatus*. a, lectotype, MNHN B-2798, 54.5 mm SL; b, MZB 1994, 63.3 mm SL.

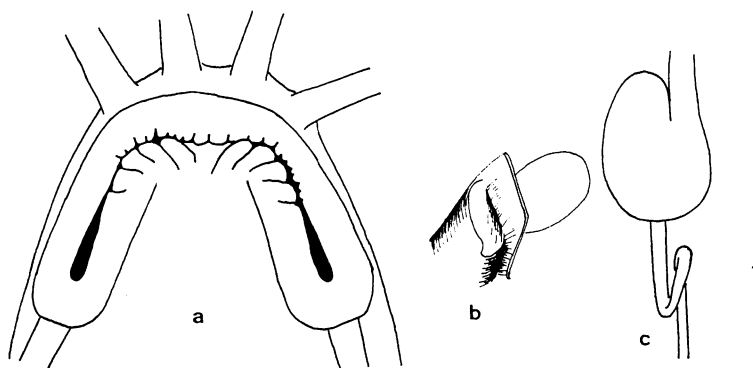


Fig. 19. *Noemacheilus fasciatus*, MZB 1994, 63.3 mm SL. a, mouth; b, left naris; c, stomach of RMNH 17039, 55 mm SL. Scale bar indicates 5 mm.

VIII 1930. MZB 1372, 3 ex., 55.4–58.0 mm SL; Tjikaniki, Paku, Bogor; Wargasasmika, 25 III 1970. ZMA 109.262, 2 ex., 43.8 and approximately 55 (head broken) mm SL; river in cave Goewa Gremeng Sewoe [Djogjakarta (7°48'S, 110°24'E)] joe-tjeng; Jacobson, II 1911. ZMA 112.884, 1 ex., 52.6 mm SL; Djember (8°10'S, 114°42'E), district of Majang; Lorentz, 1909. SUMATRA. MZB 1994, 3 ex., 59.7–67.7 mm SL; S. Sangharus, Airnaningan, Pulau Panggung, Lampung Selatan; Hardjano and Sabar, 25 II 1975. MZB 2039, 2 ex., 56.6–65.4 mm SL; same data, 2 III 1975. MZB 2259, 3 ex., 61.3–67.7 mm SL; S. Sangharus, Sinfangheula, Dafar Lebuan, Pulau Panggung, Lampung Selatan; Hardjano and Nurhasan, 1 IX 1975. OTHER. RMNH 8063, 9 ex., 36.3–65.3 mm SL; Indonesia. RMNH 28788, 5 ex., 42.6–74.2 mm SL; East Indies; Bleeker, 1850–1860. ZMA 103.221, 3 ex., 27.7–62.5 mm SL; no data.

**Diagnosis.** *Noemacheilus fasciatus* occurs in Java and South Sumatra and may be distinguished from other Sundaic noemacheilines by the combination of the following characteristics: a colour pattern consisting of a series of 14–18 dark spots along the course of the lateral line which alternate with dark saddles on the dorsal profile (a colour pattern shared with *N. masyai* only); no acuminate scales on the caudal peduncle (present in *N. selangoricus* and *N. spiniferus*); nostril valve not modified in a tube (as in *N. selangoricus*, *N. spiniferus*, *N. chrysolaimos*, *N. longipectoralis* and *N. saravacensis*) or in a barbel (as in *N. obesus* and *N. olivaceus*); caudal peduncle 1.5–1.9 times longer than deep (1.3–1.5 in *N. kapuasensis*, 1.1–1.3 in *N. chrysolaimos*, 1.0–1.4 in *N. longipectoralis*, 1.2–1.4

in *N. saravacensis*, 0.9–1.3 in *N. obesus*); 17 branched caudal rays (15 in *N. phuketensis*, 16 in *N. obesus*, *N. saravacensis* and occasionally *N. chrysolaimos*); a complete lateral line (incomplete in *N. obesus*, *N. phuketensis* and occasionally *N. chrysolaimos*).

**Description.** Morphometric and meristic data are given on Table 3. The body is elongated, its height slowly increasing up to the base of the dorsal fin; it is anteriorly rounded, posteriorly laterally flattened. The pectoral fins do not reach the base of the pelvic fins. There is a small axillary lobe at the base of the pelvic fins which are inserted under last simple to third branched dorsal rays; they do not reach the anus which lies approximately 1.5 eye diameter in front of the anal fin. The anal fin does not reach the base of the caudal fin. This last fin is forked, its lobes are subequal, the upper one being 1.5–2.0 times longer than the median rays. The dorsal fin has a concave supero-posterior edge. Vertebrae 36–37.

The body and the belly are completely covered by scales which are not embedded. The ones just along the lateral line are of greater size. They are slightly ovoid, with a small focal area, distinctly eccentric (Fig. 3a). The scales along the lateral line on the caudal peduncle are only slightly elongated. The lateral line is complete. There are 9 mandibulo-opercular, 4+11 infraorbital, 5 supraorbital and 3 occipital pores on the head sensory canals.

The front naris is pierced in the anterior side of a valve (Fig. 19b). The mouth is arched,

its gape being 2–3 times wider than long (Fig. 19a). The anterior lip is slightly furrowed in its anterior part, behind rostral barbels. The posterior lip has 4–5 deep furrows on each side of a distinct median incision. The posterior part of both lips are smooth. The maxillary and outer rostral barbels reach to mid-length of postorbital area of head; the inner rostral barbels reach as far back as posterior half of eye. The digestive duct has a loop some distance after the stomachic dilatation (Fig. 19c).

**Sexual dimorphism:** In males, there is a suborbital flaplet, the second pectoral ray is thickened and the dorsal sides of the pectoral rays are covered with small tubercles. Both sexes bear tubercles on body, particularly along the course of the lateral line; they are more developed in females.

**Colour pattern:** The body is yellowish brown with some 14–18 more or less vertically elongated dark spots along course of the lateral line. The anterior spots are thinner than the posterior ones. There are some five dark saddles on the back in front of dorsal fin; they are usually situated above the lateral line spots and may be in contact with them. There are some seven such saddles under and behind dorsal fin; they are not above the spots but alternate with them. There is a black spot at mid-base of the caudal fin. The head is dark on the dorsum with a light band in front of the eyes. The inferior third of head is lighter.

There is a dark spot on the proximal third of last simple dorsal ray; it is in contact with the dorsal profile. The distal half of this ray is dark. There are two longitudinal rows of spots on the dorsal rays: at mid-height and on the upper fourth. The other fins are hyalin.

**Discussion.** *Noemacheilus fasciatus* has been described by Kuhl and van Hasselt (in van Hasselt, 1823) (see generic introduction). They did not designate type-specimens. The specimens collected by Kuhl and van Hasselt had been received by the Leiden Museum where Valenciennes examined them. He brought back to MNHN three specimens of Javanese noemacheilines on which he based his descriptions of *Cobitis fasciata* and *C. chrysolaimos*. These three specimens having been collected by van Hasselt and Kuhl, I assume that the original description of *Noemacheilus fasciatus* is

based on them; they are thus syntypes. As there has been a lot of confusion concerning the authorship of *N. fasciatus* and as Valenciennes' description is the first unambiguous one, I designate his specimen of *Cobitis fasciata* (MNHN B-2798) as lectotype of *N. fasciatus* Kuhl et van Hasselt, notwithstanding the fact that the drawing referred to by van Hasselt (1823) represents an other species (see below). The drawing being unpublished, it just has historical value but no nomenclatorial value. Additionally, using the name *N. fasciatus* for the fish herein called *N. chrysolaimos* would have resulted in the obligation to use *N. suborbitalis*, a name which has not been used since its original description in 1846. One might argue that using *N. chrysolaimos* is exactly the same case; but *N. chrysolaimos* has the advantage that its description includes an illustration which allows a confident identification.

Two noemacheiline species occur (sympatrically at some localities) on Java. They may be distinguished at once by their colour patterns: one has a row of spots along lateral line and a series of dark saddles along the dorsal profile, while the other exhibits more or less irregular bars, often with a lighter middle area. The former also reaches a larger size (up to 74.2 mm SL vs. 50.4). They are hardly distinguishable by morphometric and meristic characteristics. The only useful one seems to be the shape of the caudal peduncle, the height of which is 9.2–11.3 ( $\bar{x}$ : 10.3) % SL and 10.2–13.1 ( $\bar{x}$ : 11.8) respectively, and 1.38–1.83 ( $\bar{x}$ : 1.62) and 1.07–1.50 ( $\bar{x}$ : 1.26) times in its length respectively.

The height of the caudal peduncle of the lectotype of *N. fasciatus* is 10.5% SL and 1.53 times in its length, that is quite near the mean value of the first species. Moreover, its standard length (54.5 mm) is larger than that of any representative of the second species known to me. On the colour pattern, Valenciennes (1846) wrote (my translation): "According to the drawing made of the living fish and sent from Java by Messrs. Kuhl and van Hasselt, the colour is . . ." The lectotype of *N. fasciatus* (Fig. 18a) apparently has been dried and no longer exhibits any colour pattern. The manuscript drawings of Kuhl and van Hasselt referred to by Valenciennes are most

probably lost but a copy is still among the manuscript notes of Cuvier and Valenciennes. The drawing labelled "*Noemacheilus fasciatus*" corresponds to the description by Valenciennes but in fact represents *N. chrysolaimos* and not *N. fasciatus*. Thus the colour pattern of *N. fasciatus* as described by Valenciennes does not merit attention as it is based on a drawing of a fish which is not conspecific with the lectotype.

*Noemacheilus fasciatus* is the name to be applied to the Javanese loach with a row of spots and a series of saddles. The second one is *N. chrysolaimos*.

The holotype of *Cobitis suborbitalis* Valenciennes in Cuvier and Valenciennes, 1846, 52.8 mm SL, has a height of the caudal peduncle 9.5% SL, 1.89 times in its length. According to Valenciennes (1846); "its colour is olive brown; the back bears, above lateral line, one series of markings, obliquely set, from front to hinder, and from bottom to top". This seems to be a clear indication of the series of saddles. I consider *Cobitis suborbitalis* as a junior subjective synonym of *N. fasciatus*.

*Modigliania papillosa* Perugia, 1893 has been described from Toba Lake, Sumatra. Two syntypes (MCSNG 9230) still exhibit a colour pattern similar to that of *N. fasciatus*. They and other specimens from that area (ZMA 112.876, NMB 3342) are identical with *N. fasciatus*, except for the number of branched caudal rays (16 vs. 17), apparently hyalin dorsal fin and possibly a smaller eye. The status of this form cannot be cleared before further material is collected. For this reason, I tentatively consider it as a valid species, *N. papillosus*, but I do not consider it useful to give a full redescription now. *Modigliania* Perugia, 1893 (type-species *M. papillosa* by monotypy) said to be characterized by the presence of a large papillae under the eye (the suborbital flaplet of subsequent authors) is a subjective junior synonym of *Noemacheilus* s.s.

*Noemachilus masyai* Smith, 1933, described from Peninsular Thailand is very similar to *N. fasciatus*. They differ in the following: the upper caudal lobe is slightly longer than the lower in *N. masyai* (they are subequals in *N. fasciatus*), the eye diameter is greater (4.6–6.2% SL vs. 3.2–5.2) and the dark saddles on the back are thinner and the ones in front of dorsal

fin have a <-shape when seen from above (in *N. fasciatus*, they are transversal). It is actually possible that this may represent geographical variation of a single species as well as vicariant species. So long as I do not have better knowledge of the Sumatranese fasciatus-like loaches, and until bionomics, ecology and genetics of these fishes are better known, I prefer to consider them as specifically distinct. As the species was named after Mr. Luang Masya, the correct spelling is *N. masyai* and not *N. masyae* as originally used by Smith (1933). *Pogononemacheilus* Fowler, 1937 (type-species *N. masyai* by original designation) should be considered a subjective junior synonym of *Noemacheilus* s.s. *Noemacheilus masyai* occurs in the Sundaic area in Western Malaysia, but also in Thailand, Laos and Kampuchea. As the status of some populations from the Mae Khong drainage is still not clear, I prefer to treat the whole species in the forthcoming revision of the Indochinese noemacheilines.

It was not possible to examine the lectotype and paralectotypes of *Cobitis jaklesi* Bleeker, 1852. The descriptions by Bleeker (1852, 1863c) and Alfred (1961a) do not allow an identification of this form, but the drawing in Bleeker (1963c) clearly represents a noemacheiline of the *fasciatus*-group.

**Distribution.** Definitely known from Java and South Sumatra (Lampung Selatan), *N. fasciatus* may possibly have a greater range in Sumatra (Fig. 11). At some localities in Western Java, it occurs sympatrically with *N. chrysolaimos*.

**Etymology.** *fasciatus* (Lat.): wearing bands; *sub* (Lat.): under; *orbitalis* (Lat.): orbital bone.

#### *Noemacheilus spiniferus* sp. nov.

(Figs. 3h, 6, 20, 21, 22)

**Material examined.** Borneo: Sarawak. ROM 39890, holotype, 39.4 mm SL; Fourth Division: Sungai Liam (3°19'N, 114°45'E), tributary of Baram River; Ang, 8 IX 1980. ROM 39891, 6 ex., paratypes, 36.9–44.3 mm SL; same data. ROM uncat., 6 ex., paratypes, 32.5–46.3 mm SL; same data. ROM uncat., 6 ex., paratypes, 35.3–45.1 mm SL; same data. ROM uncat., 7 ex., paratypes, 25.5–41.8 mm SL; Fourth Division: Sungai Ben-



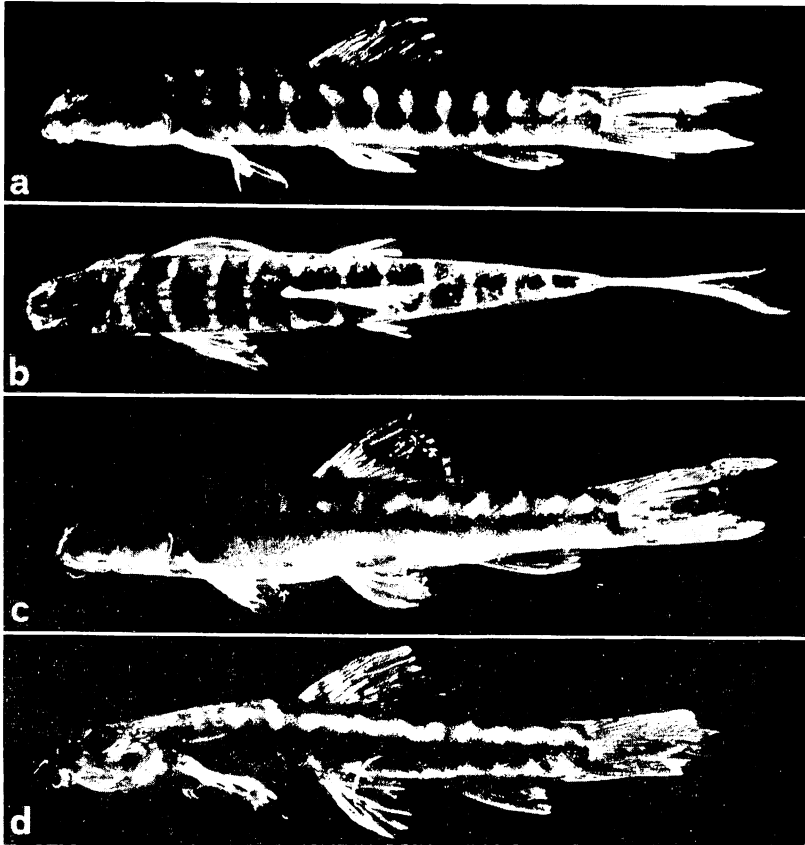


Fig. 20. *Noemacheilus spiniferus* sp. nov., paratypes, a-b, ROM uncat., 45.0 mm SL; c-d, CMK 4349, 43.6 and 43.6 mm SL.

uang (3°19'N, 114°35'E), tributary of Baram River; Ang, 10 IX 1980. ROM uncat., 5 ex., paratypes, 33.2–45.8 mm SL; Fourth Division: Sungai Kemany (3°28'N, 114°28'E), tributary of Baram River; Ang, 18 IX 1980. ROM uncat., 5 ex., paratypes, 34.5–47.9 mm SL; Fourth Division: Sungai Kaha (3°23'N, 114°34'E), tributary of Baram River; Watson, 24 III 1980. CMK 4349 17 ex., paratypes, 43.6–44.8 mm SL; Fourth Division: Sungai Lawa (3°30'N, 114°29'E), tributary of Baram River; Watson, 25 III 1980. SMF 17012, 15 ex., 29.7–46.5 mm SL; Batang Rajang at km 429, tributary of Belaga Rajang; Lelek, 6 VIII 1981. BMNH 1932. 8. 9: 31, 2 ex., 31.2–34.4 mm SL; Lejok River and Tinjar River (for details see Harrison, 1933); Oxford Univ. Exped., 1932.

**Diagnosis.** *Noemacheilus spiniferus* inhabits Sarawak waters and is easily distinguished by the possession of acuminate scales on the caudal peduncle, immediately above and below lateral

line, a character shared with *N. selangoricus* only. Its colour pattern consists of bars somewhat wider than interspaces and not very regular; these bars are wider on the dorsal midline and on lateral line than in between; in *N. selangoricus* the bars are distinctly wider than the interspaces and are very regular. The posterior process of the acuminate scales is as long as the rest of the scale (vs. shorter) and its width at base is one-half of the width of the scale (vs. one-fourth to one-third).

**Description.** Morphometric and meristic data are given on Table 5. The body is elongated, somewhat flattened laterally. The pectoral fins do not reach the base of the pelvic fins. There is an axillary lobe at the base of the pelvic fins which are inserted under first to third branched dorsal rays; they reach the anus which lies approximately 1.5 eye diameter in

Table 5. *Noemacheilus selangoricus* and *N. spiniferus*. Morphometric and meristic data.

|                                   | <i>N. selangoricus</i> |                  |           |           |                  |           | <i>N. spiniferus</i> sp. nov. |                      |           |           |                      |           |
|-----------------------------------|------------------------|------------------|-----------|-----------|------------------|-----------|-------------------------------|----------------------|-----------|-----------|----------------------|-----------|
|                                   | Holo-type              | Range<br>% of SL | $\bar{x}$ | Holo-type | Range<br>% of HL | $\bar{x}$ | Holo-type                     | Paratypes<br>% of SL | $\bar{x}$ | Holo-type | Paratypes<br>% of HL | $\bar{x}$ |
| Lateral length of head            | 22.3                   | 21.2-24.7        | 22.8      | 110       | 108-121          | 115       | 24.6                          | 22.1-25.0            | 23.8      | 109       | 106-119              | 112       |
| Dorsal length of head             | 20.3                   | 18.2-21.9        | 19.9      |           |                  |           | 22.6                          | 20.6-22.6            | 21.3      |           |                      |           |
| Predorsal length                  | 45.7                   | 45.7-51.7        | 48.3      |           |                  |           | 49.5                          | 47.6-51.6            | 48.9      |           |                      |           |
| Prepelvic length                  | 48.7                   | 47.1-55.8        | 51.6      |           |                  |           | 50.5                          | 49.8-54.7            | 52.0      |           |                      |           |
| Preanal length                    | 75.4                   | 73.4-81.8        | 78.6      |           |                  |           | 76.7                          | 74.7-79.0            | 77.1      |           |                      |           |
| Pre-anus length                   | 65.4                   | 65.4-72.2        | 69.2      |           |                  |           | 66.8                          | 65.3-70.7            | 67.6      |           |                      |           |
| Head height (at eye)              | 10.7                   | 9.5-12.9         | 10.4      | 53        | 47- 63           | 53        | 12.4                          | 9.7-12.5             | 11.0      | 55        | 45- 56               | 51        |
| Body height (at nape)             | 12.9                   | 11.2-13.8        | 12.2      | 64        | 57- 72           | 62        | 13.7                          | 11.7-13.7            | 12.6      | 61        | 57- 63               | 59        |
| Body height (at dorsal origin)    | 17.7                   | 13.9-22.6        | 17.3      | 87        | 68-114           | 88        | 16.8                          | 14.0-19.3            | 16.2      | 74        | 65- 86               | 76        |
| Height of caudal peduncle         | 11.1                   | 9.6-12.5         | 10.1      | 55        | 47- 64           | 56        | 10.4                          | 9.5-11.0             | 10.4      | 46        | 44- 52               | 49        |
| Length of caudal peduncle         | 15.9                   | 12.4-17.9        | 13.9      | 78        | 56- 89           | 70        | 15.2                          | 12.9-15.8            | 14.5      | 67        | 58- 78               | 68        |
| Snout length                      | 8.6                    | 6.7- 9.5         | 8.2       | 42        | 36- 47           | 41        | 8.9                           | 7.9-10.5             | 8.8       | 39        | 38- 44               | 41        |
| Head width (at nares)             | 8.2                    | 8.1-10.6         | 9.0       | 40        | 40- 53           | 46        | 9.4                           | 8.1- 9.6             | 8.7       | 42        | 37- 45               | 41        |
| Maximum head width                | 13.1                   | 11.0-16.3        | 12.8      | 65        | 56- 77           | 65        | 14.2                          | 12.2-16.3            | 13.6      | 63        | 57- 73               | 65        |
| Body width (at dorsal origin)     | 11.7                   | 9.6-15.3         | 11.6      | 58        | 49- 80           | 59        | 12.2                          | 9.3-12.7             | 11.1      | 54        | 47- 58               | 52        |
| Body width (at anal origin)       | 7.4                    | 6.4-10.0         | 8.0       | 36        | 30- 50           | 40        | 8.9                           | 5.5- 9.0             | 7.3       | 39        | 25- 42               | 34        |
| Eye diameter                      | 6.0                    | 4.7- 6.9         | 5.7       | 29        | 24- 33           | 29        | 6.6                           | 5.7- 7.4             | 6.5       | 29        | 26- 33               | 31        |
| Interorbital width                | 7.0                    | 4.9- 7.9         | 6.3       | 34        | 24- 40           | 32        | 7.1                           | 4.9- 7.6             | 6.3       | 31        | 24- 35               | 30        |
| Height of dorsal fin              | 24.9                   | 16.4-24.9        | 20.2      | 123       | 81-123           | 101       | 18.0                          | 16.9-23.2            | 20.7      | 80        | 80-113               | 98        |
| Length of upper caudal lobe       | 35.2                   | 29.6-40.8        | 33.4      | 174       | 144-211          | 165       | 33.8                          | 26.8-34.1            | 30.6      | 149       | 120-160              | 142       |
| Length of lower caudal lobe       | 32.0                   | 24.3-33.0        | 28.8      | 158       | 127-158          | 145       | 31.7                          | 23.8-34.3            | 28.8      | 140       | 112-153              | 135       |
| Length of median caudal ray       | 14.9                   | 14.8-22.7        | 17.8      | 74        | 72-108           | 89        | 17.5                          | 13.7-19.1            | 15.6      | 78        | 57- 88               | 74        |
| Length of anal fin                | 18.9                   | 16.9-22.7        | 18.8      | 93        | 76-108           | 95        | 16.5                          | 13.8-21.1            | 17.8      | 73        | 69- 94               | 84        |
| Length of pelvic fin              | 18.1                   | 15.7-20.1        | 17.6      | 89        | 72-101           | 88        | 19.0                          | 16.1-19.0            | 17.1      | 84        | 74- 84               | 80        |
| Length of pectoral fin            | 22.1                   | 17.0-24.7        | 21.1      | 109       | 92-122           | 106       | 26.7                          | 19.1-26.7            | 22.3      | 118       | 94-123               | 105       |
| Caudal peduncle: length/height    | 1.43                   | 1.04-1.69        | 1.25      |           |                  |           | 1.46                          | 1.13-1.60            | 1.39      |           |                      |           |
| Dorsal fin rays (simple/branched) | 4/9                    | 4/9              |           |           |                  |           | 4/9                           | 4/9                  |           |           |                      |           |
| Caudal fin rays                   | 9+8                    | 9(8)+8           |           |           |                  |           | 9+9                           | 9+8                  |           |           |                      |           |
| Anal fin rays (simple/branched)   | 3/5                    | 3/5              |           |           |                  |           | 3/5                           | 3/5                  |           |           |                      |           |
| Ventral fin rays                  | 8                      | 8                |           |           |                  |           | 8                             | 8                    |           |           |                      |           |
| Pectoral fin rays                 | 13                     | 10-13            |           |           |                  |           | 13                            | 12-13                |           |           |                      |           |
| Lateral-line pores                | 87                     | 77-96            | 84.3      |           |                  |           | 91                            | 83-93                | 88        |           |                      |           |

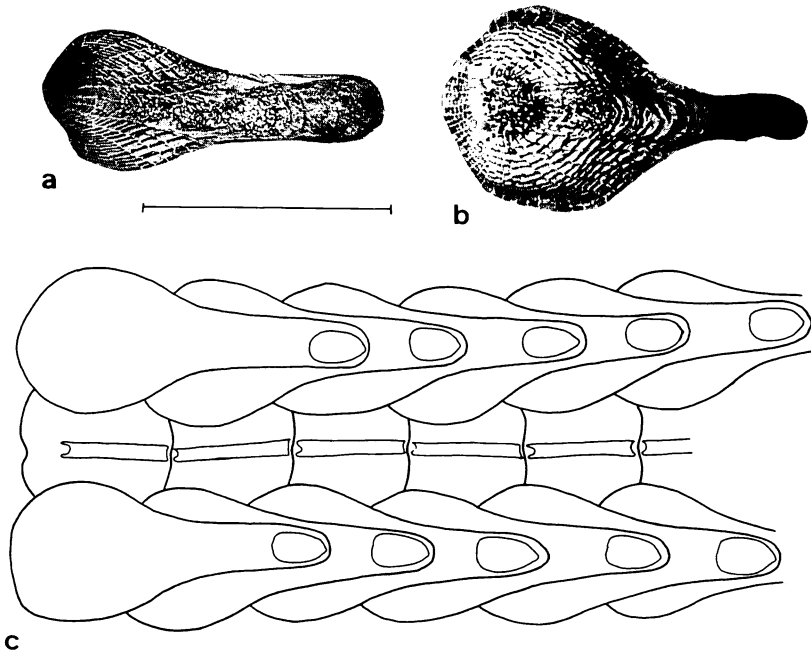


Fig. 21. Acuminate scales of *Noemacheilus spiniferus*, ROM uncat., 42.1 mm SL (a) and *N. selangoricus*, FMNH 68667, 55.0 mm SL (b). In situ aspect (schematized) in *N. spiniferus* (c). Scale bar indicates 1 mm.

front of the anal fin. The anal fin does not reach the base of the caudal fin. The caudal fin is forked, the upper lobe being 1.0–1.2 times longer than the lower one and 1.6–2.4 times longer than the median rays. The supero-posterior edge of the dorsal fin is slightly concave. Vertebrae 34–35.

The body and the belly are completely covered by scales of very small size with a medium-size focal area (approximately one-third of scale diameter) (Fig. 3h). The scales along lateral line on the caudal peduncle are posteriorly modified in a spine-like extension as long as the normal part of the scale; the width of the process at its base is approximately one-half of the width of the scale (Fig. 21a, c). The lateral line is complete. There are 9 mandibulo-opercular, 4+11 infraorbital, 5 supraorbital and 3 occipital pores on the head sensory canals.

The anterior naris is at the extremity of an obliquely cut tube-like valve (Fig. 22b). The mouth is arched, somewhat 2.0–2.5 times wider than long (Fig. 22a). Both lips are thin, the anterior one being slightly pleated, particularly

in the median area. The posterior lip has a median incision and four deep lateral furrows. The processus dentiformis is well developed. The maxillary barbels reach the middle of the postorbital area of head, the outer rostral ones reach as far back as hind border of eye and the inner rostral ones as far back as middle of eye. There is a loop in the digestive duct somewhat after the stomachic dilatation (Fig. 22c). A dissected female (43.8 mm SL) contained ovulae 0.6 mm in diameter.

**Sexual dimorphism:** Males have a sub-orbital flaplet and tubercles on the three first pectoral rays.

**Colour pattern:** The body is light brown with 10–13 dark brown bars, wider than the interspaces; the bars are wider on the back and on the lateral line. They may be interrupted above the lateral line. The middle area of the bars may be somewhat lighter brown than outer part but they only occasionally have the same colour as the back ground. They may occasionally fuse along lateral line. They do not reach the ventral profile. The black bar at the base of the caudal fin is dissociated in two

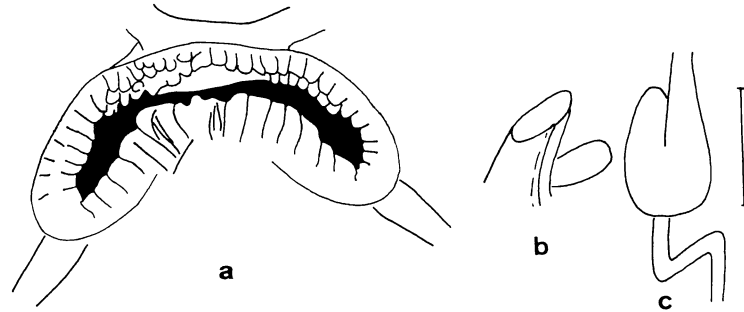


Fig. 22. *Noemacheilus spiniferus*. a, mouth of holotype; b, left naris of ROM uncat., 43.8 mm SL; c, stomach of same. Scale bar indicates 5 mm.

blotches, one between dorsal profile and lateral line and the other from on lateral line to the ventral profile. There is a dark band between the eyes which continues below the eye. There is a triangular blotch on the nape, a black line from eye to snout and a dark area on opercle. There is a dark spot at the base of the first branched dorsal rays and two rows of spots on branched rays, a median one and a subdistal one. There are three vertical rows of spots on the caudal fin, two rows on the anal fin and one on the pelvic fins.

**Distribution.** *Noemacheilus spiniferus* is reported from Sarawak only (Fig. 6). At places, it occurs sympatrically with *N. saravacensis* and *N. kapuasensis*.

**Etymology.** *spina* (Lat.): spine; *ferre* (Lat.): to wear.

**Remarks.** The material I referred to as *N. cf. fasciatus* (Kottelat, 1982) and three specimens from Tarah Merah, Lempake, Kalimantan Timor (MZB 2395) have acuminate scales on the caudal peduncle. They all are juveniles and cannot be referred to *N. spiniferus* or *N. selangoricus*.

*Noemacheilus selangoricus* Duncker

(Figs. 3g, 6, 21, 23, 24)

*Nemachilus selangoricus* Duncker, 1904: 75 (original description; type-locality: Kuala Lumpur); Herre and Myers, 1937: 65 (Singapore, Lasah); Fowler, 1938: 54 (citation); Hora, 1941: 57 (fig.; Singapore, Rengam, Mawai distr.); Alfred, 1961c: 8 (fig.; Singapore); Inger and Chin, 1962: 123 (Kalabakan).

*Nemachilus* sp. Duncker, 1904: 175 (Kuala Lumpur).

*Nemachilus fasciatus*: Tweedie, 1936: 19 (Johore); Fowler, 1938: 250 (citation); Hora, 1941: 56 (fig.; Mawai distr.).

*Nemachilus kuiperi* de Beaufort, 1939: 190 (original description; fig.; type-locality: Billiton).

*Nemacheilus trans-lineatus* Fowler, 1939: 63 (original description; fig.; type-locality: Trang).

*Nemacheilus fasciatus*: Herre, 1940: 33 (Kota Tinggi).

*Nemacheilus selangoricus*: Herre, 1940: 34 (Kota Tinggi, Singapore, Tawau).

*Noemacheilus translineatus*: Smith, 1945: 326 (citation).

*Botia selangorica*: Ladiges, von Wahlert and Mohr, 1958: 159 (lectotype designation).

*Noemacheilus kuiperi*: Wickler, 1959: 410 (ethology).

*Noemacheilus selangoricus*: Alfred, 1966: 31 (fig.; Singapore).

*Noemacheilus fasciatus*: Banareşcu and Nalbant, 1968: 329 (in part) (synonymy).

**Material examined.** Malay Peninsula. ZMH 386, lectotype, 50.3 mm SL; Kuala Lumpur (3°08'N, 101°42'E); Duncker, 1902. BMNH 1905.5.6: 16, 1 ex., paralectotype, 41.8 mm SL; same data; presented by Selangor State Museum, Nr. 1291. ANSP 68493, holotype of *N. translineatus*, 50.6 mm SL; Trang (87°35'N, 99°35'E); de Schauensee, X 1936 (examined by Dr. Eugenia B. Böhlke). ANSP 68494, 1 ex., paratype of *N. translineatus*; same data. BMNH 1980. 10. 10: 38, 1 ex., 53.4 mm SL; Sungai Nerus, Trengganu; Cramphorn, 9 III 1980. USNM 233011, 3 ex., 41.8–45.2 mm SL; halfway between Kuantan (3°48'N, 103°20'E) and Temerloh (3°28'N, 102°25'E); Roberts, 17 V 1973. CMK 1524 1 ex., 53.5 mm SL; Trengganu: Jerteh-Pasir Akar; Nagy, IV-V 1977. CMK 3029 4 ex., 16.8–48.3 mm SL; Negeri Sembilan: Kuala Pilah (2°44'N, 102°15'E); Nagy, V 1981. ZMH 3723, 1 ex., 31.2 mm SL; Kuala Lumpur, approximately 8 km on the railway to Kepong; Duncker, 1902. FMNH 40819–40820,

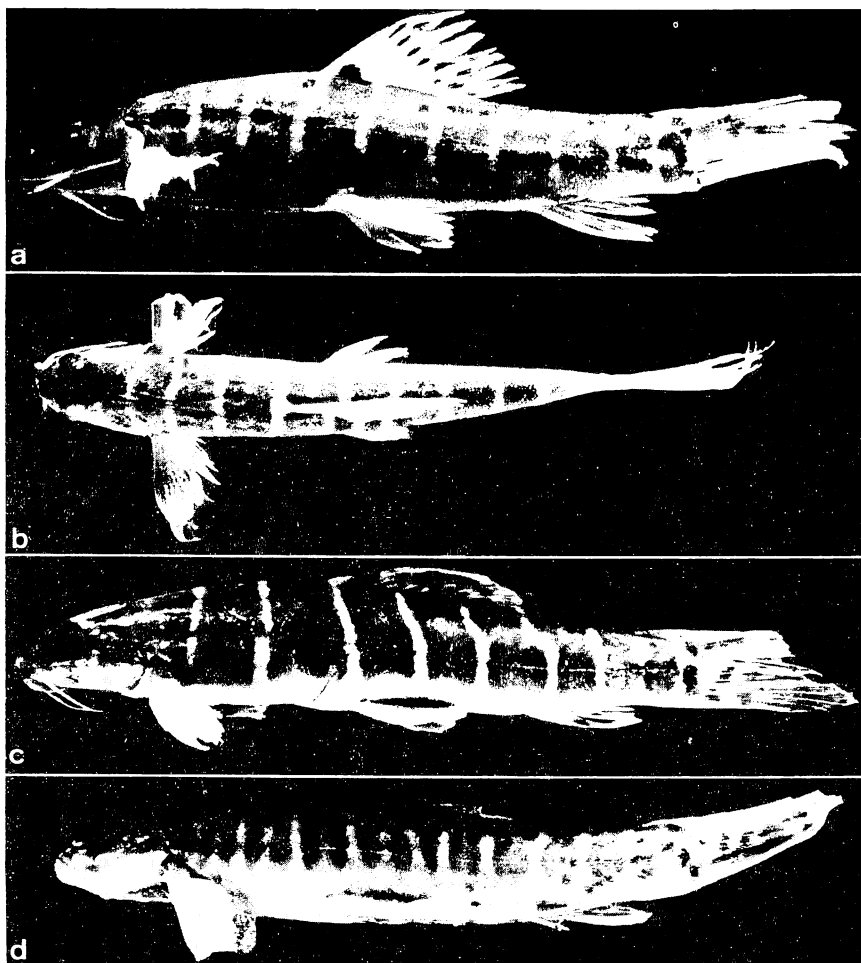


Fig. 23. *Noemacheilus selangoricus* a–b, USNM 233011, 41.8 mm SL; c, FMNH 68667, 56.5 mm SL; d, FMNH 68178, 52.5 mm SL.

2 ex., 46.7, 46.7 mm SL; Simpang Rengam (1°49'N, 103°18'E), Johore; Herre, 13X 1940. FMNH 63090, 1 ex., 17.8 mm SL; Pahang: small stream along road from Kota Tinggi (1°45'N, 103°53'E) to Mawai (1°52'N, 103°58'E); Hendrickson, 22 II 1957. FMNH 68667, 3 ex., 39.6–56.0 mm SL; Pahang: King George V National Park [=Taman Negara] (approximately 4°40'N, 102°20'E), Kuala Tahan; Alfred, 22 III 1956. ZRCUS 1467, 1 ex., 47.8 mm SL; Pahang: Kuala Tahan; Ogilvie, 1948. ZRCUS 2056, 1 ex., 21.0 mm SL; Selangor, second mile, Kampong Batu Tiga to Subang Road; Alfred, 5 VI 1966. Singapore. FMNH 60262, 1 ex., 41.5 mm SL; Jungle Reservoir; Hendrickson, 21 II 1954. FMNH 60261, 1 ex., 51.2 mm SL; Nee Soon, Riffle Range; Hendrickson, 14 II 1954. FMNH 45823, 1 ex., 48.4 mm SL; 1 miles W of Nee Soon; Hendrickson, XI 1951.

ZRCUS 1050, 1 ex., 39.4 mm SL; Davies, 1951. Billiton. ZMA 112.889, lectotype (present designation) of *N. kuiperi*, 49.5 mm SL; Kuiper, 1936. ZMA 102.145, 21 ex., paralectotypes of *N. kuiperi*, 24.2–50.8 mm SL; same data. BORNEO: SABAH. FMNH 68178, 11 ex., 23.3–59.3 mm SL; Tawau distr.: Kalabakan (4°25'N, 117°29'E); Inger, 8 VI 1956.

**Diagnosis.** *Noemacheilus selangoricus* occurs in the Malay Peninsula, Billiton and Singapore Islands and Sabah and may be easily distinguished by the presence of acuminate scales on the caudal peduncle above and below lateral line, a character shared with *N. spiniferus* only. Its colour pattern consists of 8–12 dark bars, larger than the interspaces, of regular shape;

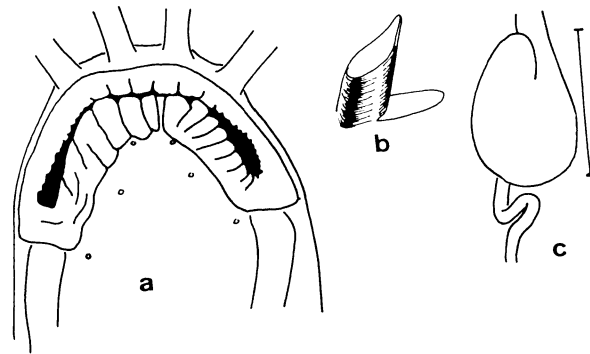


Fig. 24. *Noemacheilus selangoricus*, USNM 233011, 41.6 mm SL. a, mouth; b, left naris; c, stomach. Scale bar indicates 5 mm.

their middle area occasionally fades thus forming two thin bars. Differences between the present species and *N. spiniferus* are given in the diagnosis of last named species.

**Description.** Morphometric and meristic data are given on Table 5. The body is elongated, its height increasing slowly up to the base of the dorsal fin. The pectoral fins do not reach the pelvic ones. There is a well developed axillary lobe at the base of the pelvic fins, which are inserted under the first to fourth branched dorsal ray; they reach the anus which lies some two eye diameters in front of the anal fin. The anal fin does not reach the base of the caudal fin. There are adipose crests on the caudal peduncle. The caudal fin is long and deeply forked; its upper lobe is 1.1–1.3 times longer than the lower one and 1.5–2.4 times longer than median rays. The supero-posterior edge of the dorsal fin is convex. Vertebrae 34–35.

The body and the belly are completely covered by scales which are not embedded. They have a small eccentric focal area (Fig. 3g). The ones above and below the lateral line are larger than the others. On the caudal peduncle, there are some (usually 4–5) acuminate scales above and below the lateral line. The process of these acuminate scales is usually shorter than the rest of the scale and its width at the base is one-fourth to one-third of scale diameter. There is a tubercle at the tip of the process. These scales have already been mentioned by de Beaufort (1939) and Inger and Chin (1962). Wickler (1959) described their use in territorial

(and courtship?) behavior. The lateral line is complete. There are 9 mandibulo-opercular, 4+10 infraorbital, 5 supraorbital and 3 occipital pores on head sensory canals.

The anterior nostril is at the extremity of an obliquely cut tube-like valve (Fig. 24b). The mouth is arched, somewhat two times wider than long (Fig. 24a). The anterior lip is distinctly crenated in its centre part and only slightly crenated on the sides. The posterior lip is deeply furrowed on each side of a median incision. The inner rostral barbels reach at least the middle of postorbital area of head, the outer rostral and the maxillary barbels reach the operculum. There is a small loop somewhat after the stomachic dilatation in the digestive duct (Fig. 24c).

**Sexual dimorphism:** Males have a sub-orbital flaplet, their second pectoral ray and the upper side of their four first pectoral rays is covered with small tubercles. There are uncini on the adults of both sexes, on snout, barbels, lips, belly and between the base of the pectoral fins. Large tubercles are present on scales along lateral line, on the anterior half of the body of both sexes.

**Colour pattern:** The body is yellowish-brown with 8–12 dark brown bars, with very thin interspaces. The bars reach as low as level of the base of pectoral fins. The outer part of the bars is darker than the inner, which sometimes has the same colour as interspaces and belly. Usually, the bars are very regular in shape; they occasionally may be triangles, mainly on the caudal peduncle. At caudal

base, there is a thin black bar, generally interrupted on the lateral line. This black bar is on the hind border of the last dark bar. There are dark bars on nape, between the eyes and between the nares, and a vertical bar under eye, followed by a light blotch on the cheek and a dark one on the opercle.

There is a dark spot on the base of the first branched rays. The distal two-thirds of the last simple dorsal ray are dark. There are three rows of spots on the dorsal fin: one in level with the upper edge of the spot on simple rays, one in level with lower end of the dark part of the last simple dorsal ray and a sub-distal one which is not always very distinct. There are three rows of spots on the caudal fin, forming more or less regular bars. The first rays of the pectoral fins are dark. Some dark spots are present on the membrane of the pelvic fins and a dark band may occasionally be seen on the anal fin.

**Discussion.** A close examination of the types of *N. kuiperi* de Beaufort, 1939 and of *N. translineatus* Fowler, 1939 did not show any difference between them and *N. selangoricus*.

*Noemacheilus selangoricus* is a morphometrically and phenotypically quite variable species, but I have been unable to find any character or set of characters allowing me to distinguish the specimens of the various localities. The specimens from Sabah cannot be distinguished from the Malayan ones.

**Distribution.** *Noemacheilus selangoricus* is known from the Malay Peninsula, from Singapore Island north to Trang in Thailand, and from Billiton (Belitung) Island and Sabah in Northern Borneo (Fig. 5). Its presence on Sumatra should also be expected. In the Malay Peninsula, it occurs sympatrically with *N. masyai*.

**Etymology.** *selangoricus*: after Selangor, one of the Federated Malay States; *kuiperi*: after the collector, F. J. Kuiper; *trans* (Lat.): through; *lineatus* (Lat.): lined.

#### Species incertae sedis

As already noted in the main text, there are still problems as to the identity of nearly all specimens from Sumatra. Five nominal species have been described from that island:

*Cobitis jaklesi* Bleeker, 1852 of the *fasciatus*-group, *C. pfeifferi* Bleeker, 1853 possibly related to *N. chrysolaimos*, *Modigliania papillosa* Perugia, 1893 of the *fasciatus*-group, *Noemacheilus dunckeri* Ahl, 1922 possibly related to *N. chrysolaimos*, and *N. longipinnis* Ahl, 1922 (nec *Acanthocobitis longipinnis* Peters, 1861, a synonym of *N. pavonaceus* McClelland, according to Banareescu and Nalbant, 1968) a possibly valid species characterized by very large eyes (possibly related to *N. selangoricus*?). None of these can be redescribed or placed in synonymy before new material is collected. Further collections from East Borneo would also be of great interest.

The material mentioned by Vinciguerra (1926) and Roberts (1972) is in a too poor state for allowing identification. The last one (a syntype of *Ellopostoma megalomycter* Vaillant, 1902) may represent the young of a still unrecorded species. The material cited by Volz (1904) and Hubrecht (1887) cannot be traced.

#### Acknowledgments

It is a pleasure to thank the following people without whose help this work would not have been possible: the late James E. Böhlke (ANSP), Gordon Howes (BMNH), Pearl M. Sonoda (CAS), Donald J. Stewart (FMNH), Jean-Pierre Gosse (IRSNB), Karsten E. Hartel (MCZ), Gianna Arbocco (MCSNG), Soenartono Adisoemarto (MZB), Marinus Boeseman, Martien J. P. van Oijen (RMNH), Edwin J. Crossman (ROM), H. Zetsche, Anton Lelek (SMF), Kurt Bruwelheide (USNM), Han Nijssen (ZMA), H. J. Paepke (Naturkunde Museum, Berlin), H. Wilkens (ZMH) and Yang Chang Man (ZRCUS) arranged the loan of specimens under their care. Eugenia B. Böhlke (ANSP) examined the holotype of *N. translineatus*. Martine Desoutter helped in locating Valenciennes' manuscript and provided facilities in MNHN. Peter Nagy de Felső Eör (Salzburg) and Edith Korthaus (Hagen) gave me specimens they collected and showed great hospitality. Michel Brancucci (NMB) determined the stomach contents. Peter Studer and Kurt Wirz (Zoo Basel) provided space and care for living specimens.

Tyson R. Roberts (CAS) authorized me to describe a part of the material he collected in the Kapuas. He and Volker Mahnert (MHNG) discussed some points of the manuscript. Volker Mahnert also prepared radiographs. Fig. 19a is by Francis Humbert (MNH). Jonathan Taylor corrected my English.

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インドネシアおよびマレーシアの *Noemacheilinae* 亜科魚類の分類学的再検討

Maurice Kottelat

インドネシア, マレーシア, シンガポール産フクドジョウ属9種を記載し, そのうち *N. kapuasensis* と *N. spiniferus* を新種として報告した. 属名 *Noemacheilus* の命名者は Kuhl and van Hasselt で, 模式種は *N. fasciatus* Kuhl et van Hasselt である. *Modigliania* Perugia, 1893 (模式種 *M. papillosa* Perugia,

1893) と *Pogononemacheilus* Fowler, 1937 (模式種 *N. masyai* Smith, 1933) は共に *Noemacheilus* の新参主観シノニムである. *Cobitis suborbitalis* Valenciennes, 1846 は *N. fasciatus* (Valenciennes, 1846) の, また *N. translineatus* Fowler, 1939 と *N. kuiperi* de Beaufort, 1939 は *N. selangoricus* Duncker, 1904 のそれぞれシノニムである. また, *N. fasciatus*, *N. saravacensis* Boulenger, 1894, *N. olivaceus* Boulenger, 1894, *N. longipectoralis* Popta, 1904, *N. chrysolaimos* (Valenciennes, 1846), *N. obesus* Vaillant, 1902 の後模式を指定した. なお, スマトラより記載された *N. jaklesi* (Bleeker, 1852), *N. pfeifferi* (Bleeker, 1853), *N. papillosa*, *N. longipinnis* Ahl, 1922 (nec Peters, 1861), *N. dunckeri* Ahl, 1922 は *incertae sedis* な種である.