

The Cyprinid Fish Genus *Rasbora* in Malaya

By MARTIN R. BRITTAN, PH.D.

(Received March, 1954)

THE GENUS *Rasbora* contains about 45 species found in the Malayan and Indian zoogeographical subregions. The present evolutionary and distributional centre of the genus appears to be Malaya and the facing coasts of Sumatra and Borneo, a consequence of the joining of these in a single emergent land mass (Sundaland) during the Pleistocene, when the evolutionary centre seems to have been in the great Sunda river (now submergent) which flowed northward midway between Sumatra and Malaya on the one hand and Borneo on the other. Currently, 18 species are recognized from Malaya, 20 from Sumatra, 17 from Borneo, and 7 from Siam. Of the Malayan species, 14 are also common to Sumatra, 7 to Borneo, and 4 to Siam. Seven of the Malayan species are common also to both Sumatra and Borneo, and 2 of them are common to Sumatra, Borneo, and Siam.¹ Throughout the range the members of the genus are found in rivers, brooks, ditches and rice paddies, swamps, ponds, and lakes; they are absent, however, from mountain streams.

In size, the species range from the tiny *Rasbora maculata* of Malaya, adult at a total length of 20 millimeters, to the Malayan *R. caudimaculata* and the Indian *R. elanga*, which reach 6 to 8 inches. The body is generally elongate and slender (or only moderately deep), the scales are large, the upper lip is typically notched medially, and the fins are of small or moderate size and normal cyprinid shape. The species generally resemble superficially many of the members of such well-known genera as the European *Phoxinus* and *Leuciscus* and the American *Notropis*. Typically, the color pattern shows a dark back and a lighter belly, with a dark midlateral stripe running from the snout or opercle back to the caudal base; bordering this along its dorsal margin is a light metallic stripe, and over the anal base is a dark streak; beneath the scales of the back and sides there are usually dark markings, which are interconnected to form a reticulate or "chain mail" pattern.

1. The above figures will naturally be subject to revision as certain species are split up or synonymized, but they serve to give some idea of the occurrence of some species in several geographic areas. Although certain Malayan-Sumatran species apparently never reached Borneo, others are likely found there and merely await discovery through more complete collecting on that island.

In this paper the following *Rasbora* are recognized as occurring in Malaya: *sumatrana*, *elegans*, *caudimaculata*, *trilineata*, *dorsiocellata*, *bankanensis*, *meinken*, *myersi*, *dusonensis*, *cinthovenii*, *cephalotaenia*, *pauciperforata*, *taeniata*, *chrysotaenia*, *borapetensis*, *heteromorpha*, *kalochroma*, and *maculata*. For a detailed consideration of these, and the other members of the genus, reference is made to my recent revision of *Rasbora* (Brittan, 1954). In the present paper synonymies are limited to Malayan references, and descriptions are given only in detail sufficient to identify the species; distribution and systematic relationships are treated in detail in the revision, but are herein amplified only in respect to Malaya and to other Malayan species. Terminology used in this paper is based on that of the revision.

Available to me for the present work was (1) the Malayan material already reported in the revision, most of which is deposited in the Natural History, Museum of Stanford University, and the greater amount of which was collected by Dr. A. W. Herre in 1934, 1937, and 1940, and (2) a representative collection sent to me in 1952 by Mr. M. F. Tweedie, Director of the Raffles Museum and Library. The latter collection contains many specimens taken in northern and central Malaya (as well as in southern Malaya), while Dr. Herre's material is almost completely from southern and central Malaya; for this reason, some of the problems left unresolved or which were misinterpreted in the revision are more satisfactorily dealt with in the following pages. Most of the specimens in the Raffles Museum material were collected by Mr. Tweedie himself. I wish to take this opportunity to thank him for making this collection available to me, and for many other kindnesses in the past. Mr. Tweedie has allowed me to retain many of the specimens, and these (marked by an asterisk under "Specimens Examined") will be deposited at Stanford University. I also wish to thank Dr. George S. Myers and Miss Margaret Storey of the latter institution of allowing me to reexamine their Malayan material.

In the following pages, under "Specimens Examined", only the Raffles Museum material is listed in detail; the material examined earlier (Brittan, 1954) is cited only as to locality.

The *sumatrana-elegans* Species Complex (see Brittan, 1954, for definition of the several species complexes within the genus):

***Rasbora sumatrana* (Bleeker) (Fig. 1)**

Leuciscus sumatranus Bleeker, 1852: 601 (original description; Solok, Sumatra).

Rasbora sumatrana, Fowler, 1938: 58 (several Malayan localities).
Brittan, 1954: 53 (synonymy; description; distribution; relationships).

?*Rasbora vulgaris* Duncker, 1904 (original description; Kuala Lumpur, Selangor; Negri Sembilan).

THE GENUS RASBORA IN MALAYA

Rasbora lateristriata var. *sumatrana*, Weber and de Beaufort, 1916: 77 (description; Malacca = Malaya).

Rasbora lateristriata (nec Bleeker), Menon, 1954: 8 (Kota Tampan, Perak, in part; Baling, Kedah; Kaki Bukit, Perlis; Kota Bahru, Kelantan).

Specimens examined: Twelfth Mile, Kuala Brang-Merchang Road, Trengganu; 6; 47-48 mm.; Tweedie; August 1950. Kota Bharu, Kelantan; 8; 47-72 mm.; Tweedie; 1938.* Bachok, near Kota Bharu, Kelantan; 3; 41-58 mm.; Tweedie; July 1939.* Baling, Kedah; 1; 33 mm.; P. D. R. Williams-Hunt; 1952. Kaki Bukit, Perlis; 4; 46-71 mm.; December 1938. Redang Island, off Trengganu; 11; 61-70 mm.; L. K. Charles; October 1950.* Examined previously (Brittan, 1954:54) were examples from the following localities: Tapah, Batang Padang River, and Sungei Gunong Goal; Balik Pulau, Pinang Island (Penang Island).

R. sumatrana is the most widely variable of any *Rasbora*. A medium-large species, it has, typically, a dark midlateral stripe running from before the dorsal to the caudal peduncle, where it ends in a roundish precaudal spot; the stripe is about the width of the pupil of the eye, or slightly narrower. In living examples, there is, in reflected light, a dull gold line over the dark lateral stripe; this is absent in preserved specimens. The ground color of living specimens is burnished silvery, of preserved ones, yellowish brown. The reticulate pattern and supra-anal pigment are well developed. The fins are hyaline, but the caudal lobes are usually more or less tipped with black. In some examples the dark lateral stripe is present, while the precaudal spot is absent; in some the spot is present, while the stripe is absent; in some both are absent. Any of these may exist with the caudal lobes pigmented or unpigmented.

Head 3.7 (3.4-3.9), depth 3.4 (3.1-4.0). Depth of caudal peduncle 1.5 (1.3-1.7) in its length. Eye 3.1 (2.8-3.5), snout 3.5 (3.1-3.9) in head. Dorsal 1.2 (1.1-1.3) in body depth, its origin two scales behind pelvic insertion. Anteriorly projected dorsal-hypural distance falling between nostril and centre of pupil. Anal 1.5 (1.3-1.7) in body depth. Lateral line pores and scales 29-30 (27-31); rarely, specimens have the last 1-3 scales unperforated. Transverse line 14/1/24. Predorsal scales 11 or 12 (11-13). Circumpeduncular scales 12. Maximum total length about 140 mm.

This widely-distributed species is known from Indo-China, Siam, Malaya, Sumatra, Nias, and Borneo. It probably exists also on Banka, Billiton, and many of the smaller islands off the coasts of Malaya, Sumatra, and Borneo. I have examined material from all the Malayan states except Malacca and Negri Sembilan, and from Penang Island. Very likely the apparent absences merely reflect insufficient collecting.

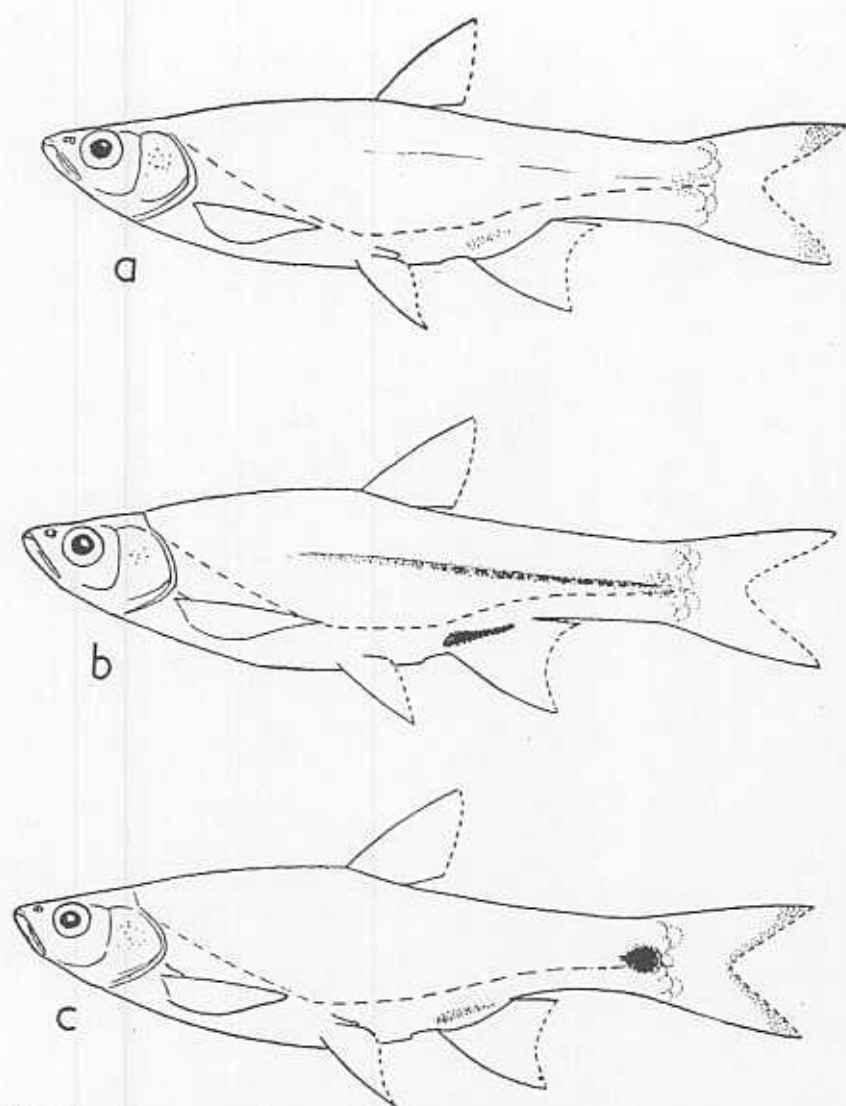
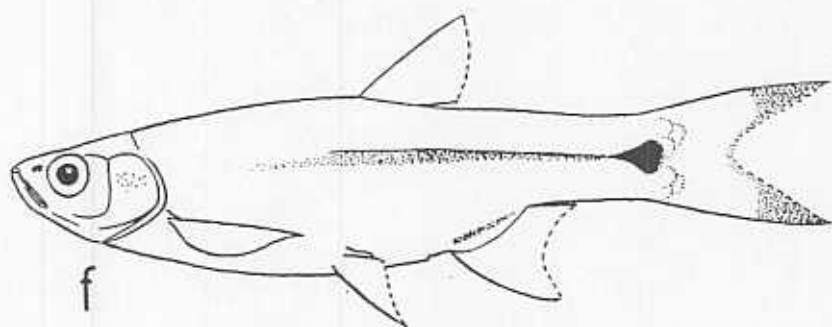
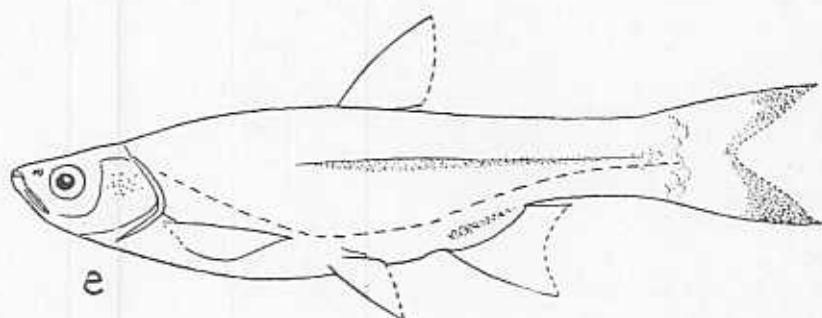
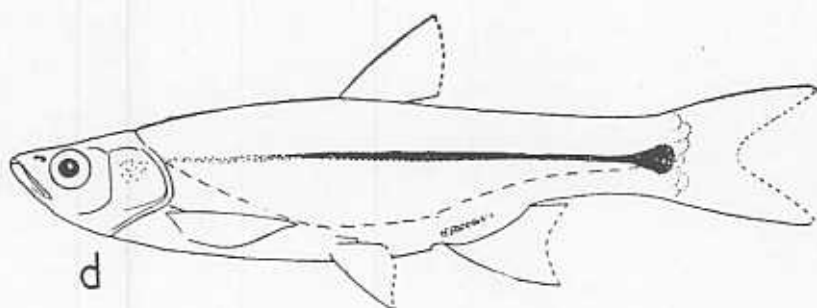


Fig. 1. Color-pattern variation in *Rashora sumatrana*. a, Gum Gum River at Sandakan, British North Borneo; b, Kinabutan Island, Tawan Islands, British North Borneo; c, Kuala Tahan, Pahang; d, Redang Island off Trengganu; e, Kabili River, British North Borneo; f, Sungei Gunong Goal, Perak.

THE GENUS RASBORA IN MALAYA



I can observe no well-marked geographic variation in this species which follows any pattern so far as scalation is concerned, although specimens from Kelantan showed the largest average number of scales, 30 (29-31). The lowest average number 28 (27-29), is exhibited by certain populations from Perak, Pahang, and Perlis, but populations in which the average number is 29 (28-30) are found in closely adjacent and intervening localities; furthermore, in each population, there is so much overlap that it is apparent that this character is useless for racial determination. So far as coloration is concerned, a clinal situation apparently exists. Specimens from Kuala Tahan, Pahang, have a precaudal spot and supra-anal streak, but no dark lateral stripe, or only a very weak one; this pattern seems to hold from Pahang south to Singapore, and also exists in specimens from the Padangse Bovenlanden of Sumatra. In material from Perak the dark lateral stripe is usually stronger, being directly confluent with the precaudal spot. Specimens from Kedah, Penang Island, and Perlis, have the stripe still stronger, but the maximum is reached in material from Trengganu, Kelantan, and Siam, where the dark lateral stripe is very intense and appears to be a streak "smeared" forward from the precaudal spot to the opercle, though fading anteriorly. An analagous situation occurs along the west coast of Borneo. In the southern portion the lateral stripe is absent or weak and the precaudal spot is plainly visible, while in the northern part the lateral stripe is stronger (though not nearly to the degree in northern Malayan and Siamese material) and the precaudal spot is weak or absent. The supra-anal pigment is generally a heavy streak in North Bornean material, a weaker, narrower streak in Sarawak and southern Malayan examples, and often only a small ovoid dot in some Siamese specimens; however, there is considerable variation between members of the same population, and between populations from different localities in the same area. North Bornean specimens have, generally, a few more lateral line and predorsal scales than southern Malayan examples. In Malayan specimens the dorsal-hypural distance, carried forward, falls on the eye, while in North Bornean examples it falls near the nostril; examples from Sarawak are intermediate (see Brittan, 1954: 60-61).

Most populations, in all parts of the range, have the caudal with only a weak, narrow wash along the posterior margin, but certain populations show weak to strong terminal pigmentation of the caudal lobes. This latter condition occurs in all parts of the range, but, among material examined by me, is best developed in certain examples from North Borneo and Perak. The tail is nearly hyaline in those specimens with the best developed lateral stripe (from Trengganu, Kelantan, and Siam).

THE GENUS RASBORA IN MALAYA

R. sumatrana is likely to be confused in Malaya only with the northern form of *R. elegans*, from which it can be distinguished by the complete lack of a central lateral blotch, or with *R. myersi*, which never has a precaudal spot, and which possesses a wider lateral stripe and different scalation.

Rasbora elegans Volz (Fig. 2)

Rasbora elegans Volz, 1903: 558 (original description; brooks in interior of Palembang Residency Sumatra). Duncker, 1904: 182 (Tras, Pahang; Kuala Jelai, Negri Sembilan; Kuala Lumpur, Selangor). Herre and Myers, 1937: 54 (Singapore; Mawai District and Gunong Pulai, Johore). Brittan, 1954: 64 (synonymy; description; distribution; relationships).

Rasbora lateristriata var. *elegans* Weber and de Beaufort, 1916: 78 (Singapore; Malacca = Malaya). Menon, 1954: 8 (Panti Forest Reserve, Johore; Kuala Tahan, Pahang; River Ketil, Kelantan).

Specimens examined: Kuala Brang, Trengganu; 13; 36-87 mm.; Tweedie; August, 1950.* River Kundor at Gua Musang, Kelantan; 10; 65-88 mm.; Tweedie; July, 1939.* River Ketil at Gua Musang, Kelantan; 7; 54-79 mm.; Tweedie; July, 1939.* Kuala Pilah, Negri Sembilan; 4; 44-49 mm.; Fisheries Department; no date.* Kuala Tahan, Pahang; 2; 61-79 mm.; C. S. Ogilvie; 1948.* Tasek Bera, Pahang; 1; 66 mm.; Tweedie; October 1949.* Trantum, Pahang; 3; all about 32 mm.; Tweedie and Herre; March, 1937. Panti Forest Reserve, Johore; 5; 43-73 mm.; Tweedie; March 1938. Mawai District, Johore; 3; 28-77 mm.; Tweedie and Herre; February 1937.*

Previously examined (Brittan, 1954: 65) were 208 specimens from the following localities: Singapore; Mawai District, Kota Tinggi, Simpang Rengam, and Gunong Pulai, Johore; Trantum, Sungai Garam, Karak, and Bentong, Pahang; Sungai Meropah, Perak; Kundor River, Kelantan.

In body form and fin structure this species is almost like *R. sumatrana*, but can be distinguished from that species, or any other by the two prominent dark markings on the side, one below the anterior origin of the dorsal fin, the other just in front of the root of the caudal fin. The first is usually roughly rectangular, and covers two or three times the area of the second, which is about the size of the eye; in the southern part of Malaya the two blotches are separate, but in the north they are connected by a dark lateral stripe, which terminates anteriorly at the midlateral blotch. The supra-anal pigment is well-defined, and occurs as a heavy streak, an elongate "teardrop", or an elongate oval. In life there is a weak gold line running from the upper margin of the midlateral spot to the upper margin of the precaudal spot; this stripe is seen only in certain light, and is absent in preserved material. The overall color

is silvery-olive above, silvery below, frequently with a rosy or mauve suffusion. In preserved material the ground color becomes brownish above, yellowish-brown below. The fins are hyaline.

Head 3.7 (3.2-4.2), 5.1 (4.5-5.5) in total length. Depth 3.5 (3.1-4.1), 4.8 (4.2-5.5) in total length. (The figures presented for these proportions in my generic revision (Brittan, 1954: 66) are incorrect). Dorsal 1.1 (0.9-1.2) in body depth, its origin two scales behind pelvic insertion. Dorsal-hypural distance, projected forward, falling at the nostril. Anal 1.4 (1.2-1.7) in body depth. Lateral line scales and pores 28-30 (27-31). Transverse line $14/1/24$. Predorsal scales most often 11, fairly often 12, rarely 13. Circumpeduncular scale rows 12. Maximum total length approximately 140 mm.

This species is known from Malaya, Sumatra, Borneo, and Bunguran (Great Natuna) Island. In Malaya it has been recorded from all the states except Malacca, Kedah, and Perlis, and from Singapore Island. The species almost certainly exists in Malacca and possibly in Kedah, Perlis, and the extreme southern part of peninsular Siam. This appears to be a relatively common species in Malaya.

Specimens from the southern part of the peninsula have the midlateral and precaudal spots unconnected by a dark lateral stripe (e.g., specimens from Singapore, Johore, Negri Sembilan, Pahang, and Selangor; this is the "typical form"), while specimens from the northern part have the spots connected by a narrow stripe, which borders the axial streak ventrally (e.g., specimens from Trengganu and Kelantan). The midlateral blotch of the typical form is roughly squarish or rectangular in form, generally with the lower, posterior "corner" of the rectangle a bit "rounded off"; in the forms with the blotches connected, the midlateral blotch is much more elongate, and the lower rear part of the blotch tapers gradually into the lateral stripe. In the specimens from the rivers Kundor and Ketil in Kelantan the interconnecting stripe is an extremely narrow streak, while in the examples from Kuala Brang, Trengganu, it is wider and more prominent; in the latter, the midlateral blotch is so narrow and passes so gradually into the lateral stripe that it is almost just an expansion of the latter. There is little variation in the supra-anal pigment, which usually forms an elongate oval. In a few specimens from the Mawai District of Johore and Kuala Tahan, Pahang, the mark is almost circular; in those from Kuala Brang, Trengganu, it is in the form of a very elongate "teardrop". Twenty-nine to 31 lateral line scales are found in the Kelantan examples, 27 to 29 in the "typical form" from the southern part of the peninsula; in the Trengganu specimens 28 or 29 scales were counted.

THE GENUS RASBORA IN MALAYA

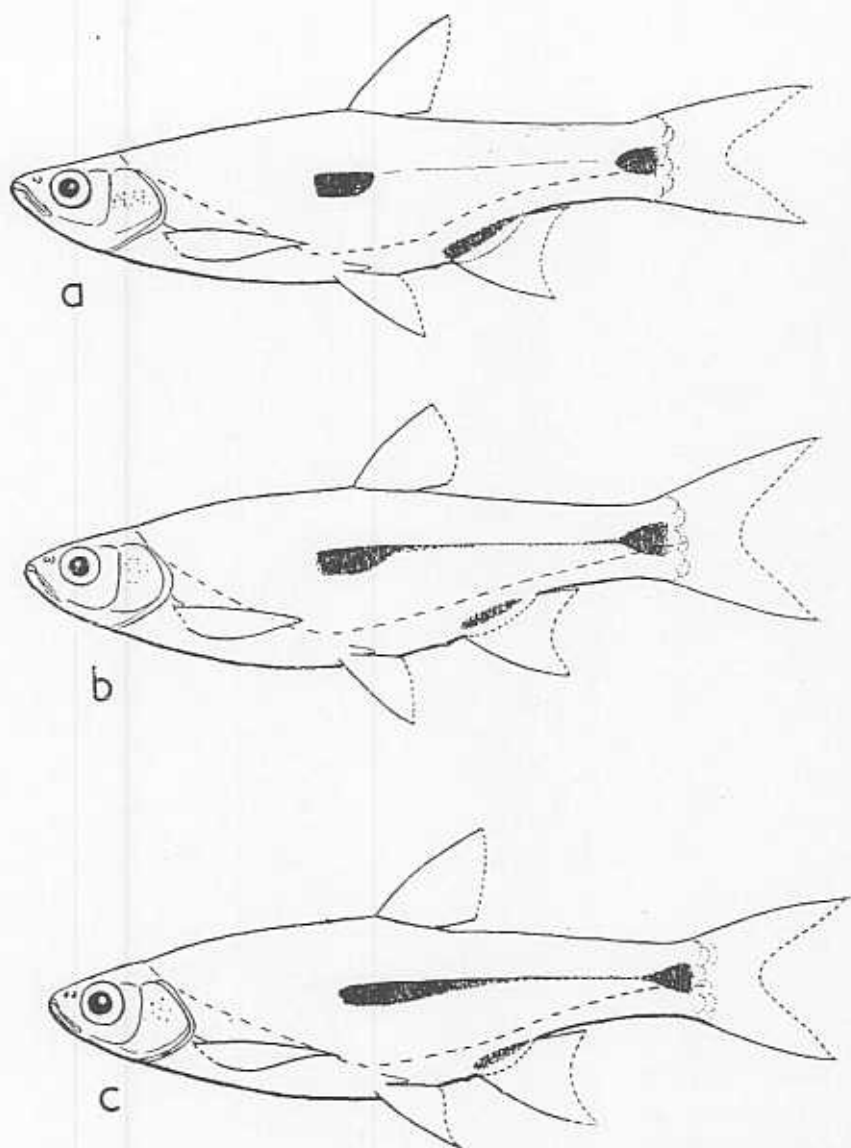


Fig. 2. Color-pattern variation in *Rasbora elegans*. a, Mawai District, Johore;
b, River Kundor at Gua Musang, Kelantan; c, Kuala Brang, Trengganu.

Rasbora elegans bunguranensis Brittan (1951:3), from Bunguran Island, has a color pattern basically like that of the Kelantan and Trengganu examples, though the interconnecting stripe is wider, and the structure of the head and fins differs. Hubbs and Brittan (*in* Brittan, 1954: 70) have described as a new subspecies¹ a form from eastern Sumatra (holotype from a small pond near Passangrahan Ranau) which is nearly identical with the Kelantan examples mentioned earlier. Another form from the Moesi River of Sumatra, also described as a new subspecies², has the midlateral and precaudal blotches connected by a hair-streak of pigment, and has long, delicate fins, fewer and rather more deciduous scales than other *elegans*, and a very large eye. Still another form, described from Java as a separate species³, has a color pattern much like that of the Trengganu specimens, though differing in certain scale counts and body proportions. Certainly this form is closely related to *R. elegans*.

With the additional material available for study while preparing the present paper, it appears that near the evolutionary centre of the species in southern Malaya and the opposite coasts of Sumatra and Borneo the "typical form" is found, while near the periphery of the range the "interconnecting-stripe form" appears. Also, it appears that populations nearer the edge of the distributional range tend to have a scale or two more in the lateral line, on the average, than those near the centre, but this observation is not based on really large series from many localities.

The author feels that variation in this species, and in the genus in general, is primarily clinal, and that while there may be a number of fairly well-defined, racially-differentiated populations existant, it is wisest not to apply further formal subspecific names until a thorough study of large series of specimens from all parts of the range can be made.

The caudimaculata Complex:

Rasbora caudimaculata Volz

Rasbora caudimaculata Volz, 1903: 559 (original description; Semangus River, Sumatra). Brittan, 1954: 76 (synonymy; description; distribution; relationships).

Rasbora trilineata (nec Steindachner) Herre and Myers, 1937: 55 (Mawai District, Johore).

Specimens examined: Mawai District, Johore; 1; 115 mm.; Tweedie; March 1934.* Previously examined (Brittan, 1954: 77) were 11 specimens, measuring 34 to 121 mm.; all from the Mawai District.

1. *Rasbora elegans spilotaenia*.

2. *R. e. nematotaenia*. This form may be ecophenotypic.

3. *R. aprotaenia*.

THE GENUS RASBORA IN MALAYA

This is probably the largest Malayan species. Several examined by me were about 120 mm. standard length, and Weber and de Beaufort (1916: 68) record a total length for *R. trilineata* of 150 mm.; since the latter never reaches more than about 80 mm. total length, Weber and de Beaufort were probably considering *R. caudimaculata*, which they list in the synonymy of *trilineata*.

The subterminal dark diagonal markings on each caudal lobe serve to distinguish this species from all except *trilineata*, which is smaller and paler. Young *caudimaculata* have terminal blackish areas on the caudal, which are subterminal in young *trilineata*, and there is a black tip to the dorsal, which disappears in older examples, while the dorsal of *trilineata* is hyaline. The dorsal spot of *dorsiocellata* is subterminal. The general coloration of *caudimaculata* is duskier than in other Malayan species, and many preserved examples exhibit an underlying greenish silvery sheen on the back. A weak blackish or leaden lateral stripe runs from the upper corner of the opercle to the caudal base. There is a weak, elongate blackish or silvery (depending on preservation) supra-anal streak. Basal areas of the fins are dusky yellowish. The body is spindle-shaped and powerful, as in *cephalotaenia*, and the fins are slightly shorter than in most other species.

Head 4.0 (3.4-4.0), depth 4.0 (3.7-4.5). Eye 3.4 (3.0-4.0), snout 3.2 (2.8-3.6). Depth of caudal peduncle 1.7 (1.3-1.8) in its length. Dorsal 1.1 (0.9-1.3) in body depth. Origin of dorsal one scale behind pelvic insertion, thus almost over the latter. Dorsal-hypural distance, carried forward, usually falls between snout and nostril. Anal 1.6 (1.4-1.9) in body depth. Lateral line scales and pores 27-30. Transverse line $\frac{1}{4}/1/2\frac{1}{2}$. Predorsal scales 11-12. Circumpeduncular scales 12. Maximum total length about 120 mm.

This species has been reported from Malaya and Sumatra, and, if *R. layangi* Fowler (1939: 66, fig. 16) is synonymous (Brittan, 1954: 76), from Siam as well. There is one somewhat doubtful record from Sarawak, Borneo, based on the identification of the holotype of *R. dorsimaculata* Herre (1940: 9, plate 3) as a juvenile *caudimaculata* (Brittan, 1954: 80). In Malaya the species is known so far only from Johore.

Rasbora trilineata Steindachner

Rasbora trilineata Steindachner, 1870: 673 (15 of reprint) (original description; Pengulon Patie, Johore; not pl. 3, fig. 3). Duncker 1904: 1810 (Kuala Lumpur, Selangor; Raub, Pahang). Menon, 1954: 10 (Kota Tampan, Perak). Brittan, 1954: 81 (synonymy; description; distribution; relationships).

Specimens examined: Kota Tinggi, Johore; 3; 47-53 mm.; Tweedie; March 1938.* Already examined (Brittan, 1954: 81) were

one from Ayer Hitam, Johore, two from an unknown locality in Johore, and one from the Moesi River at Moera Klinggi, Sumatra.

This species is familiar to American aquarists as the "scissor-tail", for as the fish darts through the water the caudal lobes in the beginning are brought together and then flicked apart, so that the striking black subterminal bars running across the caudal lobes perform a movement resembling scissors-blades in action. The general coloration is bright silvery, often with a goldish tinge (pale yellowish brown when preserved). The dark lateral stripe is of moderate intensity, and is about equal to the pupil width on the caudal peduncle; it is narrower and weaker anteriorly. A weak gold line overlies the black stripe. No pre-caudal spot in adults. The supra-anal streak is well-developed and directly confluent with the easily-seen subpeduncular streak. Fins hyaline, except the caudal.

Head 3.6 (3.3-4.1), depth 4.1 (3.6-4.3). Length of caudal peduncle 1.5 (1.4-1.7). Eye 3.2 (2.8-3.7), snout 3.6 (3.5-3.7). Dorsal height slightly in excess of body depth, 0.9 (0.9-1.0) in body. Origin of dorsal almost over pelvic insertion. Dorsal-hypural distance, when carried forward, falls between nostril and anterior rim of eye. Lateral line pores and scales 30-31 (29-32). Transverse line $14\frac{1}{2}$. Predorsal scale 12-13. Circumpeduncular scale rows 12. Maximum total length about 80 mm.

This species is known to me with certainty only from southern Malaya and the east coast of Sumatra, though the Siamese *R. stigmatura* Fowler seems to be this species. In Malaya *trilineata* is known from Johore and, if Duncker's identifications (1904: 1810) are correct, Pahang and Selangor. Doubt is cast on many records in the literature by the fact that while Steindachner's original description may refer to this species, his figure is of one of the color phases of *R. sumatrana*. His series of types may be all the present species, all *sumatrana*, all *caudimaculata*, or a mixture. The author will attempt to resolve this problem in the future, but for the present I am associating the name *trilineata* with the form under discussion.

R. trilineata can be distinguished from *R. caudimaculata* as follows: Much smaller size when adult; paler body coloration; body proportionately deeper, less circular in cross-section, not so spindle shaped; more lateral line scales; more predorsal scales; the lateral line is stronger and narrower; the supra-anal and subpeduncular streak are well marked, rather than obsolete. From certain *sumatrana* it may be distinguished by the subterminal tail markings, by never having a pre-caudal spot (except a weak one in very young examples; the pre-caudal

THE GENUS RASBORA IN MALAYA

spot is absent in some *sumatrana*), by always having a well-developed supra-anal streak (absent in some *sumatrana*), and by a smaller adult size.

There is a lengthy discussion of the nomenclatorial and identification problems in Brittan (1954: 83).

Rasbora dorsiocellata Duncker

Rasbora dorsiocellata Duncker, 1904: 183, plate 1, fig. 1 (original description; Kuala Jelai, Negri Sembilan; Muar River at Tubing Tinggi, Johore; Bukit Tray at Bandar Maharani, Selangor). Weber and de Beaufort, 1916: 68 (description; Malacca = Malaya). Herre and Myers, 1937: 54 (Tasek Bera, Pahang). Brittan, 1954: 84 (synonymy; description; distribution; relationships).

Specimens examined: Tasek Bera, Pahang; 11; 29-36 mm.; Tweedie; October 1949.* Previously examined (Brittan 1954: 84) were two examples from Tasek Bera, and one from an unknown locality 30 (?) miles north of Singapore.

The dark central spot in the dorsal, made even more striking by the white area just below it, is the distinctive "flag" of this species. The belly is silvery, the sides and back have a metallic green sheen. There is no dark lateral stripe. Supra-anal streak present, but not very prominent. The fins are hyaline.

Head 3.4 (3.1-3.6), depth 3.7 (3.4-3.9). Depth of caudal peduncle 1.9 (1.8-1.9) in its length. Eye 2.7 (2.4-2.8), snout 3.6 (3.3-3.8). Dorsal height equal to or very slightly greater than body depth. Origin of dorsal directly over pelvic insertion. Dorsal-hypural distance when carried forward, falling in front of snout. Anal 1.4 in body depth. Lateral line complete in full grown adults, usually incomplete and interrupted posteriorly in subadult examples. About 29 scales and 27 pores in lateral line. Transverse line $1\frac{1}{4}$ / $1\frac{1}{2}$ or $3\frac{1}{2}$. Predorsal scales 10-12. Circumpeduncular scales 12.

Only juvenile *caudimaculata* are likely to be mistaken for this species; in the former the dark area of the dorsal is at the tip, and the caudal lobes are blackish, while in the latter the dark area of the dorsal is subterminal, and the caudal lobes are hyaline. Adults of the two species are, of course, completely disproportionate in size, *dorsiocellata* reaching about 60 mm. total length, *caudimaculata* twice that.

R. dorsiocellata has been reported from Malaya, Sumatra, and Billiton. In Malaya it has been collected only from the southern half of the peninsula, in Johore, Pahang, and Negri Sembilan.

This species is most closely related to *R. caudimaculata* and *R. trilineata*, probably being derived from the former, or a near ancestor.

The trifasciata Complex:

Rashora bankanensis (Bleeker)

- Rashora bankanensis* Bleeker, 1853: 192 (original description; Marawang, Banka). Duncker, 1904: 181 (Tubing Tinggi on Muar River, Johore).
 Weber and de Beaufort, 1916: 69 (description; Malacca = Malaya).
 Brittan, 1954: 96 (synonymy; description; distribution; relationships).
Rashora lateristriata lateristriata, (nec van Hasselt or Bleeker) Herre and Myers, 1937: 55 (Chandra (Chenderoh) Dam and Kuala Korbu, Perak; Gunong Pulai, Johore).
Rashora lateristriata sumatrana (nec Bleeker) Herre and Meyers, 1937: 55 (Singapore).
Rashora lateristriata var. *sumatrana* (nec Bleeker), Menon, 1954: 9 (Jalong, Perak; River Ketil, Kelantan; Kota Tinggi, Johore).

Specimens examined: River Ketil, near Gua Musang, Kelantan; 5; 38-47 mm.; Tweedie; July 1939.* Jalong, Perak; 10; 45-50 mm.; 1938.* Kota Tinggi-Mersing Road, Johore; 1; 40 mm.; Tweedie; March 1938. Rengam, Johore; 2; 38-40 mm.; Tweedie; 1938. Mandai Road, Singapore Island; 4; 32-45 mm.; Tweedie; February 1938. Previously examined (Brittan, 1954: 96) were examples from the following places: Singapore; Kota Tinggi, Mawai District, Simpang Rengam, and Gunong Pulai, Johore; Kuala Korbu, Perak.

A medium-sized species with a broad, dark midlateral stripe extending forward from the caudal base, fading anteriorly. The head and body are typically relatively deep, the fins frequently markedly falcate. Supra-anal pigment definite and streaklike. Ground color of the body is yellowish brown in preserved examples. In the few living specimens which I have seen which were apparently referable to this species, the body was silvery with a yellowish brown caste, and there was a weak gold line above the dark lateral stripe. Fins are hyaline, with a yellowish wash basally; the anal often is weakly tipped with black.

Head 3.8 (3.4-4.1), depth 3.4 (3.1-3.8). Depth of caudal peduncle 1.5 (1.4-1.7) in its length. Eye 3.0 (2.6-3.7), snout 3.4 (3.2-4.0). Dorsal 1.1 (0.8-1.3) in body depth, its origin one or two scales behind the pelvics. Dorsal-hypural distance, when carried forward, falling at anterior rim of eye. Anal 1.5 (1.0-1.8) in body depth. Lateral line scales 25-27, pores 23-27, the last one or two scales often being unperforated. Lateral line forming a gentle, nearly uniform curve, without the distinct angle above the pelvic insertion which is seen in most species. Transverse line $\frac{1}{4}$ to $\frac{1}{3}$. Two normal scales between lateral line and pelvic insertion. Predorsal scales 11 (10-12). Circumpeduncular scales 12. Maximum total length about 75 mm.

R. bankanensis is known from Banka, Sumatra, and Malaya. In Malaya it is known from Singapore Island, Johore, Perak, and Kelantan, but probably is distributed throughout all the states.

THE GENUS RASBORA IN MALAYA

The closely related *R. rutteni* Weber and de Beaufort (1916: 68, fig. 26) of Borneo may prove to be conspecific, as may most of the other species of the *trifasciata* complex (see Brittan, 1954: 87-107), in this case likely representing a widespread polytypic species. If specifically distinct (e.g. *rutteni*, the eastern Bornean *trifasciata*, the Malayan *paucisquamis*), they are certainly very closely related, probably belonging to the same superspecies (see Mayr, 1942: 169; Mayr, Linsley, and Usinger, 1953: 29).

This species can be told from any others in Malaya with which it could conceivably be confused by the following characters: lateral line scales 25-27, pores 23-27; the even, bowed shape of the lateral line; the transverse line count of $14\frac{1}{3}\frac{1}{4}$; two scales between lateral line and pelvic origin.

Rasbora paucisquamis Ahl (1935: 144) is, in my opinion, doubtfully valid, and may be conspecific with *R. bankanensis*. Ahl's original description is quite sketchy, but neither this nor Meinken's (1939: 429) color description give evidence of any real points of dissimilarity between the two species, except that *paucisquamis* is given as having only 22 scales in a lateral series; however, a scale count made down the middle of the side usually results in a lesser number by one or two than if it was made down the course of the lateral line, and it is also possible that Ahl was not in the habit of counting scales beyond the end of the hypural fan (that is, on the base of the caudal). *R. paucisquamis* may be perfectly valid, but the single type specimen was taken from a few aquarium specimens of the species which were imported into Germany in 1934. The species has apparently not been collected since. Furthermore the collection locality was given only as the "Malayischer Archipel". Never having seen the type specimen, I am withholding judgement, but I am strongly inclined to synonymize *paucisquamis* with *bankanensis*.

Rasbora gerlachi Ahl (1928: 205) is in an even more doubtful category. From its scalation and other details it would seem to be *bankanensis*. A single example was imported into Germany alive in 1928; this subsequently died and was made the type of the species. The supposed collection locality, Kameruns (Cameroons), is to the author, almost certainly erroneous.

Rasbora meinkeni de Beaufort

Rasbora meinkeni de Beaufort, 1931: (original description; Sumatra; type in Amsterdam Museum). Meinken, 1935: 82 (description; life colors; breeding). Arnold and Ahl, 1936: 212, text fig. (description; Sumatra). Ahl, 1938: 115, fig. 13 (description; Sumatra). Innes, 1952: 209, text fig. (color description; distribution; relationships). Brittan, 1954: 91 (description, distribution, relationships).

Specimens examined: Sumatra (?); Stanford 15333; 1; 37 mm.; reared from holotype of *R. meinken* in aquarium of Herr Meinken. Stanford 15334; 2; 15-42 mm.; from Steinhart Aquarium, San Francisco. Collection of M. R. Brittan; 2; 31-39 mm.; aquarium specimens.

The color of this medium-small species is, in life, brownish-olive above, sides and belly silver. The sides show a green glint in certain light. There is, under many light conditions, an overall brassy or golden effect. A thin blackish midlateral stripe runs from opercle to caudal base, being darkest and widest posteriorly. A gold or coppery line borders this dorsally. Supra-anal pigment streakline, the ones on each side joining to form the subpeduncular streak. Reticulate pattern distinct, especially in preserved material. Overall color brownish in preserved examples. Fins in life hyaline, with dorsal and caudal having an orange or yellowish suffusion basally.

Head 3.6 (3.5-3.7), depth 3.6 (3.5-3.8). Eye 3.1 (2.9-3.3), snout 3.4 (3.3-3.5). Dorsal 1.1 (1.1-1.2) in body depth, its origin 2 scales behind pelvic insertion. Dorsal-hypural distance, when carried forward, falling at anterior rim of eye. Anal 1.4 in body depth. One scale (not including small axillary scale) between lateral line and pelvic origin. Lateral line pores and scales 29-30; the last scale often being unperforated.¹ Transverse line $\frac{1}{4}/1/3\frac{1}{2}$. Predorsal scales 12 (12-13). Circumpeduncular scales 12. Maximum total length about 60 mm.

This species has been several times reported in the literature from Sumatra, this being based, apparently, on the attributing of the type locality to Sumatra, the latter probably on the word of the importer. I have seen this species several times in shipments of aquarium fishes which were newly-arrived in San Francisco from Singapore. Shipments originating in Singapore are largely made up of specimens collected on Singapore Island or in Johore. It is likely this species is found both in southern Malaya and in adjacent Sumatra.

R. meinken may be confused with *R. bankanensis*, to which it is closely related. It differs in being slenderer, having one scale between lateral line and pelvic origin instead of two, in having more perforated scales in the lateral line, and in having the lateral line with an angle above the pelvic origin, rather than it being a long, uniform, shallow bow. Certain young *sumatrana* may resemble *meinken*, but the latter never has a precaudal spot and has a transverse line of $\frac{1}{4}/1/3\frac{1}{2}$.

1. The smaller of the two specimens in my own collection, which is about two-thirds grown, has 30 lateral line scales, the last 4 of which are unperforated.

THE GENUS RASBORA IN MALAYA

R. meinkenii may possibly be conspecific with *R. trifasciata* Popta (1905: 176) of the River Bo of eastern Borneo. I can detect, from the description, no significant differences between the two species, except that the former has one and the latter two scales between lateral line and pelvic origin. I cannot be sure if Popta did or did not include the small axillary scale at the pelvic insertion, so I do not know if there really are 2 intervening normal scales in *trifasciata*, or only one, as in *meinkenii*. In this paper I am omitting the axillary scale from consideration, while in the generic revision (Brittan, 1954) it is recorded as " $\frac{1}{2}$ ".

The *argyrotaenia* Complex:

Rasbora dusonensis (Bleeker)

Rasbora dusonensis Bleeker 1851: 14 (original description; River Dusan or Banjer at Bandjermassing, Borneo). Menon, 1954: 8 (Kuala Tahan and Kuala Kangsar, Pahang). Brittan, 1954: 122 (Saul, Telok Anson, and Chenderoh Dam, Perak; synonymy; description; distribution; relationships).

Rasbora argyrotaenia (in part; nec Bleeker) Herre and Myers, 1937: 54 (Telok Anson and Chenderoh Dam Perak).

Specimen examined: Forty-four examples, from the localities listed in the synonymy above, were examined for the generic revision (Brittan, 1954).

I have seen only preserved examples of this species. In these, the color is brownish above, yellowish brown below. A dusky mid-lateral stripe runs from the caudal base forward to the opercle. The axial streak is well-defined posteriorly, fading out before the pelvics; posteriorly this streak shows through the upper third of the lateral stripe, anteriorly diverging to run above it. Above the dark lateral stripe there is, anteriorly only, a distinct light streak, and bordering this dorsally there is a blackish streak. The reticulate pattern is weakly developed. Supra-anal streak obsolete or absent. Fins hyaline, except the caudal, which has a distinct, black posterior border and an olive-yellow wash basally (this probably bright yellowish in life).

Head 4.2 (3.8-4.4), depth 4.3 (4.2-4.6). Depth of caudal peduncle 1.8 (1.6-2.0) in its length. Dorsal 1.1 (1.0-1.3) in body depth, its origin midway between pelvic and anal origins, or slightly nearer the latter, 3 full scales behind pelvic origin. Dorsal-hypural distance, projected forward, falling just behind eye. Anal 1.5 (1.4-1.6) in body depth. Scales and pores in lateral line 33-35. Transverse line 14/1/24. Predorsal scales 14 or 15. Circumpeduncular scales 14. Maximum total length about 150 mm.

R. dusonensis is known from Sumatra, Borneo, and Malaya. In Malaya it has been reliably recorded only from Perak, to my knowledge.

R. retrodorsalis Smith (1945: 110, fig. 12) of Siam is regarded by me as a strongly marked race of *R. dusonensis* (Brittan, 1954: 125).

R. argyrotaenia Bleeker and *R. myersi* Brittan are the two species most closely related to *R. dusonensis*. All exhibit the same basic color pattern and morphology; the common possession of 14 circumpeduncular scale rows seems to be a real evidence of relationships in this case. The only Malayan species with which *dusonensis* may be confused is *myersi*, from which it may easily be distinguished by the more posterior origin of the dorsal fin. It may similarly be distinguished from *R. argyrotaenia*, which latter species I do not consider to exist in Malaya.

Rasbora myersi Brittan

Rasbora myersi Brittan, 1954: 117 (original description; Potoes Sibau, Borneo; distribution; relationships).

Rasbora lateristriata (nec Bleeker), Menon, 1954: 8 (Kota Tampan and Chenderoh Dam, Perak).

Specimens examined: Kota Tampan; Perak; 7; 57–72 mm.* Tasek Bera; Pahang; 10; 52–64 mm.; H. D. Collings; June, 1940. Chenderoh Dam; Perak; 13; 32–61 mm., Tweedie and Herre, March 1937*. Kuala Tahan, Pahang; 7; 78–117 mm.; C. S. Ogilvie; 1948 and 1950. Kuala Brang, Trengganu; 2; 51–68 mm.; Tweedie; August 1950. Tasek Bera; Pahang; 5; 68–83 mm.; Tweedie; November 1949*. Previously examined (Brittan, 1954: 118) were specimens from the following localities: Kuala Pilah, Negri Sembilan; Lake Chini, Pahang; Chenderoh Dam and Kuala Kurau, Perak; Lake Chin Chin, Jasin, Malacca; Ayer Hitam Johore.

This large species is one of the commonest in Malaya. It can be recognized by its weak broad dark lateral stripe; I have seen only preserved examples, but the stripe is probably dusky leaden in life. In some preserved examples this stripe seems to be almost absent. Supra-anal pigment absent. The fins are hyaline, but frequently exhibit a yellowish wash; the caudal is edged with blackish pigment. There are 14 circumpeduncular scales. The transverse line is $\frac{1}{4}4/1/3\frac{1}{2}$. These latter two characters, in combination with the broad lateral stripe, should serve to distinguish this species from any other.

Head 3.9 (3.6–4.6), depth 3.8 (3.4–4.6). Depth of caudal peduncle 1.5 (1.4–1.8). Eye 3.4 (2.8–3.7), snout 3.2 (2.8–3.6). Dorsal 1.0 (0.9–1.2) in body depth, its origin two scales behind pelvic insertion. Dorsal-hypural distance falling, when carried forward, on the eye. Anal 1.5 (1.3–1.7) in body depth. Lateral line pores and scales 30–31 (29–31). Transverse line $\frac{1}{4}4/1/3\frac{1}{2}$. Predorsal scales 13 (12–14). Circumpeduncular scales 14. Maximum total length is about 120 mm.

THE GENUS *RASBORA* IN MALAYA

This species has been collected to date from southwestern and northern Borneo, the Moesi River of Sumatra, Malaya, and peninsular and central Siam. It will probably prove to be widely distributed in Sumatra and Borneo (in the western half, at least), and may also be found in southern Indo-China. In Malaya it has been collected in Johore, Pahang, Negri Sembilan, Perak, and Trengganu, but most likely exists in all the states.

As would be expected in so wide-ranging a species, there is considerable variation in certain body proportions. Generally this species has a spindle-shaped body, like that of *cephalotaenia*, and medium short fins for a *Rasbora*. Certain populations, however, are deeper-bodied. Two specimens from Kuala Tahan, Pahang, labelled "bada", are very deep-bodied and laterally compressed, and exhibit intenser, narrower, dark lateral stripes. Of four specimens from the same locality collected in 1948, two are labelled "bada", and appear to be normal *myersi*, while the other two are much the largest of any from this locality; these latter two are labelled "bada bulai", and are also normal *myersi*. Why different native names should be applied to these examples which differ so slightly is not apparent to me.¹ Also differing from the "norm" for *myersi* is a series from Kuala Brang, Trengganu. These are much like *R. trilineata* in shape, having a much more pointed head and larger eye than is usual in *myersi*, a more projectant lower jaw, longer fins, more pronounced reticulate pattern, and nearly absent dark lateral stripe; however, they exhibit the scale counts characteristic of *myersi*, and the coloration, except for minor details.

In the past this species has been confused with *R. argyrotaenia* Bleeker and *R. dusonensis*, its two closest relatives. The author is of the opinion that the former does not range into Malaya. *R. myersi* differs in the position of the dark lateral stripe, which lies partially above the axial streak, rather than running along this streak's ventral border; the lateral stripe is paler, broader, and more diffuse; the transverse line is $\frac{1}{4}4/1/3\frac{1}{2}$, rather than $\frac{1}{4}4/1/2\frac{1}{2}$. From *R. dusonensis* it differs by having the dorsal farther forward, so that the dorsal-hypural distance, when carried forward, falls on the eye, rather than behind it; by having fewer lateral line scales (29-31), as against (33-35); by having fewer predorsal scales (12-13, rather than 14-15); by having a transverse line of $\frac{1}{4}4/1/3\frac{1}{2}$, rather than $\frac{1}{4}4/1/2\frac{1}{2}$; and by having no light lateral stripe above the dark lateral stripe.

¹ Tweedie, 1952: 91, states that "Bada" is used for "several species of *Rasbora*", "Sěluang" and "Bada Sěluang" for "species of *Rasbora*, especially *R. elegans* Volz".

The *einthovenii* Complex:

Rasbora einthovenii (Bleeker)

Leuciscus einthovenii Bleeker, 1851: 434 (original description; Sambas, Borneo).

Rasbora einthovenii Bleeker: 1860 (description; Singapore); Herre and Myers, 1937: 54 (Singapore and Johore). Menon, 1954: 8 (Mandai Road, Singapore; Mawai District and Kota Tinggi, Johore). Brittan, 1954: 149 (synonymy; description; distribution; relationships).

Rasbora einthovenii Weber and de Beaufort, 1916: 72 (description; Singapore; Malacca = Malaya). Fowler, 1938: 57 (reference; Singapore; Malacca). Innes, 1952: 208, text fig. (colors; breeding; Malayan Peninsula and Archipelago).

Rasbora cephalotaenia (nec Bleeker) Herre and Myers, 1937: 54 (in part; Mandai Road, Singapore).

Specimens examined: 8 miles north of Kota Tinggi, Johore; 3; 50-53 mm.; Tweedie and Herre; March 1937.* Previously examined (Brittan, 1954: 149) were 113 specimens from Singapore Island and 79 specimens from the following Johore localities: Kota Tinggi, Gunong Pulai, Mawai District, Ayer Hitam, and Sayong Pinang.

Distinctive of this species is its uneven-edged, downward-bowed dark lateral stripe, which starts at the snout, runs over the opercle, and then continues to the caudal base, running below the center line of the sides. The overall color is a warm brown, frequently with a pearly luster. The dorsal has a blackish streak beginning at the center of the anterior edge and directed upward and posteriorly. The center dorsal rays are also blackish. Other fins are hyaline, except for scattered pigmentation of the rays. Fins more rounded than in other Malayan *Rasbora*.

Head 3.7 (3.5-3.9), depth 3.5 (3.3-3.8). Depth of caudal peduncle 1.7 (1.5-1.9) in its length. Eye 3.3 (3.1-3.7), snout 3.4 (3.0-3.8) in head. Dorsal 1.3 (1.2-1.3) in body depth. Origin of dorsal 2 scales behind pelvic insertion. Dorsal-hypural distance, when carried forward, falling about the middle of the eye. Anal 1.5 (1.4-1.6) in body depth. Lateral line scales 30 or 31 (29-32), the last one to 6 scales usually unperforated. Transverse line $\frac{1}{4}$ to $\frac{1}{3}$. Predorsal scales 13 (12-14). Circumpeduncular scales 12. Maximum total length about 85 mm.

R. einthovenii is a fairly common species in Malaya, Borneo, and Sumatra, but is apparently absent from Siam (Brittan, 1954: 152). In Malaya it has been reported so far only from Johore and on Singapore Island.

R. cephalotaenia, occupying nearly the same range, and *R. jacobsoni* Weber and de Beaufort of Sumatra appear to have closest relationship with *einthovenii*.

THE GENUS RASBORA IN MALAYA

Rasbora cephalotaenia (Bleeker)

Leuciscus cephalotaenia Bleeker, 1852: 97 (original description; Billiton).

Rasbora cephalotaenia Bleeker 1860: 438 (description; Singapore). Herre and Myers, 1937: 54 (in part; Mandai Road, Singapore). Menon, 1954: 8 (Kota Tinggi, Johore). Brittan, 1954: 153 (synonymy; description; distribution; relationships).

Rasbora einthovenii (nec Bleeker) Herre and Myers, 1937: 54 (Mandai Road, Singapore).

Specimens examined: Tasek Bera, Pahang, 2, 67–80 mm., Tweedie, October 1949.* Examined previously (Brittan 1954: 154) were 88 specimens from the following localities in Johore: Ayer Hitam, Simpang Rengam, Mawai District.

With its characteristic double row of dark spots running down the side, this species can hardly be confused with any other. Underlying this row of spots is a weak leaden lateral stripe, which runs forward to the snout. The upperparts are brownish, the belly silvery with a pearly sheen. Fins are yellowish basally. The body is unusually spindle-shaped, giving a "racey" look, as in *R. caudimaculata*.

Head 3.9 (3.8–4.5), depth 5.2 (5.0–5.8). Eye 3.7 (3.4–4.0), snout 3.1 (2.9–3.2). Depth of caudal peduncle 1.6 (1.6–1.7) in its length. Dorsal 1.2 (1.2–1.3) in body depth, its origin about 3 scales distance behind pelvic insertions. Dorsal-hypural distance, carried forward, falls at front part of eye. Anal 1.2 in body depth. Lateral line scales and pores 32–34. Transverse line $\frac{1}{4}$ – $\frac{1}{3}$. Predorsal scales 13–14. Circumpeduncular scales 12. *R. cephalotaenia* reaches a maximum of nearly 130 mm. total length.

This species is known from western Borneo, southern Malaya, the east coast of Sumatra, and from Banka and Billiton. In Malaya it has been collected to date in Johore and Pahang, but is to be expected throughout at least the southern part of the peninsula.

On the bases of color pattern this species appears to be most closely related to *R. jacobsoni* of Sumatra and *R. einthovenii*.

The pauciperforata Complex:

Rasbora pauciperforata Weber and de Beaufort

Rasbora pauciperforata Weber and de Beaufort, 1916: 79 (original description; Gunung Sahilan, Sumatra). Tweedie, 1952: 71 (Merchang, Trengganu). Menon, 1954: 10 (Mawai District, Johore; Bukit Merah, Perak). Brittan, 1949: 25 (comparison with *R. taeniata*; Malaya); Brittan, 1954: 164 (synonymy; description; distribution; relationships).

Rasbora leptosoma (nec Bleeker) Innes, 1952: 212 (colors; Malay Peninsula).

Specimens Examined: Merchang, Trengganu; 10; 27–34 mm.; Tweedie, August 1950.* Examined earlier (Brittan, 1954: 164) were 123 examples from Kota Tinggi, Simpang Rengam, and Mawai District, Johore.

This species is probably surpassed in beauty only by *R. heteromorpha*. Its basic color is a quiet silvery-brown, with just a trace of a dark lateral stripe. A brilliant metallic red-gold streak borders this stripe along its dorsal margin, running from the snout through the upper part of the eye to the caudal base. The dusky posterior margins of the scales over the short lateral line are easily seen, forming a series of short vertical bars. The fins are hyaline. A slender species, though not so much so as *R. taeniata*.

Head 3.8 (3.5-4.1), depth 4.5 (4.1-4.7). Depth of caudal peduncle 2.4 (2.1-2.8) in its length. Eye large, 2.7 (2.5-3.1) in head length, snout 3.5 (3.1-4.2). Dorsal slightly higher than body depth, anal slightly shorter than body depth. Dorsal-hypural distance, when carried forward, falling near the anterior rim of the orbit. Lateral scales typically 30-32, pores in lateral line 5-10, frequently interrupted posteriorly. Transverse line 17 or 81. Predorsal scales 13 or 14. Circumpeduncular scale rows 12. Maximum total length about 50 mm.

Rashora pauciperforata has, like *R. taeniata*, been reported from Malaya, Sumatra, and Billiton, and seems to inhabit the same sort of waters (rice paddies, swamps, ditches, slow-moving streams, small lakes, etc.). The two species are often collected together, but *pauciperforata* is apparently much the commoner. In Malaya the "red-line rashora" has been collected in Johore and Trengganu, and will probably be found in between; whether it exists west of the north-south central mountain axis awaits further collecting.

The relationships of *R. pauciperforata* are with *R. taeniata* and *R. borapetensis*; all three are small species with reduced lateral lines and basically similar color patterns.

Rashora taeniata Ahl

Rashora taeniata Ahl., 1922: 294 (original description; Sumatra). Brittan, 1949: 21, fig. 1 (description; Malaya). Brittan, 1954: 167 (synonymy; description; distribution; relationships). Tweedie, 1952: 71 (Merchang, Trengganu). Menon, 1954: 10 (Mawai District, Johore).

Rashora agilis Ahl., 1937: (original description; Sumatra).

Specimens examined: Merchang, Trengganu; 10; 23-37 mm.; Tweedie; October, 1950.* Previously examined were 7 specimens from Southern Johore and one from the Mawai District, Johore.

A small, stunningly beautiful species. This is the slenderest of all the known species, and has unusually high, pointed fins. The intense dark lateral stripe runs from the snout to the caudal base, and the center caudal rays are markedly pigmented. An intense brassy-gold line borders the dark stripe along its dorsal margin, and the back is a metallic greenish. The basal part of the caudal, dorsal, anal and ventrals is orangeish or reddish. Supra-anal streak prominent.

THE GENUS RASBORA IN MALAYA

Head 3.8 (3.5-3.9), depth 4.8 (4.0-5.1). Depth of caudal peduncle 2.8 (2.3-3.3) in its length. Dorsal about $\frac{1}{3}$ higher than body, anal about 4 longer than body depth. Dorsal-hypural distance, when carried forward, falling near nostril. Eye large, 2.8 (2.3-3.0) in head length, the snout 3.5 (3.3-3.8). Lateral scales 29-33, lateral line pores 2-6. Predorsal scales 12-14. Transverse line $\frac{1}{4}$. Circumpeduncular scales 12. Maximum total length about 50 mm.

The species has been reported from Malaya, Sumatra, and Billiton. In Malaya it is known from Johore and Trengganu, but will probably be collected at intervening localities; whether it is to be found west of the central north-south mountain mass in Perlis, Kedah, Perak and Selangor is problematical.

R. taeniata appears to be most closely related to *R. borapetensis*, *R. beauforti* Hardenberg and *R. pauciperforata*.

Rasbora borapetensis H. M. Smith

Rasbora borapetensis Smith, 1934: 302 (original description; Bung Borapet, Siam). Tweedie, 1952: 78 (12th Mile, Kuala Brang-Kuala Trengganu Road, Trengganu). Brittan, 1954: 174 (description; distribution; relationships).

Specimens examined: 12th Mile, Kuala Brang-Kuala Trengganu Road, Trengganu; 3; 23-25 mm.; Tweedie; Aug., 1950.* Previously examined were 6 specimens from the same locality (Brittan, 1954: 175).

Small size and great beauty are characteristic of this species. A black lateral stripe runs from opercle to caudal base. There are some melanophores on the upper cheek. A green-gold stripe borders the dark lateral stripe dorsally. The back is yellowish green, the belly silvery. The basal part of the caudal is reddish.

Head 3.75 (3.7-3.8), depth 3.5 (3.4-3.7). Depth of caudal peduncle. Eye 3.0 (2.9-3.2), snout 3.8 (3.5-4.0) in head length. Dorsal in body depth, its origin 2 or 3 scales behind pelvic insertion. Dorsal-hypural distance, projected forward, falls at the center of the eye. Anal 1.5 (1.3-1.6) in body depth. Lateral line scales 29 or 30, pores 10 to 15. Transverse line $\frac{1}{4}$ to $\frac{1}{2}$. Predorsal scales 12. Circumpeduncular scales 12. This species does not exceed 50 mm. total length.

So far this species has been collected only in the Me Nam drainage of Siam and in Trengganu, Malaya. It will probably be found, in suitable ecologic situations, in watercourses presently tributary to the Me Nam, or tributary to it during the Pleistocene, when the now-submerged lower course of the Me Nam was apparently emergent.

The closest relatives of *borapetensis* are *taeniata* and *pauciperforata*.

Species of Unclear Systematic Relationships:

Rashora kalochroma (Bleeker)

Leuciscus kalochroma Bleeker, 1850: 272 (original description; Bandjermassing, Borneo).

Rashora kalochroma Weber and de Beaufort, 1916: 70, fig. 27 (Malacca = Malaya). Tweedie, 1952: 78 (Merchang, Trengganu). Brittan, 1954: 191 (synonymy; description; distribution; relationships).

Specimens examined: Merchang, Trengganu; 2; 50-57 mm; Tweedie; August 1950.* Previously examined (Brittan, 1953: 191) were 2 specimens from Merchang, and one from the Mawai District of Johore.

Characteristic of this medium-large species are the two large dark blotches on the sides, the first about five scales behind the opercle, the second, which is the larger, above the anal. The first blotch is about the size of the eye, or a bit larger, the second is roughly twice as large as the first. The two are usually connected by a series of small dark spots made up of pigmentation under the posterior edges of the 4th scale row. There is a broad, diffuse, dark swath from the second spot to the caudal root, and a mass of blackish pigment on the opercle. The back in formalin specimens is brown, the belly lighter yellowish brown. Mr. Tweedie (*in litt.*) reports that the fins, which are in preserved material hyaline-brownish, are in life a striking red. There is considerable individual variation in the number and intensity of the small spots between the two large blotches.

Head 3.8 (3.5-4.0), depth 3.6 (3.4-4.0). Depth of caudal peduncle 1.4 (1.3-1.5) in its depth. Eye 3.3 (3.0-3.5), snout 3.5 (3.3-3.7). Dorsal 1.1 (1.0-1.2) in body depth, its origin 3 scales behind the pelvic insertion. Dorsal-hypural distance, projected forward, falls about middle of eye. Anal 1.3 (1.3-1.4) in depth. Lateral line pores 30 (28-31). scales 30 (29-32). Transverse line $14\frac{1}{2}$. Predorsal scales 12 (11-12). Circumpeduncular scale rows 12. Maximum total length about 100 mm.

R. kalochroma has been collected from Malaya, Sumatra, Borneo, and Banka. In Malaya it has been found in Johore and Trengganu, and will probably be found at many intervening localities. However, it would seem to be far less common than *sumatrana*, *elegans*, or *heteromorpha*, for example.

Rashora heteromorpha Duncker

Rashora heteromorpha Duncker, 1904: 182, pl. 1, fig. 5 (original description; Kuala Lumpur, Selangor; Kuala Lumpur, Negri Sembilan; Singapore). Weber and de Beaufort, 1916: 70 (Malacca = Malaya). Herre and Myers, 1937: 55 (Gunong Pulai and Mawai District). Fowler, 1938: 57 (reference; Kuala Lumpur, Negri Sembilan; Malacca; Singapore). Innes, 1952: 211, text fig. and frontispiece (colors, breeding). Menon, 1954: 8 (Mawai District, Johore). Brittan, 1954: 187 (synonymy; description; distribution; relationships).

THE GENUS RASBORA IN MALAYA

Specimens examined: Tasek Bera, Pahang; 35; 16-24 mm.; Tweedie, October 1949.* Examined previously (Brittan, 1953: 188) were 30 specimens from Singapore Island and 65 specimens from the following Johore localities: Mawai District, Kulai, Gunong Pulai.

R. heteromorpha is by far the best known of its genus in Europe and America, whence it has been imported in great numbers. In fact, it is there known simply as "the rasbora", as if the forty-odd other members of the genus were hardly worth noticing. Its life colors are striking and superb. The body is salmon or rosy, darker above, lighter below, overlain with a sparkling metallic sheen. The fins are hyaline, but washed, more weakly, with the body color. A jet black or blue-black triangle occupies the posterior half of the body, its apex directed posteriorly and its base running downward from below the dorsal origin to a point above the pelvic insertion. Under overhead light, a gold line is seen to border the triangle dorsally. In preserved examples the ground color of the body is brownish.

Head 3.5 (3.2-3.7), depth 2.5 (2.1-2.6). Depth of caudal peduncle 1.5 (1.4-1.7) in its length. Dorsal 1.3 (1.0-1.4) in body depth, its origin one scale behind pelvic insertion. Dorsal-hypural distance, when carried forward, falling between the nostril and the tip of the snout. Anal 1.8 (1.6-2.1) in body depth. Scales along normal course of lateral line 26 or 27. Lateral line pores 8 (6-9). Transverse line $\frac{1}{8}$. Predorsal scales 10 or 11. Circumpeduncular scale rows usually 10. Maximum total length about 40 mm.

The southern part of the Malayan peninsula appears to be the distributional centre for this species. It is known from Sumatra and Siam (where it appears to be very uncommon), and from the Malayan states of Johore and Pahang, as well as Singapore Island. The two Siamese specimens examined by me (from Kao Sabap, south-east Siam) have far less deep bodies than those from Johore, and almost straight profiles from snout to dorsal insertion, rather than having marked postnuchal convexities. Further, the upper margin of the black triangle is almost straight and the lower margin is much more sinuous (concavo-convex) than in the Johore examples. The Pahang examples seem somewhat intermediate, though tending more toward those from Johore; however, they are very small (juveniles and subadults), making comparisons difficult.

Rasbora maculata Duncker

Rasbora maculata Duncker, 1904: 182, pl. 1, fig. 6 (original description; Bukit Tray near Bandar Maharani, Johore). Herre and Myers, 1937: 55 (Lake Chin Chin, Jasin, Malacca). Innes, 1952: 213, text fig. (colors; Malaya). Menon, 1954: 9 (Johore). Brittan, 1954: 194 (synonymy; description; distribution; relationships).

Rashora kalochroma (nec Bleeker) Weber and de Beaufort, 1916: 70 (in part).

Specimens examined: Kuala Brang, Trengganu; 14; 15-17 mm.; Tweedie; September 1950. Nee Soon; Singapore Island; 7, all about 13 mm.; Tweedie; 1950. Examined earlier (Brittan, 1954: 195) were 3 specimens from Lake Chin Chin, Jasin, Malacca, and 31 from the following localities in Johore: "Southern Johore", Kota Tinggi, Simpang Rengam.

This is one of the tiniest of cyprinids, its maximum total length not exceeding 30 mm. A graceful-bodied, long-finned species, its overall color varies from salmon-pink to bright reddish. The fins, while lighter, are of nearly the same color as the body. There is a large, circular black spot in the middle of the side, halfway between the pectoral and the pelvic insertion; this is surrounded by a gold circle. The black pre-caudal spot, about the size of the eye, is also surrounded by a gold ring. At the base of the anal is a third spot, which runs up onto the body a short distance. In some specimens there is a fourth spot in the middle of the side just above the supra-anal blotch; this, where present, is usually separate from the supra-anal blotch, but is often confluent with it. The dorsal and anal fins each have a black triangular area at the anterior base. The dorsal, and often the anal, is streaked with blackish just below the tip.

Head 3.6 (3.4-3.8), depth 3.9 (3.7-4.0). Depth of caudal peduncle 2.1 (1.9-2.3) in its length. Dorsal 1.1-1.2 in body depth, its origin about midway between pelvic and anal insertions, and 3 scales behind pelvic insertion. Dorsal-hypural distance, when carried forward, falling at about the anterior rim of the eye. Anal 1.9 (1.8-1.9) in body depth. Lateral line absent. Scales along normal course of lateral line 26-30. Transverse line $1\frac{1}{2}$. Predorsal scales 12 or 13 (rarely 11). Circumpeduncular scales 12.

R. maculata is known only from Malaya and the adjacent area of Sumatra. It has been collected on Singapore Island, in Johore, and in Trengganu, and is probably locally common elsewhere in the southern and central part of Malaya.

Innes (1952: 203) lists as sex distinctions in this fish the whiter belly and more distinct anterior lateral spot of the male, and states that the male has but one spot above the anal fin, while the female has two. The Kuala Brang, Trengganu, examples were checked, by dissection, by me. In all cases, specimens having but one spot above the anal proved to be males; these also exhibit a well-marked sub-distal streak on the longest anal rays, which is weak in females. The females were all egg-filled. The only specimens from the southern part of Malaya which I have been able to dissect for sex-determination have been those from

THE GENUS RASBORA IN MALAYA

Nee Soon, Singapore Island; in all of these there is only one spot above the anal, although some of the spots show a tendency to extend upward onto the middle of the side, and in none of these is there any indication of ova. The specimens are apparently not fully adult, so I hesitate to say that all of them were males, though they appear to be. Since it is a fact that aquarium examples of *R. maculata* imported into the United States are nearly always collected on Singapore Island or in Johore, Innes' observation would seem to be reliable for specimens from these localities, as well as from Trengganu.

R. maculata shows no very close systematic relationship to any other species, though the closest apparent structural similarity is to the members of *pauciperforata-taeniata-borapetensis* complex of species. However, the striking dissimilarity of the color pattern of *maculata*, in the face of its constancy in this species-complex, probably indicates lack of true relationship.

Literature cited

- AHL, ERNST, 1922. Einige neue Süßwasserfische des Indo-Malayischen Archipels. *Sitzungsberichte der Gesellschaft naturforschender Freunde* (1/2): 30-36.
- , 1928. Drei neue Westafrikanische Fische. *Zool. Anz.* 78 (5/6): 204-207.
- , 1935. Beschreibung eines neuen Cypriniden der Gattung *Rasbora*. *Zool. Anzeig.*, 3 (5/6), 144-145.
- , 1937. Neue Süßwasserfische aus dem Indischen und Malaiischen Gebiet. *Zool. Anzeig.*, 117 (5/6): 113-119.
- BLEEKER, PIETER, 1850. Bijdrage tot de kennis der ichthyologische fauna van Midden-en Oost-Java. *Verk. Batav. Gen.*, 23: 1-23.
- , 1851a. Bijdrage tot de kennis der ichthyologische fauna van Borneo. *Nat. Tijdschr. Ned. Ind.*, 1: 1-16.
- , 1851b. Vijfde bijdrage tot de kennis der ichthyologische fauna van Borneo. *Nat. Tijdschr. Ned. Ind.*, 2: 415-442.
- , 1852a. Bijdrage tot de kennis der ichthyologische fauna van Blitong (Billiton). *Nat. Tijdschr. Ned. Ind.*, 3: 87-100.
- , 1852b. Diagnostische beschrijvingen van nieuwe of weinige bekende vischsoorten van Sumatra. *Nat. Tijdschr. Ned. Ind.*, 3: 568-608.
- , 1853. Nalezingen op de ichthyologische fauna van het eiland Banka. *Nat. Tijdschr. Ned. Ind.*, 5: 175-194.
- BRITTAN, MARTIN RALPH, 1949. Rediagnosis of the Malayan cyprinid Fish *Rasbora taeniata* Ahl. *Proc. Calif. Zool. Club.*, 1 (5): 22-28, fig. 1.
- , 1951. New cyprinid fishes of the genus *Rasbora* from Borneo and Bunguran Islands. *Proc. Calif. Zool. Club.*, 2 (1): 1-5, fig. 1-2.
- , 1954. A Revision of the Indo-Malayan Freshwater Fish Genus *Rasbora*. No. 3 in *Monographs of the Institute of Science and Technology*, Manila.
- DUNCKER, GEORG, 1904. Die Fische der Malayischen Halbinsel. *Mitt. Naturh. Mus. Hamburg*, 21: 135-207, pls. 1-2. Reprinted, same pagination and plates, Lucas Grafe and Sillem, Hamburg.

- FOWLER, HENRY W., 1938. A list of the fishes known from Malaya. Govt. Printing Office, Singapore. *Fisheries Bulletin* 1: i-lvi + 1-268.
- , 1939. Zoological results of the third de Schauensee Siamese Expedition. Part 9. Additional fishes obtained in 1936. *Proc. Acad. Nat. Sci. Philadelphia*, 91: 36-76, figs. 1-23.
- GÜNTHER, ALBERT, 1868. Catalog of the fishes in the British Museum. Vol. 7. British Museum, London: xx + 512.
- HERRE, ALBERT W. C. T., 1940. New species of fishes from the Malay Peninsula and Borneo. *Bull. Raffles Mus.*, Singapore, (16): 5-26, plates 1-20.
- HERRE, ALBERT W. C. T. & MYERS, GEORGE SPRAGUE, 1937. A contribution to the ichthyology of the Malay Peninsula. *Bull. Raffles Mus.*, (13): 6-75, plates 1-7.
- INNES, WILLIAM F., 1948. A new *Rasbora*. *The Aquarium*, 17 (5): 107, text fig.
- , 1952. Exotic aquarium fishes. 14th edition. Innes Pub. Co., Philadelphia: 521, many black-and-white and colored figs., (1st ed. 1935).
- MAYR, ERNST, 1942. Systematics and the origin of species. Columbia U. Press. New York: xiv + 334, 29 figs.
- MAYR, E., LINSLEY, H. G. & USINGER, R. L., 1953. Methods and Principles of Systematic Zoology. McGraw-Hill, New York. vii + 328, 45 figs., 14 tables.
- MEINKEN, HERMANN, 1939. *Rasbora paucisquamis* E. Ahl. In Holly, Meinken, and Rachow. *Lieferung* 41-43, serial no. 8b, 8, no. 429, 2 pp. 1 fig.
- MENON, A. G. K., 1954. Notes on Malayan fishes in the collection of the Raffles Museum. *Bull. Raffles Mus.*, (25).
- SMITH, HUGH McCORMICK, 1934. Contributions to the ichthyology of Siam. XVII. New cyprinoid fishes. *Jour. Siam. Soc., Nat. Hist., Suppl.* 9: 301-309.
- , 1945. The fresh-water Fishes of Siam, or Thailand. *Bull. U.S. Nat. Mus.*, 188: i-xi + 1-622, figs. 1-107, pls. 1-9.
- STEINDACHNER, FRANZ, 1870. Ichthyologische Notizen (X). *Sitzb. Akad. Wiss. Wien, Abth. 1*, 61: 1-20, pls. 1-5.
- TWEEDIE, M. W. F., 1952. Notes on Malayan fresh-water fishes. No. 4. Some new and interesting records. No. 5. Malay Names. *Bull. Raffles Mus.* 24: 76-95.
- VOLZ, WALTER, 1903. Neue fische aus Sumatra. *Zool. Anzeig.*, 26: (703): 553-559.
- WEBER, MAX & DE BEAUFORT, LIEVEN FERDINAND, 1916. The fishes of the Indo-Australian Archipelago. Ostariophysi: II. Cyprinoidea, Apodes, Synbranchii. E. J. Brill, Leiden, 3: i-xv + 1-455, figs. 1-214.