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A new species of anostomid characoid fish, *Anostomus spiloclistron*, from the Nickerie river system of western Surinam (Pisces, Cypriniformes, Anostomidae)

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ABSTRACT

A new species of the anostomid characoid genus *Anostomus* is described from the Nickerie river system of western Surinam. The new species appears to be most closely related to *A. plicatus* Eigenmann, 1912, from the Essequibo river system of Guyana. Diagnostic features include the number of lateral line scales, the number of midventral scales between the pelvis and the anus, certain proportional measurements, and differences in the colour pattern.

During the course of a revision of the anostomid genus *Anostomus*, a new species was discovered in the Surinam collections of the Zoölogisch Museum of the University of Amsterdam. The genus *Anostomus* has been adequately defined by Myers (1950), and refinement of this definition will be deferred until the revision has been completed. The new species is closely allied to *A. plicatus* Eigenmann, 1912, which is known only from the Essequibo river system of Guyana (formerly British Guiana). These two species may be immediately distinguished from all other species of the genus by the colour pattern (a combination of vertical bars and bands both above and below the lateral line, with four well developed spots or blotches along the lateral line), and by the truncate nature of the inner (medial) two teeth in each dentary (although the outer or lateral of these may be bifid in specimens of less than about 60 mm SL). Other characters which have been used to separate *A. plicatus* from the remaining species of the genus (e.g. Myers, 1950) no longer seem as clear cut.

Measurements were taken on the left sides of the specimens, and follow Hubbs & Lagler (1949: 8—15), except for those involving the anterior tip of

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the specimen, where the measurement was taken from the anterior margin of the closed lower jaw rather than the tip of the upper jaw. The horizontal rather than vertical nature of the upper jaw, teeth, and upper lip, and the variation in relative position in preserved specimens of the lip form a less objective point of measurement than the tip of the closed lower jaw. Head length was measured to the free edge of the opercular flap, and eye diameter was measured horizontally. Olfactory lamellae counts, which involve a small dissection, were performed on the right olfactory rosette.

Anostomus spiloclistron new species (figures 1—6)
Spotbar anostomus

Holotype: 77.2 mm SL (96.5 mm total length), ZMA 112.685, Surinam, Nickerie river system, Fallawatra river at rapids, 5 km SSW of Stondansie Falls; sand bottom with rocks, river about 60 metres wide; collected (rotenone) by H. Nijssen, 6 April, 1967.

Paratypes: 6, 58.3—73.1 mm SL, collected with the type, ZMA 105.776.
1, 62.8 mm SL, collected with the type, ANSP 124334.
1, 71.6 mm SL, collected with the type, CAS 27725.
1, 76.2 mm SL, collected with the type, USNM 209432.
5, 78.6—104.1 mm SL, ZMA 105.777, Surinam, Nickerie river system, Nickerie river at Stondansie Falls; sand bottom with rocks, river about 80 metres wide; collected (rotenone) by H. Nijssen, 5 April, 1967.

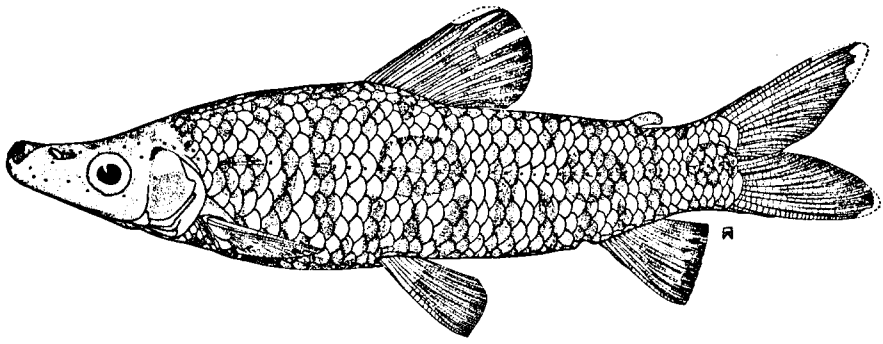

FIG. 1. Left lateral view of *Anostomus spiloclistron* (holotype, ZMA 112.685, 77.2 mm SL). Pelvic and anal fins artificially figured as though spread.

Diagnosis: Resembling *A. plicatus* Eigenmann, but with a shorter caudal peduncle (see fig. 2), its length about equal to its depth (longer than deep in *plicatus*) profile of the head somewhat more slender (see figs. 3, 4); typically two more scales (41) in the lateral line and two more scales (11) between the posterior base of the pelvis and the anus; typically two more vertebrae (38—39); broader bars and bands across the body, which extend over about two scale rows (one scale row in *plicatus*); with larger and more rounded lateral spots or blotches on the flank which extend, except for the first, over two and a half to three vertical scale rows (one scale wide in *plicatus*).

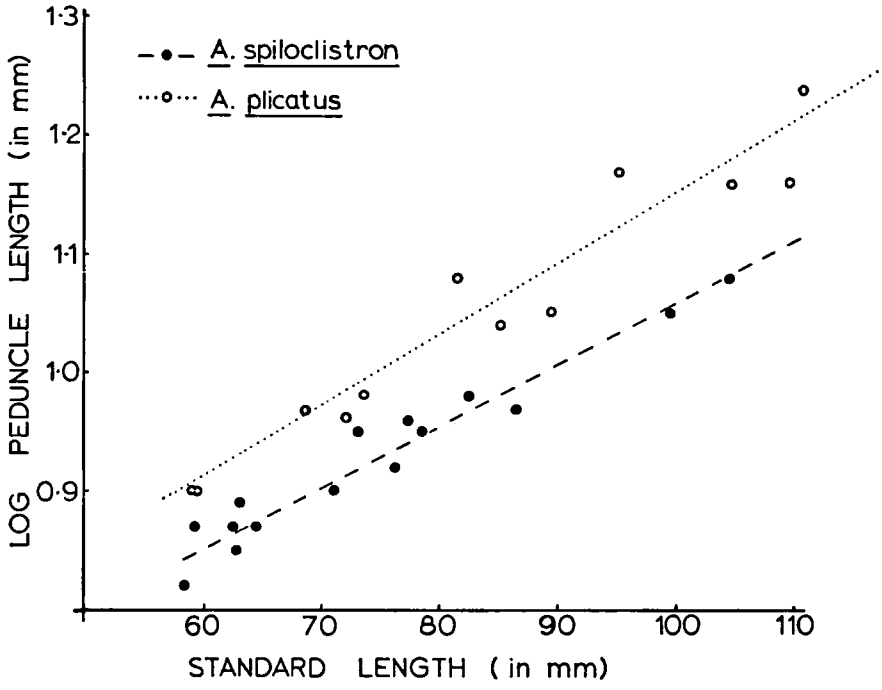

FIG. 2. Plot of the (normal) log of the peduncle length in mm (ordinate) against the standard length in mm (abscissa). Solid circles = *A. spiloclistron*, open circles = *A. plicatus*.

Description: A fusiform, somewhat compressed (especially in larger specimens) fish which reaches a maximum recorded standard length of 104 mm, and possesses a moderately elongated snout and a gentle S-shaped dorsal profile. The concave part of the S is more pronounced than the convex part, the centre of its curve lying above the eye (fig. 1). The following measurements have been divided into the standard length, and consist of the mean, followed by the range, and, in some cases, standard deviation (= SD) and standard error (= SE). Lower jaw to anal fin origin 1.19 (1.17—1.22); lower jaw to adipose fin origin 1.13 (1.11—1.15); lower jaw to dorsal fin origin 1.95 (1.90—2.01); lower jaw to pelvic fin origin 1.82 (1.75—1.86); dorsal fin origin to base of caudal fin 1.95 (1.87—2.02); dorsal fin origin to adipose fin origin 2.59 (2.44—2.78); peduncle length 8.68 (8.00—9.32, SD = 0.37, SE = 0.10); head length 3.44 (3.23—3.76); body depth 3.89 (3.37—4.14); peduncle depth 8.61 (8.00—9.18); body width at pectoral fins 7.41 (6.31—8.17). In the length of the head, preopercle length 1.36 (1.31—1.40); snout length 2.33 (2.22—2.40); head depth 1.46 (1.23—1.59, SD = 0.11, SE = 0.03); preopercle depth 1.86 (1.65—1.95, SD = 0.09, SE = 0.02); snout depth 2.96 (2.50—3.14, SD = 0.18, SE = 0.05); eye diameter 4.56 (4.25—5.11); bony interorbital 3.20 (2.95—3.33, SD = 0.11, SE = 0.03). Preopercle depth in preopercle length 1.37 (1.21—1.44, SD = 0.07,

SE = 0.02); snout length in preopercle depth 1.26 (1.19—1.41, SD = 0.07, SE = 0.02); peduncle depth in peduncle length 0.99 (0.89—1.12, SD = 0.07, SE = 0.02).

Premaxilla with four orange-brown or red-brown incisiform teeth, the outermost (most lateral) tricuspid with the central cusp longest, the other three teeth bicuspid. The innermost (most medial) tooth has cusps of approximately equal size, while the outer (more lateral) cusp is somewhat larger than the inner one in the middle two teeth. In specimens of less than about 65 mm SL, these two middle teeth may be tricuspid. Each dentary bears four similar incisiform teeth. The two innermost (medial) are largest, and are truncate. The outer teeth are tricuspid, with the middle cusp the largest. In small specimens (less than about 60 mm SL) the outer of the two truncate teeth may be bi- or even tri-cuspid. The teeth of the upper jaw project almost directly anteriorly, and form a flattened, curved, cutting edge.

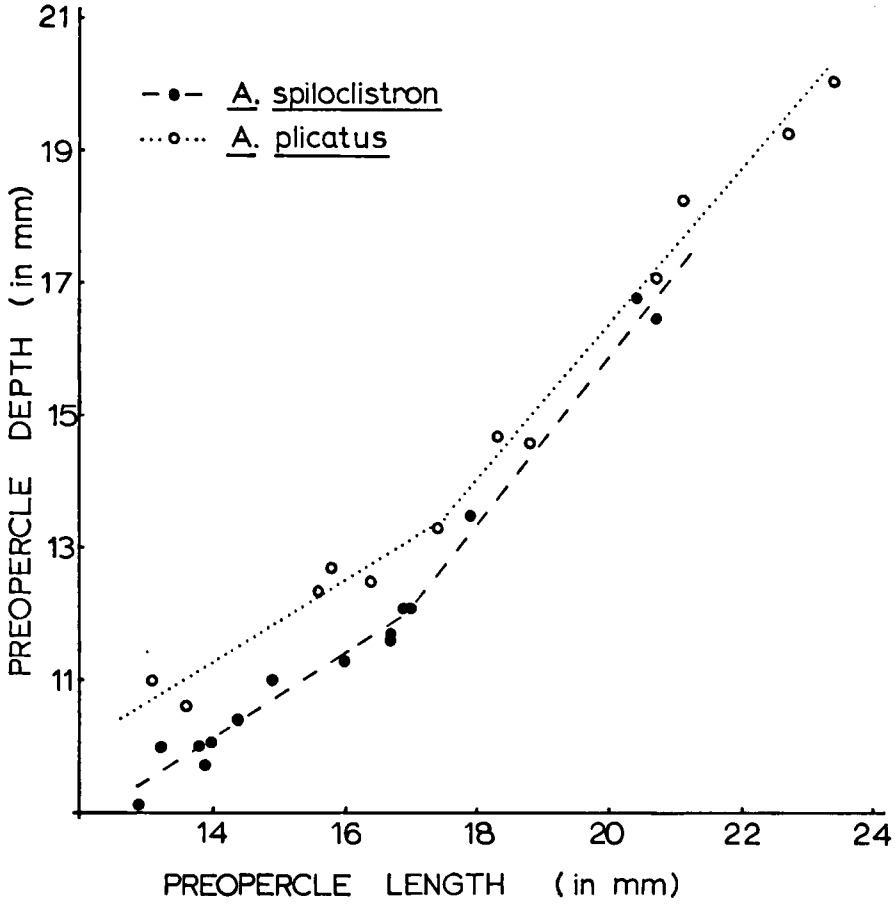

FIG. 3. Plot of preopercle depth (ordinate) against preopercle length (abscissa), both in mm. Solid circles = *A. spiloclistron*, open circles = *A. plicatus*.

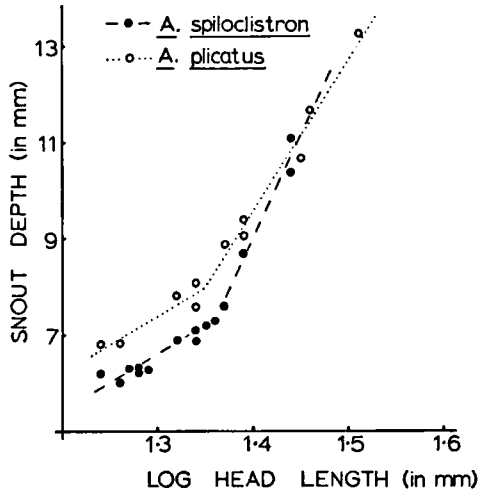

FIG. 4. Plot of snout depth (ordinate) against (normal) log of the head length, both in mm. Solid circles = *A. spiloclistron*, open circles = *A. plicatus*.

Those of the lower jaw lie along a more rounded curve, and meet the medial faces of the upper jaw teeth at an angle of about 90—100 degrees.

The number of olfactory lamellae increases with standard length, being about 30—32 at 60 mm SL, and reaching 40—42 in specimens over 100 mm SL. There are about 20 very poorly developed gill rakers along the lateral edge of ceratobranchial one and four spathiform branchiostegal rays in the cleared and stained specimen. Vertebrae 38—39 (mean 38.6, SD = 0.49, SE = 0.13). Scales (fig. 5 a, b; from below dorsal fin origin one row above lateral line) with at least four radii, which increase irregularly in number with size up to eight or more, central region of scales with reticulations.

Dorsal fin of iii10 or iv9 (iii9 in two individuals), the first ray being extremely small and often buried beneath the skin. The last ray is unusual in that it is split through its base; the anterior half is branched, but the posterior half remains single. Principal caudal rays 10 upper and 9 lower (one specimen 10/10), including the single unbranched ray forming the dorsal and ventral margins of the fin. Anal fin iii8—iv8, the last ray split to its base as in the dorsal fin; pelvic fins i8/i8; pectorals with the last few rays much reduced, usually i15—i16.

Lateral line scales usually 41 (40 and 42 in three instances each), 5½ dorsal scale rows and 4½ ventral scale rows (all counts on left and right sides). Predorsal scales somewhat irregular, 12—14; median scales between the posterior base of the dorsal fin and the adipose fin irregular, 11—14; median scales between the posterior base of the adipose fin and the caudal fin rays 6—8. Median ventral scales between the isthmus and the pelvic fin 15—17; between the posterior base of the pelvic fin and the anus 11—12

(once 10, when scale row was irregular); between posterior base of anal fin and caudal fin rays 6—7. Circumpedicular scales 16.

The colour pattern in alcohol is a complex of spots or blotches, bars (vertical pigmented areas not crossing the midline) and bands (vertical pigmented areas continuous across the midline). A large blotch is usually present on the medial face of the opercle, and a small spot is (apparently) always present just above the anterodorsal tip of that bone. The four mid-lateral spots (or blotches) are well developed, and usually of an intense black colour. Although there is some variation, the first spot usually covers lateral line scales 3—5, the second 13—18, the third 26—30 and the fourth 36—40. Vertically, they cover the scale row below the lateral line and, except for the first spot, the row above as well. The bar/band system quite variable. Bars are situated (varying in position by one to two scales anteriorly or posteriorly of the given position)above lateral line scales 1, 3, 14, 18, 28, and sometimes 36. Bands cross the lateral line at scales 9, 22, and 33. Pigmented areas that may form either bars or bands lie above (bars) or cross (bands) the lateral line at scales 6, 11, and 25. Bars generally have ventral counterparts below the same lateral line scale, but this is not always the case (see dorsal and ventral pattern of bars between the two bands separating spot three in fig. 1, where there are two dorsal bars and three ventral ones). There are also various and variable markings below and anterior to the pectoral fins. The ventral midline anterior to the anus is pale, and not crossed by any bars/bands (fig. 6B). The ground colour is light yellowish-brown which becomes darker dorsally (particularly on the head); the plicae

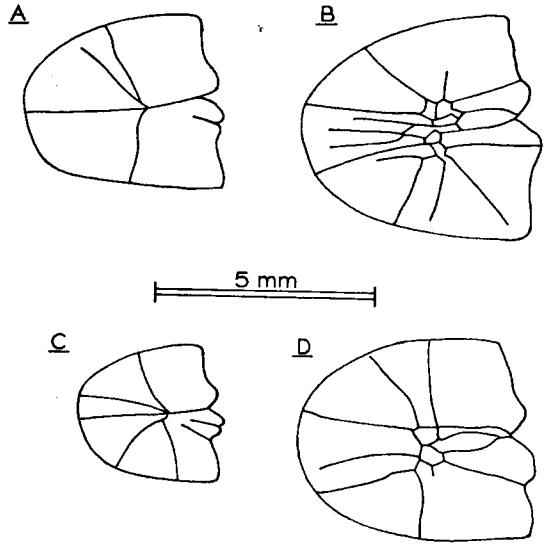

FIG. 5. Right lateral view of scales taken from below the dorsal fin origin, one row above the lateral line (anterior to the right). A: *A. spiloclistron*, ZMA 105.777, 78.6 mm SL. B: *A. spiloclistron*, ZMA 105.777, 99.7 mm SL. C: *A. plicatus*, FMNH 53395, 59 mm SL. D: *A. plicatus*, AMNH 17602, 89.3 mm SL.

FIG. 6. A: Left lateral view of *A. spiloclistron*, ZMA 105.776, 62.9 mm SL, showing the criss-cross, mesh-like colour pattern. B: Ventral view of the anterior region of *A. spiloclistron*, ZMA 105.776, 63.1 mm SL, showing the hiatus between the left and right bars/bands pattern at the midline. Note that the bars behind the pelvic fins alternate on left and right sides of the body.

of the lips are black. The bars/bands are almost always 1½—2 scale rows wide, and may be rather faint below the lateral line in some specimens. Lighter individuals may show a diagonal, criss-crossing, mesh-like pattern, in which the pigment lies in the middle or more posterior parts of the vertical scale rows (fig. 6A).

Etymology: The name *spiloclistron* is derived from the Greek *spilos*, m., a spot, and *clistron*, n., a bar, (to be treated as a noun in apposition), in allusion to the striking colour pattern of spots and bars (or bands) of the species.

Anostomus plicatus Eigenmann, 1912 (figures 2—5, 7)
Fold-lip anostomus

This species is known only from the Essequibo river system of Guyana, ranging from Bartica (near the mouth of the Essequibo*)) to the headwaters of the Essequibo and Rupununi rivers.

*) The statement by Myers (1950: 192) that *A. plicatus* occurs only in the highlands or high altitudes of Guyana would appear to be an error, for Eigenmann (1912: 296) lists two co-types of *A. plicatus* from Bartica, at the mouth of the Essequibo river near its junction with the Mazaruni and Cuyuni rivers.

FIG. 7. Left lateral view of *A. plicatus*, AMNH 17605, 110.9 mm SL.

Proportional measurements as follows: in standard length, lower jaw to anal fin origin 1.21 (1.17—1.23); lower jaw to adipose fin origin 1.14 (1.12—1.16); lower jaw to dorsal fin origin 1.90 (1.80—2.01); lower jaw to pelvic fin origin 1.77 (1.66—1.85); dorsal fin origin to base of caudal fin 1.96 (1.88—2.08); dorsal fin origin to adipose fin origin 2.68 (2.45—2.83); peduncle length 7.31 (6.38—7.97, SD = 0.49, SE = 0.14); head length 3.41 (3.28—3.67); body depth 3.70 (3.20—3.97); peduncle depth 8.48 (8.12—8.96); body width at pectoral fin 7.88 (7.08—8.86). In the head length, preopercle length 1.35 (1.31—1.39); snout length 2.28 (2.13—2.34); head depth 1.31 (1.22—1.48, SD = 0.05, SE = 0.02); preopercle depth 1.67 (1.56—1.77, SD = 0.07, SE = 0.02); snout depth 2.64 (2.43—2.91, SD = 0.13, SE = 0.04); eye diameter 4.43 (3.93—4.89); bony interorbital 3.06 (2.81—3.41, SD = 0.20, SE = 0.06). Preopercle depth in preopercle length 1.23 (1.15—1.31, SD = 0.06, SE = 0.02); snout length in preopercle depth 1.37 (1.26—1.50, SD = 0.08, SE = 0.03); peduncle depth in peduncle length 1.16 (1.02—1.32, SD = 0.08, SE = 0.03).

Lateral line scales 38—39*); 5—5½ dorsal scale rows; 4½—5 ventral scale rows. Predorsal scales 11—13; median scales between the posterior base of dorsal fin and adipose fin origin irregular, 10—12; median scales between isthmus and pelvic fin 15—18; between posterior base of pelvic fin and anus 7—10; between posterior base of anal fin and caudal fin rays 5—7. Circumpedicular scales 16.

Gill rakers absent on cleared and stained specimen (AMNH 17602), four spathiform branchiostegal rays, 36.6 vertebrae (36—37, SD = 0.48, SE = 0.15). Scales similar to those of *A. spiloclistron* (fig. 5, B, C).

The colour pattern is basically the same as that of *A. spiloclistron* (fig. 7).

*) Eigenmann, in the type description of *A. plicatus* (1912: 297) records 39—40 lateral line scales, a number he presumably reached by the addition of the first (pored) scale from the scale row immediately above the lateral line series. All specimens I have seen (including seven paratypes) have 38—39 lateral line scales.

The bars/bands are less than one scale row wide and more variable in number (up to 14 in larger specimens). The spots extend vertically for a single scale row, thus appearing more elongate. Although fading of the specimens may have occured, the agreement between some of the paratypes and the figure of the type (Eigenmann, 1912, Pl. XLI, fig. 3) is still good. There does not appear to be a spot above the anterodorsal margin of the opercle (either in the specimens or the figure). The longitudinal lines between the scale rows referred to by Myers (1950: 192) are faint in the figure of the type, but are no longer visible on any specimens I have seen, nor are they specifically mentioned in the original description. However, the iridescent spots described by Eigenmann imply that the areas separating the spots are dark (to provide the contrast), and these dark borders would lie between the

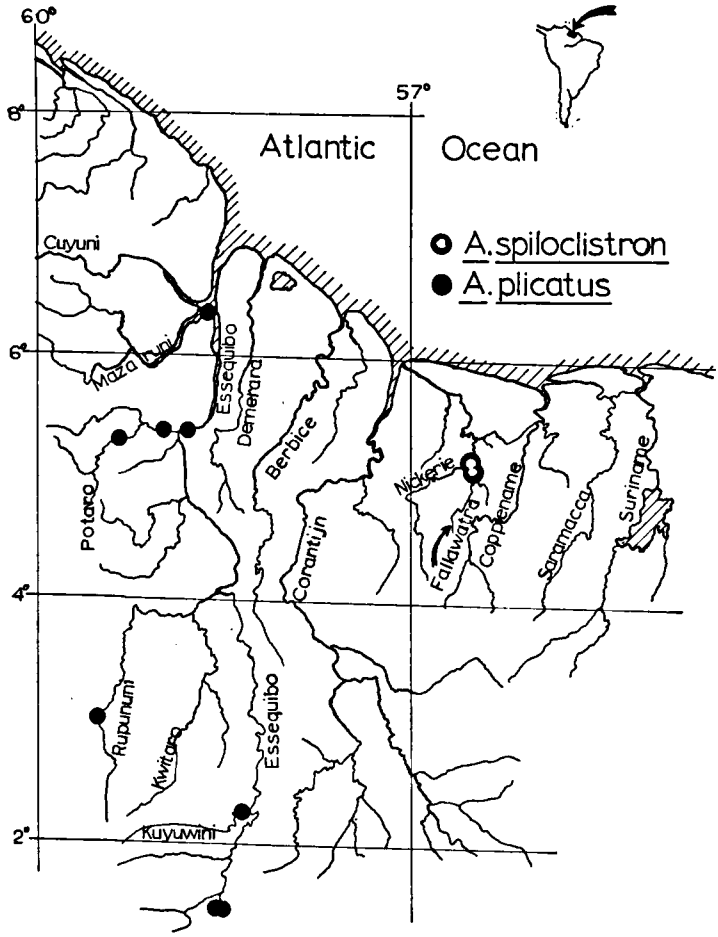

FIG. 8. Distribution map for *A. spiloclistron* (open circles) and *A. plicatus* (solid circles). Inset shows region of enlargement.

scale rows. This could give the appearance of faint lines, although the lines would, of necessity, be both longitudinal and transverse. The disposition of the lateral blotches in the figure given by Eigenmann does not correspond exactly to the description of them in the text, possibly because the type is figured with 41 lateral line scales (i.e. 42 in Eigenmann's count).

Material examined: AMNH 17602, 2, Guyana, Essequibo river system, Kuyuni (= Kuyuwini) river, half way between landing and the mouth; coll. Terry-Holden Expedition, 2 Dec., 1937. AMNH 17605, 2, Guyana, Essequibo river system, upper Essequibo at Onora (on Unorowo river), 1°35'N by 58°30'W, above cataract; coll. R. Snedeger, Terry-Holden Expedition, 28 Dec., 1937. AMNH 17610, 1, Guyana, Essequibo river system, upper Essequibo at Onora (on Unorowo river), above big falls, 1°35'N by 58°35'W; coll. R. Snedeger, Terry-Holden Expedition, 2 Dec., 1937. AMNH 17646, 1, Guyana, Essequibo river system, Rupununi river at Wichaba, coll. R. Snedeger, Terry-Holden Expedition, 12 Mar., 1938. CAS 27647, 1 (paratype), Guyana, Essequibo river system at Crab Falls; coll. C. H. Eigenmann, 1908. CAS 27648, 1, (paratype), Guyana, Essequibo river system at Bartica; coll. C. H. Eigenmann, 1908. CAS 27649, 1 (paratype), Guyana, Essequibo river system, Potaro river at Amatuk; coll. C. H. Eigenmann, 1908. CAS 27650, 1 (paratype), Guyana, Essequibo river system, Potaro river at Tumatumari; coll. C. H. Eigenmann, 1908. FMNH 53394, 1 (paratype), Guyana, Essequibo river system at Bartica; coll. R. E. Shideler, 1908. FMNH 53395, 1 (paratype), Guyana, Essequibo river system, Potaro river at Amatuk; coll. C. H. Eigenmann, 1908. FMNH 53396, 1 (paratype), Guyana, Essequibo river system, Potaro river at Tumatumari; coll. C. H. Eigenmann, 1908.

Discussion: Although the two species considered here appear to be well differentiated, there is always the possibility that the river systems draining the intervening 100—200 miles between the Essequibo and Nickerie rivers (fig. 8) may contain intermediate forms. Few collections have been made in the Berbice and Corantijn systems, although the Demerara river has been sampled as far south as Malali. The only species of *Anostomus* recorded from any of these three river systems as far as I am aware is the ubiquitous *A. anostomus*. Geographical variation in the species of *Anostomus* is not marked (apart from *A. trimaculatus*, where studies in progress indicate that more than one species may be involved), in spite of the wide range of some of the species. In view of this, and the diverse differences (meristics, morphometrics, and colour pattern), I consider it highly unlikely that populations intermediate between *A. plicatus* and *A. spiloclistron* will be found in the Demerara, Berbice, or Corantijn rivers. Both species appear to be restricted to a single river system. Nijssen's extensive collections in the Surinam rivers to the east of the Nickerie have failed to produce additional specimens of either *A. plicatus* or *A. spiloclistron*. *A. plicatus* has been collected together with other species of the genus (e.g. with *A. anostomus* and *A. trimaculatus* at Crab Falls, lower Essequibo river, by Eigenmann, 1912: 79). In Surinam, numerous specimens of *A. anostomus* were obtained by Nijssen in rivers east of the Nickerie, but only *A. spiloclistron* was collected in the Nickerie itself.

In the graphs, certain body proportions show inflection (figs. 3, 4), while others do not (fig. 2). The inflection possibly marks the onset of sexual maturity. Calculations from the positions of the inflections indicate that both

species mature (if this is indeed the cause of the inflection) at about 75—80 mm SL. A specimen of *A. spiloclistron* (ZMA 105.777, 4) of 82.5 mm SL proved to be a mature female with ova of 1.0—1.5 mm diameter, while a specimen 64.5 mm SL (ZMA 105.776, 5) was immature. The graphs also indicate that there are greater morphometric differences between the species while they are immature for proportions showing inflections.

As in most of the species of *Anostomus* investigated to date, the gut contents consist of large amounts of unidentifiable organic matter, a few bits of aquatic vascular plant leaf, some chitonous insect remains and those of their larvae, and fine to coarse sand grains. It seems probably that, as suggested by Myers (in Myers & de Carvalho, 1959: 152), members of *Anostomus* are algae eaters (although the presence, in one specimen of *A. anostomus*, of innumerable beetle remains indicates that they may become omnivorous under certain conditions).

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