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DACTYLOSCOPUS AMNIS, A NEW SAND STARGAZER FROM
RIVERS OF THE PACIFIC SLOPE OF SOUTHERN MEXICO

BY ROBERT RUSH MILLER AND JOHN C. BRIGGS

THE members of the family Dactyloscopidae are small, elongate fishes that inhabit sandy shores and estuaries of tropical America. The eyes are superior or supralateral in position, often well stalked, and placed far forward on the broad, smooth head. The mouth is terminal and oblique to nearly vertical, the lower jaw prominent, and both lips often support a fringe of fleshy papillae. The large operculum overlaps the bases of the pelvic fins below, has a wide membranous margin, and possesses fimbriae along its posterodorsal border. The gill membranes are free from the isthmus and are separate from each other or are narrowly united far forward. The long dorsal fin is continuous or divided and possesses flexible spines anteriorly. The undivided anal fin is a little shorter than the dorsal, has two spines anteriorly, and its first two soft rays and underlying supports exhibit sexual dimorphism (Fig. 3). The well-developed pectoral fins are capable of rapid movement by the action of powerful muscles. The pelvics are jugular, with a minute spine and three soft rays. The truncate caudal fin has 10 segmented rays.

The species described below appears to be restricted to the lower reaches of large, sandy rivers, occurring in strictly fresh to brackish water. Its closest relatives are those species that have been classified in a genus, *Cokeridia*, which we regard as a synonym of *Dactyloscopus* for reasons given below.

Dactyloscopus amnis, new species

(Figs. 1-3)

DIAGNOSIS.—A species of *Dactyloscopus* characterized by the following combination of characters: Dorsal fin with 2 to 4 free, and 9 to 11 connected, spines, followed by 24 or 25 soft rays; lateral-line scales

44 to 46, the anterior, horizontal segment of the lateral line including 11 to 13 scales; transverse scales 11 or 12, rarely 10 or 13; opercular fimbriae, 10 to 16; papillae on upper lip, 12 to 16, and on lower lip, 16 to 20. Color pattern consisting of about 10 to 12 dark, irregular saddles across the back, generally not extending downward on the side below the level of the first scale row ventral to the anterior segment of the lateral line; an additional 1 or 2 saddles on top of the head. Saddles on back narrower than the light interspaces (Fig. 2). An irregular, horizontal row of dark pigment, sometimes obsolescent, at the level of the posterior part of the lateral line, and a similar development about 4 scale rows below. Eyes scarcely stalked.

DESCRIPTION.—Eyes small, superior in position, weakly stalked. Anterior nostrils tubular. Mouth nearly vertical. Teeth in jaws small, biserial, conical; no teeth on palate. Tongue free anteriorly, its tip broadly rounded. Premaxillaries protractile. Rear margin of maxillary lies just below posterior margin of orbit in large adults, below middle of pupils in juveniles. Lower jaw strongly projecting. Both upper and lower lips with fringes of elongate, fleshy papillae numbering as follows: upper lip, 12(2), 13(6), 14(4), 15 (2), 16 (1); lower lip, 16 (3), 17(3), 18(7), 19(1), 20 (1). Opercles with radiating striations throughout, the dorsal ones ending in slender, finger-like fimbriae that vary in number as follows: 10(1), 11(8), 12(12), 13 (5), 14 (2), 15 (1), 16 (1). Branchiostegals 6 on each side of 2 specimens (evidently true throughout the family). Pseudobranchiae present. No gill rakers.

Scales cycloid, thin, rather large; anteriorly, present on side of body only, but occurring on back and along ventral surface posteriorly; absent from head, nape, and abdomen. Total number of scales in lateral line 44(1), 45(11), 46(3), the anterior, arched segment containing 11 to 13 scales and extending posteriorly to the ninth to eleventh dorsal spine, where the lateral line descends abruptly to continue posteriorly along the midside (Fig. 1). Transverse scale rows (maximum count near anterior end of lower segment of lateral line) 10(1), 11(2), 12(9), 13(1), the count too uncertain to record in 2 specimens. Lateral line deflected downward at its tip on the last lateral-line scale. Fin bases scaleless except caudal, which has a sheath of scales one scale-row in extent.

Dorsal and anal fins both long, the dorsal comprising 2 to 4 isolated, or semi-isolated, flexible spines anteriorly, followed by 9 to 11 connected spines and 24 or 25 articulated rays, as follows: II(3), III(8), IV(4); IX(1), X(11), XI(3); 24 (4), 25 (11). The first dorsal spine

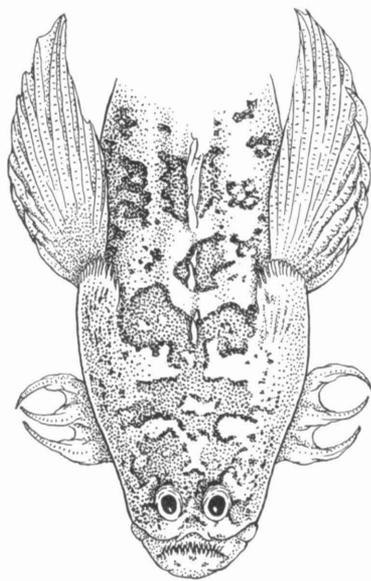
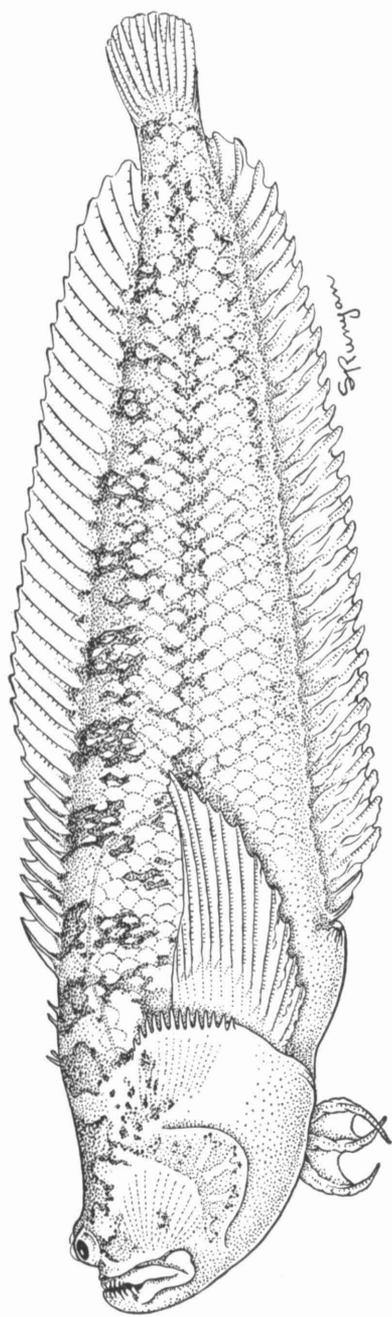


FIG. 1. Lateral view and dorsal view of anterior part of the holotype of *Dactyloscopus amnis*, UMMZ 179550, a mature female 79.6 mm. in standard length.

begins just in advance of or directly over the upper angle of the gill opening; it and the other free spines, often unequally spaced, were probably all deeply incised, but the membranes have since become torn. The membranes of the 9 to 11 connected spines are moderately incised, those of the soft rays weakly if at all. Origin of anal fin below about the third continuous dorsal spine, its first two elements comprising short, flexible spines, followed by articulated rays varying in number as follows: 29(1), 30(14). Last ray of dorsal and anal fins held to body by membrane. Caudal fin truncate, consisting of 10 segmented rays, of which the uppermost and lowermost 2 are unbranched in the adult female and male (holotype and allotype). Pectoral fins well developed, pointed, sexually dimorphic—extending (when pressed against the body) posteriorly to below the base of the first soft ray in the adult female (Fig. 1) but to the base of the fifth soft ray in the adult male (Table 1). Pectoral rays 13 on each side in all specimens, none of the rays branched. Insertion of pelvics below preopercle, the 3 soft rays of each fin preceded by a single, small, embedded spine.

Body deepest at or near origin of continuous dorsal fin. Anteriorly, top of head concave. Head much broader posteriorly than anteriorly (Figs. 1–2). Measurements, presented in Table 1, were taken as follows: head length, to the fleshy angle of the opercle just below the fimbriae; head width, at the opercles; head depth, at the pelvic insertion; preanal length, from the posterior edge of the pelvis to the anal fin origin; orbit diameter, longitudinal diameter of the pigmented orbit; snout length, from the anterior edge of the orbit to the anterior edge of the upper lip; pectoral length, from the upper axis to the tip of the fin; pelvic length, the length of the third ray (difficult to take); caudal length, from hypural plate to fin tip; snout to anterior angle of preopercle, from the origin of the preopercular margin to the tip of the upper lip.

The number of vertebrae, including the hypural complex, varies as follows: 42(1), 43(13), of which 11 or 12 are precaudal; the anterior precaudal vertebrae are much compressed, increasing in length to about the eighth; in the posterior half of the vertebral column, the vertebrae gradually become spindle shaped.

The coloration of the species of *Dactyloscopus*, and probably of sand stargazers in general, comprises dark markings on a light background, with the more conspicuous pattern confined to the back and upper sides. The coloration of *D. amnis* is well portrayed in Figures 1 and 2, and comprises (in alcohol) brown markings on a light tan

TABLE 1

MEASUREMENTS OF *Dactyloscopus amnis*. PROPORTIONS ARE EXPRESSED IN THOUSANDTHS OF THE STANDARD LENGTH; SEE TEXT FOR METHODS OF MEASURING. SPECIMEN 1 IS UMMZ 178500 AND 2 IS UMMZ 179958. SPECIMENS 3-13, ALL FROM RÍO BALSAS, ARE IN VARIOUS MUSEUMS (SEE TEXT).

| Measurement | UMMZ 179550 Holotype ♀ | UMMZ 179957 Allotype ♂ | Specimen Number | | | | | | | | | | | | |
|--------------------------------------------------|---------------------------|---------------------------|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Standard length (mm.) . | 79.6 | 79.2 | 30.4 | 42.7 | 35.2 | 35.0 | 31.2 | 30.4 | 29.0 | 28.8 | 28.5 | 25.3 | 23.5 | 23.3 | 19.4 |
| Head length | 264 | 268 | 270 | 267 | 276 | 277 | 282 | 266 | 283 | 274 | 277 | 289 | 289 | 288 | 294 |
| Head width | 188 | 186 | 161 | 157 | 168 | 171 | 167 | 164 | 176 | 146 | 172 | 158 | 166 | 163 | 170 |
| Head depth | 182 | 187 | 181 | 173 | 185 | 177 | 183 | 178 | 190 | 188 | 182 | 186 | 191 | 189 | 201 |
| Body, greatest depth . . . | 226 | 205 | 191 | 207 | 207 | 204 | 194 | 197 | 226 | 191 | 209 | 190 | 200 | 197 | 196 |
| Predorsal length | 165 | 181 | 204 | 187 | 202 | 189 | 202 | 197 | 210 | 208 | 207 | 209 | 217 | 223 | 237 |
| Preanal length | 180 | 143 | 171 | 157 | 159 | 160 | 151 | 151 | 186 | 160 | 175 | 158 | 162 | 167 | 165 |
| Caudal peduncle, depth . . | 52 | 52 | 53 | 52 | 57 | 57 | 54 | 56 | 48 | 45 | 53 | 51 | 60 | 56 | 62 |
| Orbit length | 18 | 19 | 33 | 23 | 28 | 31 | 32 | 33 | 34 | 35 | 32 | 32 | 43 | 39 | 36 |
| Snout length | 25 | 34 | 43 | 33 | 37 | 40 | 35 | 39 | 45 | 38 | 39 | 40 | 34 | 39 | 41 |
| Interorbital width | 25 | 29 | 33 | 30 | 28 | 29 | 26 | 26 | 34 | 35 | 35 | 32 | 30 | 30 | 31 |
| Upper jaw, length | 85 | 90 | 99 | 91 | 94 | 97 | 99 | 92 | 100 | 97 | 98 | 103 | 98 | 107 | 108 |
| Snout to posterior preopercular angle | 182 | 182 | 194 | 183 | 188 | 186 | 192 | 191 | 200 | 188 | 186 | 202 | 195 | 206 | 216 |
| Snout to anterior preopercular angle | 112 | 112 | 128 | 115 | 118 | 123 | 115 | 118 | 126 | 120 | 119 | 123 | 123 | 120 | 129 |
| Anal fin, length | 639 | 674 | 632 | 642 | 656 | 649 | 663 | 645 | 634 | 632 | 614 | 648 | 638 | 648 | 624 |
| Pectoral fin, length | 201 | 258 | 211 | 178 | 190 | 206 | 205 | 204 | 214 | 208 | 186 | 202 | 204 | 215 | 211 |
| Pelvic fin, length | 146 | 158 | 132 | 131 | 125 | 131 | 138 | 138 | 145 | 132 | 140 | 134 | 145 | 155 | 144 |
| Caudal fin, length | 95 | 107 | 125 | 108 | 85 | 114 | 115 | 115 | 110 | 118 | 119 | 126 | 128 | 129 | 144 |

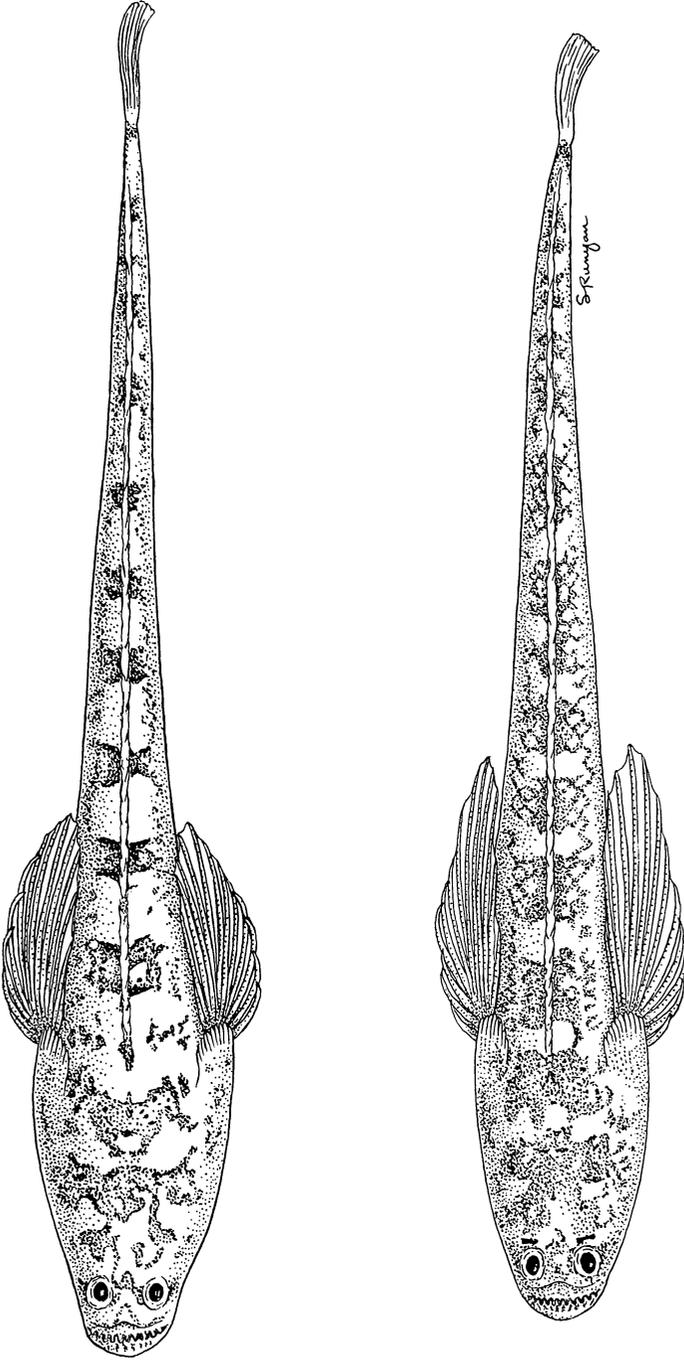


FIG. 2. Dorsal views of two species of *Dactyloscopus*. Above: *D. amnis*, paratype, 42.7 mm. long (UMMZ 179958); below: *D. crossotus*, a male 43.0 mm. long from Guatemala (USNM 114411).

background. The dark saddles across the back are narrower than the light interspaces.

DIMORPHISM.—There are several striking secondary sexual differences between the adult male and female of *D. amnis* (Fig. 3 and Table 1). In the male, the first two soft rays of the anal fin are thickened and directed forward, especially at or near their tips, and their two underlying supports are modified into broad, blade-like structures; the corresponding rays and supports of the anal fin of the female are unmodified. The male also possesses a small, genital papilla.

In body proportions, the male differs as follows: (1) the preanal length is significantly shorter at the 10 per cent level; (2) the anal fin is significantly shorter at the 5 per cent level; (3) the pectoral fin is significantly longer at the 0.1 per cent level; and (4) the pelvic fin is significantly longer at the 5 per cent level.

The sexual dimorphism in the anterior anal rays and their corresponding pterygiophores is probably characteristic of dactyloscopids in general, as suggested by Böhlke and Caldwell (1961: 539).

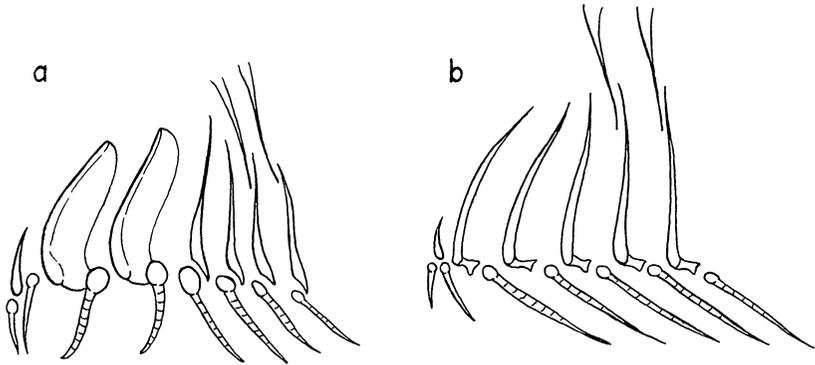


FIG. 3. Sexual dimorphism in the anterior anal fin rays and pterygiophores of *Dactyloscopus amnis*: a, mature male allotype (UMMZ 179957), 79.2 mm. long; b, the holotype, a mature female 79.6 mm. long. Drawn from radiographs by J. C. Briggs.

TYPES.—The holotype, UMMZ 179550 (Fig. 1), a mature female 79.6 mm. in standard length, was collected by Robert R. and Malcolm Miller in the Río Papagayo, at the road crossing at Chapultepec, about 25 miles SE of Acapulco, Guerrero, México, on March 23, 1957. The type locality is about 2 miles above the mouth of the river. The allotype, UMMZ 179957 (Fig. 3a), a mature male 79.2 mm. long, was collected with the holotype, as was a juvenile paratype (UMMZ 178500), 30.4 mm. long. Twelve other paratypes, all immature, were collected

at the mouth of the Río Balsas, Guerrero, by John C. Briggs and the crew of the "Marijean," on February 18, 1961; they have been dispersed as follows: UMMZ 179958, a juvenile 42.7 mm.; UBC 61-133, 7 juveniles 19.4-35.2 mm.; SU 60540, 2 juveniles 28.8 and 31.2 mm.; and USNM 197405, 2 juveniles 23.5 and 30.4 mm.

Abbreviations are: SU, Division of Systematic Biology, Stanford University; UBC, Institute of Fisheries, University of British Columbia; UMMZ, University of Michigan Museum of Zoology; and USNM, United States National Museum.

ETYMOLOGY.—The name *amnis*, used as the genitive of the Latin word *amnis*, meaning river, refers to the habitat of the new species in the lower courses of rivers and in river mouths.

GENERIC STATUS OF *Cokeridia*.—The nominal genus *Cokeridia*, with the type species *C. crossota*, was proposed by Meek and Hildebrand (1928: 902, 905, pl. 89) on the basis of a unique specimen from Chame Point, Panamá. In their key to the genera of Dactyloscopidae from Panamá, these authors separated *Cokeridia* by its divided dorsal fin, "the first dorsal consisting of 4 free spines, free or connected by membrane." Under the description of the genus, no additional distinguishing features were given, and the following remark on relationships was made: "This genus bears some relationship to *Gillellus*, especially in the presence of a separate spinous dorsal fin."

The many basic resemblances between the species of dactyloscopids currently assigned to *Dactyloscopus* and those placed in *Cokeridia* convince us that the occurrence of some species with free dorsal spines in advance of the continuous dorsal fin does not justify their placement in a separate genus. Similarities in body form, coloration, squamation, and in the rather elaborate lateral-line system on the head, indicate that these species represent a single phyletic line separate from that containing *Gillellus* and *Dactylagnus*, among other genera. We, therefore, synonymize *Cokeridia* Meek and Hildebrand with *Dactyloscopus* Gill.

COMPARISONS.—*Dactyloscopus amnis* is clearly related to what may be called the *crossotus* species group. As currently understood, this includes the following, arranged in chronological order: *D. crossotus* (Meek and Hildebrand), described from Panamá but now known also from the Pacific Coast of Guatemala (see below); *D. fimbriatus* (Reid, 1935), from Ecuador; *D. lacteus* (Myers and Wade, 1946), from South Seymour Island, Galápagos; and *D. kathetostomus* (Carvalho, 1957), from São Sebastião Island, São Paulo State, Brazil.

Dactyloscopus amnis is readily separable from *D. fimbriatus* by its larger scales and fewer soft rays in the dorsal and anal fins. It is distinguished from *D. lacteus* by the smaller lateral-line scales (42 or 43 in *lacteus*), more transverse scale rows (fewer than 10 in *lacteus*), shorter head, and in the weakly (rather than strongly) stalked eyes (the figure given by Myers and Wade is inaccurate in several respects). From *D. kathetostomus*, the new species differs in having fewer dorsal and anal soft rays (29 and 35, respectively, in *kathetostomus*), a longer anterior segment to the lateral line, more weakly stalked eyes, and a much shorter distance between the tip of the snout and the posterior angle of the preopercle.

Dactyloscopus amnis is closest to *D. crossotus*, also a Pacific-slope species that inhabits salt and brackish waters in Panamá and Guatemala. The most apparent difference between these two is in coloration (Fig. 2); the dark saddles across the back of *amnis* are more pronounced but are narrower than are the light interspaces, whereas the reverse is true in *crossotus*. Also, there is no trace of the bar or blotch of black pigment just behind the eyes that was observed on 8 specimens of *crossotus* (38.6 to 64.6 mm. long) from Guatemala (Fig. 2). The number of transverse scale rows is usually 11 or 12 in *amnis*, and 9 or 10 in *crossotus*, and the opercular fimbriae average more numerous in *crossotus* (12–16, 14 or more in 14 of 17 counts). The observations on *D. crossotus* are based on the holotype (USNM 81784) and on 8 juvenile to adult specimens (USNM 114411) from the United Fruit Company canal about 40 km. south of Tiquisate, Guatemala, collected by R. R. Miller and A. D. Holloway on March 23, 1947.

DISTRIBUTION.—The new species is known thus far only from the Río Papagayo and the Río Balsas in Guerrero, México. It should be sought in or near the mouths of other large rivers along the southern Pacific Coast of México.

HABITAT AND ASSOCIATES.—At the road crossing between Acapulco and San Marcos, about 25 miles SE of Acapulco, Guerrero, the Río Papagayo—the largest river between the Río Balsas and the Río Verde (Oaxaca)—is partly damned by a concrete abutment over which water evidently pours during the wetter parts of the year. In the dry season almost all of the flow is funnelled through a narrow spillway at the western end of the crossing to form a swift and strong current. Some water escapes through the base of the concrete abutment and flows nearly parallel to the obstruction to form independent channels that reach the main river a short distance below. The water here was fresh

during two visits in March, 1957 and 1959, with green alga on rocks and at the stream margin. The bottom consisted mostly of sand but with scattered boulders and rocky riffles. Water temperature was 86° F, the air 82° F, on March 23, 1957, about 1 P.M., and was 84° F (both water and air) at 6 P.M. on March 10, 1959. The river is unprotected from the sun and as much as 300 feet wide shortly below the "dam." Capture of the adult male and female (holotype) and of one juvenile was made with a 15-foot $\frac{1}{4}$ -inch mesh seine and a 25-foot bag seine.

Dactyloscopus was obtained only in clear water not deeper than 1½ feet, with slight current over sandy bottom, and near boulders—under which the fish took refuge when alarmed. They moved from boulder to boulder with extraordinary speed.

At the mouth of the Río Balsas, Guerrero, where the 12 smaller specimens were collected, the current moved swiftly over a steep, sandy bottom. A 25-foot $\frac{1}{4}$ -inch mesh seine was used, but its operation was made awkward by the strength of the current and the insecure footing along the sloping bottom. *Dactyloscopus amnis* was the only species taken at this station.

Associated with *D. amnis* in the Río Papagayo were 20 species belonging to 13 families as follows: *Astyanax*, *Poecilia mexicana*, *P. sphenops* (rare), *Poeciliopsis* (scarce), *Lutjanus*, *Mugil curema*, *Agonostomus*, *Eucinostomus gracilis*, *Caranx marginatus*, *Pomadasys* (reported), *Cichlasoma cajali*, *Pseudophallus*, *Gobiomorus maculatus*, *G. polylepis* (see Miller, 1959), *Eleotris*, *Awaous*, *Gobionellus microdon*, *Sicydium*, *Citharichthys*, and *Trinectes*.

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California; he also gave us the benefit of his general knowledge of dactyloscopids. Permission to collect fishes in México was kindly arranged by the authorities of that republic.

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