TWO NEW SPECIES OF CATFISHES OF THE GENERA *NANNORHAMDIA* AND *IMPARALES* (FAMILY PIMELODIDAE) FROM CENTRAL AMERICA

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ABSTRACT: Two new species of pimelodid catfishes, *Nannorhamdia lineata* and *Imparales panamensis*, are described from Costa Rica and Panama respectively. *Nannorhamdia* is recorded for the first time in Central America and each species represents a relict population. The relationships are discussed and habitats described for each species.

Recent collections by Horace Loftin (1965) in Panama and by Albert Greenberg in Costa Rica have revealed two undescribed species of small pimelodid catfishes of the genera *Nannorhamdia* and *Imparales*. The former was previously known only from South America, whereas Miller (1966) included *Imparales* sp. in his checklist of Central American fishes. In 1967 Oscar Blanco B. and I obtained additional specimens of the Costa Rican *Nannorhamdia*. More specimens of *Imparales* were collected in 1967 in the Chucunaque and Balsas drainages of Panama by members of the Battelle Memorial Institute, Pacific Northwest Laboratory (Battelle NW) as part of their sub-contractual work for the Interoceanic Sea Level Canal Feasibility Study. Material from all these sources was used in this study.

Nannorhamdia lineata, new species

Figure 1

Holotype: LACM 30688-1 (♀, 74.1 mm SL)), Costa Rica: Puntarenas Prov., Quebrada 36 (elev. 80 m) 12 km W of Pueblo Río Claro at Interamerican Highway; 5 January 1967; collectors W. Bussing, Oscar Blanco B.

Paratypes: UCR 111-10 (18, 48.5-71.7 mm SL), same data as holotype; LACM 30688-2 (3, 51.8-69.9 mm SL), same data as holotype; BMNH 1967.9.29.1-2 (2, 64.0-68.2 mm SL), same data as holotype; USNM 204694 (2, 58.4 and 69.5 mm SL), same data as holotype; USNM 194230 (1, 57.0 mm SL) Costa Rica: Puntarenas Prov., Río Salamá Nuevo (?) at Interamerican Highway; 21 January 1963; collector Albert Greenberg.

Type specimens are deposited in the British Museum (Natural History) (BMNH), Los Angeles County Museum of Natural History (LACM), Museo de Zoología, Universidad de Costa Rica (UCR) and the United States National Museum (USNM).

Comparative Material: *Nannorhamdia nemacheir* (Eigenmann and

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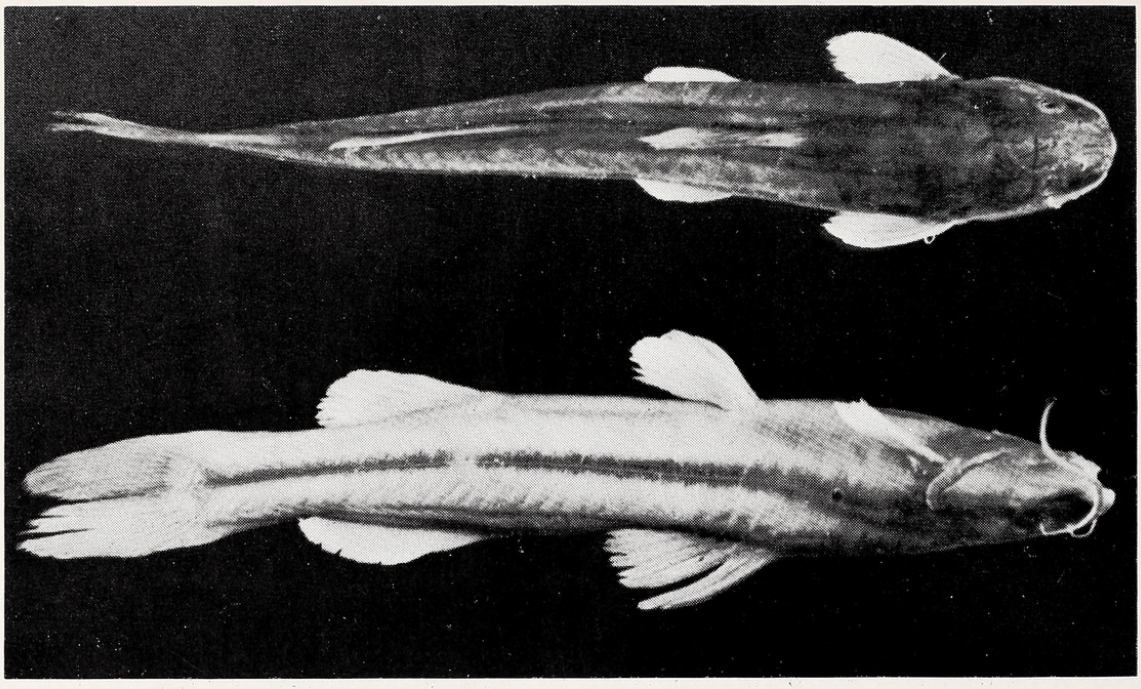

Figure 1. *Nannorhamdia lineata*, new species, lateral view of holotype LACM 30688-1, 74.1 mm SL; dorsal view of paratype UCR 111-10, 71.1 mm SL.

Fisher), USNM 121167 (30, 33.8-68.5 mm SL), Venezuela: Río San Juan at bridge, tributary to Río Motatán; 17 and 20 March 1942; collector L. P. Schultz. UCR 318-1 (6, 30.3-55.1 mm SL), Colombia: Río Salado, ca. ¼ mile upstream from junction with Río Truandó; 27 August 1967; collector H. Loftin. *Cetopsorhamdia nasus* (Eigenmann and Fisher), USNM 86816 (1, 62.5 mm SL), Bolivia: Tumupasa; December 1921; collector N. E. Pearson.

Diagnosis: A *Nannorhamdia* with pronounced lateral stripe extending from the tip of snout to caudal base; short maxillary barbels not passing pectoral fin base; subequal caudal lobes; 8-11 total gill rakers; 7-9 principal (branched rays plus one simple ray) anal fin rays; no prominent dorsal blotches on body contrasting with ground color; all pectoral and dorsal fin elements unserrated.

The new species is immediately separated from *N. guttatus* Pearson, *N. benedettii* Fernández Yépez, *N. stictnotus* Fowler and *N. nemacheir* Eigenmann and Fisher by its lateral stripe and short maxillary barbels; from *N. guttatus* and *N. benedettii* it also differs in having fewer anal rays (7-9 vs. 10-12). From *N. macrocephala* Miles it differs in having fewer anal rays (7-9 vs. 13) and lacking dorsal and pectoral spines with denticulations on the posterior borders. It differs from *N. schubarti* Gomes principally in having fewer gill rakers (8-11 vs. 9-15), shorter maxillary barbels (22.4-26.8 vs. 32.1-55.5), shorter first dorsal ray (14.3-16.9 vs. 19.4-24.6) and shorter first pectoral ray (13.3-15.4 vs. 16.7-20.0).

The new species is closest to *N. spurrellii* of the Río San Juan drainage,

Colombia. The latter is distinguished from *N. lineata* by its narrower internarial distance, interorbital distance and caudal peduncle depth, much longer maxillary and mental barbels, higher gill raker count and much more prominent lateral stripe. Mr. Alwyne Wheeler (*personal communication*, 1968) reported that the type specimen of *N. spurrellii* is quite round-bodied and does not seem to have shrunk, thus discounting unnatural proportional differences due to preservation.

Description: Head slightly depressed, snout bluntly rounded. Narrow fontanel in middorsal line extending from before eyes to base of occipital process. Mouth subterminal, snout projecting. Villiform teeth in bands on both jaws; premaxillary patches slightly wider laterally, but without posteriorly projecting angles; dentary patches wider medially, very narrow laterally; no teeth on vomer or palatines. Nostrils wide apart, anterior ones tubular and in line with bases of maxillary barbels; posterior nostrils with an anterior flap and lying equidistant between anterior nostril and margin of eye. Maxillary barbels the longest, one pair lying in a groove along the snout and extending along the first third or half of the length of pectoral fin; two pairs of mental barbels, their bases in a straight line, outer pair reaching to or slightly beyond origin of pectoral fin; inner pair extending three-fourths the distance to pectoral origin. No ontogenetic variation in barbel length on specimens in the present size range.

Caudal fin well forked, shortest median rays slightly longer than half the length of the longest rays; upper lobe slightly longer and more pointed than lower. First dorsal ray soft, not extended into a filament, margin of fin truncate; origin slightly in advance of pelvic fin origin. Anal fin margin rounded; origin directly below adipose origin. Adipose fin short, slightly longer than anal; height about 4.5 times in length. Pelvic fins short, rounded; arising below third or fourth dorsal ray. First pectoral ray soft, not extended into a filament; appressed fin not quite reaching a vertical through dorsal origin. Anus between middle of length of pelvic fins.

Counts: The counts and body proportions in percent of standard length of the holotype and nine paratypes of *N. lineata* from Quebrada 36 are recorded below, followed by data for the type of *N. spurrellii* in parentheses. Data for the type specimen of *N. spurrellii* Regan (BMNH 1913.10.1.41; Río Condoto, San Juan drainage, Colombia) were kindly furnished by Alwyne C. Wheeler of the Zoology Department, British Museum of Natural History. Proportional measurements of the single specimen from Río Salamá Nuevo, Costa Rica, which in some cases fall slightly out of the range given below due to its shrunken condition, are not included.

Dorsal rays i,6; i,5-6 (i,6). Anal v,8; iv-v,6-8 (ii,6). Pectoral i,9; i,8-9 (i,9). Pelvic i,5; i,5 (i,5). Branched caudal rays 15, 15-16 (15). Gill rakers of holotype 2 + 7 and 1 + 8, total 9; paratypes 1-2 + 7-10, total 8-11 (*N. spurrellii* 2 + 10, total 12).

TABLE 1

Comparison of holotype and 16 paratypes of *Imparales panamensis* and holotype of *I. mariai*. Proportions expressed in thousandths of standard length.

	Imparales panamensis				*I. mariai*
	Holotype USNM 204692	Paratypes[1]	Paratypes[2] USNM 204693	Paratype USNM 204693	Holotype USNM 121251
Standard length (mm)	62.3	36.5-55.0	23.4-71.5	38.2	38.5
Head length	189	180-207	192-239	223	184
Head width	144	131-175	144-175	165	127
Snout length	67	64-71	65-94	84	65
Eye to posterior nostril	18	13-18	15-19	18	13
Internarial distance	35	38-41	31-43	45	26
Mouth width	71	58-82	66-98	84	—
Eye diameter	30	31-44	28-43	34	21
Interorbital, fleshy width	51	42-54	41-64	68	52
Postorbital length of head	104	89-109	100-124	118	104
Body depth	130	91-106	118-143	118	112
Caudal peduncle, least depth	80	71-88	80-88	92	78
Caudal peduncle, length	255	224-269	212-262	230	205
Predorsal distance	305	317-342	248-353	343	343
Preanal distance	639	648-679	614-693	652	652
Tip of snout to anus	413	426-498	411-491	455	440
Prepectoral distance	178	160-186	178-235	207	171

TABLE 1 (cont.)

Preadipose distance	637	625-689	610-674	644	623
Prepelvic distance	358	369-402	356-418	387	377
Anus to anal fin origin	223	216-239	192-223	196	226
First dorsal ray, length	143	116-162	138-179	152	127
First pectoral ray, length	130	132-148	122-171	133	104
Longest pelvic ray, length	144	133-162	112-171	157	132
Longest anal ray, length	116	122-135	107-136	141	99
Upper caudal lobe, length	342	260-358	256-322	285	338
Lower caudal lobe, length	209	179-211	184-243	215	221
Shortest caudal ray, length	128	122-151	127-153	147	114
Dorsal fin base, length	117	112-134	116-138	123	—
Anal fin base, length	136	116-147	127-159	141	—
Adipose fin, length	321	261-315	282-336	314	356
Adipose fin, height	35	33-47	33-43	39	29
Maxillary barbel, length	233	221-310	231-397	301	353
Outer mental barbel, length	152	132-190	133-214	152	195
Inner mental barbel, length	127	91-147	96-179	102	130

[1]Based on 6 specimens from LACM 30689-1, LACM 30690-1, UCR 321-1, UCR 322-1

[2]Based on 9 specimens

Proportions: Standard length (mm) 74.1, 48.7-71.7 (62.5); head length 23.0, 21.6-24.0 (23.2); head width at pectorals 16.6, 16.7-18.3 (19.4); snout length 9.5, 8.7-10.1 (8.8); distance from eye to posterior nostril 3.2, 2.9-3.7 (2.9); distance between nostrils 3.9, 3.7-4.7 (3.4); mouth width 9.4, 8.8-10.3 (8.8); eye diameter 3.4, 3.3-4.1 (3.7); fleshy interorbital distance 7.7, 7.3-8.8 (6.2); postorbital distance 10.9, 10.6-11.3 (10.7); greatest body depth 17.8, 16.8-20.4 (17.1); caudal peduncle depth 9.7, 9.7-10.8 (6.9); caudal peduncle length 21.2, 19.0-21.9 (21.6); predorsal distance 36.0, 36.6-39.3 (36.0); preanal distance 68.8, 66.7-70.9 (67.2); prepectoral distance 19.3, 19.2-21.6 (21.6); prepelvic distance 38.8, 40.2-43.1 (42.7); preadipose distance 66.2, 65.8-69.7 (67.2); distance between tip of snout and anus 45.9, 46.7-49.6 (48.0); distance between anus and anal fin origin 23.6, 20.5-23.7 (20.5); length of first (simple) ray of dorsal fin 15.1, 14.3-16.9 (13.6+); length of first pectoral ray 14.7, 13.3-15.4 (16.8); longest pelvic ray 14.0, 14.2-16.2 (15.7); longest anal ray 13.8, 12.5-15.2 (13.3); longest ray upper lobe of caudal fin 20.2, 19.5-24.0 (16.0+); longest ray of lower lobe of caudal fin 19.3, 16.2-23.4 (22.4+); shortest middle ray of caudal fin 12.1, 11.9-14.2 (10.4); length dorsal fin base 11.9, 11.1-12.2 (13.6); length anal fin base 12.5, 10.6-12.9 (11.2); total length adipose fin 23.4, 20.6-23.9 (20.8); height of adipose fin 4.6, 3.8-4.7 (3.2); length of maxillary barbel 23.6, 22.4-26.8 (35.7); length of outer mental barbel 15.8, 14.7-17.5 (19.2); length of inner mental barbel 10.8, 11.4-12.6 (12.8).

Coloration: In alcohol, specimens brownish above, pale below. A black stripe running from maxillary barbel origin through the eye and extending along midside to caudal base; stripe diffuse on cheek and operculum and near caudal base, well defined and about equal to eye diameter in width along rest of body. Predorsal area and interval between dorsal and adipose fins slightly darker than area immediately along these fin bases. Dorsal and caudal fin rays dusky; anal fin pale; paired fins with scattered melanophores only on proximal half. Maxillary barbels pigmented on upper surface.

Dimorphism: Sexual dimorphism is evident in the size of individuals. The three smallest specimens measured (48.7-55.3 mm SL) are males. The seven larger examples (58.6-74.1 mm SL) are females. None of the ten specimens examined in detail were in breeding condition although they were mature individuals. The shape of the genital papilla was usually, but not always, consistent with sex. A tubular papilla was found on all three males and one female. The six other females had thicker, more conical papillae.

Etymology: The specific name, *lineata*, refers to the promient lateral stripe of the species.

Relationships: Specimens of this small Costa Rican catfish clearly fall within the limits of *Nannorhamdia* Regan. The specimens also bear a close resemblance to species of *Cetopsorhamdia* Eigenmann and Fisher, but differ in having eyes with free dorsal margins. Schultz (1944a) pointed out that

"The state of preservation determines to a large extent whether the rim of the orbit is free from the eye dorsally." Although the present well preserved forms clearly present a free orbital rim, they were compared to the eleven species of *Cetopsorhamdia* and were shown to differ from them in other characteristics as well.

Nannorhamdia was described by Regan (1913) as lacking dorsal and pectoral spines. Eigenmann (1922), however, separated *Nannorhamdia* from *Cetopsorhamdia* on the basis of the former's "spines." Schultz (1944a) has clarified this confusion by showing how the flexible distal segments of the first pectoral ray may fracture and produce a fairly sharp spine. The species described by Miles (1943) as *Nannorhamdia macrocephala* should be reexamined. It was described as notorious for inflicting painful wounds with its short, pungent dorsal and pectoral spines.

The anus-origin of anal fin distance could prove useful in distinguishing species of *Nannorhamdia* from *Cetopsorhamdia*. In *N. lineata, spurrellii* and *nemacheir* the distance between anus and anal fin origin is 17.5-25.1 percent of SL. In *C. nasus, shermani, pickelei* and *orinoco* the anus-origin of anal fin distance is 10.1-14.0 percent of SL.

Habitat: The type locality is Quebrada 36, a small tributary of the Río Esquinas flowing into the upper Golfo Dulce in southern Costa Rica. The region receives over 4.5 meters of precipitation annually. The stream is one to four meters wide with shallow rapid areas and small pools no deeper than 0.5 meter. The current is moderate and flows over a bottom of gravel and sand. Grasses line the shore. At the time of collection, the water temperature was 27° C and visibility good.

Twenty-two species of fishes were collected at this site by poisoning with Pro-Noxfish. Four other species of siluriform fishes were taken: *Rhamdia wagneri, Pimelodella chagresi, Hypostomus plecostomus* and *Pygidium striatum*.

Imparales panamensis, new species

Figure 2

Imparales sp, Miller, 1966: 786 (name only; Panama)

Holotype: USNM 204692 (♂, 62.3 mm SL), Panama: Veraguas Prov., creek crossing road on S side of Santa Fe (elev. 305 m); 9 February 1962; collectors H. Loftin and E. L. Tyson; original field no. HL-106.

Paratypes: USNM 204693 (40, 23.4-71.5 mm SL), same data as holotype; LACM 30689-1 (3, 45.2-51.7 mm SL), Panama: Darien Prov., Río Membrillo tributary to Río Chucunaque; 22 March 1967; collector Battelle NW; LACM 30690-1 (1, 55.0 mm SL), Panama: Darien Prov., Río Chucunaque at Uala; 17 March 1967; collector Battelle NW; UCR 321-1 (1, 44.7 mm SL), Panama: Darien Prov.; Río Congo, tributary to Río Chucunaque;

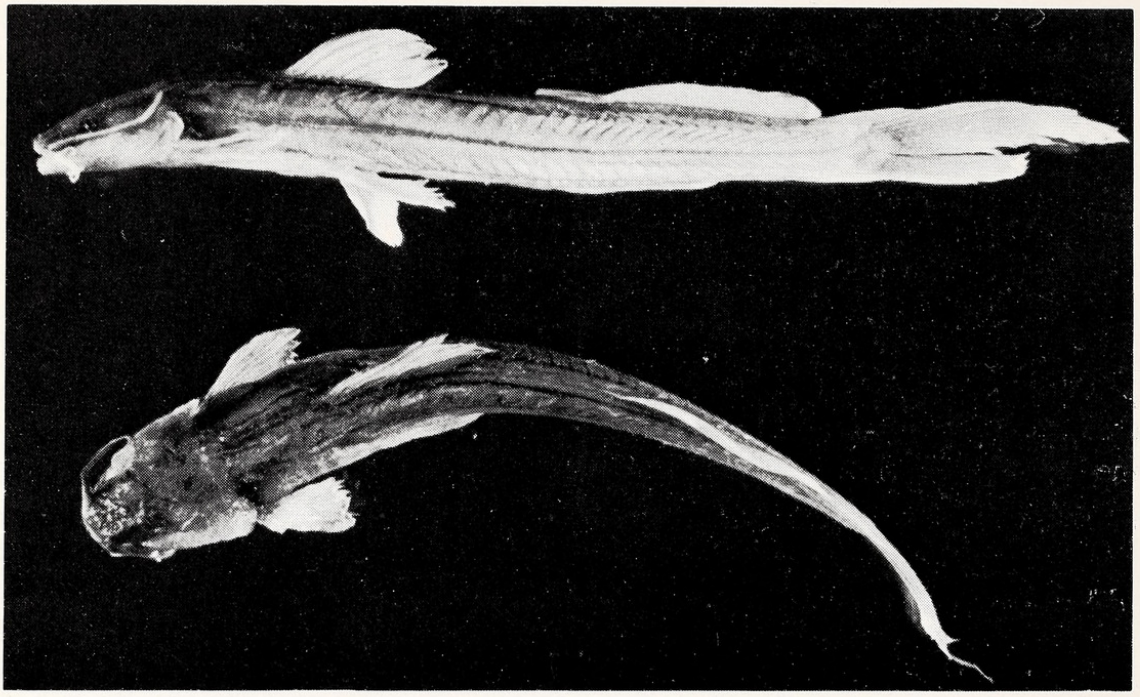

Figure 2. *Imparales panamensis*, new species, lateral view of holotype USNM 204692, 62.3 mm SL; dorsal view of paratype USNM 204693, 63.8 mm SL.

24 March 1967; collector Battelle NW; UCR 322-1 (1, 36.5 mm SL) Panama: Darien Prov.; Quebrada Coho, tributary to Río Congo; 8 March 1967; collector Battelle NW.

Diagnosis: The species is distinguished from its only known congener, *Imparales mariai* Schultz, by a series of proportional differences and at least two meristic distinctions. *Imparales panamensis* is characterized by its shorter adipose fin (26.1-33.6 vs. 35.6 percent of SL), which is not confluent with the caudal fin at any age in the present size range; greater head width (13.1-17.5 vs. 12.7 percent of SL); greater distance between nostrils (3.1-4.5 vs. 2.6 percent of SL); longer first branched anal ray (10.7-14.1 vs. 9.9 percent of SL); shorter maxillary barbels (22.1-31.0 vs. 35.3 percent of SL); more pectoral rays i,7-8 vs. i,6); fewer average gillrakers (3-7, usually 5 vs. about 7).

Description: Head wide, strongly depressed. Mouth terminal, snout slightly rounded in dorsal view. Narrow fontanel in middorsal line extending from before eyes to base of occipital process. Occipital process short. Villiform teeth in bands on both jaws; premaxillary patches of equal width throughout; dentary patches wider medially; no vomerine or palatine teeth. Anterior nostrils tubular; posterior nostrils with a fleshy flap on anterior border. Eyes small, located on middle of length of head on largest specimens or just in front of middle of head on smaller individuals. Pelvic insertion below base of third or fourth dorsal element; pectoral fin tip reaches a vertical with the base of the first or second dorsal ray. Adipose origin over base of second to fourth anal

element. Both lobes of caudal fin rounded; upper lobe nearly half again as long as the lower lobe. Anus between middle of length of pelvic fins. Lateral line complete.

Maxillary barbels reaching slightly beyond middle of pectoral fin; outer mental barbels not extending beyond posterior margin of pectoral base; inner mental barbels not extending beyond the anterior margin of pectoral base. Bases of four mental barbels in a straight line.

The smallest mature individual examined was a female of 46.8 mm SL. No sexual dimorphism with respect to size was evident, although mature males reveal a consistently longer and more pointed urogenital papilla. This papilla arises about an eye's diameter behind the anus. Several adult sepcimens from USNM 204693 were in breeding condition.

Counts: Proportional measurements for *I. panamensis* and *I. mariai* are presented in Table 1. Counts for the holotype are followed by the range for 17 paratypes from USNM 204693, LACM 30689-1, LACM 30690-1, UCR 321-1 and UCR 322-1. Dorsal fin rays i,6; i,6 (i,6). Anal vii,5; v-vii,5-7 (v,7). Pectoral i,7; i,7-9 (i,6). Pelvic i,5; i,5 (i,5). Branched caudal rays 15, 13-15 (13). Gill rakers 1 + 4 and 0 + 3 on holotype; 0-1 + 3-7 on paratypes; (1-2 + 5-6 on *I. mariai*). Total gill rakers 3-5 on holotype; 3-7 on paratypes; (about 7 on *I. mariai*).

Coloration: Specimens in alcohol dark brown above, gradually paling below. Predorsal and humeral areas slightly darker than surrounding regions. All fin rays brown, interradial membranes clear or with few scattered melanophores; adipose fin brown. Maxillary barbels brown; mental barbels pale.

Etymology: The specific name, *panamensis*, refers to the principal known distribution of the species.

Remarks: The generic description of *Imparales* Schultz (1944b) is amended to read: pelvic insertions under base of first to third branched dorsal ray; adipose fin confluent or not with caudal fin; either adipose or anal fin origin opposed or one or the other slightly in advance; anal fin of five to seven simple soft rays followed by five to seven branched rays; lateral line complete or possibly incomplete.

Although the differences between the Panamanian species and *I. mariai* are not great, I believe that the former merits specific rank for two reasons. *I. panamansis* shows little intraspecific variation throughout its range and it is expected that when further specimens of *I. mariai* are available they will still be consistently separable from *I. panamensis* by the diagnostic characters. The Cordillera Oriental extends to the sea in northern Colombia and forms an effective barrier between the faunas of the Amazon, the Orinoco and the Maracaibo basins on the east, and of the Magdalena and Atrato basins on the west. It is not suprising then to find divergences between the Panamanian and the Río Meta (Orinoco drainage) populations of *Imparales*.

Distribution: *I. panamensis* occurs from west of the Canal Zone to near

the Colombian border on the Pacific slope and in the Río Chagres Basin on the Atlantic versant. It was collected in only one locality west of the Canal in Veraguas Province. The other specimens included in this study were taken in extreme eastern Panama in the Río Chucunaque and Río Congo drainages. The following collections of *Imparales*, presumably I. *panamensis*, were not available to me. Dr. Loftin (1965) identified specimens of *Imparales* from a small stream in the Río Chagres system, and more recently from several other streams in the same drainage. He also identified as *Imparales*, specimens collected by Battelle NW in the Río Balsas, Darien Province in March 1967.

The type locality near Santa Fe is a swift flowing stream with a maximum width of 7 meters and depths to 1 meter. Large and small rocks and sand cover the bottom. At the time of collection, the water was clear. The site, at the foot of Cerro Tuto, is a tributary of the Río Santa María which runs southwesterly for some distance and then swings east to empty into the Golfo de Parita, a part of the Golfo de Panamá.

Twelve other species of fishes were collected with the holotype. The siluriform fishes, *Pimelodella chagresi* and *Pygidium striatum* were among those taken.

Discussion: The presence of disjunct Middle American populations of *Nannorhamdia* and *Imparales* gives clear evidence of a former, much larger range for these genera; the center of dispersal of both genera is northern South America. The genus *Imparales* is formerly known from one other species collected in the Río Meta, Colombia. Other species of *Nannorhamdia* are known from the Atrato, Magdalena, San Juan and Orinoco drainages of Colombia as well as Venezuela, Brazil and Bolivia.

The presence of these now relict populations suggests a once more favorable environment in Middle America which allowed these small catfishes to extend at least as far north as Costa Rica and Panama. It is not yet obvious what environmental factors presently restrict the distribution of stenoecious forms such as *I. panamensis* and *N. lineata.*

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RESUMEN

Se determinaron dos nuevas especies de barbudos pequeños (Familia

Pimelodidae) de colecciones recientes de Costa Rica y Panamá. *Nannorhamdia lineata*, restringida a la cuenca del Río Grande de Térraba, presenta como forma más cercana en parentesco a *N. spurrellii* de la cuenca del Río San Juan, Colombia. Esta última se distingue de *N. lineata* por las siguientes características: distancia internasal, interorbital, y profundidad del pedúnculo caudal menores; mayor número de branquiespinas y banda oscura lateral muy prominente.

Imparales panamensis se colectó en el Río Santa María, Provincia de Veraguas. Se distingue de *I. mariai* del Río Meta, Colombia por diferencias proporcionales y por presentar mayor número de radios pectorales y menos branquiespinas.

Las dos especies nuevas representan poblaciones reliquias cuya distribución anterior fue más amplia y continua con sus antepasados sudamericanos en una época más favorable para su expansión.

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