



## Two new species of callanthiid fishes of the genus *Grammatonotus* (Percoidei: Callanthiidae) from Pohnpei, western Pacific

WILLIAM D. ANDERSON, JR.<sup>1</sup> & G. DAVID JOHNSON<sup>2</sup>

<sup>1</sup>*Grice Marine Biological Laboratory, College of Charleston, 205 Fort Johnson, Charleston, South Carolina 29412-9110, U.S.A. E-mail: andersonwd@cofc.edu*

<sup>2</sup>*Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A. E-mail: johnsond@si.edu*

### Abstract

In late July/early August 2015, ichthyologists from the Bishop Museum collecting fishes off Pohnpei in the Caroline Islands group, western Pacific Ocean, obtained specimens of two undescribed species of *Grammatonotus*. One of the new species, *G. xanthostigma*, closely resembles the recently described *G. brianne*, differing most strikingly in the shape of the caudal fin. The other, *G. pelipel*, is distinctive in having the following combination of characters: disjunct lateral line, barred pattern of coloration (most distinctive in small individuals), and caudal fin truncate to slightly emarginate in small specimens, but with upper and lower lobes produced in largest example known. Herein we provide characters that distinguish callanthiids from other percoids and that distinguish *Grammatonotus* from *Callanthias*, the other genus in the family Callanthiidae, along with descriptions of the new species.

**Key words:** *Grammatonotus xanthostigma*, *Grammatonotus pelipel*, *Grammatonotus brianne*, Pohnpei, Caroline Islands

### Introduction

There are two genera in the marine perciform family Callanthiidae, *Callanthias* (the Splendid Perches — with seven species, Anderson *et al.*, 2015) and *Grammatonotus* (the Groppos — with the new species, *G. xanthostigma* and *G. pelipel*, becoming the ninth and tenth described species). The previously described species of *Grammatonotus* are: *G. ambiortus* Prokofiev, 2006; *G. brianne* Anderson, Greene and Rocha, 2016; *Grammatonotus crosnieri* (Fourmanoir, 1981); *Grammatonotus lanceolatus* (Kotthaus, 1976); *Grammatonotus laysanus* Gilbert, 1905; *Grammatonotus macrophthalmus* Katayama, Yamamoto and Yamakawa, 1982; *Grammatonotus roseus* (Günther, 1880); and *Grammatonotus surugaensis* Katayama, Yamakawa and Suzuki, 1980. Groppos are brightly colored planktivorous fishes found in moderately deep waters (to depths of a few hundred meters), most commonly in areas with considerable relief. The species of *Grammatonotus* and *Callanthias*, share three characters, a combination that is unusual among percoid fishes: nasal organ with poorly developed lamellae, presence of modified scales with unique ornamentation along body midlaterally, and lateral line running along base of dorsal fin to terminate near base of ultimate dorsal soft ray or continuing posteriorly on dorsolateral surface of caudal peduncle (Anderson and Johnson, 1984; Johnson, 1984; Anderson *et al.*, 2015). In addition, the species of these genera have an unusual arrangement of the supraneural bones, which do not interdigitate with the neural spines; instead they are oriented more or less obliquely, with their proximal ends usually terminating anterior to or dorsal to the distal end of anteriormost neural spine (Anderson *et al.*, 2015). *Grammatonotus* can be distinguished from the other callanthiid genus, *Callanthias* Lowe, 1839 (type species *Callanthias paradisaeus* Lowe, 1839 = *C. ruber*), by the following characters (with those of *Callanthias* in parentheses): one opercular spine (vs. two opercular spines); soft rays in dorsal fin usually 9, rarely 8 or 10 (vs. 10 or 11, very rarely 9 or 12); soft rays in anal fin 9 (vs. 10 or 11, very rarely 9 or 12); branched caudal-fin rays 13 = 7 + 6 (vs. 15 = 8 + 7); first caudal vertebra without parapophyses (vs. parapophyses present) — see Anderson and Johnson (1984:949); Anderson *et al.* (2015:5, 6).

## Methods and abbreviations

Methods used were those of Anderson *et al.*, 2015, except gillrakers were counted on both sides. Institutional abbreviations are: BPBM (Bernice Pauahi Bishop Museum, Honolulu, Hawaii) and USNM (National Museum of Natural History, Smithsonian Institution, Washington, DC). SL denotes standard length.

**Characters shared by the two new species of *Grammatonotus*.** *Grammatonotus xanthostigma* and *G. pelipel* are morphologically similar. In order to avoid repetition, we characterize them under a single heading and then elaborate as necessary under the individual species accounts.

Body compressed, moderately deep. Mouth terminal and oblique; jaws almost equal. Maxilla reaching posteriorly to near middle of eye. Premaxilla protrusile. No supramaxilla. Interorbital convex. One opercular spine; distal margins of interopercle and subopercle smooth; margin of preopercle smooth to somewhat roughened.

Premaxilla with outer series of conical teeth and usually one to a few small canines or canine-like teeth at anterior end of jaw; inner band of villiform to small conical teeth, band expanded near symphysis; no teeth at symphysis. Dentary with series of conical teeth (a few well back on jaw enlarged into caniniform teeth); patch of villiform to conical teeth next to symphysis; usually one to a few exerted canines at anterior end of jaw; no teeth at symphysis. Vomer with small conical teeth, arranged in a chevron-shaped patch, patch without posterior prolongation. Palatines with row or band of villiform to small conical teeth. No teeth on tongue or pterygoids.

Scales peripheral ctenoid (Roberts, 1993:92); posterior field of a scale with primary and secondary cteni (i.e., no ctenial bases present in posterior field). Body with midlateral series of modified scales (see Anderson *et al.*, 2015:74, fig. 2). Secondary squamation absent from scales. Most of head, including maxilla, dorsum of snout, and interorbital region with scales. Dentary, gular region, branchiostegals, and branchiostegal membranes without scales. Dorsal, anal, pectoral and pelvic fins without (or nearly without) scales; pelvic axillary scales present; modified scales (interpelvic process) overlapping pelvic-fin bases along midventral line; scales extending well out onto caudal fin.

Dorsal fin not incised at junction of spinous and soft portions. Dorsal-fin rays XI, 9. Anal-fin rays III, 9. Pelvic-fin rays I, 5. Principal caudal-fin rays 15 (8 + 7). Branchiostegals 6. Lateral line ascending abruptly from its origin near opercle to run just below dorsal-fin base; lateral line disjunct, with 1 or 2 scales near opercle separated from main part of lateral line. Rows of cheek scales 5. Scales between dorsal-fin origin and lateral line 1. Scales between anal-fin origin and lateral line (counted along a posterodorsal series) 9. Circumpeduncular scales ca. 16.

Vertebrae 24 (10 precaudal + 14 caudal). Parapophyses absent from first caudal vertebra. No spur on posteriormost ventral procurrent caudal-fin ray; preceding ventral procurrent caudal-fin ray not shortened basally (see Johnson, 1975). Parhypural autogenous, with well-developed hypurapophysis; hypural 1 + hypural 2 present as a single unit, no evidence of ontogenetic fusion; hypural 3 + hypural 4 present as a single unit, no evidence of ontogenetic fusion; hypural 5 autogenous; epurals 3. Ribs on vertebrae 3 through 10. Configuration of supraneural bones, anterior neural spines, and anterior dorsal pterygiophores difficult to depict in the conventional symbolization of Ahlstrom *et al.* (1976) because supraneural bones do not actually interdigitate with neural spines; the two supraneural bones oriented more or less obliquely with their proximal ends usually terminating anterior to or dorsal to distal end of anteriormost neural spine. Morphometric data are presented in Tables 1 & 2.

### ***Grammatonotus xanthostigma*, new species**

Yellowspot Groppo

(Figures 1–3; Tables 1 & 2)

**Diagnosis.** A species of *Grammatonotus* distinguishable from *G. pelipel* (described herein) and from all other previously described species of the genus, except *G. brianne*, by the following combination of characters: caudal fin rhomboid shaped with mid-caudal rays produced, lateral-line disjunct, anal-fin spines short (see Tables 1 & 2), and live coloration (see Figs. 1–3 and description of coloration below). It is distinguished from *G. brianne* by absence of scales on dentary (present in *G. brianne*), measurements of several body parts (see Table 2), and shape of caudal fin (compare Figs. 1–3 with Fig. 4). Caudal fin rhomboid shaped in both species, but posterior halves of dorsalmost and ventralmost borders of fin slightly concave in *G. xanthostigma* (gently rounded to convex in *G. brianne*). Also, *G. xanthostigma* with a bright yellow spot at upper base of pectoral fin (lacking in *G. brianne*).

**TABLE 1.** Morphometric data for two new species of *Grammatonotus* collected off Pohnpei. Standard length in mm; other measurements in percentages of standard length. NP = not produced..

	<i>G. xanthostigma</i>		<i>G. pelipel</i>		
	Holotype	Paratype	Paratype	Paratype	Holotype
	BPBM	USNM	USNM	BPBM	BPBM
	41271	432533	432534	41268	41273
Standard length	60.2	61.0	28.1	28.1	49.3
Depth at dorsal-fin origin	29.6	31.1	34.2	damaged	34.3
Predorsal length	33.2	33.9	36.7	37.7	35.7
Head length	30.2	29.8	31.0	34.0	32.0
Snout length	4.7	4.9	4.3	5.3	4.5
Bony orbit diameter	9.0	9.0	7.8	7.5	9.6
Bony interorbital width	5.6	5.7	6.8	5.9	6.4
Postorbital length of head	15.0	13.9	14.6	16.2	15.8
Upper jaw length	12.8	12.3			12.8
Pectoral-fin length	23.4	24.1			27.4
Pelvic-fin length	27.6	26.6			29.6
Length of caudal peduncle	23.4	22.8	21.4	21.7	23.3
Depth of caudal peduncle	13.8	12.6	13.2	12.5	14.4
Upper caudal-fin lobe	NP	NP	29.9	29.5	41.4+
Lower caudal-fin lobe	NP	NP	29.5	27.6+	46.7
Mid-caudal-fin rays	55.6	59.3	28.5	26.3	26.6
Depressed anal-fin length	42.7	39.7	31.3	31.3	36.5
First anal-spine length	3.7	3.8			5.7
Second anal-spine length	7.2	6.7			9.1
Third anal-spine length	8.0	8.7			10.3
Anal-fin, base length	18.6	20.7	19.6	19.9	19.3
Penultimate dorsal-fin ray, length	~19.6	18.9			
Ultimate dorsal-fin ray, length	~14.6	15.6			
Penultimate anal-fin ray, length	—	18.0			
Ultimate anal-fin ray, length	—	15.2			

**Description.** The characters included in the combined description of *G. xanthostigma* and *G. pelipel* and those presented in the species diagnosis form part of the species description. Pectoral-fin rays 19. Branched caudal-fin rays 7 + 6. Procurent caudal-fin rays 6 dorsally and ventrally. Pseudobranch with 11 to ca. 12 filaments. Total number of gillrakers on first arch 25 to 29. Lateral line disjunct with two most anterior tubed scales separated from the more posterior ones; number of tubed scales 15 to 18 (2 + 13, 2 + 15, 2 + 16; counts of lateral-line scales made on both sides of each specimen). Midbody lateral scales 23 or 24. Epineural bones associated with first 12 or 13 vertebrae. One trisegmental pterygiophore associated with dorsal fin, and one with anal fin.

**Coloration.** Coloration based on digital photographs of two specimens (BPBM 41271, 60.2 mm SL, the holotype [Fig. 1], and USNM 432533, 61.0 mm SL, the paratype [Fig. 2]): Dorsally head and anterior two thirds of body rosy; rosy line along dorsum of caudal peduncle; ventrally head and area anterior to base of pectoral fin silvery to silvery pink; large blotch of grayish brown on posteroventral portion of opercle; mid-body and ventrum dull orange to yellow. Iris of eye with broad blue arch dorsally and narrow yellow stripe posteriorly; anteriorly adjacent to pupil, one specimen with narrow arch of yellow. Dorsal fin yellow proximally, bordered by light to dark purple distally (distal ends of dorsal spines and soft rays yellow). Anal fin purple with distal margin of yellow. Pectoral fin pale pink with bright yellow spot at upper base of fin. Pelvic fin purple. Anterior border of caudal fin

outlined in rosy purple; caudal fin yellow, with some purplish near middle of distal end of fin; distal ends of produced mid-caudal rays bright yellow.

A digital photograph (Fig. 3) of another specimen (BPBM 41294, 57 mm SL) collected off Pohnpei in 137 meters on 16 July 2016 shows an individual with coloration closely resembling that described above. The major differences are in the pigmentation of the iris of the eye and in the absence of rosy purple outlining the anterior border of the caudal fin. We have not examined that specimen. The narrow purplish stripe (or partial stripe) evident along middle of body of two of the three specimens of *G. xanthostigma* (see Figs. 1 & 3) is most likely the manifestation of a blood vessel.



**FIGURE 1.** *Grammatonotus xanthostigma*. Pohnpei; holotype, BPBM 41271, 60.2 mm SL. Photograph by Brian D. Greene.



**FIGURE 2.** *Grammatonotus xanthostigma*. Pohnpei; paratype, USNM 432533, 61.0 mm SL. Photograph by Brian D. Greene.



**FIGURE 3.** *Grammatonotus xanthostigma*. Pohnpei; BPBM 41294, 57 mm SL. Photograph by Brian D. Greene.



**FIGURE 4.** *Grammatonotus brianne*. Batangas, southern Luzon, Philippine Islands; holotype, PNM 15196 (formerly CAS 237785), 84.4 mm SL. Photograph by Luiz A. Rocha.

**Distribution.** This species is only known from specimens collected off Pohnpei Island, Senyavin Islands (part of the Caroline Islands group), western Pacific Ocean.

**Material examined.** Two specimens (60.2–61.0 mm SL) caught off Pohnpei Island (Gorgonian Buttress); Lat. 6.991784° N, Long. 158.137131° E.; depth 142 meters; collected by B. D. Greene, with hand net, 03 August 2015.

**Holotype.** BPBM 41271, 60.2 mm SL.

**Paratype.** USNM 432533 (out of BPBM 41271), 61.0 mm SL.

**Etymology.** The name *xanthostigma* is from the Greek — xanthos (yellow), stigma (spot) — in reference to the yellow spot at the upper base of the pectoral fin. The specific name of this new species is a noun in apposition to the generic name *Grammatonotus*.

### ***Grammatonotus pelipel*, new species**

Barred Groppo

(Figures 5 & 6; Tables 1 & 2)

**Diagnosis.** A species of *Grammatonotus* distinguishable from all other described species of the genus by its barred coloration — most evident in specimens less than 30 mm SL, barring only vaguely apparent in color photograph of largest specimen examined (49.3 mm SL), but very obvious in preserved individual. Also, the shape of the caudal fin is distinctive, being truncate to slightly emarginate in small specimens, but with upper and lower lobes produced in largest example known.

**Description.** The characters included in the combined description of *G. xanthostigma* and *G. pelipel* and those in the species diagnosis form part of the species description. Pectoral-fin rays 19 or 20. Total number of gillrakers on first arch 28 (count from only one specimen). Lateral aspect of snout without scales. Lateral line disjunct with one or two most anterior tubed scales separated from the more posterior ones; number of tubed scales 15 to 17 (1 + 14, 2 + 14, 2 + 15). Midbody lateral scales ca. 23 (count from only one specimen). Epineural bones associated with first 11 or 12 vertebrae.

**Coloration.** Description of coloration is based on examination of digital photographs of freshly caught specimens. Holotype (49.3 mm SL) with dorsum of head and narrow strip below dorsal fin rosy to purplish; ventral part of snout and lower jaw bright yellow; rest of head mostly silvery except for purplish on opercle; side of body dull yellow to pale purplish. Hint of vertical bars along side of body in color photograph; these show up as ca. 11 or 12 dark bars on preserved specimen. Iris of eye with blue dorsally, pale yellow anteriorly and posteriorly. Dorsal fin

bright yellow with narrow distal border of purple. Distal 50 to 60 per cent of anal fin bright yellow, broad band of purple proximally. Pectoral fin dull rose. Pelvic fin rather nondescript. Broken purplish vertical line at base of caudal fin; dorsalmost and ventralmost caudal-fin rays bright yellow and adjacent to purplish rays that are produced well beyond distal ends of mid-caudal rays; rest of fin mostly dull yellow (see Fig. 5). Two smaller specimens (each 28.1 mm SL) distinctly barred, 11–13 bars present (see Fig. 6). Third small specimen (20.6 mm SL) with some pigmentation dorsally that may be remnants of dark bars.



**FIGURE 5.** *Grammatonotus pelipel*. Pohnpei; holotype, BPBM 41273, 49.3 mm SL. Photograph by Brian D. Greene



**FIGURE 6.** *Grammatonotus pelipel*. Pohnpei; paratype, USNM 432534, 28.1 mm SL. Photograph by Brian D. Greene.

**Distribution.** This species is only known from specimens collected off Pohnpei Island, Senyavin Islands (part of the Caroline Islands group), western Pacific Ocean.

**Material examined.** Four specimens (20.6 – 49.3 mm SL) caught off Pohnpei Island (Gorgonian Buttress and Ahnd [Ant] Atoll).

**Holotype.** BPBM 41273, 49.3 mm SL; Gorgonian Buttress; Lat. 6.991784° N, Long. 158.137131° E; depth — 151 meters; collected by B. D. Greene, with hand net, 05 August 2015.

**Paratypes.** BPBM 41268, two specimens, each 28.1 mm SL (one now USNM 432534); Ahnd (Ant) Atoll; Lat. 6.802793° N, Long. 158.014694° E.; depth 136 meters; collected by R. L. Pyle, with hand net, 29 July 2015.

**Additional specimen, not part of the type series.** BPBM 41267, 20.6 mm SL; Ahnd (Ant) Atoll; Lat. 6.802793° N, Long. 158.014694° E.; depth 136 meters; collected by R. L. Pyle, with hand net, 29 July 2015.

**Etymology.** The barring on the side of the young of this species resembles markings found in many Pohnpeian tattoos. The Pohnpeian word "pelipel" means "tattoo" or "to tattoo." Consequently, it seems appropriate to name the new species *Grammatonotus pelipel*. The specific name *pelipel* is a noun in apposition to the generic name, and, as pointed out to us, ties together character/culture/locality. We thank Brian Greene for suggesting the name.

**TABLE 2.** Comparisons of selected measurements for two new species of *Grammatonotus* from Pohnpei with those for *Grammatonotus brianne*. Standard length in mm; other measurements in percentages of standard length.

	<i>G. brianne</i>		<i>G. xanthostigma</i>		<i>G. pelipel</i>	
	n	Range	n	Range	n	Range
Standard length	4	72.9–84.4	2	60.2–61.0	3	28.1–49.3
Depth at dorsal-fin origin	4	33.0–35.4	2	29.6–31.1	2	34.2–34.3
Predorsal-fin length	4	30.6–33.5	2	33.2–33.9	3	35.7–37.7
Head length	4	29.5–32.1	2	29.8–30.2	3	31.0–34.0
Diameter of bony orbit	4	9.7–11.1	2	9.0–9.0	3	7.5–9.6
Width of bony interorbital	4	7.0–7.7	2	5.6–5.7	3	5.9–6.8
Postorbital length of head	4	12.4–14.2	2	13.9–15.0	3	14.6–16.2
Length of caudal peduncle	4	23.8–24.6	2	22.8–23.4	3	21.4–23.3
Depth of caudal peduncle	4	14.4–16.2	2	12.6–13.8	3	12.5–14.4
Mid-caudal fin rays	4	58.6–82.2	2	55.6–59.3	3	26.3–28.5
Length of depressed anal fin	4	39.2–42.2	2	39.7–42.7	3	31.3–36.5
Length of first anal spine	4	2.8–3.4	2	3.7–3.8	1	5.7
Length of second anal spine	4	5.3–7.3	2	6.7–7.2	1	9.1
Length of third anal spine	4	7.5–9.2	2	8.0–8.7	1	10.3

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## References

- Ahlstrom, E.H., Butler, J.L. & Sumida, B.Y. (1976) Pelagic stromateoid fishes (Pisces, Perciformes) of the eastern Pacific: Kinds, distributions, and early life histories and observations on five of these from the northwest Atlantic. *Bulletin of Marine Science*, 26 (3), 285–402.
- Anderson, W.D., Jr., Greene, B.D. & Rocha, L.A. (2016) *Grammatonotus brianne*, a new callanthiid fish from Philippine waters, with short accounts of two other *Grammatonotus* from the Coral Triangle. *Zootaxa*, 4173 (3), 289–295. <https://doi.org/10.11646/zootaxa.4173.3.7>
- Anderson, W.D. Jr. & Johnson, G.D. (1984) A new species of *Callanthias* (Pisces: Perciformes: Percoidei: Callanthiidae). *Proceedings of the Biological Society of Washington*, 97 (4), 942–950.
- Anderson, W.D. Jr., Johnson, G.D. & Baldwin, C.C. (2015) Review of the splendid perches, *Callanthias* (Percoidei: Callanthiidae). *Transactions of the American Philosophical Society*, 105 (Part 3), i–xxii + 1–126, pls. 1–8, figs. 1–23, tables 1–20, maps 1–5.
- Fourmanoir, P. (1981) Poissons (première liste). In: Résultats des Campagnes Musorstom. I. Philippines (18–28 mars 1976). *Mémoires de l’ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer)*, No. 91 (Art. 3), 85–102.
- Gilbert, C.H. (1905) The deep-sea fishes of the Hawaiian Islands. In: Jordan, D.S. & Evermann, B.W., The aquatic resources of the Hawaiian Islands. *Bulletin of the United States Fish Commission*, 23 (for 1903), Part II, Section II, pp. 575–713, pls. 66–101.
- Günther, A. (1880) Report on the shore fishes procured during the voyage of H. M. S. Challenger in the years 1873–1876. In: *Report on the scientific results of the voyage of H. M. S. Challenger during the years 1873–76*, Zoology 1 (Part 6), 1–82,

- pls. 1–32. [reprinted in 1963 by J. Cramer, Weinheim]
- Johnson, G.D. (1975) The procurrent spur: An undescribed perciform caudal character and its phylogenetic implications. *Occasional Papers of the California Academy of Sciences*, 121, 1–23.
- Johnson, G.D. (1984) Percoidei: Development and relationships. In: Moser, H.G. et al. (Eds.), *Ontogeny and Systematics of Fishes*. *American Society of Ichthyologists and Herpetologists, Special Publication No. 1*. Allen Press, Lawrence, Kansas, pp. 464–498.
- Katayama, M., Yamakawa, T. & Suzuki, K. (1980) *Grammatonotus surugaensis*, a new serranid fish from Suruga Bay and the Straits of Ōsumi, Japan. *Bulletin of the Biogeographical Society of Japan*, 35 (4), 45–48.
- Katayama, M., Yamamoto, E. & Yamakawa, T. (1982) A review of the serranid fish genus *Grammatonotus*, with description of a new species. *Japanese Journal of Ichthyology*, 28 (4), 368–374, figs. 1–4.
- Kotthaus, A. (1976) Fische des Indischen Ozeans. Ergebnisse der ichthyologischen Untersuchungen während der Expedition des Forschungsschiffes "Meteor" in den Indischen Ozean, Oktober 1964 bis Mai 1965. A. Systematischer Teil, XVII. Percomorphi (7). "Meteor" *Forschungsergebnisse*, Reihe D, No. 23, 45–61.
- Lowe, R.T. (1839) A supplement to a synopsis of the fishes of Madeira. *Proceedings of the Zoological Society of London*, Part 7, 76–92.
- Prokofiev, A.M. (2006) *Grammatonotus ambiortus* sp. nova: A new species of callanthiids (Perciformes) from the western tropical Pacific. *Journal of Ichthyology*, 46 (1), 13–17. [originally published in Russian in *Voprosy Ikhtiologii*, 2006, 46 (1), 17–21.]
- Roberts, C.D. (1993) Comparative morphology of spined scales and their phylogenetic significance in the Teleostei. *Bulletin of Marine Science*, 52 (1), 60–113.