Five Valid Species of Cardinalfishes of the Genus *Apogon* (Apogonidae) in the Eastern Pacific Ocean, with a Redescription of *A. atricaudus* and Notes on the Distribution of *A. atricaudus* and *A. atradorsatus*

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Six nominal species of cardinalfishes are known from the eastern Pacific Ocean: *Apogon atradorsatus*, BlacktipCardinalfish; *A. atricaudus*, Plain Cardinalfish; *Apogon dovii*, Tailspot Cardinalfish; *A. guadalupensis*, Guadalupe Cardinalfish; *A. pacificus*, Pink Cardinalfish; and *A. retrosella,* Barspot Cardinalfish (Allen and Robertson, 1994; Fraser andRandall, 2002; Robertson and Allen, 2015; Piñeros et al., 2019). Three of these species are easily distinguished by a pattern of spots and/or bars on the lateral portion of the body (*A. dovii, A. pacificus,* and *A. retrosella*) and are not considered further herein. The other three species lack distinctive bodymarkings: *A. atradorsatus* (Galápagos Islands, Malpelo Island, and Cocos Island), *A. atricaudus* (Revillagigedo Islands, Clipperton Island, Cabo San Lucas, lower Gulf of California,and Alijos Rocks), and *A. guadalupensis* (Guadalupe Island,San Benito Islands, and Channel Islands of Southern California). The latter two nominal species have been conveniently regarded as distinct based on their disjunct distributions in the eastern North Pacific as well as presumed differences in pigmentation patterns. Furthermore, with its distribution at Guadalupe Island, off the north central coastof Baja California, Mexico, and the Southern California Channel Islands, *A. guadalupensis* has been considered a warm-temperate species compared to the more southern tropical *A. atricaudus*.

The first report of *Apogon guadalupensis* from California was by Hobson (1969) from San Clemente Island, the most southern of the Channel Islands. Since then, numerous observations have been made, with increased frequency during warm-water or El Niño oceanographic conditions, including the more northerly Channel Islands (SantaCatalina, Santa Barbara, Anacapa, and the east end of Santa Cruz Island; Richards and Engle, 2001). The species often forms small to medium size schools under ledges, withincrevices, and in caves and is a frequent subject of underwater photographers (Fig. 1). Both *A. atricaudus* and *A. guadalupensis* are currently considered as valid by Page et al. (2013), Kells et al. (2016), and Fricke et al. (2020), herein referred toas *Eschmeyer's Catalog of Fishes*. Kells et al. (2016) included brief descriptions and excellent illustrations for each nominal species emphasizing the reputed differences in first dorsal-fin pigmentation (i.e., dorsal blotch present in *A. atricaudus* and absent, except in small specimens, in *A. guadalupensis*). In their molecular phylogenetic study oftropical eastern Pacific (TEP) *Apogon,* Piñeros et al. (2019: 240) concluded: ''our analysis suggests that *A. guadalupensis*, the most northern of the TEP *Apogon* species, may be a population of *A. atricaudus* rather than a distinct species.'' The purpose of the current study is to examine morphological, pigmentation, and genetic evidence to explore the possible synonymy of *Apogon guadalupensis* with *Apogon atricaudus*.

Status of the types.—Apogon atricaudus was based on 25 syntypes (according to *Eschmeyer's Catalog of Fishes*), all from the Revillagigedo Archipelago, primarily Socorro Island. Jordan and McGregor's (1899: 271) original intent was to publish the description of *A. atricaudus* as a report to the United States Commission of Fish and Fisheries, ''List of fishes collected at the Revillagigedo Archipelago and neigh- boring islands,'' with the premise it would precede Part 3 of the *Fishes of North and Middle America*. The account was added by Jordan and Evermann as an addendum to Part 3 to make these volumes as complete as possible. The appearance in Jordan and Evermann (1898) prior to Jordan and McGregor's (1899) description was apparently not intention-al, and both descriptions are similar but with several minordifferences. There are two departures in the Jordan and McGregor (1899) description that indicate the description given in Jordan and Evermann (1898) was incomplete orunfinished. In Jordan and McGregor (1899: 277) it was noted that the ''scales [are] large, finely ctenoid, 3-26-11,'' which ismore definitive than in Jordan and Evermann (1898). Thereis also the mention of a type, ''Type, No. 5708, L.S. Jr. Univ. Mus.'' in Jordan and McGregor (1899) that was not includedin Jordan and Evermann (1898). The account in Jordan and Evermann (1898: 2853), gives ''1501(a). APOGON ATRICAU-DUS. Jordan & McGregor'' plus the added commentary ''West Coast of Mexico and the derivation of the specific name, (*ater*, black; *cauda*, tail)''. It is interesting to note that both accounts include the statement that the ''Body [is] similar inshape to *A. retrosella''* (in Jordan and McGregor, 1899: 277),but the specific name was changed to *retrosellus* in the Jordan and Evermann (1898) description. No figure of any of the syntypes of *A. atricaudus* was included. As stated above, *Eschmeyer's Catalog of Fishes* indicates 25 syntypes at four museums. There are 12 specimens (one of which is shown inFig. 2A) at the California Academy of Sciences as CAS-SU 5708, all from Socorro Island. Other apparent syntypes thatTHF has examined are USNM 48527 and BMNH 1898.10.29.22-25, both from Socorro Island.

Amia guadalupensis was described by Osburn and Nicholsin 1916, based on a single specimen; the description includeda figure of the species (herein as Fig. 3). Of consequence, thefirst dorsal fin is shown with a blackish blotch on the membrane between the first and third spines, the second and fourth spines based on our interpretation. Osburn and Nichols (1916: 160) state that *A. guadalupensis* differs from *A. atricaudus* ''in the structure and color of the dorsal fin.'' However, no further explanation is provided. We believe thatOsburn and Nichols thought that their new species had fivefirst dorsal spines and a leading spine on the second dorsalfin followed by ten soft rays and reported the counts as V-I,10. A radiograph of the holotype of *Amia guadalupensis* (Fig. 3C) shows that the first dorsal spine is missing, evidently aninjury, and the second dorsal fin has nine soft rays, the standard count for all eastern Pacific and Atlantic cardinal-fishes in the genus *Apogon*.

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Fig. 1. School of *Apogon* ''*guadalupensis*'' at Guadalupe Island, BajaCalifornia, Mexico. Photograph © Daniel Richards, June 2010.

Apogon ''*guadalupensis*'' is relatively common at Guadalupe Island, Mexico (Fig. 1). The dorsal blotch is recognizable in aphotograph taken at Santa Catalina Island, California (Fig. 4A). The holotype of *Apogon guadalupensis* clearly shows a dorsal-fin blotch between spines 1 and 3 (between 2 and 4 due to a missing first spine). The first author along with William Eschmeyer (Eschmeyer et al., 1983) have been awareof the *A. atricaudus*–*A. guadalupensis* conundrum since themid-1970s, ultimately resulting in the more detailed investigation reported herein. In addition, the status of *A. guadalupensis* as a valid species was questioned by Mabuchiet al. (2014) and Piñeros et al. (2019). *Apogon guadalupensis* was placed in the synonymy of *A. atricaudus* in Kuiter and Kozawa (2019) without rationale or discussion.

MATERIALS AND METHODS

Counts and measurements follow those used by Fraser (2005) and are included in Tables 1 and 2. The first dorsal fin was examined to determine the presence or absence of a melanistic spot or blotch and recorded as absent or present.If a blotch was present, its position between the dorsal spines was noted, with 82 specimens examined. A summary of thischaracter state is given in Table 3. Materials examined are listed as catalog number, followed by sample size, range of sizes in mm standard length (SL), location, date collected, and any other relevant information.

Pectoral-fin clips were taken from two live aquarium individuals of *A. guadalupensis* captured at Santa Catalina Island and housed at the Catalina Island Marine Institute, stored in 95% ethanol, and shipped to the Smithsonian Institution in Washington, DC for DNA extraction and amplification of the cytochrome c oxidase subunit I (COI). DNA barcoding was performed as outlined by Weigt et al. (2012). Sequences were assembled and aligned using *Geneious Prime 2019.2.3* (Biomatters, Ltd., Auckland, New Zealand) and then uploaded to the Barcode of Life Data Systems v. 4(BOLD, https://www.boldsystems.org; DROPE046-20 and DROPE047-20).

The BOLD database was then queried for sequences of alleastern Pacific species of *Apogon*. Forty-five sequences wereobtained for all six eastern Pacific species and the Atlantic *A.imberbis*. *Apogon imberbis* was chosen as an outgroup as it hasbeen identified as the sister species to the clade containing all eastern Pacific *Apogon* (Piñeros et al., 2019). Sequences were aligned using CLUSTAL Omega (https://www.ebi.ac.uk/Tools/msa/clustalo/) with default settings. Inter- and intra-specific uncorrected p-distances were calculated using MEGA v. 10.1.6 and a neighbor-joining tree was created using default settings and uncorrected interspecific distances.

RESULTS

***Apogon atricaudus* Jordan and McGregor in Jordan andEvermann, 1898**
Figures 1–7, Tables 1–5

Amia guadalupensis Osburn and Nichols, 1916.
Apogon guadalupensis (Osburn and Nichols, 1916).

Diagnosis.—A member of the genus *Apogon* (Fraser, 1972; Fraser and Randall, 2002; Mabuchi et al., 2014) with dorsalfin VI+I, 9; pectoral-fin rays 11–12; and 13–17 well-developedgill rakers. In life, head and body reddish to yellowish abdominally; spinous dorsal fin with or without a black blotch; distal parts of soft dorsal and anal fins pale without black markings, occasionally with scattered melanophores; caudal fin blackish; no dark markings on body

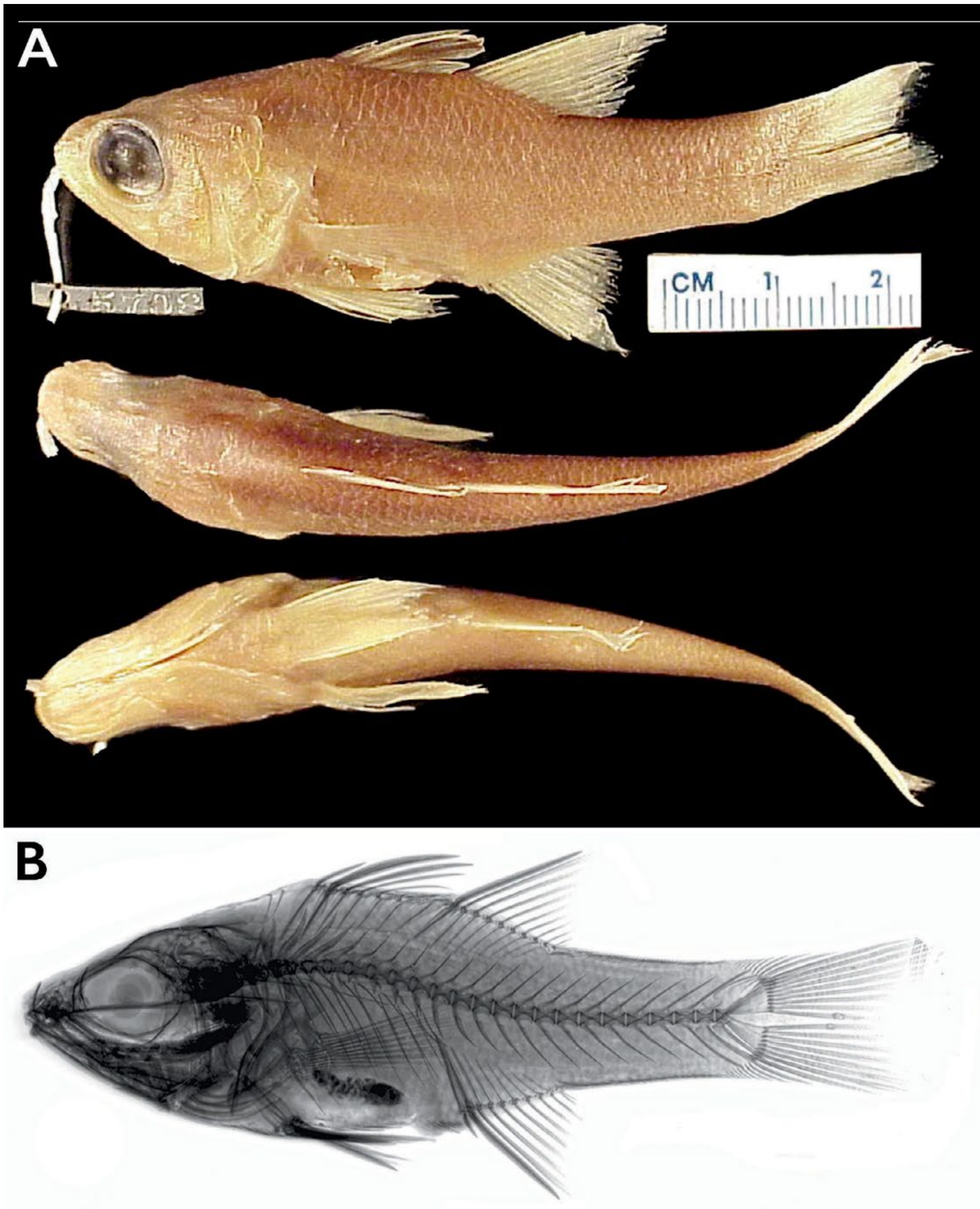

Fig. 2. (A) *Apogon atricaudus*, syntype, CAS-SU 5708 (1 of 12 in lot), Revillagigedo Archipelago, Socorro Island, collected May 1897, photograph by David Catania, CAS. (B) Positive radiograph from a negative of syntype USMN 48527, 70.9 mm SL, by Thomas Fraser in 1974.

Description.—Dorsal fin VI+I, 9; anal fin II, 8; pectoral fin usually 11–12; pelvic fin I, 5; principal caudal rays 9+8; pored lateral-line scales 24; transverse scale rows above lateral line2; transverse scale rows below lateral line 6; median predorsal scales 5. The frequencies of gill-raker counts are given in Table 2. Villiform teeth in several rows on the premaxilla;two rows on the dentary; one row on the palatine and vomer.Vertebrae 10+14. Five free hypurals, one pair of slender uroneurals, three epurals, a free parhypural. Two supra- neurals, one supernumerary spine on first dorsal pterygio- phore. Supramaxilla absent. Posttemporal serrate onposterior margin. Preopercle ridge smooth and poorlyossified on posterior vertical and ventral horizontal margins.Infraorbital edges mostly smooth. Scales on head, breast, nape, and body ctenoid, pored lateral-line scales from posttemporal to base of hypural.

Color in life.—Head and body reddish to orangish abdominally; spinous dorsal fin with or without a black blotch; spinous dorsal-, soft dorsal-, and anal-fin rays reddish,membranes clear, occasionally with scattered melanophores;caudal fin blackish; no dark markings on body; no dark snout mark extending through the eye (Figs. 3A, 4).

Color in alcohol.—Pigmentation muted or lost in preservation (Figs. 2A, 3B).

Distribution.—Revillagigedo Archipelago, Clipperton Island,Cabo San Lucas, and southern Sea of Cortez, Alijos Rocks, SanBenitos Islands, Guadalupe Island, and Channel Islands of California with exception of northwestern islands (San Miguel and Santa Rosa; Fig. 6). The type locality for *A. atricaudus,* as listed in Jordan and Evermann (1898: 277) was noted as ‘‘Numerous specimens collected at San Benedicto, Socorro, and Clarion Islands.’’

Genetic analysis.— Overall, 621 base pairs of the COI were resolved in the final alignment. Among eastern Pacific species of *Apogon*, mean interspecific genetic variation was 7.27% (range 1.6–9.9%; Table 4), while mean intraspecific genetic variation was 0.52% (range 0–2.25%; Table 5). Interspecific genetic variation between eastern Pacific speciesof *Apogon* and the western Atlantic *A. imberbis* ranged from 9.9–11.6% (Table 5). The topology of the neighbor-joiningtree (Fig. 7) was congruent with that for eastern Pacific species of *Apogon* in Piñeros et al. (2019), with *A. atricaudus* and *A. guadalupensis* clustered together with a mean interspecific genetic difference of 1.6%. All nominal species of eastern Pacific *Apogon* clustered together to the exclusionof all other species.

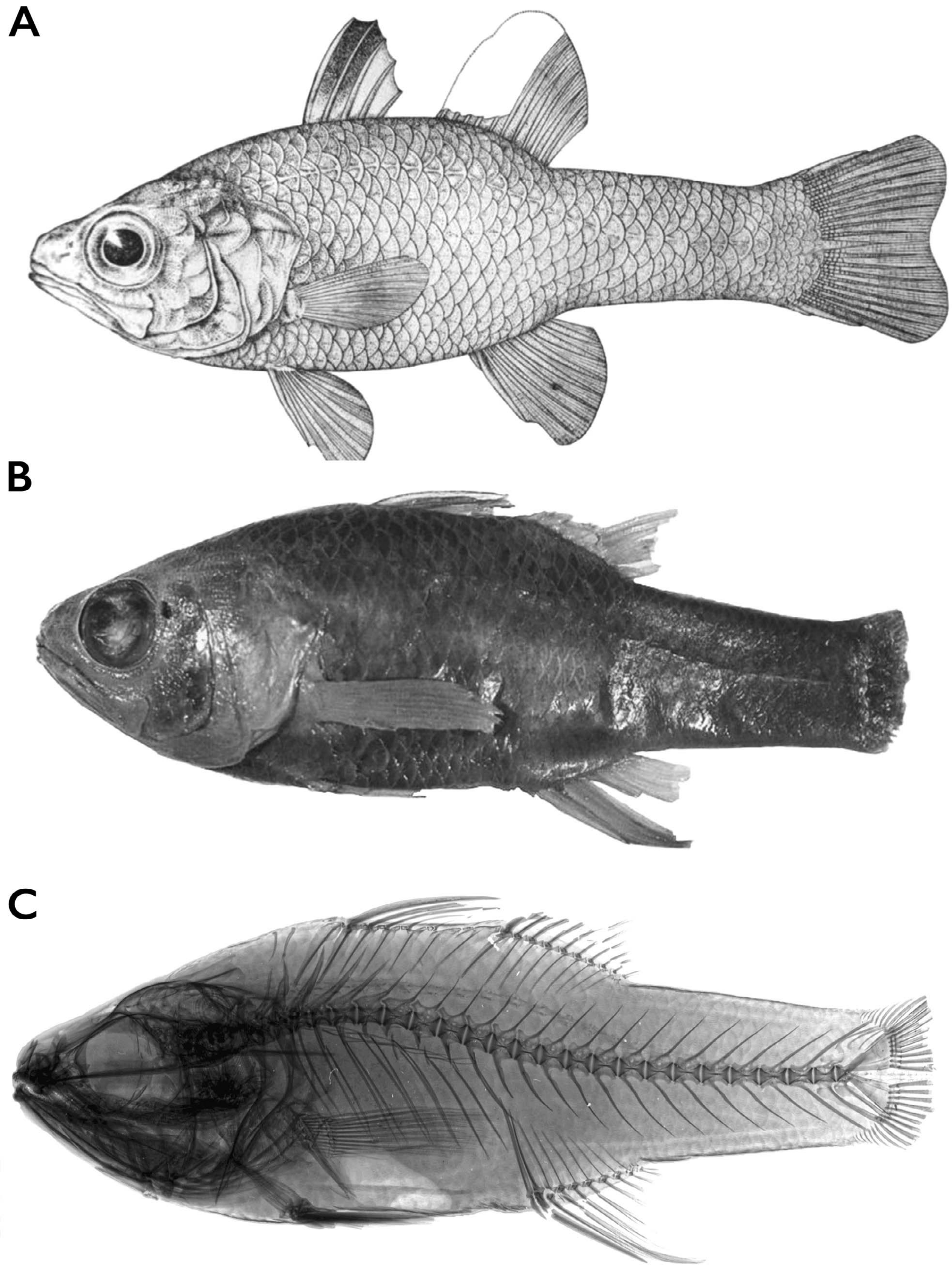

Fig. 3. *Amia guadalupensis*, holotype, 84.0 mm SL, USNM 87545 (originally AMNH 5204), now in *Apogon*. (A) Figure 9 in Osburn and Nichols,1916. (B) Photograph by Thomas Fraser in 1974. (C) Positive radiograph of a film negative by T. Fraser in 1974.

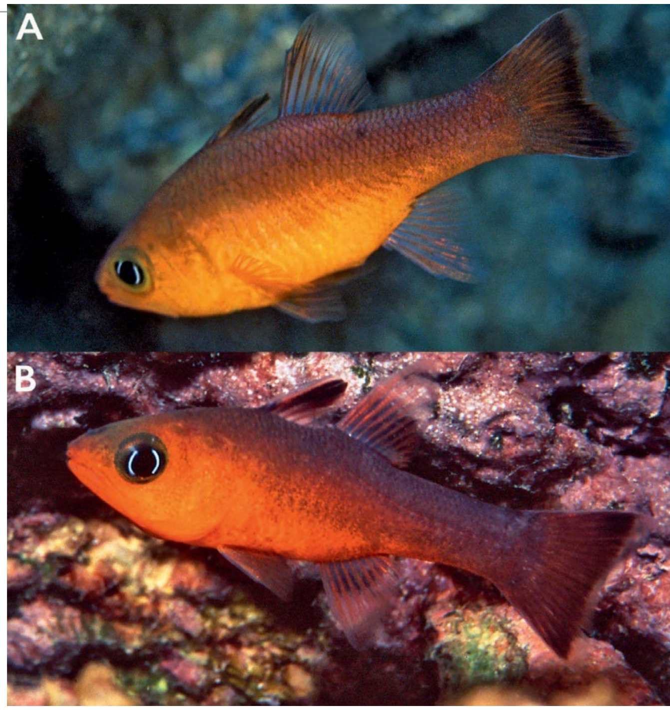

Fig. 5. Apogon atradorsatus. Isla Salsipuedes, Baja California, Mexico. LACM 60025-1. Photograph copyright Daniel Richards, October 2014.

Fig. 6. Station locations from CAS, LACM, SIO, and USNM for Apogon atricaudus (yellow dots, syntypes yellow star), A. atricaudus (green dots, holotype of Amia guadalupensis green star), and Apogon atradorsatus (orange dots, holotype orange star).

MATERIAL EXAMINED

Type material: Syntypes *Apogon atricaudus*: CAS-SU 5708, 12, 40.1–65.2, Socorro Island, Mexico, May 1907, x-ray, photo graphs; BMNH 1898.10.29.22–25, 4, 47.2–0.9, same data as CAS-SU 5708; USNM 48527, 4, 48.2–66.4, x-ray, same data as CAS-SU 5708. Holotype *Amia guadalupensis* USNM 87545 (originally AMNH 5204), 84.0, Guadalupe Island, Mexico, Albatross Expedition 1911, 2 March 1911, Fig. 3A, Osburn and Nichols fig. 9, photograph and x-ray. Mexico: Revillagigedo Archipelago: SIO 58-142, SIO 70-392, SIO 70-394, SIO 74-150, SIO 74-151, SIO 74-155; Bahia San Lucas: SIO 59- 210, 59-215; Cabo San Lucas: SIO 61-227, SIO 67-10; Alijos Rocks: SIO 70-371; Guadalupe Island: SIO 50-40, SIO 53-160, SIO 53-161, SIO 53-163, SIO 53-165, SIO 53-169, SIO 53-173, SIO 54-213, SIO 54-219, SIO 54-219A, SIO 57-182, SIO 57-190, SIO 58-493, SIO 58-497, SIO 60-10, SIO 60-14, SIO 63- 162, SIO 63-167, SIO 63-174, SIO 63-178, SIO 63-184, SIO 63-188, SIO 65-71, SIO 65-75; Islas San Benito: SIO 84-224, SIO 85-200, SIO 90-75; 2, 84.2–86.3. USA: California, San Clemente Island: SIO 96-93, SIO 08-59; USNM 444182, from live specimen held in aquarium at the Catalina Island Marine Institute, which was taken, ca. 50 m south of Toyon Bay, depth 5 m, M. Schleiderer, 6 January 2019; USNM 444183,image of specimen from which fin clip taken for genetic analysis, same information as for USNM 444182; USNM 444184, image of specimen from which fin clip taken for genetic analysis, same information as for USNM 444182.

Table 1. Morphometric values of body proportion as percent of standard length for *Apogon atricaudus*, including all syntypes, and specimens identified as *Apogon guadalupensis*.

	Apogon atricaudus *n* = 17		*Apogon guadalupensis* *n* = 11	
Character state	Range	Mean	Range	Mean
Standard length in mm	40.1–84.5	61.8	38.9–97.0	60.5
% Body depth	31.5–35.5	33.7	26.6–33.7	31.5
% Head length	38.5–42.7	40.9	30.6–42.1	38.6
% Eye diameter	9.8–12.6	12	8.5–12.4	10.2
% Snout length	8.1–9.8	9.3	7.2–9.3	8.8
% Interorbital width	7.3–9.7	8.8	7.7–9.3	8.6
% Upper jaw length	19.0–21.0	20.5	19.4–20.6	20.1
% Pectoral fin length	22.1–25.2	23.9	20.6–25.8	23.4
% Pelvic fin length	20.5–23.8	22.4	18.3–23.3	21.2
% Caudal peduncle length	24.3–30.2	26.8	19.7–30.4	27.9
% Caudal peduncle depth	14.2–16.3	15.3	13.1–15.2	14.2

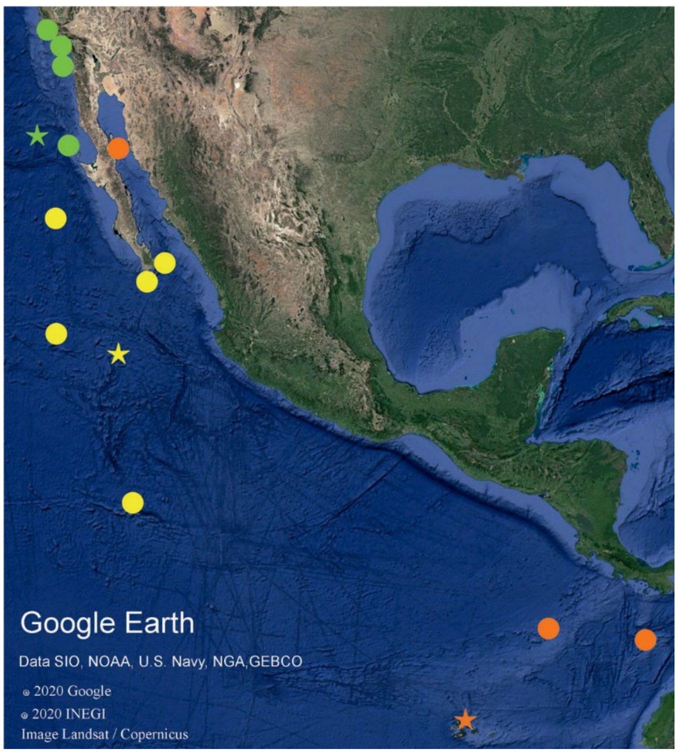

Fig. 6. Station locations from CAS, LACM, SIO, and USNM for *Apogon atricaudus* (yellow dots, syntypes yellow star), *A. atricaudus* (green dots, holotype of *Amia guadalupensis* green star), and *Apogonatradorsatus* (orange dots, holotype orange star).

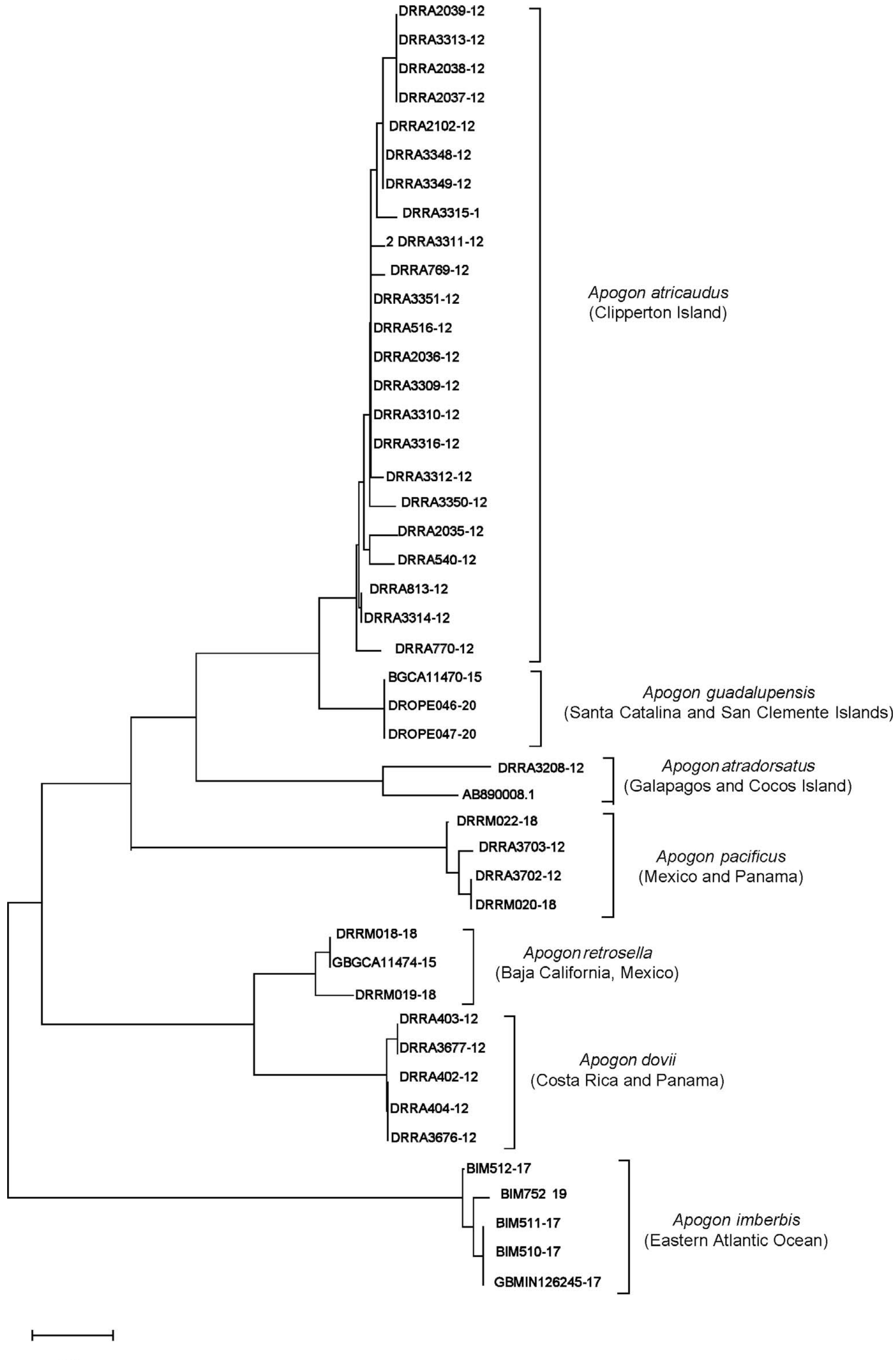

Fig. 7. Neighbor-joining tree for eastern Pacific species of *Apogon* and the Atlantic A. *imberbis*. Terminal taxa numbers are Barcode of Life Data System (BOLD) numbers. Locations of collection are presented in parentheses. See Data Accessibility for tree file.

Table 2. Frequency distribution of gill raker elements on first gill arch for the nominal *Apogon atricaudus* and *Apogon guadalupensis* including all syntypes of *A. atricaudus* and the holotype (*) of *A. guadalupensis*.

		Upper arch gill rakers		Lower arch gill rakers				Total arch gill rakers			
n		3	4	10	11	12	13	14	13	14	15
19	*Apogon atricaudus*	17	2	1	1	9	8	-	1	1	7
9	*Apogon guadalupensis*	6*	3	-	-	3	4*	2	-	-	3
28	Totals	23	5	1	1	12	12	2	1	1	10
		Upper arch rudiments		Lower arch rudiments				Total arch rudiments and rakers			
n		1	2	3	2	3	4	19	20	21	22
19	*Apogon atricaudus*	2	16	1	5	11	3	3	9	6	1
9	*Apogon guadalupensis*	1	8*	-	3*	4	2	-	4*	4	1
28	Totals	3	24	1	8	15	5	3	13	10	2

DISCUSSION

The morphological and genetic data presented hereinsupport the hypothesis that *Apogon atricaudus* and *A. guadalupensis* are conspecific. In the eastern Pacific, species of*Apogon* are genetically distinct at the COI locus (mean interspecific genetic difference 7.27%; Table 4). While sequences from the nominal species *A. guadalupensis* and *A.atricaudus* form separate clusters in the neighbor-joining tree, the mean difference of COI sequences is only 1.6% (Table 4), on genetic differentiation in conspecific fishes that are well above typical differences seen in broadcast spawners. Two species, *Apogon psuedomaculatus* (Atlantic Ocean) and *Apogon fugax* (Indian Ocean), have broad distributions (Wirtz et al., 2007: 10–11; Gon et al., 2020: 485). Color patterns and genetic comparisons for Brazilian specimens and those from far less than the mean difference among other species of São Tomé and Principe islands in the Gulf of Guinea *Apogon*. This pattern of large inter- and intraspecific differences between species of *Apogon* is not exclusive to species in the eastern Pacific. For example, the interspecific differencebetween *A. cyanosoma* and *A semilineatus* is 11.7% at the 16S locus; however, conspecific populations of *A. properuptus* (notably with two color morphs) are 11.6% different at 16S (Mabuchi et al., 2003), and *A. taeniophorus* collected at Ogasawara Islands and Ryukyu Islands show difference of 4.1–4.4% at the 16S locus (Mabuchi et al., 2004). This is notsurprising given the reproductive biology of the group. Species of *Apogon* are mouthbrooders, thus the dispersal potential of the combined egg and larval stage is reduced ascompared to the more typical broadcast spawning seen in most marine fishes. It is noteworthy that all samples of the nominal *A. atricaudus* were collected at Clipperton Island, and the samples of the nominal *A. guadalupensis* were collected at the Channel Islands (Santa Catalina and San Clemente Islands). This represents a straight-line distance of ~2,700 km. The relatively high genetic difference within species of *Apogon* from individuals collected at distant locations is also supported by the data presented for *A. atradorsatus*. The two sequences available for this species were collected from the Galápagos Islands and Cocos Island (straight-line distance ~750 km apart) and show a differenceof 2.3% (Table 5). Considering our data and those of Mabuchiet al. (2003, 2004), it thus appears that both geographic distance and reproductive biology may have profound effects confirmed the species identity. Color patterns and a molecular phylogenetic analysis provided the evidence that specimens from the Red Sea, Myanmar, and Western Australia are identified as the same species. A broad distribution for *Apogon atricaudus* is therefore not surprising. This presents an interesting model group for the explorationof genetic partitions and biogeography among fish species with low dispersal potential in the marine realm, particularlyamong isolated island groups.

The character of the dorsal blotch on the spinous dorsal fin has been used as the distinguishing feature separating *A. atricaudus* and *A. guadalupensis* for at least 39 years. The firstuse of the dorsal blotch as a differentiating character between these two nominal species, that we are aware of, is the photographic guide intended primarily for divers andunderwater photographers by Gotshall (1982: 24), stating for Plain Cardinalfish: ‘‘Similar to Guadalupe cardinalfish but possess a dark blotch on first dorsal fin.'' In the descriptionprovided by Allen and Robertson (1994: 122), it is stated that‘‘[In] *Apogon atricaudus*… middle portion of first dorsal finwith blackish streak; *Apogon guadalupensis*… very similar to *A. atricaudus*, but lacks blackish streak in middle part of first dorsal fin.'' Most recently, Kells et al. (2016) included briefdescriptions and excellent illustrations for each species,emphasizing the presumed differences in first dorsal-finpigmentation with a dorsal-fin blotch present in *A. atricaudus* and absent (except in small specimens) in *A. guadalupensis*.

Table 3. Position of dorsal fin blotch on spinous dorsal fin relative to dorsal spines. Specimens of *Apogon atricaudus* are from Revillagegido Archipelago, Cape San Lucas, Alijos Rocks (*n* ¼ 33). Specimens of *Apogon guadalupensis* are from Guadalupe Island, San Benito Islands, San Clemente Island, and Santa Catalina Island (*n* ¼ 49). Number of specimens observed with no blotch shown in first column.

Position of dorsal blotch relative to spine number	**No blotch**	**1–4**	**2–3**	**2–4**	**2–5**	**3–4**	**3–5**
Apogon atricaudus	3	3	0	15	10	2	0
Apogon guadalupensis	5	0	2	24	4	10	4
Totals	8	3	2	39	14	12	4
Percentage	10	4	2	48	17	15	5

Table 4. Interspecific genetic distance within eastern Pacific species of *Apogon* and the Atlantic *A. imberbis* (uncorrected p-distance expressed as %).

	A. imberbis	*A. dovii*	*A. retrosella*	*A. pacificus*	*A. guadalupensis*	*A. atricaudus*
A. imberbis						
A. dovii	9.98					
A. retrosella	10.48	2.83				
A. pacificus	11.61	9.32	9.1			
A guadalupensis	10.24	8.28	7.51	7		
A. atricaudus	10.63	8.66	7.91	7.31	1.6	
A. atradorsatus	10.93	9.9	9.21	8.66	6.12	5.7

The original description of *Apogon guadalupensis* clearly shows a dorsal-fin blotch between spines 2 and 4 (Osburn and Nichols, 1916: fig. 9; our Fig. 3A). In examining materialfrom various eastern Pacific localities, we find the first dorsalblotch to be variable in both presence and position, and we do not believe that it is a reliable character for separatingthese two nominal species (Table 3). We further find no reliable differences in counts and measurements between the two species (Tables 1, 2). We propose that *A. guadalupensis* be treated as a junior synonym of *A. atricaudus* based on pigmentation, morphology, and DNA barcodes and hereinrecommend the acceptance of this finding.

In addition to the above, this study also provides new information on the geographical distribution of *A. atradorsatus* and *A. atricaudus*. *Apogon atradorsatus* is endemic to the Galápagos Islands, Malpelo Island, and Cocos Island (Grove and Lavenberg, 1997). In 2014, during a dive trip on the Rocio Del Mar to the Sea of Cortez, Daniel Richards, accompaniedby R. N. Lea, photographed a cardinalfish at Isla Salsipuedes(lat. $28843^{0}38^{00}$N), approximately mid-Gulf. The photograph was filed and given little attention until 2019, when RNLrequested photos of *Apogon* (other than *A. retrosella*, the common Gulf of California cardinalfish) taken during thecruise, hoping to find *A. atricaudus* at a locality north of Cabo San Lucas and Cabo Pulmo. A photo of a plain-colored *Apogon* was located and immediately identified as *A. atradorsatus* (Fig. 5). Piñeros et al. (2019: 236) stated, ''*A. atradorsatus* [is confined] to Galápagos, Cocos, and Malpelo islands, with a few vagrants (between 1 to 10 individuals) registered in the Cortez and Panamic Provinces and even between TEP islands.'' We treat the Isla Salsipuedes cardinalfish as a waifdistribution. The occurrence of *A. atricaudus* inside the Gulf of California is poorly known. Thomson et al. (2000) listed fourspecies known to occur in the Sea of Cortez (*A. atricaudus*, *A. dovii*, *A. pacificus*, and *A. retrosella*) with *A. atricaudus* reportedas only collected at Cabo San Lucas. Ayala Bocos et al. (2018) included three species of *Apogon* in their checklist of fishes at Cabo Pulmo reef, *A. atricaudus*, *A. pacificus*, and *A. retrosella*. Figure 4 illustrates *A. atricaudus* from Cabo Pulmo, a relativelyshort distance north of Cabo San Lucas. De la Cruz Agüero and collaborators (1997) give a distribution of Cabo San Lucas and Bay of La Paz for *A. atricaudus*, but without elaborationregarding Bay of La Paz. RNL has made visual sightings of the species at Cabo Pulmo and Los Islotes (lat. $24835^{0}56^{00}$), at both sites only of solitary fish.

Table 5. Intraspecific genetic distances between eastern Pacific species of *Apogon* and the Atlantic *A. imberbis* (uncorrected p-distance expressed as %).

Species	%
A. atradorsatus	2.25
A. atricaudus	0.36
A. dovii	0.1
A. guadalupensis	0
A. imberbis	0.23
A. pacificus	0.27
A. retrosella	0.43
Mean	0.52

DATA ACCESSIBILITY

Supplemental material is available at https://www. ichthyologyandherpetology.org/i2020137. Unless an alternative copyright or statement noting that a figure is reprinted from a previous source is noted in a figure caption, the published images and illustrations in this article are licensedby the American Society of Ichthyologists and Herpetologistsfor use if the use includes a citation to the original source(American Society of Ichthyologists and Herpetologists, the DOI of the *Ichthyology & Herpetology* article, and any individualimage credits listed in the figure caption) in accordance withthe Creative Commons Attribution CC BY License.

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