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Five New Records of Fishes for the Hawaiian Islands

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Abstract

The Ringed Snake Eel *Myrichthys colubrinus* (Boddaert) is reported here as a first record for the main Hawaiian Islands from an underwater photograph taken off Kaua‘i, and its record for the Northwestern Hawaiian Islands by a specimen in the fish collection of the California Academy of Sciences (CAS). The first Hawaiian records of the Shadowfin Soldierfish *Myripristis adusta* (Bleeker) are from photographs of two fish caught from the Kailua-Kona pier of the island of Hawai‘i. The third new record, the Bumphead Parrotfish *Bolbometopon muricatum* (Valenciennes), the largest of the parrotfishes, is based on a specimen that was speared in 70 feet in Onomea Bay, near Hilo on the island of Hawai‘i. The fourth record, the Bignose Unicornfish *Naso vlamingii* (Valenciennes), is based on two underwater photographs, one taken at the island of Hawai‘i, and the other at Ni‘ihau. These 4 species are wide-ranging in the Indo-Pacific region from the western Indian Ocean to the Line Islands. *Myrichthys colubrinus* is reported as well from Johnston Island. The fifth new record is the northern subspecies of the Eastern Pacific Bonito, *Sarda chiliensis lineolata* (Girard); a specimen was caught in Kāne‘ohe Bay on the island of O‘ahu. None except *N. vlamingii* are in the aquarium trade. Although valid as new records for the Hawaiian Islands, they are not regarded as an integral part of the fish fauna.

Key words: ichthyology, coral-reef fishes, Indo-Pacific Ocean, biogeography, Hawai‘i

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Introduction

Species of fishes are still being added to the fauna of the Hawaiian Islands, mainly as waifs that swim in as prejuveniles and grow to a size that can be identified. A large majority fail to establish a breeding population. Much has been published on the probable origin of these newcomers. Genetic research is providing positive clues to the origin of many. An extensive summary of the Hawaiian fish biota may be found in Mundy (2005).

Five species are reported here as first records for the Hawaiian coastal fish fauna. Four are not aquarium fish and *N. vlamingii* is rare in the trade, making a release unlikely. Until new records are determined as representing a breeding population in the Hawaiian Archipelago, they are not included in the official Hawaiian coastal fish fauna.

Materials and Methods

We describe coastal fishes as species found from the shore to 200 m. We reviewed the popular fishing and diving media resources from the time period of 2008–2018 for evidence of novel or unusual species occurrences in Hawaiian seas; we also interviewed the individuals who caught or observed these fishes.

The first 4 new records of fishes for the Hawaiian Islands are based on photographs. Only the fifth record, the northern subspecies of the Eastern Pacific Bonito, *Sarda chiliensis lineolata* (Girard), is represented by a specimen. It was caught by hook and line in Kāneʻohe Bay, Oʻahu and is deposited in the Bishop Museum, Honolulu as BPBM 41212. Its length measurement is given as fork length, the distance from the tip of the snout to the most anterior end of the indented posterior margin of the caudal fin.

New Records of Fishes for the Hawaiian Islands

Myrichthys colubrinus (Boddaert)

Ringed Snake Eel

Figures 1–3.

Muraena colubrina Boddaert, 1781: 56 (type locality, Ambon, Indonesia).
Myrichthys colubrinus McCosker & Rosenblatt 1993 (Indo-Pacific Ocean).

Diagnosis. Vertebrae 190–202; body very elongate, depth 51–68 in total length; head length 17–20 in total length; snout rounded, 3–5 in HL; head and trunk 2.0–2.3 in total length; origin of dorsal fin on head, predorsal

Figure 1. *Myrichthys colubrinus*, Kauaʻi, Hawaiʻi (William T. Brooks).

length 1.7–2.3 in HL; anal fin ending well in advance of end of dorsal fin; pectoral fins very small, 3–5 in snout length; teeth granular, in two rows in jaws; white to dusky white or cream-colored with 25–32 black rings, most completely encircling head and body, first enclosing eye; a round black spot (sometimes 2 or 3) often present in pale interspaces, developing with age and present in both sexes. Largest specimen reported, 97 cm total length.

Remarks. Wide-ranging in the Indo-Pacific: in the Indian Ocean from the Red Sea south along the coast of Africa at least to Delagoa Bay, Mozambique; east across the Indian and Pacific Oceans to Johnston Atoll, Line Islands, Society Islands, and the Tuamotu Archipelago; in the western Pacific north to Kochi Prefecture, Japan and south to New South Wales, Australia.

Typically found on sand flats and seagrass beds of lagoons or bays in the depth range of 0.5–25 m, usually buried in the sand. Seen in the open more often at night, but occasionally entirely exposed by day, moving slowly over open sand substrata. Believed to feed mainly on benthic crustaceans. A 73-cm specimen collected in Papua New Guinea by the first author and Dr. Lynne Parenti contained a half-digested 65-mm stomatopod in its stomach. This species was suggested as a mimic of the venomous banded sea snakes by McCosker & Rosenblatt (1993) in their revision of the genus. They included Palmyra Atoll of the Line Islands and Johnston Atoll as locations for their material examined. The species has 10 junior synonyms, as might be expected from its variable color pattern and broad distribution. Its two English common names are Ringed Snake Eel and Banded Snake Eel.

Hawaiian Record. In July 2010, William T. Brooks took the underwater photograph of Figure 1 of an adult individual of *Myrichthys colubrinus* moving over the sand bottom at a depth of about 1.5 m off Poipu Beach, Kaua‘i. Its excursion in the open was brief. Brooks noted the exact location and planned to try to collect the eel the next day, but rough seas forced cancellation. This species probably ranges over a broad area as it forages on

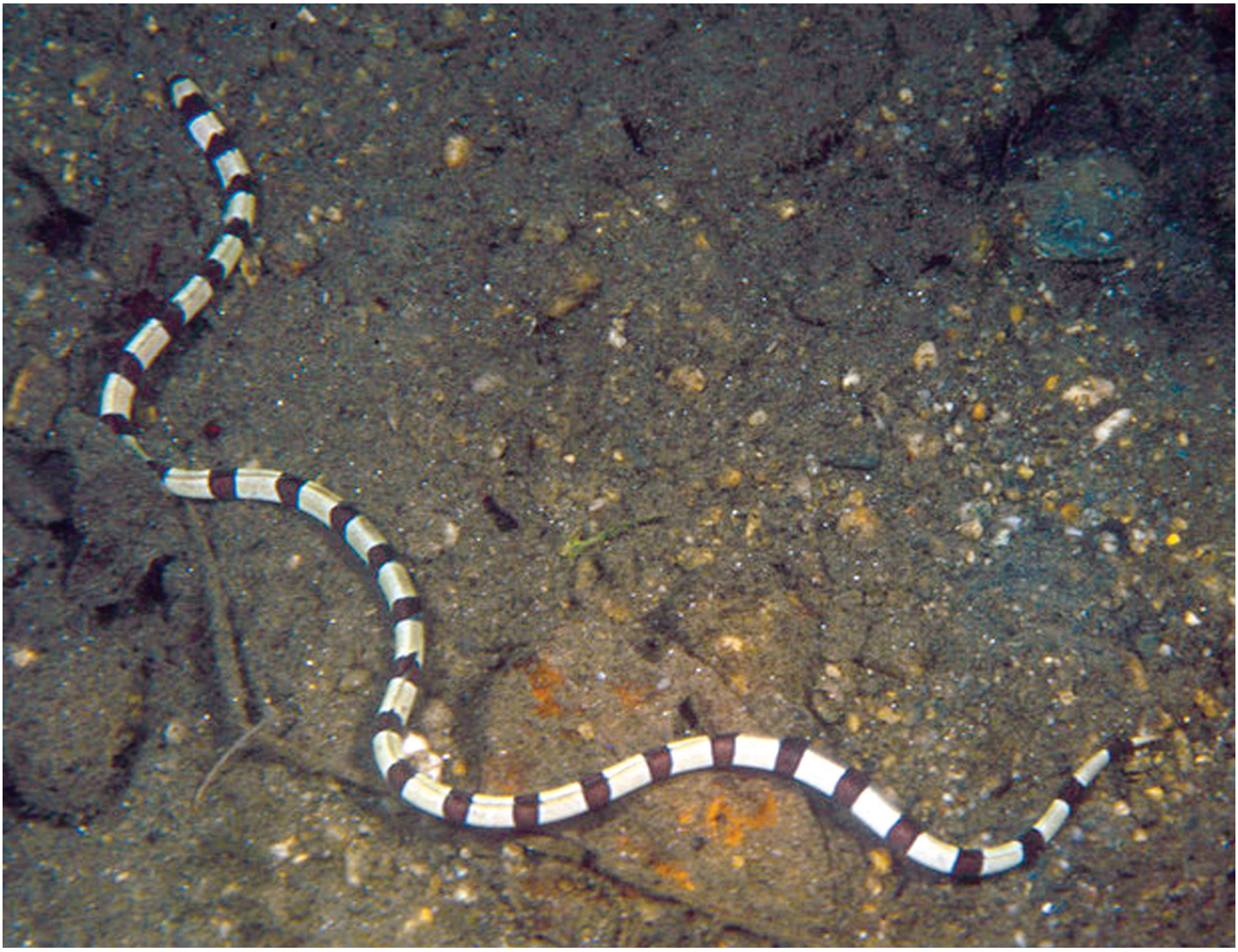

Figure 2. *Myrichthys colubrinus*, estimated length of 40 cm, Papua New Guinea (John E. Randall).

Figure 3. *Myrichthys colubrinus*, 73 cm, Papua New Guinea (John E. Randall).

and beneath open sand or sand-and-rubble substrata, so chances of successful collection would have been slim.

The identification of the photograph of the snake eel as *M. colubrinus* was confirmed by the fifth author JEM. Subsequent checking of the fish collection of the California Academy of Sciences for possible specimens of *M. colubrinus* from the Hawaiian Islands revealed that CAS 79371, first misidentified as *Leiuranus* sp., is a specimen of *M. colubrinus*. It was collected at 23° 15' N, 165° 39' W (approximately 25 miles SE of La Perouse Pinnacle), Northwestern Hawaiian Islands, by the crew of the R/V *Pioneer* on 23 June 1951 from a depth of 150 feet by hand line with a red feather. The specimen is the basis for the first record of the species for the Northwestern Hawaiian Islands, while Brooks' photograph is the first record for the main Hawaiian Islands.

Could *Myrichthys colubrinus* already be an established species in the Hawaiian Islands but missed because it is rarely seen in the open during the day? This is possible, but unlikely. The piscicide rotenone has been liberated over areas of open sand with the intention to collect fossorial fishes frequently throughout the islands, yet no specimens of *M. colubrinus* have been taken.

Could Brooks' photograph be *Leiuranus semicinctus* Lay & Bennett, a wide-ranging snake eel that is known from the Hawaiian Islands? It has black saddle-like markings, but, when viewed from above, these cannot easily be distinguished from the complete rings found in *M. colubrinus* (Fig. 3). If the head can be seen, *L. semicinctus* has a longer and more pointed snout (about twice the orbit diameter), whereas *M. colubrinus* has a blunt snout about the length of the orbit. With specimens in hand, the definitive way to distinguish the two species, along with the extent of the rings, is to take X-rays for vertebral counts: *L. semicinctus* has 162–171 vertebrae, compared to 190–202 for *M. colubrinus*.

McCosker & Rosenblatt (1993: 161) reported *M. colubrinus* from Johnston Atoll, a likely source of the species for the Hawaiian Islands. The current pattern is also favorable for transport of the pelagic stage from the Line Islands (Kobayashi 2006).

Myripristis adusta Bleeker

Shadowfin Soldierfish

Figures 4–6.

Myripristis adusta Bleeker, 1853: 108 (type locality, Ambon, Indonesia).
Myripristis adusta Randall & Greenfield 1996: 14 (Indo-Pacific).

Diagnosis. Dorsal-fin elements XI-I,14–16; anal-fin elements IV,12–14; pectoral-fin rays 15–17; lateral-line scales 27–29; no small scales in axil of pectoral fin, but one or two moderately large scales (usually two, one above other, just below middle of axil); gill rakers 35–40; body moderately deep, depth 2.0–2.5 in SL; snout very short and blunt; eye very large, diameter nearly half head length; lower jaw slightly projecting when mouth closed; one or two tooth patches at front of lower jaw just outside gape; fourth anal-fin spine longer than third; caudal fin forked with rounded lobes. Color in life silvery white, tinged with orange, scales rimmed with brownish orange; scale edges progressively darker dorsally, becoming dark brown above lateral line and black on nape; scale centers on nape and below spinous portion of dorsal fin metallic green; top of head blue-green with black ridges; a large oval black spot posteriorly on opercle; axil of pectoral fins black; iris red; spinous dorsal fin reddish black with a bluish white middle stripe beginning on third membrane; remaining median fins light blue, very broadly tipped with black. Attains 27 cm total length.

Remarks. Wide-ranging in the Indo-Pacific: in the western Indian Ocean from the Red Sea and African coast east across the Indian and central Pacific Oceans to the Line Islands, Society Islands, and Tuamotu Archipelago; in the western Pacific north to the Ryukyu Islands of Japan and south to the Great Barrier Reef and New Caledonia. Usually found by day in small aggregations in caves or beneath ledges, mainly in lagoons or bays, some as

Figure 4. *Myripristis adusta*, Kailua-Kona pier, island of Hawai‘i (Ian Kau).

Figure 5. *Myripristis adusta*, Kailua-Kona pier, island of Hawai‘i (Tasha Palmer).

Figure 6. *Myripristis adusta*, Kiritimati, Line Islands (John E. Randall).

shallow as 2 m. Occurs to at least 24 m when in exposed outer-reef areas. Nocturnal, as is characteristic of species of the genus, dispersing to feed on the larger animals of the zooplankton, chiefly crustacean postlarvae.

Hawaiian Records. *Hawaii Fishing News* of February 2011 published the photograph of Figure 4, the head in dorsal view of a soldierfish readily identified as the Shadowfin Soldierfish *Myripristis adusta*. The fish was caught by Ian Kau while fishing at night from the Kailua-Kona pier on the island of Hawai‘i. He recognized it as a species of menpachi, the usual local name (of Japanese origin) in Hawai‘i for fishes of the genus *Myripristis* (the equivalent Hawaiian name is ‘u‘u). Five species of the genus are known from Hawaiian seas, all dominantly red. Having never seen a soldierfish of such unusual color, Kau released it. Later, *Hawaii Fishing News* of December 2011 published the photograph of Figure 5, taken by Tasha Palmer, of an adult *M. adusta* in hand that she caught, also from the Kailua-Kona pier; this one was retained for consumption (reported weight was 0.5 lb.). It is not known if this fish was the same individual that Kau released. Diver friends in Kailua-Kona have been alerted to inform the authors of any further catches or sightings: none has been reported. This species has not been recorded from Johnston Atoll (Lobel & Lobel 2004), but it is common in the Line Islands. Figure 6 shows an aggregation at the raised atoll of Kiritimati (formerly Christmas Island), Line Islands.

Bolbometopon muricatum (Valenciennes)

Bumphead Parrotfish

Figures 7–10.

Scarus muricatus Valenciennes in Cuvier & Valenciennes, 1840: 208 (type locality, Java, Indonesia).
Bolbometopon muricatum Smith 1956: 8 (Indo-Pacific).
Bolbometopon muricatum Bellwood 1994: 65 (phylogenetic study).

Diagnosis. Pectoral-fin rays usually 16; median predorsal scales 2–5 (usually 4); rows of scales on cheek 3, lower row with only 1 or 2 scales; dental plates largely exposed, each of fused teeth forming a small bump on outer plate surface; dorsal profile of head very steep, with a prominent convexity on forehead of adults; body very deep, depth 2.05–2.5 in SL (depth increasing with age); adults usually green or greenish gray (seen as blue on some underwater photographs), front of head whitish to pale yellowish or pink. Largest parrotfish species: reported to 139 cm total length and a weight of 52 kg (Hamilton & Choat 2012).

Remarks. Wide-ranging from the Red Sea and east coast of Africa east across the Indian Ocean and central Pacific to the Line Islands and Samoa; in the western Pacific north to the Ryukyu Islands of Japan and south to the Great Barrier Reef and New Caledonia. Usually seen in small feeding aggregations that move over the reef and are difficult to approach. The first author observed one such group at Tabuaeran Atoll (Fanning Island) in the Line Islands from above while decompressing from a deep dive. He noted that they fed about half the time on live coral and the other half on algal-covered limestone. The sound of their jaws biting into the substratum was clearly audible (see also Bellwood and & Choat [1990]). At night, the fish retire to a cave or beneath a ledge. Spearfishing at night when they are particularly vulnerable has taken a heavy toll on this species in recent decades, which is now scarce near human populations (Dulvy & Polunin 2004). American Samoa has proclaimed this species to be fully protected at its 7 islands. Photographs here show a terminal-phase male asleep at night beneath a ledge in Sabah, Malaysia (Fig. 8); an aggregation of initial-phase adults in Bali, Indonesia (Fig. 8); and a juvenile collected from seagrass in Java, Indonesia (Fig. 10).

Hawaiian record. On 7 August 2011, Patrick Galon speared a subadult of *Bolbometopon muricatum* in 70 feet in Onomea Bay, 4 miles north of Hilo on the eastern coast of the island of Hawai‘i, a first record for the Hawaiian Islands. It weighed “almost 40 lbs.”. A photograph of the fish (minus its caudal fin) taken by Karen Coder was published in the December 2011 issue of *Hawaii Fishing News* (Fig. 7).

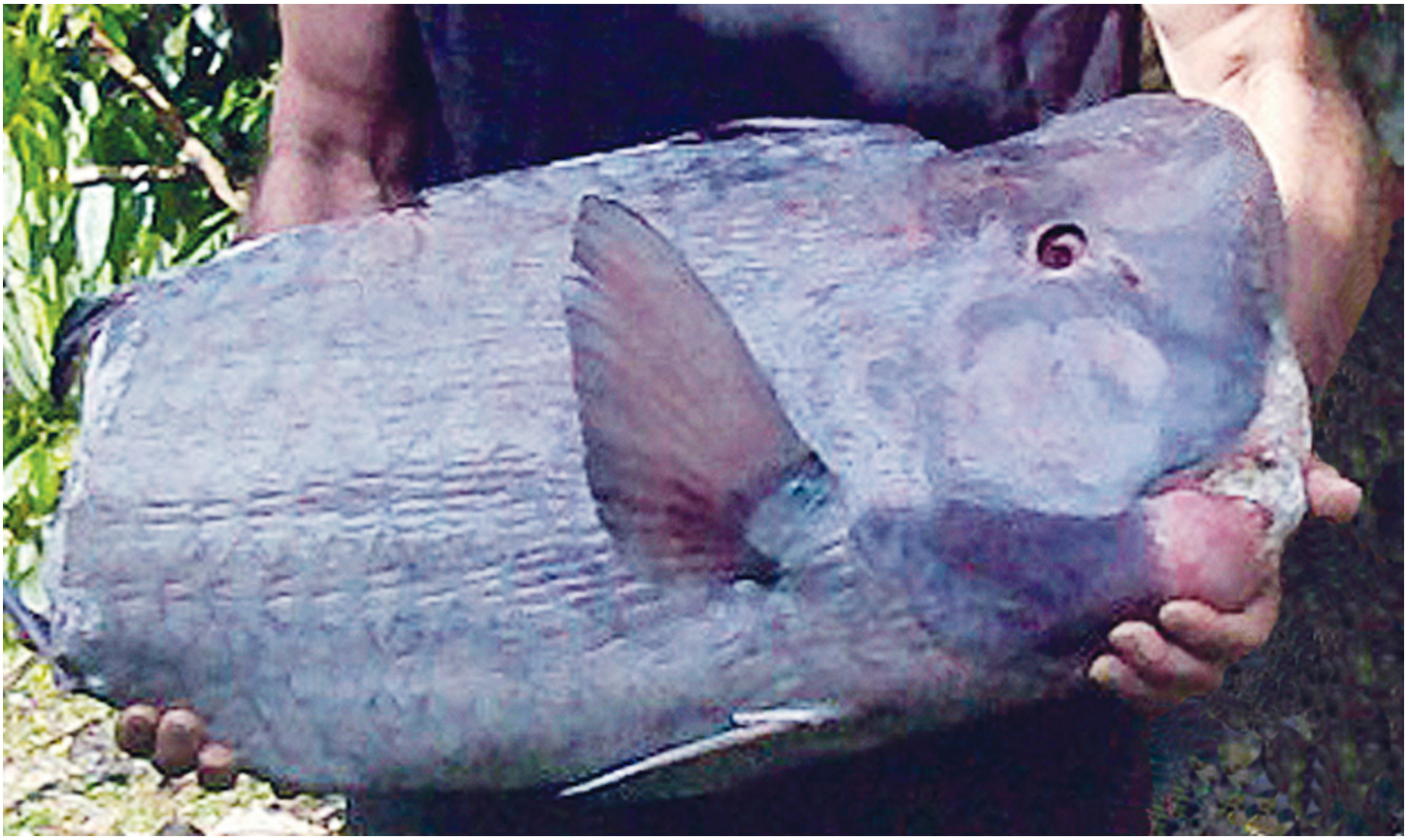

Figure 7. *Bolbometopon muricatum*, near Hilo, island of Hawai‘i (Karen Coder).

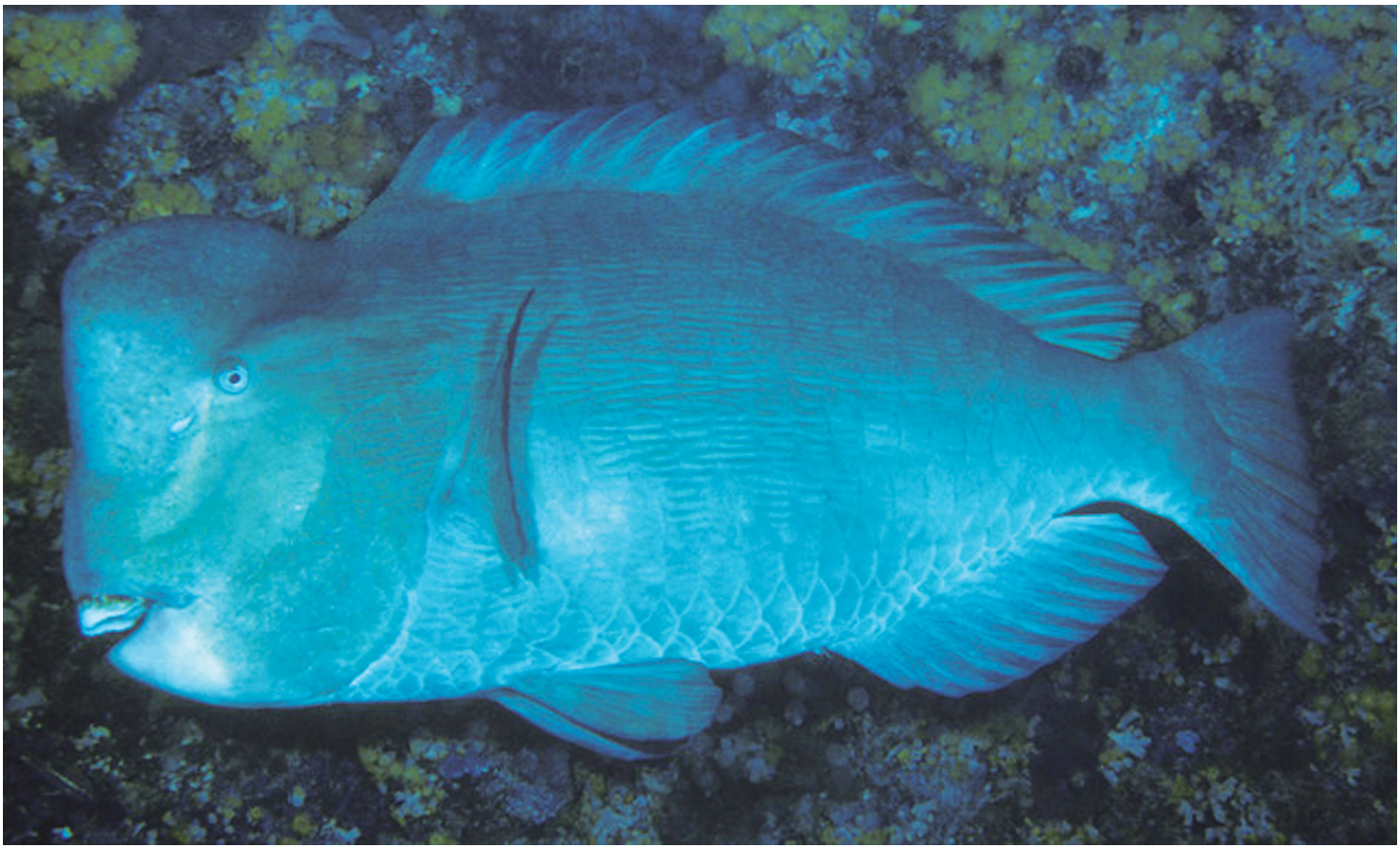

Figure 8. *Bolbometopon muricatum*, terminal-phase male, night, Sabah, Malaysia (John E. Randall).

Figure 9. *Bolbometopon muricatum*, terminal-phase males, Bali, Indonesia (John E. Randall).

Figure 10. *Bolbometopon muricatum*, juvenile, 13.4 cm, Java, Indonesia (John E. Randall).

Naso vlamingii (Valenciennes)

Bignose Unicornfish

Figures 11 & 12.

Naseus vlamingii Valenciennes in Cuvier & Valenciennes, 1835: 293 (type locality, Molucca Islands, Indonesia).
Naso vlamingii Randall 2002: 94, 4 figs. (Indo-Pacific).

Diagnosis. Dorsal-fin elements VI,26–27; anal-fin elements IIII,27–29; pectoral-fin rays 17–19; body very deep, depth varying from 2.2 in SL in subadults to 2.6 in SL in large adults; a prominent convex protuberance on forehead of adults; two horizontally aligned peduncular plates, each with a large keel that has a forward-projecting point in adults; dorsal fin elevated and nearly uniform in height; caudal fin emarginate in juveniles, slightly emarginate to truncate with long upper and lower filaments in adults Attains 55 cm total length.

Remarks. Wide-ranging in the Indo-Pacific Ocean: in the western Indian Ocean from the African coast east across the Indian and central Pacific Oceans to the Society Islands and Tuamotu Archipelago; in the western Pacific north to the Kii Peninsula of Japan and south to the Great Barrier Reef and New Caledonia. One photographic record of a waif was taken in the Galapagos Islands. The record from the Hawaiian Islands by Smith (1966) is an error. Usually seen in open water in outer-reef areas near drop-offs. Feeds mainly on zooplankton, occasionally on the feces below semi-stationary diurnal schools of the barracudas *Sphyraena forsteri* and *S. genie* and the jack *Caranx sexfasciatus*.

Hawaiian records. There are two new records for this species, both based on underwater photographs. Keller Laros took the photograph of Figure 11 on the reef at Garden Eel Cove, Makako Bay, Kona coast of the island

Figure 11. *Naso vlamingii*, Kona, island of Hawai‘i (Keller Laros).

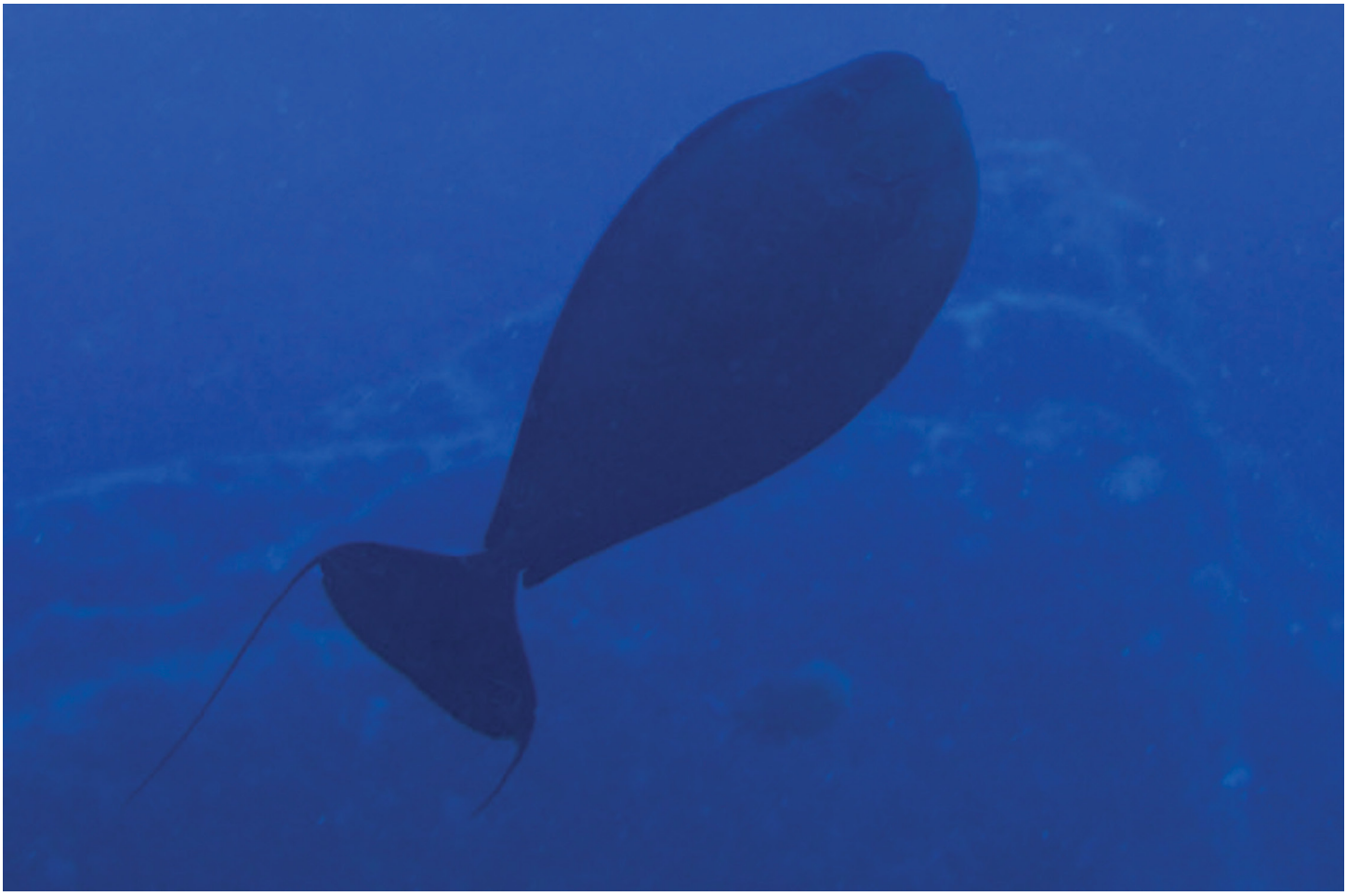

Figure 12. *Naso vlamingii*, Ni‘ihau, Hawai‘i (Andrew Gray).

of Hawai‘i on 15 September 2014. The second author took the photograph of Figure 12 while on a drift dive off the small island of Lehua, 1.1 km north of Ni‘ihau, at a depth of about 20 m. He gave the approximate location as 22.018° N, 10.10° W. Although the photograph is little more than a silhouette, there is no other species of *Naso* with which it might be confused.

Sarda chiliensis (Cuvier)

Eastern Pacific Bonito

Figure 13.

Pelamys chiliensis Cuvier in Cuvier & Valenciennes, 1832: 163 (type locality, Valparaiso, Chile).
Pelamys lineolata Girard, 1858: 106 (type locality, San Diego, California).
Sarda chiliensis lineolata Collette & Chao 1975: 106 (Alaska to southern tip of Baja California); Collette & Nauen 1983: 51.

Diagnosis. Dorsal-fin elements XVII–XIX, 13–15, dorsal finlets usually 8; anal-fin elements 12–15, anal finlets usually 6 or 7; pectoral-fin rays 22–26; gill rakers 22–27; upper-jaw teeth 18–30, lower-jaw teeth 14–25, no teeth on vomer; base of first dorsal fin 26.7–31.4% HL; maxilla 46–50.3% HL; 5 or 6 slightly oblique and wavy dark stripes dorsally on body; dorsal and caudal fins black. Maximum fork length 102 cm for northern subspecies (79 cm for southern subspecies).

Figure 13. *Sarda chilensis lineolata,* Kane‘ohe Bay, O‘ahu (John E. Randall).

Remarks. Collette & Nauen (1983) recognized two subspecies of the Eastern Pacific Bonito *Sarda chiliensis*: the northern *S. chiliensis lineolata* (Girard), from southern Alaska to Cabo San Lucas, Baja California and the southern *S. chiliensis chiliensis* (Cuvier) that ranges from Mancora, Peru to Talcahuano, Chile. The two subspecies are separated in the tropical zone by the wide-ranging *Sarda orientalis* (Temminck & Schlegel). The all-tackle angling record for the northern subspecies is 10.07 kg for a fish caught off Malibu, California in 1978. The species is described as neritic and epipelagic (Collette & Nauen 1983).

Hawaiian record. A specimen of *Sarda chiliensis lineolata* was caught by hook and line in Kāne‘ohe Bay, O‘ahu at a depth of 30 to 40 feet by Raymond G. Pregara at 15:30 hours on 19 September 2014. He removed the gills and internal organs. The specimen was deposited in the Bishop Museum, Honolulu as BPBM 41212: it measures 317 mm in fork length, and the present weight is 3.6 kg.

Sources of the five fishes newly recorded from the Hawaiian Islands

The most likely sources for 4 of the species newly recorded for the Hawaiian Islands are the islands or shallow banks from which surface currents flow towards the Hawaiian Archipelago. Three areas are usually mentioned as possible sources for marine species arriving in the Hawaiian Islands, although there is a small possibility that at least one of the individuals of *N. vlamingii* could have been an aquarium release. Foremost in proximity is Johnston Atoll, 1200 km southwest of Hawai‘i (Gosline 1955, Kobayashi 2006), followed by Kingman Reef in the northern Line Islands, 1700 km south of Hawai‘i (Gosline 1971, Skillings et al. 2011). Source locations in the northwestern Pacific are much more distant, but have been mentioned because some fish species, such as the Japanese Angelfish *Centropyge interrupta* (Tanaka) occurs in the Hawaiian Islands only at the far northwestern islands of Midway and Kure (Randall 2007).

Myrichthys colubrinus is the only one of the new records that is found at Johnston Atoll (McCosker & Rosenblatt 1993). The specimen photographed at Kaua‘i could have been a waif from there. Kobayashi (2006) wrote, “Several, recent scientific findings across a wide group of taxa have given rise to compelling evidence that Johnston Atoll is a stepping stone to species colonization in the Hawaiian Archipelago”. Using computer simulations and high-resolution ocean-current data, he charted two potential larval transport corridors between Johnston Atoll and the Hawaiian Archipelago, one to the vicinity of French Frigate Shoals and one to Kaua‘i. Some genetic data support the route through French Frigate Shoals (Leray et al. 2010, Bowen 2016), but species distribution data support the route through Kaua‘i. An example of the latter includes the coral *Acropora cytherea* (Dana), common at Johnston Atoll, and the butterflyfish *Chaetodon trifascialis* Quoy & Gaimard which associates with the coral to feed on the polyps (Randall et al. 1985). Kaua‘i is the only main Hawaiian island where this coral and butterflyfish have been found together; both are rare there (Mundy 2005, Randall 2007). The butterflyfish has been found as a waif at the other main Hawaiian Islands (Franklin 2017). However, the hypothesis that the *M. colubrinus* observed at Kaua‘i originated from Johnston Atoll does not preclude alternative hypotheses.

Myripristis adusta, *Bolbometopon muricatum*, and *Naso vlamingii* have not been reported from Johnston Atoll (Randall et al. 1985, Kosaki et al. 1991, Randall & Greenfield 1996, Lobel 2003, Kobayashi et al. 2011), making it an improbable source of the waifs of these species found in the Hawaiian Islands. All three species have broad Indo-Pacific distributions. The northern boundary of the distribution of *M. adusta* in the Pacific Ocean is delimited by the Ryukyu, Mariana, Marshall, Kiribati, Phoenix, and Line Island groups, but the species is found eastward in the South Pacific to the Tuamotu Archipelago (Randall & Greenfield 1996). The northern boundary of the distribution of *B. muricatum* in the Pacific Ocean is delimited by the southernmost Ryukyu Islands, the Mariana Islands, Wake Atoll, Marshall Islands, Kiribati, and the Line Islands (Shimada 2002, Kobayashi et al. 2011). The easternmost confirmed records of *B. muricatum* are at the Line Islands to the north and American Samoa to the south, although there are unconfirmed records from French Polynesia (Kobayashi et al. 2011). The northern boundary of the range of *N. vlamingii* is delimited by the Kii Peninsula of Japan, the Phoenix Islands, and the Line Islands, but the species occurs eastward in the South Pacific to the Society Islands and Tuamotu Archipelago (Randall 2005, Mundy et al. 2010). In the northern Line Islands, *M. adusta* and *N. vlamingii* are reported from Palmyra Atoll and Kingman Reef, and *B. muricatum* from Palmyra Atoll (Mundy et al. 2010). Abundance estimates of *M. adusta* and *N. vlamingii* are unavailable, but the highest densities of *B. muricatum* in the central Pacific are reported from Wake Atoll (297 per km^2; Zgliczynski et al. 2013), with the second highest (5 per km^2) at Palmyra Atoll (Kobayashi et al. 2011). Greater densities are reported from western Pacific marine protected areas, e.g. 5170 per km^2 at Palau, 800–4500 per km^2 at the Great Barrier Reef, 1210 per km^2 at New Caledonia, and 970 per km^2 at Vanuatu (calculated from information in Bellwood & Choat [1990], Bellwood et al. [2003], and Kobayashi et al. [2011]), but those are not likely sources for the Hawaiian specimens.

Sources to the west of the Hawaiian Islands could include Wake Atoll, Marshall Islands, Mariana Islands, and the Ryukyu Islands of Japan. Geostrophic currents sweep past the Ryukyus into the Kuroshio Current and the Kuroshio Extension, providing a potential pathway for larval transport to the Hawaiian Islands (Hourigan & Reese 1987, Bird et al. 2011). The slower and more variable North Pacific Subtropical Countercurrent moves from west to east through the regions of Wake Atoll and Johnston Atoll (Qui 1999, Qui & Chen 2010), providing a possible pathway for dispersal from those locations. The moderate pelagic larval duration of *B. muricatum* (ca. 31 days; Kobayashi et al. 2011) and *N. vlamingii* (ca. 37 days; Luiz et al. 2013) makes transport from western Pacific sources implausible for those species. Species of *Myripristis* have a pelagic duration of at least 58 days (Craig et al. 2007). However, the distances involved and the northerly position of the Kuroshio Extension (Taguchi et al. 2010) make a western Pacific origin for any of the waifs recorded in this paper unlikely, unless rafting of juveniles with floating objects is possible (see Luiz et al. [2011] for a discussion of the role of rafting in coral-reef fish biogeography). However, neither species is known to have juveniles that associate with floating objects. The Mariana and Marshall Islands are within the strong east-to-west flow of the North Equatorial Current, making direct dispersal from those archipelagos eastward to the Hawaiian Islands unlikely.

Kingman Reef and Palmyra Atoll in the northern Line Islands are the nearest reef-fish habitats to the Hawaiian Islands after Johnston Atoll. However, the Line Islands are isolated from the Hawaiian Islands by strong counter-flowing geostrophic currents: the west-to-east flowing Equatorial Countercurrent in the regions of Kiribati, Phoenix Islands, and most of the Line Islands, and, to the north, the east-to-west flowing North Equatorial Current in the region of the northernmost Line Islands and the southern end of the Hawaiian Islands (Tomczak & Godfrey 2003). These currents would make dispersal from the northern Line Islands to Hawai`i seem implausible. However, there is growing evidence that this is not the case: two fish species with ranges restricted to the southern and central equatorial Pacific, *Mulloidichthys mimicus* Randall & Guézé and *Zebrasoma rostratum* (Günther), have been recorded as waifs in the Hawaiian Islands (Randall 2007). The nearest recruitment source within the natural range of those species would be Kingman Reef (Mundy et al. 2010). Kingman Reef is also the most likely pathway for colonization of the Hawaiian Islands by the sea cucumber *Holothuria atra* Jaeger (the Johnston Atoll population is derived from the Northwestern Hawaiian Islands according to Skillings et al. [2011]). The genetic structure of *H. atra* agrees with an hypothesis proposed more generally after genetic analyses– that gene flow and dispersal of central-Pacific marine species is sometimes across the prevailing central Pacific geostrophic currents instead of along them (Benzie & Williams 1997, Benzie 1999). The physical mechanisms of cross-current transport are poorly understood and include eddy fields and equatorial tropical instability waves that can affect the northern

Line Islands (Mundy et al. 2010). Their potential to influence transient dispersal events from the Line Islands to the Hawaiian Archipelago clearly needs more investigation.

We therefore suggest that the source of individuals of *Myripristis adusta* and *Bolbometopon muricatum* found at the island of Hawai`i is the northern Line Islands. *Myrichthys colubrinus* occurs at both Johnston Atoll and Palmyra Atoll (McCosker & Rosenblatt 1993): either location could have been the source of the specimen documented from the main Hawaiian Islands, but the occurrence at Kaua‘i leads us to favor Johnston Atoll as the probable source for the eel. *Naso vlamingii* is rarely sold in the aquarium trade. We cannot discount an aquarium release as the source of the individual seen off the Kona Coast of Hawai‘i Island. It seems very unlikely that the individual seen off of remote, uninhabited Lehua Rock was there as a result of human activity. Thus, we suggest that these occurrences were also most likely naturally recruited waifs. The source of the specimen of *Sarda chiliensis lineolata* is likely the southern end of the species range, in Baja California, Mexico, possibly facilitated by the east-to-west North Equatorial Current.

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