

Updated catalogue of bony fishes observed in deep waters at Isla del Coco National Park and Las Gemelas Seamount, Costa Rica (Eastern Tropical Pacific)

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Received 30-V-2018. Corrected 13-VIII-2018. Accepted 31-VIII-2018.

Abstract: From 2006 to date the submersible *DeepSee* has been used to study the deep waters in and around Isla del Coco National Park, Costa Rica. Over these years, images and samples have been collected at depths between 50 and 450 m. Here we present a catalogue of bony fishes recorded by the submersible in deep waters of Isla del Coco, 500 km south-southwest of mainland Costa Rica, and at Las Gemelas Seamount within the designated Seamounts Management Area, 50 km southwest of Isla del Coco. A database with video-images of bony fishes was created from videos taken by the submersible's high-definition digital camera from 2006 to 2015. Additional information on the distribution of fishes was obtained from 11 dives (24.3 hrs) using the remotely operated vehicle *Hela* at Las Gemelas Seamount during February 2012. Images of bony fishes were obtained during 376 dives (365 *DeepSee* dives plus 11 *Hela* dives) in 18 different locations, and here we report on a total of 85 taxa (i.e. putative species). In this catalogue we present images that are the first color photographs published for some species. In other cases, identifications were possible only to the level of genus (11), family (5) or order (1); hence the information is presented in terms of putative taxa. Four new records are reported for Isla del Coco: *Leptenchelys vermiformis* (Ophichthidae), *Hyporhodus mystacinus* (Serranidae), *Kathetostoma averuncus* (Uranoscopidae), and *Symphurus diabolicus* (Cynoglossidae). Depth ranges of twenty-six species are expanded beyond previously published records; three were observed in shallower water, twenty-two in deeper water and one was observed both shallower and deeper than in previous reports. As might be expected, increased bottom time with the submersible resulted in additions to the list of documented species. This highlights the importance of maintaining systematic research efforts in the deep waters around Isla del Coco, both for scientific purposes as well as conservation.

Key words: Deep-water fishes; marine biodiversity; Cocos Island; *DeepSee*; ROV; submersible research.

Sánchez-Jiménez, A., Naranjo-Elizondo, B., Rodríguez-Arrieta, A., Quesada, A. J., Blum, S., McCosker, J. E., Robertson, D. R., Auster, P. J., & Cortés, J. (2018). Updated catalogue of bony fishes observed in deep waters at Isla del Coco National Park and Las Gemelas Seamount, Costa Rica (Eastern Tropical Pacific). *Revista de Biología Tropical*, 66(Supplement 5), S1-S113.

Isla del Coco is the only section of the Coco Volcanic Submarine Range (Cordillera Volcánica Submarina del Coco) that emerges above sea level (Rojas & Alvarado, 2012), reaching a height of over 2500 m above the ocean floor (Lizano, 2012), and 575 m above sea level (Montoya, 2016). The island is a hotspot of biological diversity in the Eastern Tropical Pacific, with at least 1688 marine species reported (Cortés, 2012) and with the highest number of endemic marine species in Costa Rica (Wehrmann, Cortés, & Echeverría-Sáenz, 2009; Cortés, 2012). Although the shallow-water marine biodiversity of Isla del Coco has been well studied and documented (Cortés, 2008), there are still unexplored regions with large potential for discovery, such as deep ocean zones (Cortés, 2012, 2016).

The waters of Isla del Coco are totally protected from fishing within the area designated as a National Park whereas Las Gemelas Seamount is subject to fishing pressure within a Seamounts Management Area; however, illegal fishing is recognized as a major threat (Soto, 2014; López-Garro, Zanella, Martínez, Golfín-Duarte & Pérez-Montero, 2016). Since 2006 the submersible *DeepSee* has been used to study waters between 50-450 m depth at Isla del Coco (Cortés & Blum, 2008), and more recently at depths between 167-311 m at Las Gemelas Seamount, 50 km southwest of the island (Lizano, 2012). The use of *DeepSee* has led to a series of investigations into deeper areas that address multiple topics: diversity and associated marine environments (Cortés & Blum, 2008; Starr, Cortés, Barnes, Green, & Breedy, 2012a; Starr, Green, & Sala, 2012b), reproductive behavior of fish (Erisman, Konotchick, & Blum, 2009), imaging of new fish species (Bussing, 2010; McCosker & Rosenblatt, 2010; Poss, McCosker, & Baldwin, 2010), first reports of range extensions for bony fish species (Angulo, Naranjo-Elizondo, Corrales-Ugalde & Cortés, 2014), first reports of elasmobranchs (Long, McCosker, Blum, & Klapfer, 2011; Cortés et al., 2012), quantitative sampling of fish communities (Starr et al., 2012b), and the first report of group hunting by

piscivores in deep-water communities (Auster et al., 2016). There are also publications on invertebrates: a description of a new family of octocorals (Breedy, Van Ofwegen, & Vargas, 2012), diversity and abundance of invertebrates (Starr et al., 2012a), descriptions of new gastropod species (Owen & Reitz, 2012), and reports of gelatinous zooplankton (Corrales-Ugalde, Quesada, Naranjo-Elizondo, & Cortés, 2017). Also, the *DeepSee* acquired images of anthropogenic debris deposited in the deep waters of Isla del Coco, where mainly plastic litter from fishing gear can be found (Naranjo-Elizondo & Cortés, 2018).

Isla del Coco has 514 reported species of bony fishes, of which 72 are limited to deep zones (> 50 m) as defined by Fourrière, Alvarado, Bocos, and Cortés (2017). Most of fish diversity known so far at Isla del Coco is associated with shallow coral reefs (Fourrière et al., 2017), one of the most threatened ecosystems around the world due to global change and human activities (Hughes et al., 2017). Mesophotic coral reefs, occurring from 30 to 150 m (Hinderstein et al., 2010) are recognized to be distinct from shallow reefs and have been proposed to offer refuge for many shallow species able to survive in deeper areas (Baldwin, Tornabene, & Robertson, 2018). However, mesophotic reefs are also impacted by human activities and their recovery might take more time (Rocha et al., 2018). Since conservation efforts are usually focused on shallow waters, the protection of deeper ecosystems should be a priority in marine conservation in order to protect both shallow and deep reef species (Rocha et al., 2018). Recently, Baldwin et al. (2018) proposed a classification for fishes differentiating between the altiphotic (0 to ~ 40 m), mesophotic (~ 40 to ~ 130 m) and rariphotic (~ 130 to ~ 300 m) zones, which are defined according to the amount of light present (from high in the altiphotic to scarce in the rariphotic). Since the mesophotic zone can provide refuge for altiphotic species, so can the rariphotic zone for the mesophotic (Baldwin et al., 2018). Therefore, studies on depth boundaries and species composition in each depth region can

provide information for the conservation of many fishes.

As a baseline for future studies, here we present a catalogue of deep-water species of Isla del Coco and Las Gemelas Seamount (50-450 m depth), recorded by the submersible *DeepSee* and ROV (remotely operated vehicle) *Hela*, the latter has been used only at Las Gemelas and is a technology not yet employed for the exploration of Isla del Coco National Park. We included images, descriptions and distributions of 85 deep-water fish species, some of which had not been previously reported for the island, and others are imaged alive in the field for the first time in color.

MATERIALS AND METHODS

Dives were conducted at 18 different locations (15 sites around Isla del Coco National Park and three at Las Gemelas Seamount) between 2006 and 2015 (Table 1, Fig. 3). The places most frequently sampled were Everest and The Wall 475, with the least frequent

being Canyons and Banana (Table 1, Fig. 3). A total of 365 dives of the *DeepSee* submersible were analyzed. *DeepSee* is a three-person submersible with capability to dive to 450 m, equipped with a high definition camera placed outside (Fig. 1; see Cortés & Blum, 2008 for more details); MV *Argo* serves as the support ship (Fig. 2). Prior to 2013 videos were recorded with an AVI format on mini-DVC tapes with a Sony FX1 and from 2013 to 2015 with a Sony High Definition HXR-NX70U. The videos were transcoded with a 4:2:2 low codec to a .mov format. Image-captures of fishes were made in the laboratory with iMovie and FinalCut software and linked to information (e.g., location, depth, dive time) collected during each dive from 2006-2015. Observations of fishes were not made systematically because the submersible is used mainly for tourism; however, since the recordings are usually focused on large and conspicuous animals, the ichthyofauna is well represented in the videos. Each *DeepSee* dive lasted approximately two hours; however, since observation periods

TABLE 1
List of diving sites where the submersible *DeepSee* (2006-2015) and ROV *Hela** (2012) had explored the deep waters at Isla del Coco National Park and Las Gemelas Seamount, Costa Rica

| Site | Number of dives | Latitude (N) | Longitude (W) | Depth (m) | |
|--------------------|-----------------|--------------|---------------|-----------|---------|
| | | | | Minimum | Maximum |
| 1. Argo 2 | 4 | 05°35.244' | 87°02.848' | 180 | 205 |
| 2. Kili Rock | 5 | 05°34.903' | 87°03.400' | 220 | 220 |
| 3. The Edge | 5 | 05°34.920' | 87°03.161' | 200 | 300 |
| 4. Kili 2 | 17 | 05°35.006' | 87°03.141' | 160 | 180 |
| 5. The Wall 475 | 104 | 05°34.753' | 87°03.504' | 200 | 450 |
| 6. Piedra 165 | 25 | 05°34.670' | 87°03.473' | 150 | 170 |
| 7. Kili | 7 | 05°34.703' | 87°03.400' | 130 | 170 |
| 8. Piedra Drop | 50 | 05°34.640' | 87°03.557' | 180 | 300 |
| 9. Banana | 1 | 05°34.497' | 87°03.606' | 225 | 225 |
| 10. Canyons | 1 | 05°34.383' | 87°03.909' | 308 | 308 |
| 11. Boulders | 5 | 05°34.267' | 87°03.818' | 250 | 311 |
| 12. Everest | 117 | 05°33.950' | 87°02.862' | 45 | 90 |
| 13. Bajo Manuelita | 10 | 05°33.741' | 87°02.715' | 40 | 65 |
| 14. Arena | 2 | 05°33.732' | 87°02.232' | 110 | 110 |
| 15. The Arch | 6 | 05°29.076' | 87°05.144' | 60 | 90 |
| 16. Las Gemelas 1 | 3 | 04°59.153' | 87°26.472' | 250 | 250 |
| 17. Las Gemelas 2 | 1 | 04°59.120' | 87°26.410' | 170 | 200 |
| 18. Las Gemelas 3 | 2 + 11* | 05°04.851' | 87°38.525' | 163 | 261 |

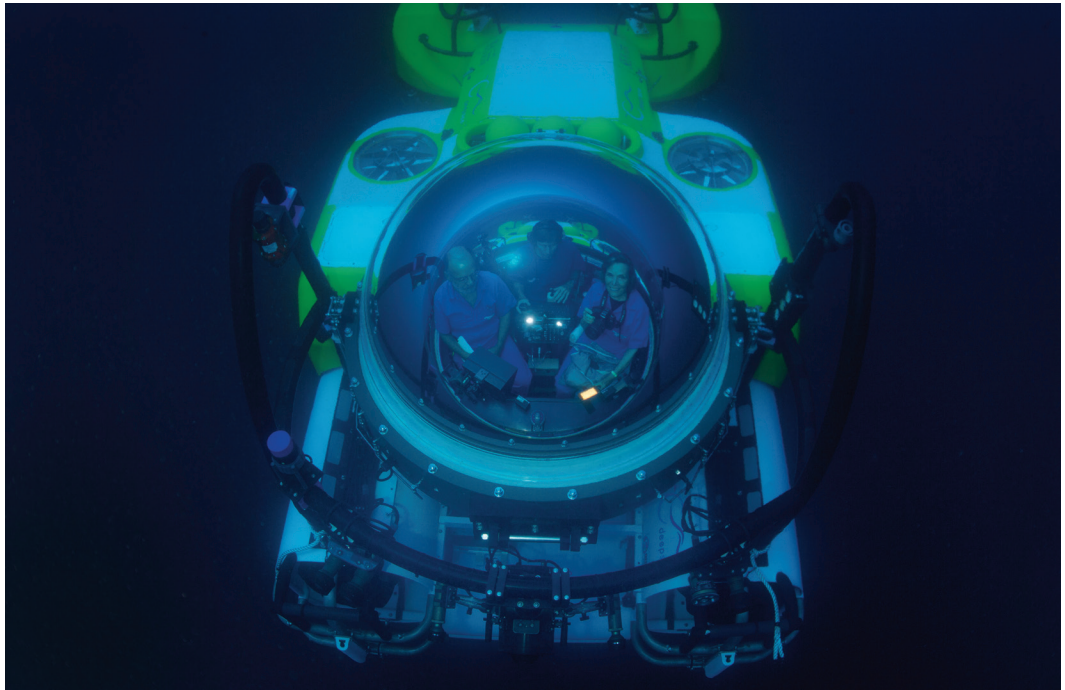


Fig. 1. *DeepSee* submersible with the pilot in the back and two persons in the front. Photograph by Kip Evans.



Fig. 2. *DeepSee* mothership MV *Argo*. (Reproduced with permission from *Revista de Biología Tropical*, Vol. 56, Suppl. 2, page 192). Photograph by Jenaro Acuña-González.

were not made systematically, we measure the sampling effort based on the number of dives and not on their duration. Additionally, 11 dives (24.3 hrs) with the ROV *Hela* were conducted at Las Gemelas Seamount in February 2012 (Table 1, see Auster et al., 2016 for details). *Hela* carried a Kongsberg OE 14-502A HD

(1080i) video camera and sent video in real time to the surface via an HDSDI signal over fiber-optic with image captures of fishes made directly using BTV Pro software. Video was translated to an analog signal and recorded to DVD.

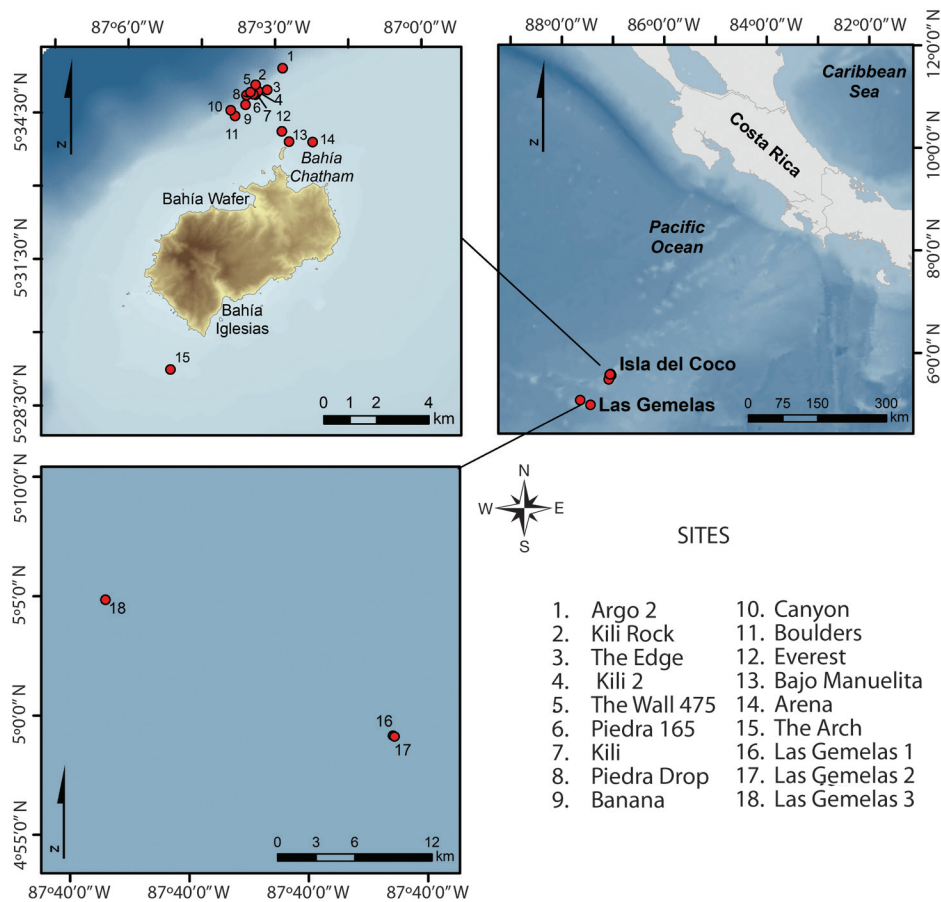


Fig. 3. Location of sites at Isla del Coco National Park and Las Gemelas Seamount where the submersible *DeepSee* and ROV *Hela* acquired video of bony fishes. Maps generated with topographic data from the Instituto Geográfico Nacional (Costa Rica) and bathymetric data provided by Omar Lizano.

Images of every species are included in the Appendix, with a brief description of the species, its local and global distribution, details of the observations at Isla del Coco and Las Gemelas (location, depth, date and time of day) and previous reports at either location. A list of these taxa is presented in Table 2 in a phylogenetic sequence following Nelson (2006) and Page et al. (2013). Within each family, species are arranged alphabetically using valid names according to Eschmeyer, Fricke, and van der Laan (2017). Common names are given in both English and Spanish, according to Page et al. (2013) if the species was included in that work, otherwise following the common names used

in Robertson and Allen (2015). The depth range of occurrence is shown for each specific locality as the minimum and maximum depth where the species was recorded. Previous reports and comments (in some cases) are also included for each taxa. The underwater vehicles used in this study are not equipped to capture specimens, thus all the fishes were visually identified to the minimum taxonomical level possible. We used for the identification: Fischer et al. (1995), Bussing and López (2005, 2009), Garrison (2005), Cortés and Blum (2008), Erisman et al. (2009), Bussing (2010), McCosker and Rosenblatt (2010), Poss, McCosker, and Baldwin (2010), Starr et al. (2012b); Robertson and

TABLE 2

List of bony fishes recorded by the *DeepSee* and *HeLa* at Isla del Coco National Park and Las Gemelas Seamount, Costa Rica with common names and catalogue page number

| Order | Family | Scientific name | Common name | Nombre común | Page number in Appendix |
|-------------------|-------------------|--|---|----------------------------|-------------------------|
| Anguilliformes | Chlopsidae | 1) <i>Chlopsis bicollaris</i> (Myers & Wade, 1941) | Collared False-moray | Morena-falsa de Galápagos | 20 |
| | Myrocongridae | 2) <i>Myroconger nigrodentatus</i> Castle & Béarez, 1995 | Orange Conger-moray | Morena-congrío anaranjada | 21 |
| | Muraenidae | 3) <i>Gymnothorax angusticeps</i> (Hildebrand & Barton, 1949) | Wrinkled Moray | Morena arrugada | 22 |
| | Muraenidae | 4) <i>Gymnothorax dovii</i> (Günther, 1870) | Fine-spotted Moray | Morena pintita | 23 |
| | Muraenidae | 5) <i>Gymnothorax</i> sp. A | Moray | Morena | 24 |
| | Muraenidae | 6) <i>Gymnothorax</i> sp. B | Moray | Morena | 25 |
| | Muraenidae | 7) <i>Gymnothorax</i> sp. C | Moray | Morena | 26 |
| | Muraenidae | 8) <i>Muraena argus</i> (Steindachner, 1870) | Argus Moray | Morena argos | 27 |
| | Ophichthidae | 9) <i>Leptenchelys vermiformis</i> Myers & Wade, 1941 | Slender Worm-eel | Tieso esbelto | 28 |
| | Ophichthidae | 10) <i>Ophichthus rugifer</i> Jordan & Bollman, 1890 | Wrinkled Snake-eel | Tieso arrugado | 29 |
| Ateleopodiformes | Ophichthidae | 11) <i>Quassiremus evionthas</i> (Jordan & Bollman, 1890) | Galapagos Snake-eel | Tieso peccoso | 30 |
| | Ophichthidae | 12) Ophichthidae, unidentified | Snake-eel | Tieso | 31 |
| | Congridae | 13) <i>Bathycongrus variidens</i> (Garman, 1899) | Largehead Conger | Congrio cabezón | 32 |
| | Congridae | 14) Congridae, unidentified sp. A | Conger Eel | Congrio | 33 |
| | Congridae | 15) Congridae, unidentified sp. B | Conger Eel | Congrio | 34 |
| | Congridae | 16) <i>Heteroconger klausewitzi</i> (Eibl-Eibesfeldt & Köster, 1983) | Galapagos Garden-eel | Ángula-jardín de Galápagos | 35 |
| | Ateleopodidae | 17) <i>Guenitherus alivela</i> Osório, 1917 | Jellynose fish | Trompa dulce | 36 |
| | Aulopidae | 18) <i>Aulopus</i> sp. | Galapagos Flagfin | Lagarto de Galápagos | 37 |
| | Chlorophthalmidae | 19) <i>Chlorophthalmus mento</i> Garman 1899 | Greeneye | Ojiverde robusto | 38 |
| | Gadiformes | Moridae | 20) <i>Laemonema</i> cf. <i>gracillipes</i> Garman, 1899. Unconfirmed species | Codling | Mora |
| Moridae | | 21) <i>Physiculus</i> sp. | Mora Codling | Mora | 40 |
| Ophidiidae | | 22) <i>Brotula ordwayi</i> Hildebrand & Barton, 1949 | Fore-spotted Brotula | Lengua pintada | 41 |
| Lophidae | | 23) <i>Lophiodes caulinaris</i> (Garman, 1899). | Spottedtail Goosefish | Rape rabo manchado | 42 |
| Lophidae | | 24) <i>Lophiodes spilurus</i> (Garman, 1899) | Threadfin Goosefish | Rape de hebra | 43 |
| Antennariidae | | 25) <i>Antennarius commerson</i> (Lacepède, 1798) | Giant Frogfish | Ranisapo gigante | 44 |
| Antennariidae | | 26) <i>Fowlerichthys avalonis</i> (Jordan & Starks, 1907) | Roughjaw Frogfish | Ranisapo antenado | 45 |
| Ogcocephalidae | | 27) <i>Dibranchius</i> sp. | Batfish | Murciélago | 47 |
| Ogcocephalidae | | 28) <i>Ogcocephalus porrectus</i> Garman, 1899 | Cocos Batfish | Pez-murciélago del Coco | 48 |
| Ogcocephalidae | | 29) <i>Zalieutes elater</i> (Jordan & Gilbert, 1882) | Round Batfish | Murciélago biocelado | 49 |
| Gasterosteiformes | Aulostomidae | 30) <i>Aulostomus chinensis</i> (Linnaeus, 1766) | Chinese Trumpetfish | Trompeta china | 50 |

TABLE 2 (Continued)

| Order | Family | Scientific name | Common name | Nombre común | Page number in Appendix | |
|-----------------|-----------------|---|---------------------------|---------------------------|-----------------------------|----|
| Scorpaeniformes | Scorpaenidae | 31) <i>Pontinus clemensi</i> Fitch, 1955 | Spotted Scorpionfish | Rascacio moteado | 51 | |
| | Scorpaenidae | 32) <i>Pontinus</i> sp. A | Scorpionfish | Rascacio | 52 | |
| | Scorpaenidae | 33) <i>Pontinus</i> sp. B | Scorpionfish | Rascacio | 53 | |
| | Scorpaenidae | 34) <i>Pontinus</i> sp. C | Scorpionfish | Scorpionfish | Rascacio | 54 |
| | Scorpaenidae | 35) <i>Scorpaena afferae</i> Hildebrand, 1946 | Peruvian Scorpionfish | Scorpionfish | Rascacio párlamo | 55 |
| | Scorpaenidae | 36) <i>Scorpaenodes rubrivinctus</i> Poss, McCosker & Baldwin, 2010 | Red-banded Scorpionfish | Scorpionfish | Rascacio de barras rojas | 56 |
| | Scorpaenidae | 37) Scorpaenidae, unidentified | Scorpionfish | Scorpionfish | Escorpión | 57 |
| | Triglidae | 38) <i>Bellator</i> sp. | Searobin | Searobin | Vaca o rubio | 58 |
| | Peristediidae | 39) <i>Peristedion nexium</i> Bussing, 2010 | Insular Armoured-scarobin | Insular Armoured-scarobin | Cabro isleño | 59 |
| | Serranidae | 40) <i>Anthias noeli</i> Anderson & Baldwin, 2000 | Rosy Jewelfish | Rosy Jewelfish | Pez-joya rosada | 60 |
| | Serranidae | 41) <i>Dermatolepis dermatolepis</i> (Boulenger, 1895) | Leather Bass | Leather Bass | Mero cuero | 61 |
| | Serranidae | 42) <i>Epinephelus eifuentesi</i> Lavenberg & Grove, 1993 | Olive Grouper | Olive Grouper | Cabrilla gallina | 63 |
| | Serranidae | 43) <i>Hyporthodus mystacinus</i> (Poey, 1852) | Misty Grouper | Misty Grouper | Mero listado | 65 |
| | Serranidae | 44) <i>Hyporthodus niphobles</i> (Gilbert & Starks, 1897) | Star-studded Grouper | Star-studded Grouper | Baqueta ploma | 67 |
| | Serranidae | 45) <i>Liopropoma fasciatum</i> Bussing, 1980 | Rainbow Basslet | Rainbow Basslet | Cabrilla arcoiris | 69 |
| | Serranidae | 46) <i>Liopropoma longilepis</i> Garman, 1899 | Scafyfin Basslet | Scafyfin Basslet | Cabrilla aleta escamosa | 70 |
| | Serranidae | 47) <i>Mycteroperca olfax</i> (Jenyns, 1840) | Sailfin Grouper | Sailfin Grouper | Garropa parda, Mero bacalao | 71 |
| | Serranidae | 48) <i>Paranthias colomus</i> (Valenciennes, 1846) | Pacific Creolefish | Pacific Creolefish | Sandia | 73 |
| | Serranidae | 49) <i>Pronotogrammus multifasciatus</i> Gill, 1863 | Threadfin Bass | Threadfin Bass | Serrano бага | 75 |
| | Serranidae | 50) <i>Serranus tico</i> Allen & Robertson, 1998 | Cocos Serrano | Cocos Serrano | Serrano del Coco | 76 |
| | Opistognathidae | 51) <i>Opistognathus</i> sp. | Jawfish | Jawfish | Bocón | 77 |
| | Pracanthidae | 52) <i>Cookeolus japonicus</i> (Cuvier, 1829) | Bulleye | Bulleye | Catalufa aleta larga | 78 |
| | Pracanthidae | 53) <i>Pristigymys serrula</i> (Gilbert, 1891) | Popeye Catalufa | Popeye Catalufa | Catalufa semáforo | 79 |
| | Apogonidae | 54) <i>Apogon atradorsatus</i> Heller and Snodgrass, 1903 | Blacktip Cardinalfish | Blacktip Cardinalfish | Cardenal aleta negra | 80 |
| | Malacanthidae | 55) <i>Caulolatilus princeps</i> (Jenyns, 1840) | Ocean Whitefish | Ocean Whitefish | Pierna o conejo | 81 |
| | Carangidae | 56) <i>Caranx lugubris</i> Poey, 1860 | Black Jack | Black Jack | Jurel negro | 82 |
| | Carangidae | 57) <i>Caranx melampygus</i> Cuvier, 1833 | Bluefin Trevally | Bluefin Trevally | Jurel aleta azul | 83 |
| | Carangidae | 58) <i>Caranx sexfasciatus</i> Quoy & Gaimard, 1825 | Bigeye Trevally | Bigeye Trevally | Jurel voraz | 84 |
| | Carangidae | 59) <i>Elagatis bipinnulata</i> (Quoy & Gaimard, 1825) | Rainbow Runner | Rainbow Runner | Macarela salmón | 85 |
| | Carangidae | 60) <i>Seriola rivoliana</i> Valenciennes, 1833 | Almaco Jack | Almaco Jack | Medregal limón u hojarán | 86 |
| | Echeneidae | 61) <i>Remora remora</i> (Linnaeus, 1758) | Remora | Remora | Rémora tiburonera | 87 |

TABLE 2 (Continued)

| Order | Family | Scientific name | Common name | Nombre común | Page number in Appendix |
|-------------------|---------------------------------|---|-------------------------------|--------------------------------|-------------------------|
| | Lutjanidae | 62) <i>Lutjanus aratus</i> (Günther, 1864) | Mullet Snapper | Pargo raicero | 88 |
| | Haemulidae | 63) <i>Anisotremus interruptus</i> (Gill, 1862) | Burrto Grunt | Burro bacoco | 89 |
| | Mullidae | 64) <i>Mullotichthys cf. dentatus</i> (Gill, 1862), Unconfirmed species | Mexican Goatfish | Chivo barbón | 90 |
| | Chaetodontidae | 65) <i>Johmandallia nigrostris</i> (Gill, 1862) | Barberfish | Mariposa barbero | 91 |
| | Chaetodontidae | 66) <i>Prognathodes carlhubbsi</i> Nalbant, 1995 | Southern Scythe Butterflyfish | Mariposa sureña de profundidad | 92 |
| | Pomacentridae | 67) <i>Holacanthus passer</i> Valenciennes, 1846 | King Angelfish | Ángel real | 93 |
| | Cirriidae | 68) <i>Cirrhitichthys oxycephalus</i> (Bleeker, 1855) | Coral Hawkfish | Halcón de coral | 94 |
| | Cirriidae | 69) <i>Oxyrrhites typus</i> Bleeker, 1857 | Longnose Hawkfish | Halcón narigón | 95 |
| | Pomacentridae | 70) <i>Chromis alta</i> Greenfield & Woods, 1980 | Silverstripe Chromis | Castañeta alta | 96 |
| | Labridae | 71) <i>Bodianus diploaenia</i> (Gill, 1862) | Mexican Hogfish | Vieja mexicana | 97 |
| | Labridae | 72) <i>Decodon melasma</i> Gomon, 1974 | Blacksport Wrasse | Vieja manchada | 99 |
| | Labridae | 73) <i>Polypteron cruentum</i> Gomon, 1977 | Bleeding Wrasse | Vieja sangradora | 100 |
| | Uranoscopidae | 74) <i>Kathetostoma averruncus</i> Jordan & Bollmann 1890 | Smooth Stargazer | Miracielo buldog | 102 |
| | Callionymidae | 75) <i>Synchiroptus atrilabiatus</i> (Garman, 1899) | Blacklip Dragonet | Dragoncillo de asta | 103 |
| | Gobiidae | 76) <i>Lythrypnus cobaltus</i> Bussing, 1990. | Cocos Blue Banded Goby | Gobio pícaro | 104 |
| | Acanthuridae | 77) <i>Prionurus laticlavus</i> (Valenciennes, 1846) | Razor Surgeonfish | Cochinito barbero | 105 |
| | Trichiuridae | 78) Trichiuridae, unidentified | Cutlassfish | Sable o cinta | 106 |
| | Bothidae | 79) <i>Bothus mancus</i> (Broussonet, 1782) | Tropical Flounder | Lenguado tropical | 107 |
| Pleuronectiformes | Cynoglossidae | 80) <i>Symphurus diabolicus</i> Mahadeva & Munroe, 1990 | Devil's Tonguefish | Lengua diabólica | 108 |
| | Pleuronectiformes, unidentified | 81) Pleuronectiformes, unidentified | Flatfish | Lenguado | 109 |
| Tetraodontiformes | Tetraodontidae | 82) <i>Arothron hispidus</i> (Linnaeus, 1758) | Stripebelly Puffer | Botete panza rayada | 110 |
| | Tetraodontidae | 83) <i>Arothron melegris</i> (Lacepède, 1798) | Guineafowl Puffer | Botete aletas punteadas | 111 |
| | Tetraodontidae | 84) <i>Lagocephalus lagocephalus</i> (Linnaeus, 1758) | Oceanic Puffer | Botete oceánico | 112 |
| | Diodontidae | 85) <i>Chilomycterus reticulatus</i> (Linnaeus, 1758) | Spotfin Burrfish | Pez erizo enano | 113 |

New species records are in **bold type**.

Allen (2015), and FishBase (Froese & Pauly, 2012). Since all the identifications were visually made, the largest possible number of images from different angles of the fishes was examined and images were compared with published photographs whenever possible. Coloration was one of the most important features; however, some of the images allowed useful meristic and morphometric measurements, although not precise in all cases. Identifications of the fish taxa, together with relevant images, were sent for corroboration to various experts: Rachel J. Arnold (University of Washington), Ginger Garrison (U.S. Geological Survey), Theodore W. Pietsch (University of Washington), Stuart G. Poss (California Academy of Science), Eva

Salas (Cabrillo College, California), Wayne C. Starnes (North Carolina Museum of Natural History), Richard Starr (Moss Landing Marine Laboratory), Franz Uiblein (Institute of Marine Research, Norway) and Benjamin Victor (Ocean Science Foundation).

In a few cases, we present some low-quality images because there were no photographs with better resolution, although it was still possible to identify the species. Finally, how often the submersible *DeepSee* and ROV *Hela* have acquired videos of bony fishes at Isla del Coco National Park and Las Gemelas Seamount, as well the percentage of dives and sites where each species was observed, are presented in Table 3. To evaluate how representative our

TABLE 3
Frequency (number and percentage of dives) in which the submersible *DeepSee* and ROV *Hela* has acquired videos of bony fishes at Isla del Coco National Park and Las Gemelas Seamount, with depth ranges and specific location for each species

| Taxa | Dives (#) | Dives (%) | Depth (m) | Location |
|------------------------------------|-----------|-----------|-----------|--------------------|
| <i>Anisotremus interruptus</i> * | 8 | 2.1 | 20-90 | 12, 13 |
| <i>Antennarius commerson</i> * | 2 | 0.5 | 20-87 | 12, 13 |
| <i>Anthias noeli</i> † | 33 | 8.8 | 90-350 | 1, 4, 5, 8, 12, 18 |
| <i>Apogon atradorsatus</i> | 1 | 0.3 | 40-50 | 13 |
| <i>Arothron hispidus</i> | 2 | 0.5 | 10-80 | 12 |
| <i>Arothron meleagris</i> * | 5 | 1.3 | 10-80 | 12, 13 |
| <i>Aulopus</i> sp.† | 10 | 2.7 | 150-310 | 3, 4, 5, 6 |
| <i>Aulostomus chinensis</i> | 7 | 1.9 | 45-60 | 12, 13 |
| <i>Bathycongrus varidens</i> | 9 | 2.4 | 215-304 | 5, 8, 18 |
| <i>Bellator</i> sp. | 1 | 0.3 | 110 | 14 |
| <i>Bodianus diplotaenia</i> * | 29 | 7.7 | 40-85 | 12, 15 |
| <i>Bothus mancus</i> | 1 | 0.3 | 40-60 | 13 |
| <i>Brotula ordwayi</i> | 35 | 9.3 | 83-200 | 1, 4, 6, 8, 12 |
| <i>Caranx lugubris</i> | 11 | 2.9 | 0-86 | 12 |
| <i>Caranx melampygus</i> | 1 | 0.3 | 0-86 | 12 |
| <i>Caranx sexfasciatus</i> | 4 | 1.1 | 0-50 | 12 |
| <i>Caulolatilus princeps</i> * | 7 | 1.9 | 50-160 | 6, 12 |
| <i>Chilomycterus reticulatus</i> | 4 | 1.1 | 45-60 | 12 |
| <i>Chlopsis bicollaris</i> * | 2 | 0.5 | 45-90 | 12 |
| <i>Chlorophthalmus mento</i> | 5 | 1.3 | 250-311 | 11, 16 |
| <i>Chromis alta</i> | 3 | 0.8 | 80-90 | 12 |
| <i>Cirrhichthys oxycephalus</i> * | 2 | 0.5 | 40-65 | 12, 13 |
| Congridae, unidentified sp. A | 1 | 0.3 | 250 | 16 |
| Congridae, unidentified sp. B | 1 | 0.3 | 250-400 | 5 |
| <i>Cookeolus japonicus</i> | 58 | 15.4 | 45-300 | 12, 13, 15 |
| <i>Decodon melasma</i> * | 4 | 1.1 | 150-300 | 1, 3, 5, 6 |
| <i>Dermatolepis dermatolepis</i> * | 48 | 12.8 | 45-90 | 12, 13, 15 |

TABLE 3 (Continued)

| Taxa | Dives (#) | Dives (%) | Depth (m) | Location |
|---|-----------|-----------|-----------|------------------------------|
| <i>Dibranchius</i> sp. | 1 | 0.3 | 30-150 | 16 |
| <i>Elagatis bipinnulata</i> | 5 | 1.3 | 0-86 | 12 |
| <i>Epinephelus cifuentesi</i> * | 57 | 15.2 | 45-250 | 2, 3, 4, 5, 6, 8, 12, 14, 15 |
| <i>Fowlerichthys avalonis</i> | 111 | 29.5 | 150-220 | 3, 4, 6 |
| <i>Guentherus altivela</i> | 87 | 23.1 | 200-402 | 5, 8, 18 |
| <i>Gymnothorax angusticeps</i> | 41 | 10.9 | 80-180 | 4, 6, 8, 12, 18 |
| <i>Gymnothorax dovii</i> * | 9 | 2.4 | 45-160 | 6, 12 |
| <i>Gymnothorax</i> sp. A | 2 | 0.5 | 180-230 | 3, 8 |
| <i>Gymnothorax</i> sp. B | 3 | 0.8 | 130-170 | 6, 7 |
| <i>Gymnothorax</i> sp. C | 4 | 1.1 | 150-170 | 6 |
| <i>Heteroconger klausewitzii</i> * | 3 | 0.8 | 50-90 | 12, 13 |
| <i>Holacanthus passer</i> | 9 | 2.4 | 20-60 | 12 |
| <i>Hyporthodus mystacinus</i> | 55 | 14.6 | 62-330 | 3, 4, 5, 9, 12, 13, 15, 18 |
| <i>Hyporthodus niphobles</i> | 47 | 12.5 | 80-450 | 1, 2, 3, 4, 5, 6, 8, 12, 18 |
| <i>Johnrandallia nigrirostris</i> * | 2 | 0.5 | 10-50 | 12, 13 |
| <i>Kathetostoma averruncus</i> | 2 | 0.5 | 180-311 | 4, 11 |
| <i>Laemonema</i> cf. <i>gracillipes</i> ^{†?} | 4 | 1.1 | 150-250 | 3, 5, 6, 11 |
| <i>Lagocephalus lagocephalus</i> | 3 | 0.8 | 0-200 | 5, 12 |
| <i>Leptenchelys vermiformis</i>* | 4 | 1.1 | 223-400 | 5, 18 |
| <i>Liopropoma fasciatum</i> | 3 | 0.8 | 60-160 | 6, 12 |
| <i>Liopropoma longilepis</i> * | 10 | 2.7 | 130-450 | 1, 3, 5, 6, 11 |
| <i>Lophiodes caularis</i> | 2 | 0.5 | 70-300 | 5, 12 |
| <i>Lophiodes spilurus</i> | 5 | 1.3 | 130-300 | 3, 5 |
| <i>Lutjanus aratus</i> * | 10 | 2.7 | 0-80 | 12, 13 |
| <i>Lythrypnus cobalus</i> | 8 | 2.1 | 60-90 | 12 |
| <i>Mulloidichthys</i> cf. <i>dentatus</i> | 1 | 0.3 | 0-60 | 12 |
| <i>Muraena argus</i> | 23 | 6.1 | 60-90 | 12, 13 |
| <i>Mycteroperca olfax</i> | 33 | 8.8 | 50-90 | 4, 12, 13, 15 |
| <i>Myroconger nigrodentatus</i> | 25 | 6.6 | 150-220 | 3, 4, 6, 7 |
| <i>Ogocephalus porrectus</i> | 6 | 1.6 | 30-150 | 12, 13 |
| Ophichthidae, unidentified | 3 | 0.8 | 150-250 | 3, 6, 16, 17 |
| <i>Ophichthus rugifer</i> | 3 | 0.8 | 110-180 | 6, 14 |
| <i>Opistognathus</i> sp. | 1 | 0.3 | 45-80 | 12 |
| <i>Oxycirrhites typus</i> | 1 | 0.3 | 84 | 12 |
| <i>Paranthias colonus</i> | 27 | 7.2 | 45-90 | 4, 12, 15 |
| <i>Peristedion nesium</i> * | 3 | 0.8 | 130-200 | 4, 6 |
| <i>Physiculus</i> sp. | 14 | 3.7 | 200-304 | 3, 5, 16, 18 |
| Pleuronectiformes, unidentified | 1 | 0.3 | 180-190 | 4 |
| <i>Polylepidion cruentum</i> [†] * | 9 | 2.4 | 80-305 | 5, 6, 8, 12, 16, 18 |
| <i>Pontinus clemensi</i> | 50 | 13.3 | 150-230 | 1, 2, 3, 4, 5, 6, 7, 9 |
| <i>Pontinus</i> sp. A | 10 | 2.7 | 220-320 | 5 |
| <i>Pontinus</i> sp. B | 7 | 1.9 | 180-400 | 4, 5, 16, 18 |
| <i>Pontinus</i> sp. C | 9 | 2.4 | 150-220 | 1, 3, 4, 5, 6, 7, 17 |
| <i>Prionurus laticlavus</i> * | 1 | 0.3 | 40-65 | 13 |
| <i>Pristigeyys serrula</i> | 3 | 0.8 | 60-90 | 15 |
| <i>Prognathodes carlhubbsi</i> | 4 | 1.1 | 90-150 | 12, 15 |
| <i>Pronotogrammus multifasciatus</i> | 35 | 9.3 | 80-226 | 1, 2, 3, 4, 6, 9, 18 |

TABLE 3 (Continued)

| Taxa | Dives (#) | Dives (%) | Depth (m) | Location |
|----------------------------------|-----------|-----------|-----------|-------------|
| <i>Quassiremus evionthas</i> * | 2 | 0.5 | 40-80 | 12, 13 |
| <i>Remora remora</i> * | 2 | 0.5 | 40-300 | 6, 12 |
| <i>Scorpaena afuerae</i> | 26 | 6.9 | 60-90 | 12, 13 |
| Scorpaenidae, unidentified | 1 | 0.3 | 150-170 | 6 |
| <i>Scorpaenodes rubrivinctus</i> | 9 | 2.4 | 150-230 | 4, 5, 6, 18 |
| <i>Seriola rivoliana</i> | 13 | 3.5 | 20-90 | 12 |
| <i>Serranus tico</i> * | 10 | 2.7 | 10-60 | 13 |
| <i>Symphurus diabolicus</i> | 4 | 1.1 | 250-316 | 5, 10 |
| <i>Synchiropus atrilabiatus</i> | 1 | 0.3 | 155 | 6 |
| Trichiuridae, unidentified | 1 | 0.3 | 300 | 5 |
| <i>Zalieutes elater</i> | 7 | 1.9 | 80-200 | 3, 4, 12 |

Locations (Fig. 3): 1) Argo 2, 2) Kili Rock, 3) The Edge, 4) Kili 2, 5) The Wall 475, 6) Piedra 165, 7) Kili, 8) Piedra Drop, 9) Banana, 10) Canyons, 11) Boulders, 12) Everest, 13) Bajo Manuelita, 14) Arena, 15) The Arch, 16) Las Gemelas 1, 17) Las Gemelas 2, 18) Las Gemelas 3. New species records are in **bold type** and the ones marked with a symbol are those whose depth ranges have expanded (*maximum depth increased, †minimum depth decreased).

sampling was to elucidate fish biodiversity, a cumulative species curve was plotted with the function ‘specaccum’ of the package ‘vegan’ (Oksanen et al., 2018), using R (R Core Team, 2018). Random method was used, which finds the mean species accumulation curve and its standard deviation from random permutations of the data (999 in this case) (Gotelli & Colwell, 2001). The species richness estimator Chao was calculated using the function ‘chao2’ of ‘fossil’ package (Vavrek, 2011), designed for an incidence matrix.

RESULTS AND DISCUSSION

Images of bony fishes were obtained from 376 dives made to depths between 50 and 450 m, during which a total of 85 taxa were observed, corresponding to 66 genera, 42 families and 11 orders (Table 2, Appendix). The richest orders were Perciformes (20 families, 39 species), Anguilliformes (six families, 16 species), Scorpaeniformes (three families, nine species) and Lophiiformes (three families, seven species). Serranidae was the richest family with 11 species. Four new records are reported for Isla del Coco: *Leptenchelys vermiformis* (Ophichthidae), *Hyporthodus mystacinus* (Serranidae), *Kathetostoma averruncus*

(Uranoscopidae), and *Symphurus diabolicus* (Cynoglossidae) (Table 2). Depth ranges of twenty-six species are expanded beyond previously published records (Table 3, Table 4). The minimum known depth was decreased for three species, ranging between 10 and 365 m shallower than that previously reported in the literature; the maximum known depth was increased for 22 species, ranging between 7 and 315 m; also, one species was observed both shallower and deeper than previous records (Table 3, Table 4), suggesting that our knowledge on the vertical distribution of many species is limited.

The species most frequently observed were *Fowlerichthys avalonis* (Antennariidae), *Guentherus altivela* (Ateleopodidae), *Cookeolus japonicus* (Priacanthidae), *Epinephelus cifuentesi* (Serranidae), *H. mystacinus* (Serranidae) and *Pontinus clemensi* (Scorpaenidae) (Table 3). These species might have important ecological roles that should be assessed in future research. As zooplanktivorous in the case of *C. japonicus*, that was observed forming big groups, or as predators in all the other cases, these common species must sustain significant links in the local food chain.

Meanwhile, some species were observed only once, including unidentified species of

TABLE 4
List of bony fishes with details on changes of depth distribution at Isla del Coco National Park and Las Gemelas Seamount, Costa Rica

| SPECIES | Maximum Depth (m) | | | Minimum Depth (m) | | |
|---|-------------------|------------|------------|-------------------|------------|------------|
| | Previous record | New record | Net change | Previous record | New record | Net change |
| <i>Anisotremus interruptus</i> | 30 | 90 | 60 | | | |
| <i>Antennarius commerson</i> | 70 | 87 | 17 | | | |
| <i>Anthias noeli</i> | | | | 100 | 90 | 10 |
| <i>Arothron meleagris</i> | 73 | 80 | 7 | | | |
| <i>Aulopus</i> sp. | | | | 305 | 150 | 155 |
| <i>Bodianus diplotaenia</i> | 76 | 85 | 9 | | | |
| <i>Caulolatilus princeps</i> | 150 | 160 | 10 | | | |
| <i>Chlopsis bicollaris</i> | 30 | 90 | 60 | | | |
| <i>Cirrhichthys oxycephalus</i> | 40 | 65 | 25 | | | |
| <i>Decodon melasma</i> | 300 | 220 | 80 | | | |
| <i>Dermatolepis dermatolepis</i> | 40 | 90 | 50 | | | |
| <i>Epinephelus cifuentesi</i> | 135 | 250 | 115 | | | |
| <i>Gymnothorax dovii</i> | 70 | 160 | 90 | | | |
| <i>Heteroconger klausewitzii</i> | 30 | 90 | 60 | | | |
| <i>Johnrandallia nigrirostris</i> | 40 | 50 | 10 | | | |
| <i>Laemonema</i> cf. <i>gracillipes</i> | | | | 515 | 150 | 365 |
| <i>Leptencheilus vermiformis</i> | 85 | 400 | 315 | | | |
| <i>Liopropoma longilepis</i> | 250 | 450 | 200 | | | |
| <i>Lutjanus aratus</i> | 60 | 80 | 20 | | | |
| <i>Mycteroperca olfax</i> | 100 | 180 | 80 | | | |
| <i>Peristedion nessium</i> | 180 | 200 | 20 | | | |
| <i>Polyplepion cruentum</i> | 200 | 305 | 105 | 150 | 80 | 70 |
| <i>Prionurus laticlavus</i> | 30 | 65 | 35 | | | |
| <i>Quassiremus evionthas</i> | 30 | 80 | 50 | | | |
| <i>Remora remora</i> | 200 | 300 | 100 | | | |
| <i>Serranus tico</i> | 43 | 60 | 17 | | | |

Congridae, Scorpaenidae, Trichiuridae and Pleuronectiformes (Table 3). Other uncommon fishes were unidentified species of *Bellator* (Triglidae), *Dibranchius* (Ogcocephalidae) and *Opistognathus* (Opistognathidae). Some of the uncommon species may have been underestimated due to their small size (as *Apogon atradorsatus*, *Oxycirrhites typus* and *Synchiropus atrilabiatus*), or they may be unusual in deep waters (as *Prionurus laticlavus*, a common species in shallow waters).

For some fishes, only higher taxonomic identification was possible at level of genus (11), family (5) or order (1). In two cases, species is proposed but unconfirmed, so the information is presented in terms of a higher

taxonomic level (*Laemonema* cf. *gracillipes* and *Mulloidichthys* cf. *dentatus*). The latter species is suggested because two very similar species of *Mulloidichthys* are known to co-occur in the TEP (Robertson & Allen, 2015), which makes it difficult to distinguish between them based on the photographs. Images of *Aulopus* sp. were identified to genus, although earlier works at Isla del Coco reported this species as *Aulopus bajacali*. However, is now recognized that the species present around Isla del Coco and Galápagos is a distinct species from *A. bajacali*, therefore *Aulopus* sp. present at Isla del Coco has already a holotype and paratypes but its description was never published (see the catalogue for more information). In

other cases, the identification was not possible at the species level because better images and/or specimen collection are required, and some of them might be new species.

Despite more systematic studies are needed at Isla del Coco to establish the specific fish fauna depth boundaries between the altophotic, mesophotic and rariphotic zones, using the same depth ranges found in the Caribbean by Baldwin et al. (2018) a strong shift on the species composition was observed in this study, mainly between the mesophotic and rariphotic zone (approximately at 130 m). According to the known depth range for each species most of fishes associated with deep areas at Isla del Coco can be found both in the altophotic and the mesophotic zone (37.6 % of the species), followed by species restricted to deeper areas at the rariphotic zone or below (31.8 %). The mesophotic and rariphotic zone shared a total of 15 species (17.6 %), while 7.1 % were restricted to the mesophotic zone, and only 5 species (5.9 %) had a wider vertical distribution from the altophotic to the rariphotic zone. As Baldwin et al. (2018) stated, the mesophotic zone can act as refugia for shallow-water species stressed by global warming, and so may the rariphotic zone for mesophotic species. This highlights the importance of the biological studies in deep zones, which should be considered as priority research in order to understand the impacts of global change in our oceans.

Once the depth boundaries at which changes in species composition occur, the specific ecological role of each species in each zone should be assessed. Auster et al. (2016) established a foundation on the strength of behavioral interactions within and between deepwater fish species at Isla del Coco and Las Gemelas Seamount, and recognized that information on feeding, growth and fecundity are important features to a better understanding of the region. Of the total species we found, 67 were predators (78.8 %), while 15 were strictly or not zooplanktivorous (17.6 %), 2 species were omnivorous, and just 1 species was herbivorous. Half of the zooplanktivorous species include other elements in their diets, as predators (*Cirrhitichthys oxycephalus*,

Elagatis bipinnulata, *Lagocephalus lagocephalus*, *Lythrypnus cobalus* and *O. typus*) or as predators and cleaners eating ectoparasites (as *Johnrandallia nigrirostris*, *Holacanthus passer*, *Remora remora*); the other half are strictly zooplanktivorous, as the congrid *Heteroconger klausewitzii*, the serranids *Anthias noeli*, *Paranthias colonus* and *Pronotogrammus multifasciatus*, the priacanthid *C. japonicus*, the apogonid *A. atradorsatus* and the pomacentrid *Chromis alta*. The omnivorous fishes were represented by the genus *Arothron* (Tetraodontidae) and were only seen at the shallower locations (Bajo Manuelita and Everest). Bajo Manuelita was also the location where the only herbivorous, *P. laticlavus*, was seen, which is related to the amount of light reaching this area that allows algae development.

These results provide useful management information for the area in order to ascertain the diversity and distribution of taxa subject to stewardship. Starr et al. (2012b) observed more than 45 taxa of deep-water bony fishes at Isla del Coco National Park and Las Gemelas Seamount from 22 submersible dives. Our study includes information from 376 dives in 18 different locations, which resulted in a total of 85 taxa. As more submersible dives were reviewed the number of species recorded increased (Fig. 4). However, according to the species accumulative curve and the species richness estimator Chao, which suggests a total of 129 fish species, the diversity of fishes between 50 and 450 m is greater than the described in this study. Furthermore, the depth range expansion found for some species indicates that our knowledge of many deep-water organisms is limited. These statements highlight the importance of continuing systematic deep-water research at Isla del Coco, both for scientific purposes as well as for conservation. The species list with updated known depth ranges presented here, as well as the new reports and unidentified species that might be new species, serve as a framework for the conservation of Isla del Coco's deep-water environments and should motivate future research in this biodiversity hotspot.

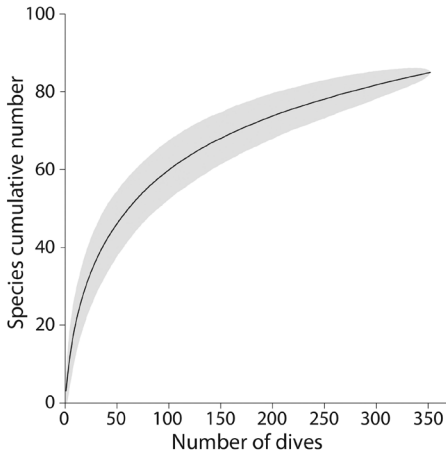


Fig. 4. Species accumulative curve of fishes recorded by the submersible *DeepSee* and ROV *Hela* in deep waters (50-450 m) at Isla del Coco National Park and Las Gemelas Seamount (2006-2015).

ACKNOWLEDGEMENTS

We thank the Undersea Hunter Group for the use of the videos from *DeepSee* and University of Connecticut for ROV *Hela* operations, ACMIC and Isla del Coco National Park for the permits to develop this project; Vicerrectoría de Investigación and Centro de Investigación en Ciencias del Mar (CIMAR), Universidad de Costa Rica, for their financial and logistic Support; and the Consejo Nacional de Rectores de las Universidades Públicas (CONARE) for its financial support. The 2012 expedition to Las Gemelas Seamount was supported mainly by the National Geographic Society and the U.S. National Science Foundation. We appreciate the time taken by the following ichthyologists that helped us with the identification and/or the review of drafts of this paper: Rachel J. Arnold, Ginger Garrison, Ted Pietsch, Stuart Poss, Eva Salas, Wayne Starnes, Rick Starr, Franz Uiblein and Benjamin Victor. We thank Catalina Benavides, SIGMAR-CIMAR, Universidad de Costa Rica for Figure 3. Also, we are grateful to seven anonymous reviewers, who with their comments helped to improve the manuscript. This work was printed thanks to the financial support of MarViva and Undersea Hunter Group.

Catálogo actualizado de peces óseos observados en aguas profundas en el Parque Nacional Isla del Coco y en el monte submarino Las Gemelas. Aunque la biodiversidad marina de la Isla del Coco, Costa Rica, ha sido relativamente bien estudiada y documentada, todavía hay regiones poco exploradas con gran potencial para la investigación, como es el caso de las zonas profundas. Desde 2006 el sumergible *DeepSee*, se ha utilizado para estudiar las aguas profundas en el Parque Nacional Isla del Coco. En este trabajo se presenta un catálogo de peces óseos filmados desde el sumergible entre 50 y 450 m de profundidad de la Isla del Coco, a 500 km sur-suroeste de la costa de Costa Rica, y en los Montes Submarinos Las Gemelas, a 50 km al suroeste de la Isla del Coco. Los videos fueron tomados con una cámara digital de alta definición colocada sobre el sumergible, y a partir de estos videos en el laboratorio fue creada una base de datos con fotos de peces óseos, utilizando la información recopilada durante el periodo 2006-2015. Se obtuvo información adicional de la distribución de los peces utilizando el submarino no tripulado *Hela*, durante 11 buceos (24,3 hrs) en los Montes Submarinos Las Gemelas en febrero 2012. Las tomas de peces óseos se obtuvieron de 376 inmersiones (365 con el *DeepSee* y 11 con el *Hela*) en 18 localidades diferentes y se presenta aquí un total de 85 taxones (consideradas especies distintas). En el catálogo se muestran imágenes que representan las primeras fotografías a color para algunas especies. Algunos organismos solo se pudieron identificar a nivel de género (11), familia (5) u orden (1). Se reporta por primera vez la presencia de cuatro especies: *Hyporthodus mystacinus* (Serranidae), *Kathetostoma averruncus* (Uranoscopidae), *Leptenchelys vermiformis* (Ophichthidae) y *Symphurus diabolicus* (Cynoglossidae). Ampliamos la profundidad máxima conocida para veintiseis especies; tres fueron observadas en aguas más someras, veintidós en aguas más profundas y una se extiende a aguas más someras y más profundas que informes previos. Funcionando como línea base, estos resultados proporcionan información útil para el manejo de la zona, sobre todo si se tiene en cuenta la constante presión de la pesca ilegal en el Parque Nacional y aguas adyacentes. Al igual que otros autores han señalado, encontramos que el mayor esfuerzo de investigación con el sumergible ha contribuido a incrementar la lista de las especies conocidas. Este aspecto pone en evidencia la importancia de mantener una investigación sistemática en aguas profundas del Parque Nacional Isla del Coco y áreas adyacentes, tanto para fines científicos como de conservación.

Palabras Clave: Peces de profundidad; biodiversidad marina; *DeepSee*; ROV; investigación con sumergible.

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APPENDIX

Updated catalogue of bony fishes observed in deep waters at Isla del Coco National Park and Las Gemelas Seamount, Costa Rica (Eastern Tropical Pacific)

ORDER ANGUILLIFORMES

Family Chlopsidae

Chlopsis bicollaris (Myers & Wade, 1941)

Collared False-moray / Morena-falsa de Galápagos



Chlopsis bicollaris at Everest (88 m), 30 November 2010, afternoon.

DESCRIPTION: Body elongate, worm-like in appearance; large eyes, snout conical with rounded tip (Robertson & Allen, 2015). Contrasting colors, grey-brown above and whitish below; two collar-like whitish bars, one across the head behind the mouth and one at level of gill opening and dorsal fin origin. Without pectoral fins, dorsal and anal fins confluent; gill opening small, oval and lateral. Size: Up to 20 cm. Depth range: 5-30 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Galapagos Islands and Isla del Coco (Robertson & Allen, 2015; Fourrière et al., 2017).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-90 m at Everest, afternoon and morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Fourrière et al. (2017) as a shallow-water species. Previously known only from the Galapagos Islands.

REMARKS: Observed only at Everest. Known maximum depth increases by 60 m.

Family Myrocongridae

Myroconger nigrodentatus Castle & Béarez, 1995
Orange Conger-moray / Morena-congrío anaranjada



Myroconger nigrodentatus
at The Wall 475 (306 m),
10 June 2009, afternoon.



Two *Myroconger*
nigrodentatus interacting at
The Wall 475 (306 m),
8 September 2007, afternoon.

DESCRIPTION: Body elongate and very compressed. Anterior nostril in a tube, posterior nostril, a hole. Dorsal fin raised and originating above gill opening. Three rows of sharp teeth on each jaw and a single row on upper inner part of the mouth. Body and fins orange with a bright yellow stripe from eye back along body above midline (Robertson & Allen, 2015). Max length: 36 cm. Depth range: 50-458 m (Robertson & Allen, 2015), 220-345 m (McCosker & Rosenblatt, 2010).

WORLDWIDE DISTRIBUTION: Mainland Ecuador, Galápagos Islands and Isla del Coco (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 150-220 m; Kili (150 m), The Edge (220 m) and The Wall 475 (306 m), afternoon; Piedra 165 (150-170 m) and Kili 2 (180 m), morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: First reported in deep waters at Isla del Coco by McCosker and Rosenblatt (2010). Reported by Starr et al. (2012b) at more than 50 m, and by Fourriére et al. (2017).

Family Muraenidae

Gymnothorax angusticeps (Hildebrand & Barton, 1949)

Wrinkled Moray / Morena arrugada



Gymnothorax angusticeps at Kili 2 (180 m), 14 July 2007, afternoon.



Gymnothorax angusticeps at Piedra 165 (150-170 m), 1 July 2007, morning;
near Piedra Drop (180 m), 15 May 2009, morning.

DESCRIPTION: Body brown, head and gill opening slightly darker; body, tail and fins a lighter tone. Teeth slightly serrated (Böhlke & Smith, 2002). Skin of body with wrinkles, darker lines within wrinkles and dorsal fin. Head large, snout long, anterior nostrils tubular. Teeth on jaws and vomer. Length: to 98 cm (Robertson & Allen, 2015). Depth range: 1-200 m (McCosker & Rosenblatt, 2010).

WORLDWIDE DISTRIBUTION: Pacific Ocean, Perú (Smith, 1994), Malpelo, Galápagos Islands and Isla del Coco (McCosker & Rosenblatt, 2010).

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 80-180 m; Everest (80 m), Piedra 165 (150-170 m) and Las Gemelas 3 (170 m), morning and afternoon; at sites close to Kili 2 and at Piedra Drop (around 180 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by McCosker and Rosenblatt (2010) along rocky outcrops between 150-200 m, and by Fourrière et al. (2017).

Gymnothorax dovii (Günther, 1870)
Finespotted Moray / Morena pintita



Gymnothorax dovii at Piedra 165 (160 m), 1 July 2007, afternoon.

DESCRIPTION: Moderately robust; body dark-brown to black, with numerous minute white spots (McCosker & Rosenblatt, 1995; Bussing & López, 2005). Head slender and snout pointed; rear nostril not tubular, with a raised rim (Robertson & Allen, 2015). Maximum length: 170 cm. Depth range: 3 m to at least 36 m (Humann & Deloach, 1993), reported at 70 m by Robertson & Allen (2015).

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010). Costa Rica to Colombia and oceanic islands (Garrison, 2005).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-160 m, Everest (45-90 m) and Piedra 165 (160 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Common in shallow waters above coral reefs and rocky bottoms (Garrison, 2005), and by Fourrière et al. (2017) as a shallow water species.

REMARKS: Known maximum depth increases from 70 m to 160 m.

Gymnothorax sp. A
Moray / Morena



Gymnothorax sp. A near Piedra Drop (230 m), 2 December 2010, morning.



Gymnothorax sp. A near Piedra Drop (230 m), 2 December 2010, morning.
Laser beams are 33 cm apart.

DESCRIPTION: Body elongate and brown, covered with thin irregular paler blotches.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 180-230 m at sites close to Piedra Drop and The Edge.

PREVIOUS REPORTS FROM ISLA DEL COCO: Genus present at Isla del Coco (McCosker & Rosenblatt, 2010).

Gymnothorax sp. B
Moray / Morena



Gymnothorax sp. B, at Kili (130-170 m), 4 February 2007, in the morning.



Gymnothorax sp. B, at Kili (130-170 m), 4 February 2007, in the morning.

DESCRIPTION: Body brown and elongate with pale spots.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 130-170 m, Kili (130 m) and Piedra 165 (150-170 m), morning and afternoon.

PREVIOUS REPORTS: Genus present at Isla del Coco (McCosker & Rosenblatt, 2010).

Gymnothorax sp. C
Moray / Morena



DESCRIPTION: Body brown and elongate, with rows of irregular white blotches. Dorsal fin with a row of white blotches and a white fin edging.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Piedra 165 (150-170 m) morning and afternoon.

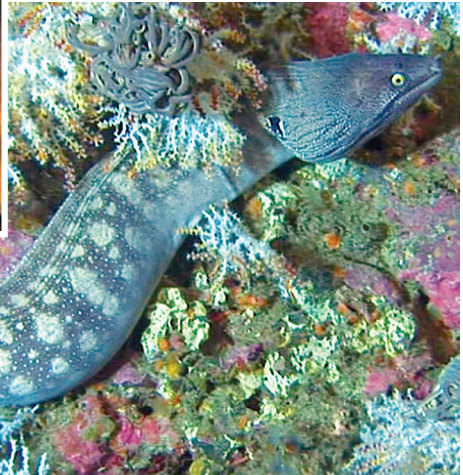
PREVIOUS REPORTS FROM ISLA DEL COCO: This is probably a new species.

REMARKS: Lives in crevices in rocks. Hunts at night, apparently aided by the light of the submersible, when it feeds on *Protonogrammus multifasciatus*.

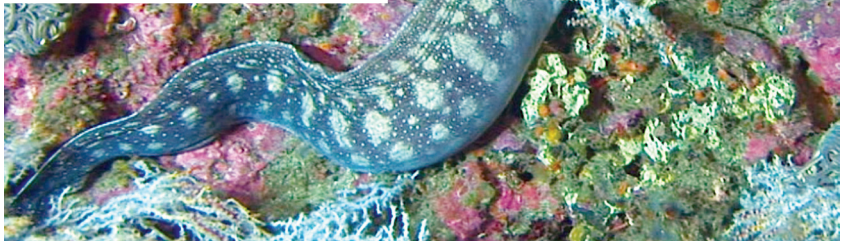
Muraena argus (Steindachner, 1870)
Argus Moray / Morena argos



Muraena argus at Everest (75 m),
30 June 2007, afternoon.



Muraena argus
at Everest (60 m),
30 August 2007,
morning.



DESCRIPTION: Body with three rows of large yellow blotches and numerous smaller white spots. Intense black spot covering gill opening (McCosker & Rosenblatt, 1995, Bussing & López, 2005). Distal margin of dorsal and anal fins whitish (Robertson & Allen, 2015). Rear nostril tubular, eyes yellow. Attains a maximum length of 120 cm (McCosker & Smith, 2004). Depth: in shallow water up to 60 m (Humann & Deloach, 1993) and in deep waters in the Gulf of California from 80 m up to 120 m (Aburto-Oropeza, Caso, Erisman & Ezcurra, 2010).



Muraena argus at Everest (77 m),
30 August 2007, morning.

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010). Baja California Sur, Gulf of California, Isla del Coco, Isla Malpelo, Isla Gorgona, Galápagos Islands, Isla la Plata (Ecuador) and Lobos de Afuera (Perú) (McCosker & Smith, 2004).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 60-90 m; Everest (60-90 m) morning and afternoon; Bajo Manuelita (60 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Bussing and López (2005), at Manuelita Island on gravel rubble and sandy bottoms (Garrison, 2005), and by Fourriére et al. (2017).

Family Ophichthidae
Leptenchelys vermiformis Myers & Wade, 1941
Slender Worm-eel / Tieso esbelto



Leptenchelys vermiformis at The Wall 475 (270 m), 29 August 2014, morning.

DESCRIPTION: Body elongate, cylindrical and wormlike. Throat basket expanded. Gill openings curved and constricted, pectoral fins absent and a tail that is flexible at the tip. (McCosker, & Rosenblatt, 1995, Robertson & Allen, 2015). Usually uniform light yellow (Robertson & Allen, 2015), the individuals found in the Isla del Coco with a pinkish appearance and tones of grey ventrally and dorsally. Up to 12 cm length. Depth range: 20-85 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Reported from Costa Rica (Eastern Pacific) (McCosker & Rosenblatt, 1995) to Mexico (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 223-400 m, Las Gemelas 3 (223 m) and The Wall 475 (250-400 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: This represents the first report for the island.

REMARKS: Known maximum depth increased by 315 m, from 85 m to 400 m.

Ophichthus rugifer Jordan & Bollman, 1890
Wrinkled Snake-eel / Tieso arrugado



Ophichthus rugifer at Arena (110 m), 16 September 2009, afternoon.

DESCRIPTION: HEAD WITH DORSAL BROWN ROUND BLOTCHES. A series of brown spots from mid-flank to dorsal base. Dorsal fin margin with series of brown streaks; dorsal and pectoral fins with black blotches in adults (McCosker & Rosenblatt, 1995). Dorsal and anal fins expanded near tail tip which is pointed at its tip (Bussing & López, 2005). Half the tail yellow. Depth: from shallow water, up to 200 m (McCosker & Rosenblatt, 1995).

WORLDWIDE DISTRIBUTION: Galápagos Islands and Isla del Coco (McCosker & Rosenblatt, 1995).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 110-180 m, Arena (110 m), Piedra 165 (170 m) and insular shelf (180 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Rare in shallow waters (Bussing & López 2005, Garrison, 2005), and by Fourriére et al. (2017).

Quassiremus evionthas (Jordan & Bollman, 1890)
Galapagos Snake-eel / Tieso pecoso



Quassiremus evionthas at Everest (72 m), 13 July 2007, afternoon.

DESCRIPTION: A yellowish eel with head, body and tail covered with black spots, with areas of larger and darker spots, forming saddles. Dorsal fin origin well behind gill opening (Bussing & López, 2005). Front nostril tubular, teeth in simple rows on jaws and roof of mouth (Robertson & Allen, 2015). Golden eyes, small pectoral fins (Garrison, 2005). Maximum length close to 71 cm. Depth range: 3-30 m (Humann & Deloach, 1993; Robertson & Allen, 2015).

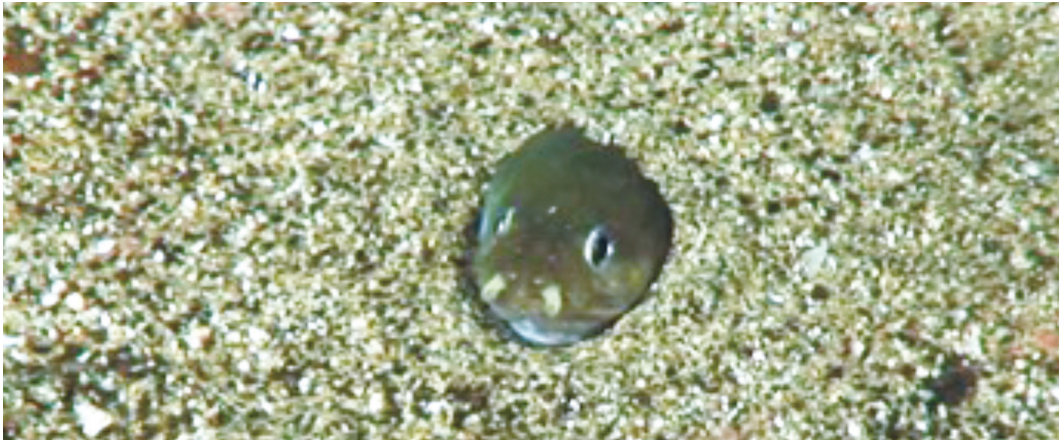
WORLDWIDE DISTRIBUTION: Galápagos Islands (Jordan & Bollman, 1890; McCosker & Rosenblatt, 2010) and Isla del Coco (Bussing & López, 2005; Garrison, 2005).

OCCURRENCES AT ISLA DEL COCO (DEEPSEE): 40-80 m, Bajo Manuelita (40-60 m) and Everest (45-80 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO (THIS STUDY): Reported by Bussing and López (2005) at Manuelita and at Roca Langosta (Garrison, 2005), and by Fourrière et al. (2017).

REMARKS: NO PUBLISHED REPORTS FROM DEEP WATERS FOR THE SPECIES. MAXIMUM DEPTH REPORTED BY Humann and Deloach (1993) of 30 m, extended to 80 m.

Ophichthidae, unidentified
Snake-eel / Tieso



Snake-eel unidentified at Las Gemelas 1 (250 m), 14 September 2009, morning.



Snake-eel unidentified at The Edge (200 m), 15 May 2009, morning.

DESCRIPTION: Body elongate, pelvic fins absent, pectoral fins usually present. Tail tip pointed. Gill basket expanded. Narrow gill openings (Robertson & Allen, 2015). However, some of those features are not observed in the photograph as the individuals are buried in the sand.

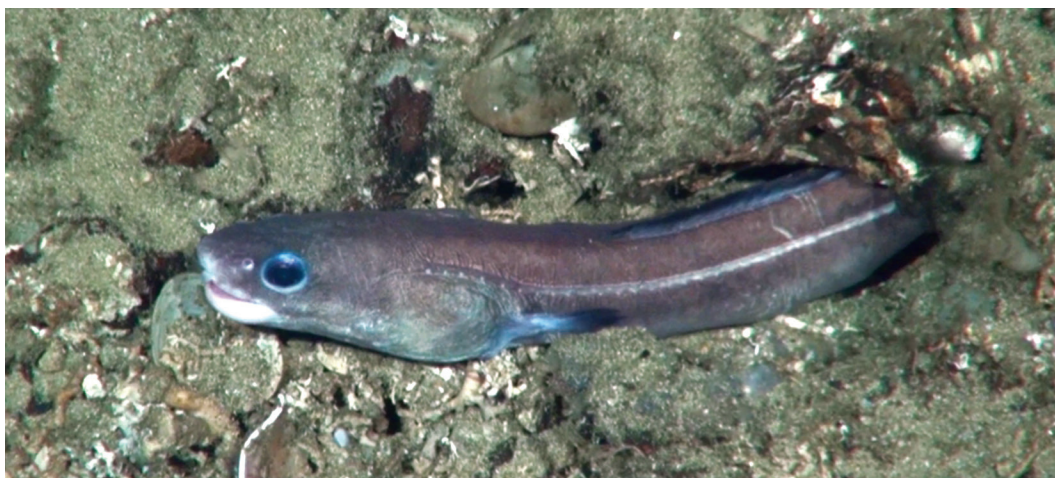
OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 150-250 m; Piedra 165 (150-170 m), The Edge (200 m) and Las Gemelas 1 (250 m), morning; Las Gemelas 2 (170-200 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Other snake eel species are represented at Isla del Coco (McCosker & Rosenblatt, 2010).

Family Congridae
Bathycongrus varidens (Garman, 1899)
Largehead Conger / Congrio cabezón



Bathycongrus varidens at The Wall 475 (304 m), 3 November 2009, morning.



Bathycongrus varidens at The Wall 475 (230 m), October 21, 2014, morning.

DESCRIPTION: Body elongate and blackish with rows of melanophores alongside; dorsal and anal fins with a narrow border of black (Raju, 1985). Head longer than trunk, i.e.: longer than the distance from gill opening to anus (Smith, 1995). Up to 1 m in length (Smith, 1995). Depth range: 165-935 m (Smith, 1995).

WORLDWIDE DISTRIBUTION: From southern Canada to Chile (Smith, 1995).

OCURRENCES AT ISLA DEL COCO (THIS STUDY): 215-304 m, Piedra Drop (215 m) and The Wall 475 (230-304 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Species presence reported by Starr et al. (2012b) at more than 50 m deep, and by Fourri re et al. (2016).

Congridae, unidentified sp. A
Conger Eel / Congrio



Congridae, unidentified at Las Gemelas 1 (250 m), 14 September 2009, morning.

DESCRIPTION: Body elongate, cylindrical, compressed posteriorly, characteristic of many Congridae (Smith, 1995). Bluish-grey in colour.

WORLDWIDE DISTRIBUTION: Most species of congridids live on the continental shelf or slope (Smith, 1995).

OCCURRENCES AT LAS GEMELAS SEAMOUNT (THIS STUDY): Las Gemelas 1 (250 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Family present at Isla del Coco (McCosker & Rosenblatt, 2010).

Congridae, unidentified sp. B
Conger Eel / Congrio



Congridae, unidentified at The Wall 475 (270 m), 28 September 2009, afternoon.



Congridae, unidentified at The Wall 475 (270 m), 28 September 2009, afternoon.

DESCRIPTION: Grey opaque fish, elongate with cylindrical body compressed posteriorly. Corner of mouth beneath eye, dorsal and anal fins confluent with caudal fin. Dorsal origin before pectoral, characteristic of the Congridae family (Smith, 1995).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): The Wall 475 (250-400 m), afternoon. Usually in caves and crevices.

PREVIOUS REPORTS FROM ISLA DEL COCO: Congrids reported at more than 50 m and at Las Gemelas Seamount by Starr et al. (2012b).

Heteroconger klausewitzi (Eibl-Eibesfeldt & Köster, 1983)
Galapagos Gardeneel / Ánguila-jardín de Galápagos



Heteroconger klausewitzi at Bajo Manuelita (60 m), 21 May 2007, morning.

DESCRIPTION: Body blackish, much lighter in juveniles, with irregular white blotches. Pectoral fin and branquial region dark brown (Castle, 1999). Body very elongate and cylindrical; lateral line pores outlined by white spots (Bussing & López, 2005; Garrison, 2005). Size: 60-90 cm. Depth: from 3 m (J. McCosker, personal observation, September 2017) to 30 m (Castle, 1999).

WORLDWIDE DISTRIBUTION: FOUND ALONG CONTINENTAL MARGINS FROM COSTA RICA TO ECUADOR, INCLUDING MALPELO, ISLA GORGONA, ISLA DEL COCO AND GALÁPAGOS ISLANDS (Castle, 1999; McCosker & Rosenblatt, 2010; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 50-90 m, Bajo Manuelita (50-60 m) and on route from Everest (60-90 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Bussing and López (2005), common in shallow waters sandy substrates (Garrison, 2005), and by Fourrière et al. (2017).

REMARKS: Known maximum depth increases from 30 m to 90 m.

ORDER ATELEPODIFORMES

Family Atelepodidae

Guentherus altivela Osório, 1917

Jellynose Fish / Trompa dulce



Adult *Guentherus altivela* at
The Wall 475 (300 m),
21 March 2009, afternoon.



Juvenile of *Guentherus altivela* at
The Wall 475 (303 m),
11 April 2010, morning.

DESCRIPTION: Adults dark brown, with a large bulbous snout. Juveniles or in post-larval stage nearly transparent with black blotches along body and fins. Depth range: 220-700 m (Bussing & López, 1977).

WORLDWIDE DISTRIBUTION: Atlantic Ocean, from Portugal to Southeast Africa (Bussing & López, 1977; McCosker & Humann, 1996). Eastern Pacific (McCosker & Rosenblatt, 2010): in Costa Rica at Cabo Blanco and Quepos; in Panamá at Punta Jaqué (Bussing & López, 1977) and in the Galápagos Islands (McCosker & Humann, 1996).

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 200-402 m, The Wall 475 and Piedra Drop (200 to 402 m), and Las Gemelas 3 (262 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: In deep waters at The Wall 475 (Cortés & Blum, 2008), beyond 50 m (Starr et al., 2012b), and by Fourrière et al. (2017).

REMARKS: Juveniles have been observed only at Piedra Drop at more than 300 m in the morning. They hover above the bottom with the dorsal fin undulating in a sinusoidal pattern.

ORDER AULOPIFORMES

Family Aulopidae

Aulopus sp.

Galapagos Flagfin / Lagarto de Galápagos



Aulopus sp. at Piedra 165 (170 m),
8 March 2008, afternoon.



Aulopus sp. at The Edge (240 m),
18 September 2006, afternoon.

DESCRIPTION: Body slender and cylindrical. Head robust (Sommer & Parin, 1995), eyes large, adipose fin present (Bussing & López, 2005). Single dorsal fin high, located near mid-body, originating just posterior to the insertion of the pectoral fin (Thompson, 1998). Brown, usually with dark bands on upper body, a large dark blotch covering the opercle, upper half of the eye yellow (Robertson & Allen, 2015). Body size up to 31 cm (Robertson & Allen, 2015). Depth range: 305-513 m at Galápagos Islands (Thompson, 1998).

WORLDWIDE DISTRIBUTION: In the Eastern Tropical Pacific, Galápagos Islands and Isla del Coco (McCosker & Rosenblatt, 2010).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 150-240 m; site near Kili 2 (180 m), morning; The Edge (240 m) and The Wall 475 (230-310 m), afternoon, and Piedra 165 (150-170 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: *Aulopus* sp. was reported by Starr et al. (2012b) as well as a southern population around the island (Robertson & Allen, 2015).

REMARKS: Thompson (1998) proposed that *Aulopus bajacali* Parin & Kotlyar, 1984 was known from southern Baja California and the southwest part of the Gulf of California and population around Coco and Galápagos islands and mainland Ecuador. McCosker and Rosenblatt (2010: 189) reported that the late “Thompson (1998) initially recognized Galápagos and Cocos specimens as *Aulopus bajacali* Parin & Kotlyar 1984, but subsequently determined that they were a distinct species (pers. comm. to J. E. McCosker, July 1999). In 1999 he designated CAS Galápagos specimens as the holotype and paratypes but his description was never published.” Minimum known depth decreased from 305 m (Thompson, 1988) to 150 m.

Family Chlorophthalmidae
Chlorophthalmus mento Garman 1899
Greeneyes / Ojiverde robusto



Chlorophthalmus mento at Boulders (311 m), 12 September 2009, afternoon.



Chlorophthalmus mento at Boulders (311 m), 20 June 2007, afternoon.

DESCRIPTION: Body brown to iridescent bluish-green, with dark blotches on the flank; very large shiny green eyes. Body cylindrical, compressed posteriorly, dorsal fin before middle of body, pelvic fins inserted just behind dorsal fin origin, adipose fin tiny, inserted opposite anal fin (Sulak, 1995). Size: 10-30 cm. Depth: 235-1260 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: In the Eastern Tropical Pacific, Costa Rica to Perú, Galápagos Islands and Isla del Coco (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO AND AT LAS GEMELAS SEAMOUNT (THIS STUDY): 250-311 m, Las Gemelas 1 (250 m) and Boulders (311 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: *Chlorophthalmus mento* was reported by Starr et al. (2012b) at Isla del Coco and Las Gemelas at more than 50 m.

ORDER GADIFORMES

Family Moridae

Laemonema cf. gracillipes Garman, 1899

Codling / Mora



Laemonema cf. gracillipes at Boulders (250 m), 10 May 2009 in the afternoon.

DESCRIPTION: Body elongate, narrowing towards the caudal peduncle, reddish maroon. Fins reddish. Two dorsal fins, the first triangular and short based, the second long based. Mouth terminal and broad. Body diminishes towards caudal peduncle. Depth range: 515-722 m (Meléndez & Markle, 1997).

WORLDWIDE DISTRIBUTION: Distribution records for *Laemonema* are between 60°N and 40°S. *Laemonema gracillipes* is found in Eastern Pacific tropical islands (Meléndez & Markle, 1997; McCosker & Rosenblatt, 2010), off the Galápagos Islands and Panama (Meléndez & Markle, 1997).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 150-250 m; Boulders (250 m), afternoon; Piedra 165 (150-170 m), The Edge (200-220 m) and The Wall 475 (220-250 m), in crevices. Difficult to see from the submersible because it hides from the light.

PREVIOUS REPORTS FROM ISLA DEL COCO: *Laemonema* sp. reported by Starr et al. (2012b) at depths greater than 50 m. If *Laemonema gracillipes* is correct, minimum known depth decreased from 515 m (Meléndez & Markle, 1997) to 150 m.

Physiculus sp.
Mora Codling / Mora



Physiculus sp. at Las Gemelas 1 (250 m), 14, September 2009, morning.



Physiculus sp. at The Wall 475 (304 m), 31 May 2010, afternoon.

DESCRIPTION: Species of the genus *Physiculus* are characterized by having a body with a narrow tail base, a chin with a barbell, fins without spines, two dorsal fins and a tail fin separate from dorsal and anal fins (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: A circumglobal genus with three endemics species in the Eastern Pacific (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 200-304 m, The Edge (200-300 m) and The Wall 475 (200-304 m); Las Gemelas 1 (250 m) and Las Gemelas 3 (205 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Starr et al. (2012b) at depths greater than 50 m at Isla del Coco and Las Gemelas Seamount.

ORDER OPHIDIIFORMES

Family Ophidiidae

Brotula ordwayi Hildebrand & Barton, 1949

Fore-spotted Brotula / Lengua pintada



Brotula ordwayi at Piedra 165
(150-170 m),
23 November 2009.



Close up of barbels in snout and lower jaw of
Brotula ordwayi at Everest
(84 m), 9 September 2009, morning.

DESCRIPTION: Body elongate, compressed. Greyish with blackish spots on head and front part of the body. Dorsal and anal fins with black margin; tail fin continuous with dorsal and anal. Snout and lower jaw with six barbels. Grows to at least 75 cm and has a depth range of 0-270 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: In tropical and subtropical seas (Nielsen, Cohen, Markle, & Robins, 1999). SE Gulf of California (Robertson & Allen, 2015) to Perú and the Galápagos Islands (Nielsen et al., 1999; McCosker & Rosenblatt, 2010) and the Revillagigedo Islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 83-200 m; Everest (83-84 m) and Argo 2 (200 m), morning; Piedra 165 (150-170 m), Kili 2 (180 m) and site close to Piedra Drop (around 200 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Starr et al. (2012b) stated that this species was found at more than 50 m at Isla del Coco, and see Fourrière et al. (2017).

ORDER LOPHIIFORMES
Family Lophiidae
Lophiodes caularis (Garman, 1899)
Spottedtail Goosefish / Rape rabo manchado



Lophiodes caularis at The Wall 475 (230 m), 28 November 2009, afternoon.

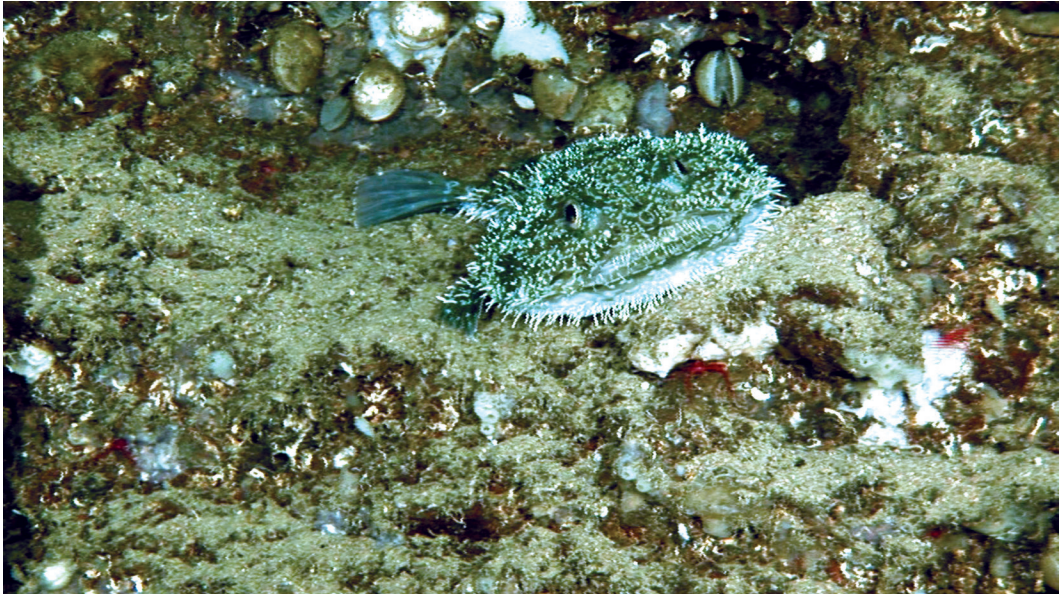
DESCRIPTION: Brown. Head and anterior part of the body depressed, posterior part of the body gradually narrowing. Body with bony spines. First dorsal fin formed by three isolated cephalic spines, the first of which resembles a fishing rod with a complex esca or bait consisting of a pennant-like flap, with long cirri and usually dark, stalked eye-like appendages (Caruso, 1995). Tail dark, very large depressed head and mouth (Bussing & López, 2005). Pectoral fins limb-like (Robertson & Allen, 2015), caudal fin has a row of six spots (Caruso, 1995). Size: to about 40 cm. Depth range: 15-311 m (Caruso, 1995).

WORLDWIDE DISTRIBUTION: South California to Perú (López & Bussing, 1982); Isla del Coco and Malpelo (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 70-300 m, Everest (70-80 m) and The Wall 475 (230-300 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Bussing & López (2005), and by Fourrière et al. (2017).

Lophiodes spilurus (Garman, 1899)
Threadfin Goosefish / Rape de hebra



Lophiodes spilurus at The Wall 475 (230 m), 28 Nov 2009, afternoon.

DESCRIPTION: Maroon with turquoise and white lines. Head and anterior part of the body depressed, posterior part of the body gradually narrowing. Body armed with bony spines. First dorsal fin formed by three isolated cephalic spines, the first of which resembles a fishing rod with esca or bait that it's a simple bulb (Caruso, 1995). Tail dark, very large depressed head and mouth (Bussing & López, 2005). Pectoral fins limb-like (Robertson & Allen, 2015), caudal fin has a row of six spots (Caruso, 1995). Size: to about 40 cm. Depth range: 15-311 m (Caruso, 1995), 80-850 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Southern California to Perú (López & Bussing, 1982); Isla del Coco and Malpelo (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 200-300 m, The Edge (200-220 m) and The Wall 475 (300 m) up to the slope (230 m), morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Cortés and Blum (2008), Starr et al. (2012b), and Fourrière et al. (2017).

Family Antennariidae
Antennarius commerson (Lacepède, 1798)
Giant Frogfish / Ranisapo gigante



Antennarius commerson at Everest (87 m), 4 April 2007, afternoon.

DESCRIPTION: Body globular; a very large upward directed mouth. Third dorsal spine movable, not bound down by skin, first spine (the esca) modified as a fishing rod. Fleshy pelvic fins leg-like (Schneider & Lavenberg, 1995). Color variable and skin of body rough (Garrison, 2005). Illicium approximately twice the length of the second dorsal spine; esca branched (Bussing & López, 2005). Size: 35 cm. Depth range: usually at 20 m (Schneider & Lavenberg, 1995), but Myers (1999) records it down to 70 m.

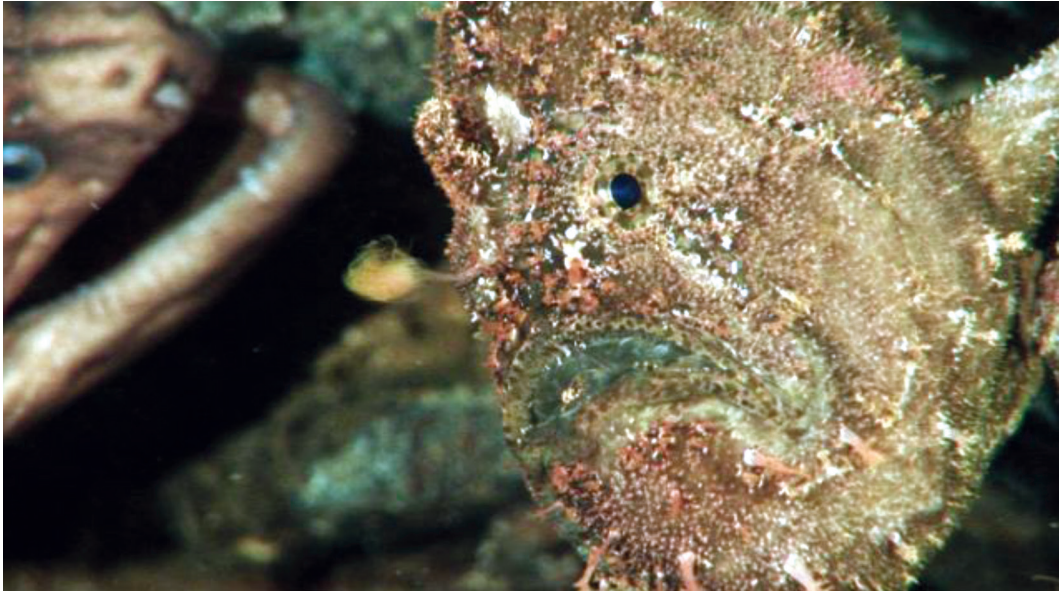
WORLDWIDE DISTRIBUTION: Indo-Pacific (Randall, 2005); Eastern Pacific (Garrison, 2005) from central México to Panamá, and the Revillagigedo, Coco, Malpelo and Gorgona islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 20-87 m, Bajo Manuelita from 20 m down to Everest (80-87 m), observed in the afternoon.

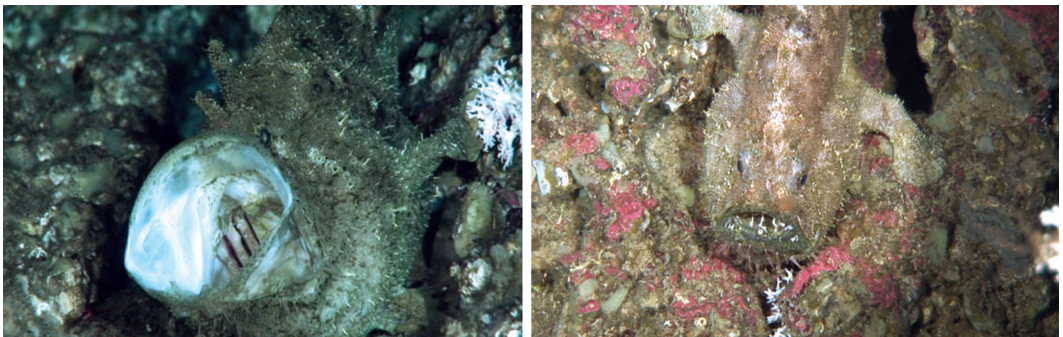
PREVIOUS REPORTS FROM ISLA DEL COCO: Rarely recorded in shallow waters: from Roca Sucia, south side of Isla Manuelita and Isla Pájara (Garrison, 2005), and by Fourrière et al. (2017).

REMARKS: Known maximum depth increases from 70 m to 87 m.

Fowlerichthys avalonis (Jordan & Starks, 1907)
Roughjaw Frogfish / Ranisapo antenado



Fowlerichthys avalonis at Piedra 165 (150-160 m), 12 May 2009, afternoon.



Left, *Fowlerichthys avalonis* at Piedra 165 (150-160 m), 12 June 2009, afternoon, opening its mouth for feeding. Right, *F. avalonis* with cryptic coloration at a site near Piedra Drop (200 m), 17 March 2010, afternoon.

DESCRIPTION: Body, head and fins mottled with a network of dark and light brown lines around white spots and a dark irregular bar on the tail fin. Dark blotch at base of last dorsal rays. Upper jaw vertical. First dorsal spine fragmented, second spine modified with a fleshy flap, third dorsal spine not bound. Pectoral fin very thick. Skin of body covered with thick single-pointed spicules; second and third dorsal spines covered with close-set double pointed spicules. Fleshy flaps on lower jaw (Jordan & Starcks, 1907). Wide range of colors (black, orange, yellow, white, brown) (Robertson & Allen, 2015). Illicium (first dorsal fin spine) about equal to length of second dorsal



Fowlerichthys avalonis (juvenile frogfish, 5 m) at Piedra 165 (150 m), 11 July 2014.

spine (Schneider & Lavenberg, 1995), esca, or tip of the illicium, a cluster of appendages (Bussing & López, 2005) that act as bait. Maximum length: 33 cm. Depth range: from surface to 300 m (Schneider & Lavenberg, 1995).

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010), southern California to the Gulf of California to Perú, Galápagos Islands and Isla del Coco (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 150-220 m, Piedra 165 (150-170 m), Kili 2 (180 m) and The Edge (220 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), Starr et al. (2012b) for Isla del Coco as well as for Las Gemelas Seamount, and by Fourrière et al. (2017) at Isla del Coco.

Family Ogcocephalidae

Dibranchus sp.

Batfish / Murciélago



Dibranchus sp. at Las Gemelas 1 (250 m), 14 September 2009, morning.



Dibranchus sp. at
Las Gemelas 1 (250 m),
14 September 2009, morning.

DESCRIPTION: Head wide and strongly depressed. Fish-lure between tip of the snout and the mouth (Caruso, 1995). Dorsal surface and dorsal fins salmon-coloured, whitish tubercles. Caudal fin and pectoral fins orange-coloured. Body covered with large tubercles that separate into two longitudinal rows on surface of tail. Pectoral “feet” with smaller tubercles (Bradbury, 1999).

OCCURRENCES AT LAS GEMELAS SEAMOUNT (THIS STUDY): At Las Gemelas 1 (250 m), morning.

REMARKS: Identification of this species remains tentative until capture of organisms for detail examination. *Dibranchus cracens* was reported by Starr et al. (2012b) at Las Gemelas at more than 50 m deep.

Ogocephalus porrectus Garman, 1899
Cocos Batfish / Pez-murciélago del Coco



Ogocephalus porrectus at Everest (89 m), 11 December 2007, morning.



Ogocephalus porrectus at
Everest (89 m),
06 October 2007, morning.

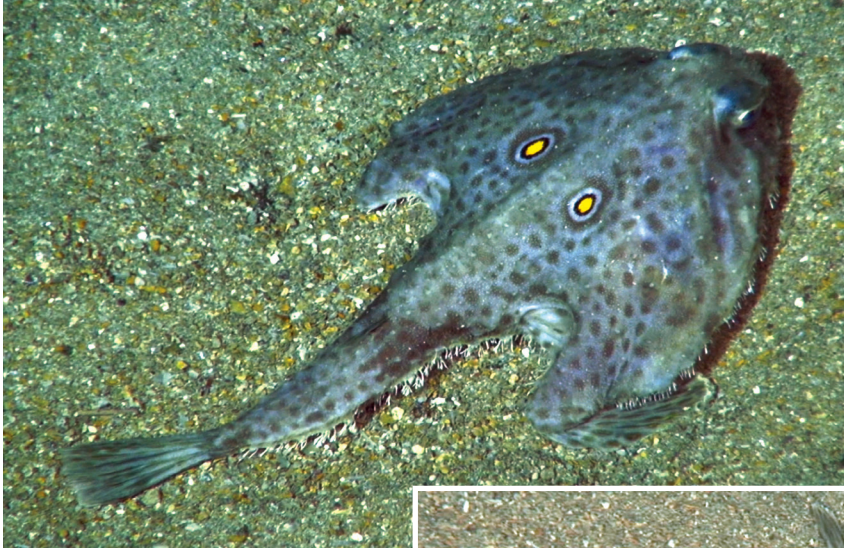
DESCRIPTION: Disc and caudal region subtriangular, flattened at the inner surface. Skin rough with prominent spiny buckles. Each side of the body with a longitudinal dark brown stripe starting at the head and going all the way to the tail. Brownish on dorsal surface, orange-red along ventral surface, pelvic and anal fins on ventral region mostly white (Bradbury, 1980). Mouth red (Garrison, 2005) with horn-like rostrum. Fish-lure in a small cavity under horn. Size: 16 cm (Robertson & Allen, 2015). Depth: 35-150 m (Bradbury, 1980; Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Isla del Coco (Bussing & López, 2005; Garrison, 2005) and probably Malpelo, although that population could belong to an undescribed species (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): From 30 m descending to Everest, down to 150 m near Piedra 165. Everest (85-90 m), morning; Bajo Manuelita (62-65 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported in shallow waters at Isla del Coco (Bussing & López, 2005; Garrison, 2005): Ulloa, Bajo Manuelita and Roca Sucia (Garrison, 2005), and by Fourrière et al. (2017).

Zalieutes elater (Jordan & Gilbert, 1882)
Roundel Batfish / Murciélago biocelado



Zalieutes elater at the insular shelf edge (180 m), 17 May 2014.



Zalieutes elater at insular shelf edge (180 m), 15 July 2007, morning.

DESCRIPTION: Brown with many darker irregular brown spots. A pair of black-rimmed dorsal yellow ocelli. Head and body much depressed, together forming a broad subtriangular disc. Ilicium protractile, esca large. Skin covered with fine closely placed sharp striate-based tubercular scales, among with larger scattered tubercles. Arm-like pectoral fin. “Fishing pole” in small cavity under snout (Robertson & Allen, 2015). Size: up to 15 cm. Depth: 20-160 m (Robertson & Allen, 2015), maximum depth reported for Costa Rican waters: 329 m (Angulo-Sibaja, 2014).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 80-200 m, Everest (80 m), insular shelf edge on the north side of the island (180 m), Kili 2 (180 m) and The Edge (200 m).

WORLDWIDE DISTRIBUTION: California to Perú, and Isla del Coco (Robertson & Allen, 2015).

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported at Isla del Coco by Bussing and López (2005), also on sandy bottoms between 160-180 m by Cortés and Blum (2008), and by Fourrière et al. (2017).

ORDER GASTEROSTEIFORMES

Family Aulostomidae

Aulostomus chinensis (Linnaeus, 1766)

Chinese Trumpetfish / Trompeta china



Aulostomus chinensis at Everest (60 m), 28 April 2009, afternoon.

DESCRIPTION: Long slender compressed body encased in bony plates (Fritzsche, 1995) usually brown with pale bars; some individuals are completely bright yellow (Bussing & López, 2005) but are less common (Garrison, 2005). Long tubular snout, lateral line continuous. Size: 75 cm (Fritzsche, 1995). Depth: to 122 m (Myers, 1999).

WORLDWIDE DISTRIBUTION: Indo-Pacific, and Eastern Tropical Pacific from Panamá to Ecuador, in the tip of Baja California and all the oceanic islands (Robertson & Allen, 2015).

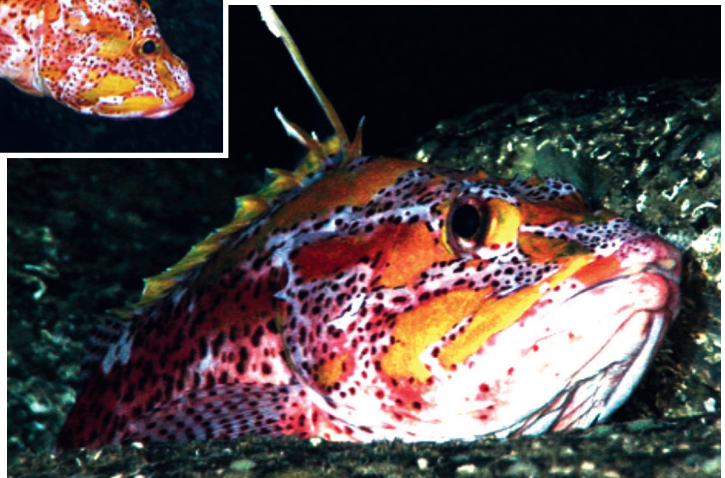
OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-60 m; Bajo Manuelita (50-60 m), afternoon; Everest (45-60 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Common in shallow waters (Bussing & López, 2005; Garrison, 2005), and by Fourrière et al. (2017) as a deep-water species.

ORDER SCORPAENIFORMES
Family Scorpaenidae
Pontinus clemensi Fitch, 1955
Spotted Scorpionfish / Rascacio moteado



Pontinus clemensi at The Wall 475 (230 m),
29 August 2007, afternoon.



Pontinus clemensi at
Piedra 165 (160 m),
4 February 2009, afternoon.

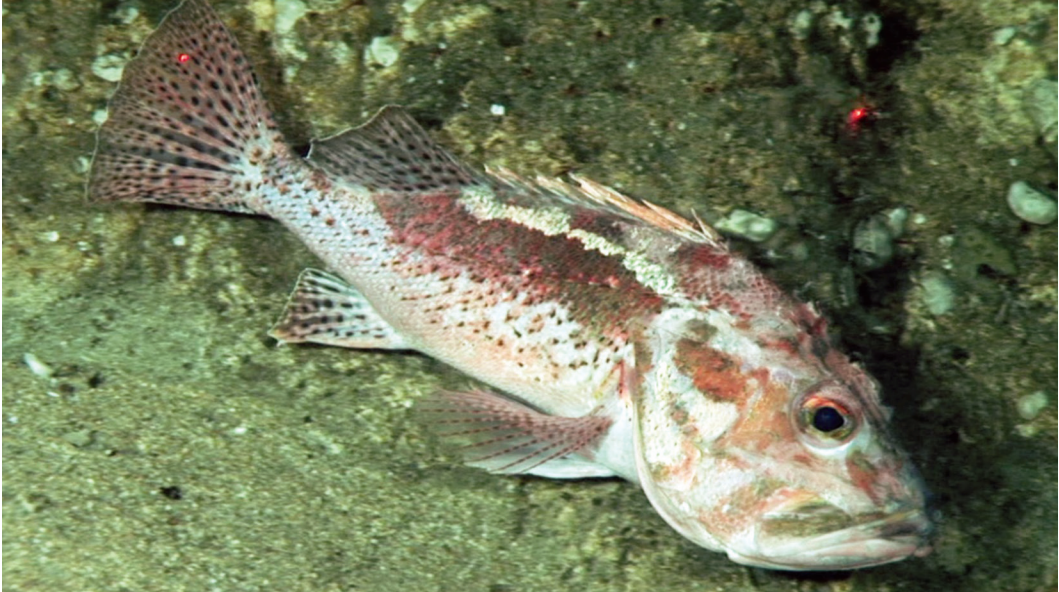
DESCRIPTION: Head and body compressed, pink color. Large eyes; body with irregular dark reddish spots (Poss, 1995) forming bars on caudal fin. Second and third dorsal fin spines elongated, of equal length (Bussing & López, 2005). Size: 56 cm (Robertson & Allen, 2015). Depth: 50-250 m (Robertson & Allen, 2015); Mora, Jiménez, and Zapata (2000) collected individuals at more than 90 m; Aburto-Oropeza et al. (2010) reported the species at 250 m.

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010; Robertson & Allen, 2015). Colombia (Franke & Acero, 1996), northern Perú (Chirichigno, 1978), Islas Galápagos (McCosker et al., 1997), Isla Malpelo (Mora et al., 2000), Isla del Coco (Bussing & López, 2005) and the Gulf of California (Aburto-Oropeza et al., 2010).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 150-230 m, Piedra 165 (150-170 m), Kili (170 m), near Kili 2 (180 m), Argo 2 (180-205 m), The Edge (200-220 m), Kili Rock (220 m), The Wall 475 (215-230 m) and Banana (225 m). Species observed morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), in deep waters at more than 50 m by Starr et al. (2012b), and by Fourrière et al. (2017).

Pontinus sp. A
Scorpionfish / Pez escorpión



Pontinus sp. A at The Wall 475 (250 m), 12 September 2009, morning.
Laser beams are 33 cm apart.

DESCRIPTION: Representatives of *Pontinus* have compressed pinkish bodies and heads. Eyes large; body with irregular dark reddish spots (Poss, 1995). Second and third dorsal spine elongate or equal length depending on the species (Bussing & López, 2005). This individual shows a D-III spine of intermediate length if compared with *Pontinus clemensi*, snout larger than diameter of eyes.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): The Wall 475 (220-320 m), morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: In addition to the records of *P. clemensi* already mentioned (Bussing & López, 2005, Starr et al., 2012b), *P. strigatus* and *P. furcirhinus* have also been reported for Isla del Coco (Bussing & López, 2005; Robertson & Allen, 2015). Starr et al. (2012b) reported two species of *Pontinus* as *P. furcirhinus?* and *P. strigatus?*

REMARKS: The photographed individual, which has the snout longer than the eye, is not *P. strigatus* as this species is characterized as having a snout shorter than the diameter of the eye (Robertson & Allen, 2015). This species is unlikely to be *P. strigatus* as it has a much longer snout and pattern of coloration over the dorsum, but not the ventrum, is quite distinct from that seen in [the holotype of] *P. strigatus* (Stuart Poss, personal communication 2017).

Pontinus sp. B
Scorpionfish / Pez escorpión



Pontinus sp. B at
The Wall 475 (270 m),
28 September 2009,
afternoon.

DESCRIPTION: Head very bony; with numerous spines, lateral line complete. The genus is characterized by having 15-20 pectoral rays, all unbranched (Poss, 1995). The second and third dorsal spines are elongate or equal length, depending on the species (Bussing & López, 2005). The individuals photographed for this publication are red with greenish blotches and a paler underbody. Also, the second and third dorsal spines appear elongate and broadened at the tip. Dorsal and anal fins have a white margin.



Pontinus sp. B at The Wall 475
(309 m), 10 February 2010, afternoon.

OCCURRENCES AT ISLA DEL COCO AND AT LAS GEMELAS SEAMOUNT (THIS STUDY): 180-400 m; Kili 2 (180 m), morning; Las Gemelas 3 (205 m), The Wall 475 (215-400 m) and Las Gemelas 1 (250 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: In addition to the mentioned registers of *P. clemensi* (Bussing & López, 2005; Starr et al., 2012b), *P. strigatus* and *P. furcirhinus* have also been reported for Isla del Coco (Bussing & López, 2005; Robertson & Allen, 2015). Starr et al. (2012b) reported two species of *Pontinus* as *P. furcirhinus?* and *P. strigatus?*

REMARKS: Of the species of *Pontinus* present in the Eastern Tropical Pacific, only *P. clemensi* (which was described above as having characteristics that do not match the photographs of *Pontinus* sp. B) and *P. vaughani* have the second and third dorsal spines elongate. However, *P. vaughani* has a dark pink body with dense blotches, often dotted with striking colors such as yellow and blue. In addition, it is restricted to Baja California, the southeastern part of the Gulf of California and the Revillagigedo and Clipperton islands. In *Pontinus strigatus* the third dorsal spine is much longer than the second, which is not the case with this individual. The photographs shown here do not match any of the named members of the genus found in the eastern Pacific.

Pontinus sp. C (might be *P. strigatus* or *P. furcirhinus*)
Scorpionfish / Pez escorpión



Pontinus sp. C on a sponge at Piedra 165 (160 m), 29 November 2009, morning.

Pontinus sp. C at The Edge (200 m), 29 November 2009, morning.



DESCRIPTION: Head very bony; with numerous spines, lateral line complete. The genus is characterized by having 15-20 pectoral rays, all unbranched (Poss, 1995). The second and third dorsal spines are elongate or equal length, depending on the species (Bussing & López, 2005). Some of the photographed individuals shown in this paper have an elongate third dorsal spine. Also, in some cases, it is possible to see a stalked branched tentacle over the eye and D membranes yellow, as in *P. strigatus*.

OCCURRENCES AT ISLA DEL COCO AND AT LAS GEMELAS SEAMOUNT (THIS STUDY): 150-220 m, Piedra 165 (150-170 m), Kili (170 m), Kili 2 (170 m), Argo 2 (200 m), Las Gemelas 2 (200 m), The Edge (200 m) and The Wall 0475 (215-220 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: In addition to the afore mentioned records of *P. clemensi* (Bussing & López, 2005; Starr et al., 2012b), *P. strigatus* (Bussing & López, 2005) and *P. furcirhinus* (Robertson & Allen, 2015) have also been reported for Isla del Coco. Starr et al. (2012b) reported two species of *Pontinus* as *P. furcirhinus*? and *P. strigatus*?

REMARKS: Identification of this species remains tentative until captured of organisms for detail examination. In case the species is *P. furcirhinus* (50-390 m), which extends from the Gulf of California to Peru (Robertson & Allen; 2015) the known depth range will not change.

Scorpaena afuerae Hildebrand, 1946
Peruvian Scorpionfish / Rascacio párlamo



Scorpaena afuerae
at Everest (77 m),
18 May 2007, afternoon.



Scorpaena afuerae
at Everest (75 m),
30 June 2007, afternoon.

DESCRIPTION: Body, head and fins scarlet to orange brown, with striations and discrete red mottling and spotting. Irregular red barring on fins, except spiny dorsal which is all red. Dorsal fin with 12 spines and 9 soft rays. Head large, with spines above the eyes (three or four). Lower jaw without tentacles (Poss, 1995). Horizontal bony ridge below eye smooth (Bussing & López, 2005). Maximum length: 35 cm. Depth: 35 to 100 m (Jiménez-Prado & Béarez, 2004, Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: The tip of Baja California to Ecuador and Perú and Isla del Coco (Jiménez-Prado & Béarez, 2004; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 60-90 m, Bajo Manuelita (60 m) and Everest (60-90 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported at Isla del Coco by Bussing and López (2005). Starr et al. (2012b) indicate the possible presence of this species at Las Gemelas at more than 50 m; however, they also point out that there is doubt with the identification and thus recorded it as *Scorpaena* sp. Also reported by Fourrière et al. (2017) as a deep-water species.

Scorpaenodes rubrivinctus Poss, McCosker & Baldwin, 2010
Red-banded Scorpionfish / Rascacio de barras rojas



Scorpaenodes rubrivinctus at Piedra 165 (150 m), 23 June 2009, afternoon.



Scorpaenodes rubrivinctus, at Piedra 165 (150 m), 23 June 2009, afternoon.

DESCRIPTION: Head and body pink grading to white on rear of body and tail base. Body with three broad and distinct red bars from top to bottom, the first at level of center of spiny dorsal fin, second at level of soft dorsal fin and the last one in the tail base and base of tail fin. Head also with red bars. Pectoral fin with 18-20 rays. Dorsal spines elongate. Snout long, suborbital ridge with spines extending laterally to form a crest with suborbital spines. Depth range 160-412 m, more abundant at 260-290 m; often in association with sponges (Poss et al., 2010).

WORLDWIDE DISTRIBUTION: Eastern Pacific at Islas Galápagos and Isla del Coco (Poss et al., 2010).

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 150-230 m; Las Gemelas 3 (170 m) and The Wall 475 (210-230 m), afternoon; Piedra 165 (150-170 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Recorded previously for Isla del Coco by Poss et al. (2010) at a depth range of 160-300 m with the submersible *DeepSee*, and by Fourrière et al. (2017).

Scorpaenidae, unidentified sp.
Scorpionfish / Pez escorpión



Scorpaenidae, unidentified at Piedra 165 (170 m), 22 March 2007, afternoon.

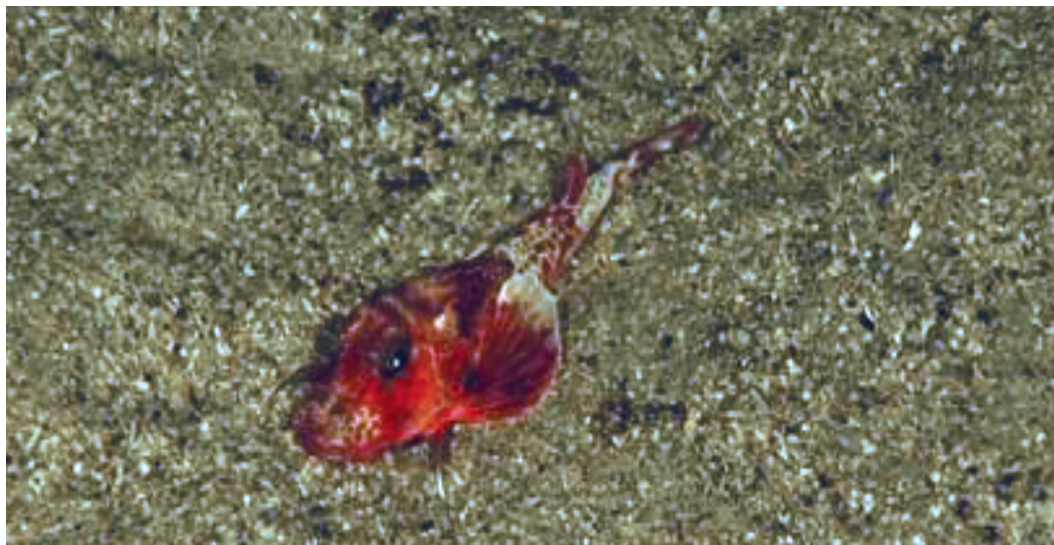


Scorpaenidae, unidentified at Piedra 165 (170 m), 11 September 2009, afternoon.

DESCRIPTION: Head and body reddish, with dark spots on the head.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Piedra 165 (150-170 m).

Family Triglidae
Bellator sp.
Searobin / Vaca o rubio



Bellator sp. at Arena (110 m), 16 September 2009, afternoon.

DESCRIPTION: Triglids are characterized for having an armoured and spiny head. The genus *Bellator* consists of fishes with a body with rough scales and a large, squarish and bony head that has many ridges and spines and are narrow between eyes (Robertson & Allen, 2015). Pectoral fins short, with 12 joined rays reaching origin of anal fin, and with 3 enlarged, free rays detached from main fin (Robertson & Allen, 2015).

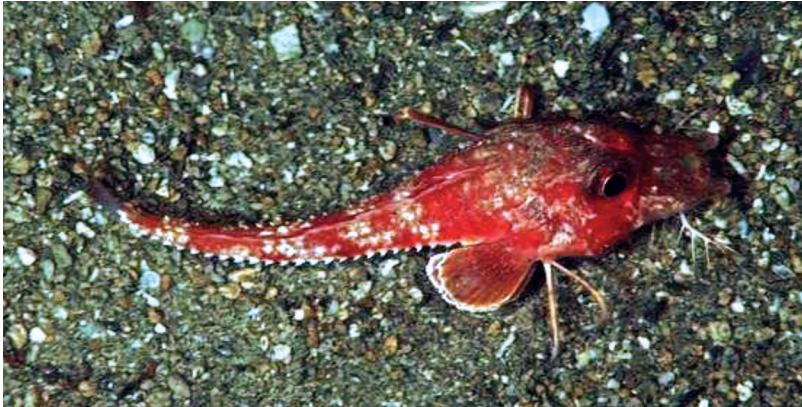
WORLDWIDE DISTRIBUTION: A neotropical to subtropical genus. Four species are known to be endemic to the Eastern Tropical Pacific.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Arena at 110 m.

PREVIOUS REPORTS FROM ISLA DEL COCO: *Bellator farrago* is known from the Galápagos and Isla del Coco, *B. loxias* is known from southern Baja to Peru and the Revillagigedos and Isla del Coco, and *B. gymnostethus* and *B. xenisma* are known from mainland waters from Baja California to Ecuador or Perú (Richards & McCosker, 1998, Robertson & Allen, 2015).

REMARKS: In addition to the four known species occurring in the Eastern Tropical Pacific, a fifth species from Isla del Coco remains undescribed (Robertson & Allen, 2015).

Family Peristediidae
Peristedion nesium Bussing, 2010
Insular Armoured-searobin / Cabro isleño



Peristedion nesium at Kili 2 (170 m), 15 May 2007, afternoon.



Peristedion nesium at Kili 2 (170 m), 22 January 2007.

DESCRIPTION: Body encased in four rows of spinous scutes on each side of the body; snout wide extended by a pair of flattened bony extensions. Filamentous barbel short. Red head and paler nape. Irregular red bars across body. Pectoral fins bright red, spinous dorsal fin, red with a white margin. Depth: captured between 110-180 m with trawl nets (Bussing, 2010).

WORLDWIDE DISTRIBUTION: Endemic, only known from Isla del Coco (Bussing, 2010).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 130-200 m, Piedra 165 (150-170 m), Kili 2 (170-180 m) and at the slope between 130-200 m, in the afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Species described with Isla del Coco specimens by Bussing (2010), and reported by Fourrière et al. (2017).

REMARKS: Known maximum depth increases from 180 m to 200 m.

Family Serranidae

Anthias noeli Anderson & Baldwin, 2000

Rosy Jewelfish / Pez-joya rosada



Anthias noeli at The Wall 475 (210 m),
1 September 2007, afternoon.



Anthias noeli at The Wall 475
(230 m), 1 September 2007,
afternoon.

DESCRIPTION: Body elongate, oblong to oval, pink above and paler pink below, iris blue grey with a cream inner ring; a yellow streak across lachrymal and part of cheek, a yellow stripe from posterior margin of eye to superior tip of opercle (Anderson & Baldwin, 2000; Robertson & Allen, 2015). A few yellow stripes or blotches on lateral and ventral aspects of body; black blotch present at anterior base of spinous dorsal fin (Anderson & Baldwin, 2000). Dorsal fin with spiny part silvery and soft part blue-pink, with the long rays yellow; caudal fin reddish to dark pink with upper and lower borders blue-white (Robertson & Allen, 2015). Two or more soft dorsal-fin rays, one or more soft anal-fin rays, usually first two soft pelvic-fin rays (second longest), and caudal-fin lobes produced (Anderson & Baldwin, 2000). The species reaches 32 cm, and the known depth range is 100-350 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Galápagos (Anderson & Baldwin, 2000) and Coco islands (Robertson & Allen, 2015), and mainland Ecuador (Béarez & Jiménez-Prado, 2003).

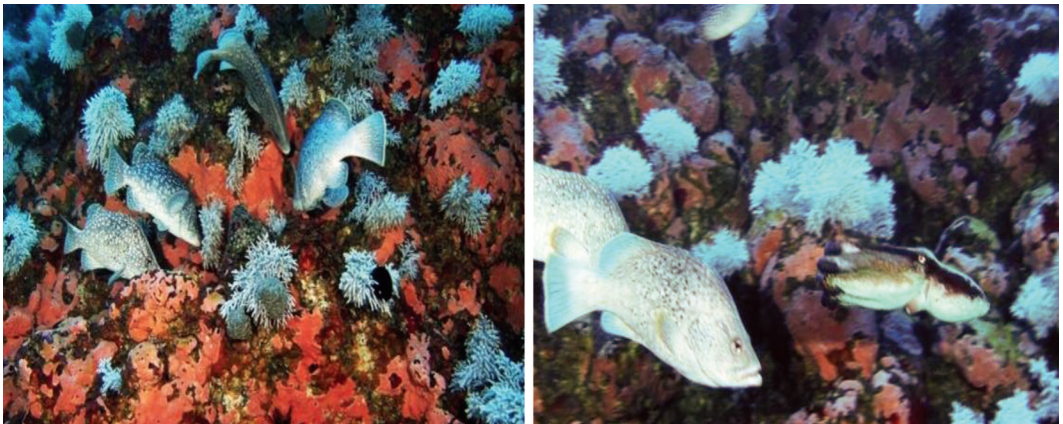
OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 90-350 m, Everest (90 m), Las Gemelas 3 (167-262 m), Kili 2 (180 m), at Argo 2 (205 m), Piedra Drop (230-300 m), and The Wall 475 (230-350 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Starr et al. (2012b) and Fourrière et al. (2017). Minimum known depth decreases from 100 to 90 m.

Dermatolepis dermatolepis (Boulenger, 1895)
Leather Bass / Mero cuero



Dermatolepis dermatolepis at Everest (76 m), 31 January 2007, afternoon.



Dermatolepis dermatolepis feeding on a cephalopod at Everest (60 m),
13 December 2009, afternoon.

DESCRIPTION: Head profile steep, several dark bars on head and body with pale or white interspaces (Bussing & López, 2005). Body greyish and deep; deepest at origin of dorsal fin (Robertson & Allen, 2015). Numerous white to pale blotches. Fin margins mostly yellow (Garrison, 2005). Juveniles white with bars on head and body and extending onto dorsal and anal fins. Size: grows to 100 cm. Depth range: down to at least 40 m (Heemstra, 1995) and 50 m (Erisman et al., 2009).



Dermatolepis dermatolepis at Everest (60 m), 13 December 2009.

WORLDWIDE DISTRIBUTION: Southern California to the central Gulf of California to Ecuador and all the oceanic islands including Isla del Coco (Robertson & Allen, 2015; Erisman et al., 2009).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-90 m, Everest (45-90 m), Bajo Manuelita (50-60 m) and The Arch (60-80 m), morning and afternoon.

PREVIOUS REPORTS AT ISLA DEL COCO: At Everest (50 m) (Erisman et al., 2009), also in shallow waters (Bussing & López, 2005; Garrison, 2005), and by Fourrière et al. (2017).

REMARKS: Courtship and spawning behavior were described for this species by Erisman et al. (2009) at Everest and were observed from the *DeepSee* submersible (at 40-50 m). The mating sequence was characterized by subgroup formation within aggregations of 50-70 individuals followed by a brief vertical spawning rush and gamete release. Known maximum depth is increased by 40 m.

Epinephelus cifuentesi Lavenberg & Grove, 1993
Olive Grouper / Cabrilla gallina



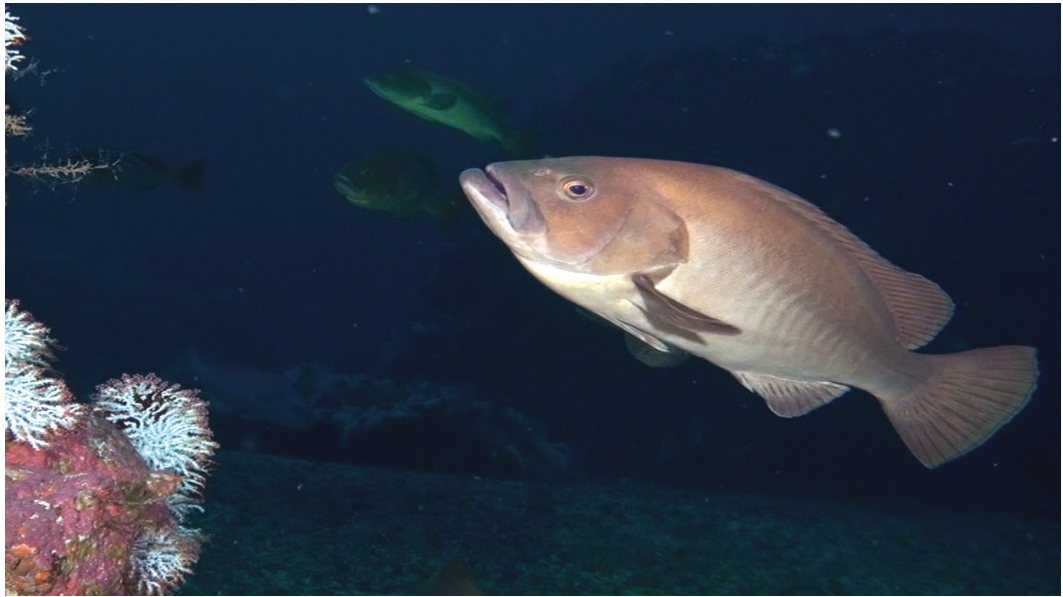
Epinephelus cifuentesi at Everest (84 m), 5 December 2007, morning.



Epinephelus cifuentesi at Piedra 165 (160 m), 4 February 2009, afternoon.

DESCRIPTION: Body solid greenish brown, second dorsal fin longest (Bussing & López, 2005). Intense green iridescence on body; fins darker, pectoral with intense blue iridescence. Margins of pectoral and anal fins cream. Juveniles are gray-brown with dark line above top jaw. Size: 100 cm. Fishing depth 40-135 m (Heemstra & Randall, 1993; Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010). The tip of Baja; southern México to Ecuador; Galápagos, Malpelo and Revillagigedo islands, Rocas Alijos (Robertson & Allen, 2015) and Isla del Coco (Heemstra & Randall, 1993; Robertson & Allen, 2015).



Epinephelus cifuentesi at Everest (60 m), 28 July 2012.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-250 m, Everest (45-90 m), The Arch (80 m), Arena (110 m), Piedra 165 (160 m), Kili 2 (180 m), The Edge (200-220 m), The Wall 475 (215-250 m), near to Piedra Drop (218 m) and Kili Rock (220 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Bussing and López (2005) for Isla del Coco. Cortés and Blum (2008) reported the species at The Arch, and Starr et al. (2012b) in deep waters at more than 50 m. Reported by Fourrière et al. (2017) as a shallow water species.

REMARKS: Present observations extend maximum depth reported by Heemstra and Randall (1993) and Robertson and Allen (2015) by 115 m to 250 m.

Hyporthodus mystacinus (Poey, 1852)
Misty Grouper / Mero listado



Hyporthodus mystacinus at The Wall 475 (250 m), 29 May 2007, afternoon.



Left, *Hyporthodus mystacinus* at Piedra 165 (160 m), 6 April 2007, afternoon. Right, *H. mystacinus* at Piedra 165 (150 m), 15 May 2009, morning.

DESCRIPTION: Body robust; chocolate brown with pale spots and 9-10 dark bars on head and body. Eyes large; tail rounded. Juveniles have stronger colors and also a dark bar across tail base. Dorsal fin with 11 spines (3rd the longest). Size: 115 cm. Depth: 12-400 m. Deep-water species, usually between 100-400 m and juveniles around 30 m (Heemstra & Randall, 1993).

WORLDWIDE DISTRIBUTION: Tropical Northeastern Atlantic and Eastern Tropical Pacific: Galápagos Islands and Isla del Coco (Robertson & Allen, 2015).



Hyporthodus mystacinus at Piedra 165 (160 m), 20 Apr 2015.

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 62-330 m; Bajo Manuelita (62 m), The Arch (90 m), morning; The Edge (215 m) and Banana (225 m), afternoon; Everest (80-90 m), Piedra 165 (150-170 m), Kili (170 m), Kili 2 (180 m), Las Gemelas 3 (180 m) and The Wall 475 (220-330 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: This is the first published report for Isla del Coco. Reported by Fourrière et al. (2017) based on Robertson and Allen (2015) website, who obtained the information of this record for Isla del Coco during the preparation of the present work.

Hyporthodus niphobles (Gilbert & Starks, 1897)
Star-studded Grouper / Baqueta ploma



Hyporthodus niphobles (probably a female with eggs) at Piedra 165 (170 m),
31 December 2009, morning.



Left, *Hyporthodus niphobles* at Piedra 165 (165 m), 12 May 2009, afternoon.
Right, juvenile of *H. niphobles* at Kili 2 (160 m), 10 December 2007, morning.

DESCRIPTION: Adults solid brown or grey, sometimes with several rows of pale spots along body (Robertson & Allen, 2015). Body of juveniles with elongated pearl white spots, which are usually absent in large adults (Bussing & López, 2005). Dorsal rays XI, second spine longest in adults (Robertson & Allen, 2015). Tail fin dark or pale yellow, pelvics and anal very dark, pectorals clear (Robertson & Allen, 2015). Adults and juveniles with a dark moustache along margin of upper jaw (Robertson & Allen, 2015). Size: reaches 121 cm. Depth: 1-450 m (Robertson & Allen, 2015), mainly in deep waters, and less abundant in reef systems (Heemstra, 1995).



Hyporthodus niphobles at Piedra 165 (160 m), 19 April 2015, morning.

WORLDWIDE DISTRIBUTION: Atlantic and Eastern Pacific (McCosker & Rosenblatt, 2010), southern California to the Gulf of California to northern Perú (Heemstra, 1995; Aburto-Oropeza et al., 2010), Malpelo and Galápagos Islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 80-450 m; Everest (80-85 m), Las Gemelas 3 (168-271 m), Argo 2 (200 m) and near Piedra Drop (235 m), morning; Kili Rock (220 m) afternoon; Piedra 165 (160-170 m), near Kili (170 m), Kili 2 (180 m), The Edge (200-270 m) and The Wall 475 (230-450 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005). Starr et al. (2012b) reported it deeper than 50 m at Isla del Coco, and by Fourrière et al. (2017).

Liopropoma fasciatum Bussing, 1980
Rainbow Basslet / Cabrilla arcoiris



Liopropoma fasciatum photographed in shallow waters. Photograph: Scott Michael.

DESCRIPTION: BODY MODERATELY ELONGATE AND COMPRESSED; HEAD POINTED WITH NEARLY HORIZONTAL UPPER PROFILE; HEAD AND BACK DARK PINKISH PURPLE, REDDISH BELOW (ROBERTSON & ALLEN, 2015). *Liopropoma fasciatum* is distinguished by a dark brown band from the tip of the snout to the posterior margin of the caudal fin (Bussing, 1980). The midlateral dark band with yellow stripe above and below; a red to brownish stripe below base of dorsal fin with narrow yellow stripe above; dorsal fin black with red base and white edge; anal fin red; caudal fin with two white stripes from flank stripes (Robertson & Allen, 2015). Reaches 26.5 cm, depth: 25-250 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Eastern Pacific: Central Gulf of California to Ecuador, Clipperton, Isla del Coco, Malpelo and Galápagos Islands (Béarez & Jiménez-Prado, 2003; Fourrière, Reyes-Bonilla, Rodríguez-Zaragoza & Crane, 2014; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 60-160 m, Everest (60-90 m) and Piedra 165 (160 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Previously reported in shallow waters at Isla del Coco (Garrison, 2005), and by Fourrière et al. (2017) as a deep-water species.

Liopropoma longilepis Garman, 1899
Scalyfin Basslet / Cabrilla aleta escamosa



Liopropoma longilepis at Piedra 165 (160 m),
15 May 2009, afternoon.



Liopropoma longilepis at Argo 2 (180 m), 5 February 2009, morning.

DESCRIPTION: Body moderately elongate and compressed, head pointed with nearly horizontal upper profile, tail slightly concave (Robertson & Allen, 2015). Upper head and body pink, whitish below, iris blue-grey; a yellowish stripe from center of rear of eye to tip of snout, a red stripe along the body midline to the tail fin, a yellowish stripe along top of body on each side of midline stripe (Bussing & López, 2005; Robertson & Allen, 2015). Outer half of dorsal fin, upper and lower edges of caudal fin and front edge of anal and pelvic fins yellow (Robertson & Allen, 2015). Size reaches 26 cm, depth range: 50-250 m (McCosker, Merlen, Long, Gilmore & Villon, 1997; Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Baja California, Costa Rica and Panamá, Galápagos Islands and Isla del Coco (McCosker et al., 1997; McCosker & Rosenblatt, 2010; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 130-450 m; Argo 2 (180 m) morning; Boulders (250 m), afternoon; Piedra 165 (150-170 m), The Edge (200-215 m) and The Wall 475 (215-450 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Previously reported by McCosker and Rosenblatt (2010) at 164 m, and by Fourrière et al. (2017) as a deep-water species.

REMARKS: Present observations extend, by 200 m, the maximum depth reported by McCosker and Rosenblatt (2010) for Isla del Coco, and by McCosker et al. (1997) for the Eastern Pacific region.

Mycteroperca olfax (Jenyns, 1840)
Sailfin Grouper / Garropa parda, Mero bacalao



Mycteroperca olfax at Everest (90 m), 9 April 2009, afternoon.



Mycteroperca olfax at Everest (60 m), 9 April 2009.

DESCRIPTION: Head and body pale grey-brown with numerous close-set brown spots (Robertson & Allen, 2015). Sometimes with dark bars on upper sided (Bussing & López, 2005) that tend to disappear with age (Heemstra, 1995). Rare bright yellow individuals exist (Bussing & López, 2005; Robertson & Allen, 2015). Edge of tail straight, lower jaw projecting (Robertson & Allen, 2015). Reaches at least 120 cm; depth: 5-100 m (Robertson & Allen, 2015).



Mycteroperca olfax (yellow phase) at Everest (50 m), 9 April 2009.

WORLDWIDE DISTRIBUTION: Galápagos, Isla del Coco and Malpelo (Garrison, 2005; McCosker & Rosenblatt, 2010; Robertson & Allen, 2015). Occasionally found between central Colombia and northern Perú (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 50-180 m, The Arch (90 m) and Kili 2 (180 m), morning; Bajo Manuelita (62 m) and Everest (50-90 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: In shallow waters by Bussing and López (2005), and at Dos Amigos (Grande and Pequeño), Roca Sucia and Punta María (Garrison, 2005); also, deeper than 50 m by Starr et al. (2012b), and by Fourriére et al. (2017) as a shallow water species.

REMARKS: Present observations extend maximum depth reported by Robertson & Allen (2015) to 180 m.

Paranthias colonus (Valenciennes, 1846)
Pacific Creolefish / Sandia



Paranthias colonus at Everest (80 m), 26 May 2007, afternoon.



Paranthias colonus among black corals at The Arch (80 m), 15 January 2008, afternoon.

DESCRIPTION: Form larger midwater schools while feeding on plankton. Body elongate, fusiform, tail strongly concave (Robertson & Allen, 2015). Reddish or reddish grey body color with 2-3 bright blue or violet spots on dorsal part of the body and another 2 on caudal peduncle. Juveniles are pinkish-yellow, usually with 5 dark dorsal dots; adults are greenish brown dorsally and reddish below, with 5 white spots on the back (Robertson & Allen, 2015). Reaches up to 36 cm (Robertson & Allen, 2015), depth: 10-70 m (Heemstra, 1995), down to 120 m (Aburto-Oropeza et al., 2010).



Paranthias colonus at Everest (50 m), 11 May 2013.

WORLDWIDE DISTRIBUTION: From Baja California including the central Gulf of California to Perú and all the Eastern Tropical Pacific oceanic islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-90 m; on the way to Kili 2 (90 m) in the morning; Everest (45-90 m) and The Arch (80 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Bussing and López (2005) and by Garrison (2005) in shallow waters down to at least 43 m.

Pronotogrammus multifasciatus Gill, 1863
Threadfin Bass / Serrano boga



Pronotogrammus multifasciatus at Piedra 165 (150-170 m), 25 November 2007, afternoon.



Pronotogrammus multifasciatus at Piedra 165 (150-170 m), 25 November 2007, afternoon.

DESCRIPTION: Body elongate, strongly compressed (Robertson & Allen, 2015). Head and body rose color, yellow stripe below eye (Bussing & López, 2005), upper body with several thin short irregular dark bars (Heemstra, 1995), lower body with yellow mottling (Robertson & Allen, 2015). Tail forked, tips pointed. Rear edge of tail broadly yellow, angular tips; fins red with yellow edges (Robertson & Allen, 2015). Size to 26 cm, depth 40-300 m (Robertson & Allen, 2015). Heemstra (1995) reported that it has been captured by commercial fishermen to a depth of 400 m.

WORLDWIDE DISTRIBUTION: From California to northern Perú, and the Revillagigedo, Galápagos, Coco and Malpelo islands (Aburto-Oropeza et al., 2010; McCosker & Rosenblatt, 2010; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 80-220 m; Argo 2 (205 m), Kili Rock (220 m) and Banana (225 m), afternoon; Piedra 165 (150-170 m), Las Gemelas 3 (170-217 m), Kili 2 (180 m) and The Edge (200-220 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Bussing and López (2005) in shallow waters, and by Starr et al. (2012b) at depths greater than 50 m, and by Fourriére et al. (2017) as a deep-water species.

Serranus tico Allen & Robertson, 1998
Cocos Serrano / Serrano del Coco



Serranus tico photographed in shallow waters by Ross Robertson.

DESCRIPTION: Body elongate and moderately depressed. Head and nape red brown, with a thin dark stripe behind top of eye, another above eye; a white stripe under eye. A blackish blotch and small orange spots on lower preopercle. Body with about eight long, narrow bars, red on upper part and yellow to orange below; a broad whitish bar across tail base (Robertson & Allen, 2015). Size: to at least 8.5 cm (Robertson & Allen, 2015). Depth: 10-43 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Endemic to Cocos and Malpelo islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): From shallow waters to Bajo Manuelita (60 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), Garrison (2005), and by Fourrière et al. (2017) as a shallow species.

REMARKS: Present observations extend depth range reported by Robertson and Allen (2015) to 60 m.

NOTE: Our images available from deep waters are of very poor quality, reason why we use this shallow water photograph.

Family Opisthognathidae

Opisthognathus sp.

Jawfish / Bocón



Opisthognathus sp. at Everest (80 m), 22 August 2006, afternoon.

DESCRIPTION: Jawfishes have an enlarged bulbous head, with eyes large and high on head, and a large mouth. They construct elaborate burrows by scooping sand or small stones with their mouth, and frequently line and reinforce their burrows with pebbles or shell fragments. There are 12 species in two genera in the Eastern Tropical Pacific (Robertson & Allen, 2015). This species appears to be a new and probably endemic species.

WORLDWIDE DISTRIBUTION: Jawfishes occur in all warm seas of the world.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Everest (45-80 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Only *Opisthognathus panamaensis* reported previously for Isla del Coco (Robertson & Allen, 2015), which, unlike the image of the present species, has a yellow head with blue spots.

Family Priacanthidae
Cookeolus japonicus (Cuvier, 1829)
Bulleye / Catalufa aleta larga



Cookeolus japonicus over Everest (45 m), 26 May 2007, afternoon.



Cookeolus japonicus at Everest (70 m),
17 May 2007, morning.



Cookeolus japonicus at Everest (60 m),
06 November 2012.

DESCRIPTION: Bright red (Bussing & López, 2005), including iris of eye (Robertson & Allen, 2015). All fins transparent with tinges of yellow. Eyes big and tail fin slightly rounded (Garrison, 2005). Attains 68 cm; depth: mostly deep waters (100-400 m) around islands (Starnes, 1995), but occasionally to 30 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Circumglobal in tropical seas (Robertson, 2008; McCosker & Rosenblatt, 2010); in the Eastern Pacific from the Gulf of California to Perú and the Revillagigedo, Malpelo and del Coco islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-300 m, Bajo Manuelita (60 m), Everest (45-80 m) and The Arch (70 m), morning and afternoon, off Piedra 165 on the wall (300 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported in deep waters (The Arch) by Cortés and Blum (2008). Few sightings in shallow waters, mainly at Alcyone (Garrison, 2005), and by Fourrière et al. (2017).

Pristigenys serrula (Gilbert, 1891)
Popeye Catalufa / Catalufa semáforo



Pristigenys serrula at Everest (70 m), 1 September 2007, afternoon.



Pristigenys serrula at Everest (70 m),
1 September 2007, afternoon.



Pristigenys serrula at Bajo Manuelita (60 m),
1 July 2013, afternoon.

DESCRIPTION: Deep oval body, dark red including iris of eye, outer part of pelvic fins blackish (Robertson & Allen, 2015), tail and soft parts of dorsal and anal fins with red-black margin. Large upturned mouth with a projecting lower jaw; preopercle without spine in adults; dorsal fin X, 11-12; anal III, 10-11; tail and pelvics rounded (Starnes, 1995; Robertson & Allen, 2015). Grows to 33 cm; young specimens with faint pale bars on sides (Robertson & Allen, 2015). Depth: 3-250 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: From central California to Chile, including Galápagos, Coco and Revillagigedo islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 60-90 m, Bajo Manuelita (60 m), The Arch (60-90 m) and Everest (70 m) morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Species reported by Garrison (2005), and by Fourrière et al. (2017).

Family Apogonidae
Apogon atradorsatus Heller & Snodgrass, 1903
Blacktip Cardinalfish / Cardenal aleta negra



Apogon atradorsatus at Bajo Manuelita (40-50 m), 21 October 2010, morning.

DESCRIPTION: Red-brown above, orange below. Tip of second dorsal fin with black spot. Grows to at least 13 cm; depth: 3-45 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Galápagos, Coco and Malpelo islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Frequent at Bajo Manuelita at 40-50 m.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Garrison (2005), Friedlander et al. (2012), and Fourrière et al. (2017).

Family Malacanthidae
Caulolatilus princeps (Jenyns, 1840)
Ocean Whitefish / Pierna o conejo



DESCRIPTION: Body robust, quadrangular; head relatively deep, snout profile relatively steep; mouth small reaching to front edge of eye (Schneider & Krupp, 1995; Robertson & Allen, 2015). Color generally light bluish grey, with a blue stripe along dorsal and anal fins; pectorals blue, with central yellow stripe (Robertson & Allen, 2015). Size: 102 cm. Depth range reported by Robertson and Allen (2015): 3-150 m.

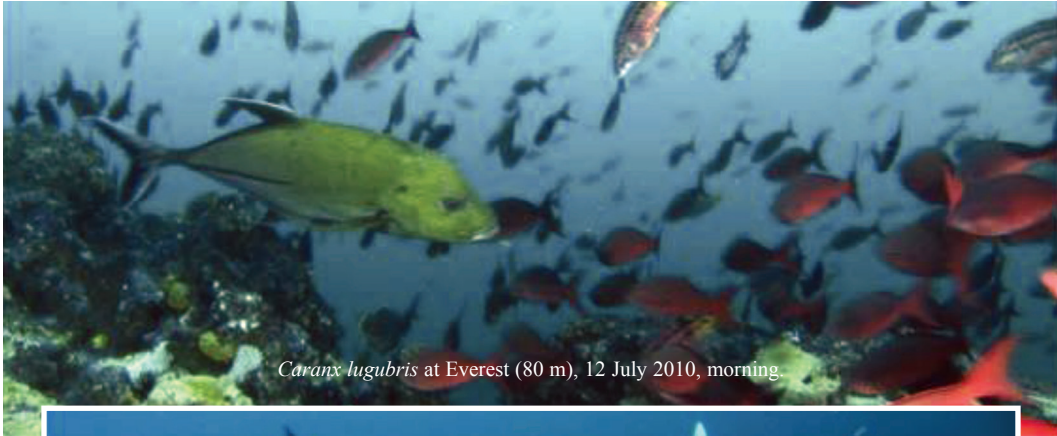
WORLDWIDE DISTRIBUTION: Eastern Pacific, from British Columbia and Gulf of California to Chile, including the oceanic islands except Clipperton (Robertson & Allen, 2015; Eschmeyer, Fricke, & van der Laan, 2017).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 80-160 m, Everest (80-85 m) and Piedra 165 (160 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Species reported at Isla del Coco by Bussing and López (2005) and Fourrière et al. (2017).

REMARKS: A similar species previously reported from Isla del Coco, *C. hubbsi*, was recently synonymized with *C. princeps* (Lea & Feeney, 2016; Eschmeyer et al., 2017). Known maximum depth increased by 10 m to 160 m.

Family Carangidae
Caranx lugubris Poey, 1860
Black Jack / Jurel negro



DESCRIPTION: Body oblong, compressed (Smith-Vaniz, 1995). Head profile steep; a black dot on the upper edge of the operculum; second dorsal and anal fins elongated (Bussing & López, 2005). Body mostly uniform grey, forked tail, narrow caudal peduncle (Garrison, 2005), scutes often black (Robertson & Allen, 2015). Size: grows to 100 cm. Depth: 3-380 m (Robertson & Allen, 2015), usually 25-65 m (Smith-Vaniz, 1995).

WORLDWIDE DISTRIBUTION: Circumtropical distribution (McCosker & Rosenblatt, 2010). Eastern Pacific: southern Baja California and the mouth of the Gulf of California; all the offshore islands and Panamá (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): From the surface down to Everest (75-86 m), where it schools with other species; morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing & López (2005); in shallow waters at Roca Sucia, north of Manuelita and Roca Aleta de Tiburón (Garrison, 2005), and by Fourrière et al. (2017).

REMARKS: In deep waters recorded only at Everest.

Caranx melampygyus Cuvier, 1833
Bluefin Trevally / Jurel aleta azul



Caranx melampygyus at Everest (86 m), 19 March 2007, afternoon.

DESCRIPTION: Body oblong, compressed. Adults with head and dorsal half of body brassy. In juvenile fish, body silver, yellow pectoral fins (Smith-Vaniz, 1995). Head and dorsal region with dark spots and fins electric blue except pectoral (Bussing & López, 2005). Caudal peduncle narrow, forked tail (Garrison, 2005). Maximum size to 100 cm (Smith-Vaniz, 1995). Depth: 0-230 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Indo-Pacific from East Africa to the Americas; the tip of Baja California and the mouth of the Gulf of California; Costa Rica to Ecuador and the oceanic islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): From the surface down to Everest (86 m) where it schools with other species; afternoon

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), common in shallow waters (Garrison, 2005), and Fourrière et al. (2017).

REMARKS: In deep waters observed only at Everest, in the afternoon.

Caranx sexfasciatus Quoy & Gaimard, 1825
Bigeye Trevally / Jurel voraz



Caranx sexfasciatus at Everest (50 m), 13 July 2013.

DESCRIPTION: Body compressed; iridescent blue green on back, shading to silvery white below; blackish spot near upper end of gill opening; white-tipped dorsal fin lobe. Size: reaches 120 cm. Depth: 1-96 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Indo-Pacific, Eastern Tropical Pacific (from southern California to the lower Gulf of California) to northern Perú and all the oceanic islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): From the surface down to Everest at 50 m, in the afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported in shallow waters at the island (Garrison, 2005; Bussing & López, 2005), and Fourrière et al. (2017).

Elagatis bipinnulata (Quoy & Gaimard, 1825)
Rainbow Runner / Macarela salmón



Elagatis bipinnulata at Everest (86 m),
19 March 2007, afternoon.



Elagatis bipinnulata at Everest (45 m),
28 September 2012.

DESCRIPTION: Body elongate; dark olive green to blue above, white below (Garrison, 2005). Mouth small, snout pointed (Smith-Vaniz, 1995). Dorsal and anal fins each followed by a finlet with 2 rays (Bussing & López, 2005). Fins with a yellow tint. Two narrow and light blue or bluish-white stripes along sides, with a broader olive or yellowish stripe between them. Size: grows to 180 cm. Depth: 0-150 m (Myers, 1999).

WORLDWIDE DISTRIBUTION: Circumtropical (Garrison, 2005; McCosker & Rosenblatt, 2010); México to Panamá (López & Bussing, 1982), Gulf of California to Ecuador and the Revillagigedo islands, Isla del Caño and Isla del Coco (Garrison, 2005).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): From the surface down to Everest (45-86 m), where they school with other species, in the afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005); common in shallow waters (Garrison, 2005), and Fourrière et al. (2017).

REMARKS: In deep waters observed only at Everest, in the afternoon.

Seriola rivoliana Valenciennes, 1833
Almaco Jack / Medregal limón u Hojarán



DESCRIPTION: Body high, compressed, snout pointed; bluish to greenish on upper back, silvery below (Robertson & Allen, 2015). An oblique dark band between eye and origin of the first dorsal fin (Bussing & López, 2005). Fins dark, white margin on ventral fins. Caudal peduncle narrow; tail forked (Garrison, 2005). Size: at least 157 cm. Depth: 5-250 m (Robertson & Allen, 2015), although rarely found at less than 30 m (Myers, 1999).

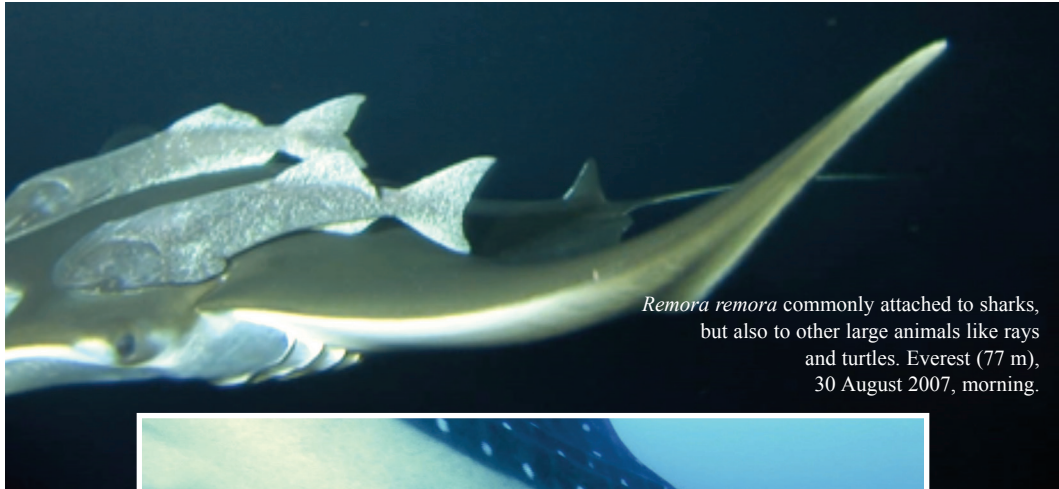
WORLDWIDE DISTRIBUTION: Circumtropical; in the Eastern Pacific from Southern California to the SW Gulf of California to Perú and the oceanic islands (Robertson & Allen, 2015).

OCCURENCES AT ISLA DEL COCO (THIS STUDY): Observed from 20 m when descending to Everest (50-90 m), morning and afternoon.

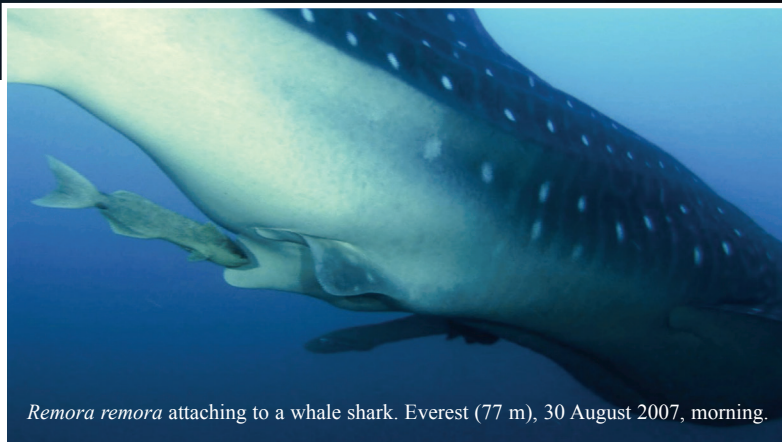
PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), occasionally in shallow waters (Garrison, 2005), and Fourrière et al. (2017).

REMARKS: In deep waters observed only at Everest.

Family Echeneidae
Remora remora (Linnaeus, 1758)
Remora / Réмора тибуронера



Remora remora commonly attached to sharks, but also to other large animals like rays and turtles. Everest (77 m), 30 August 2007, morning.



Remora remora attaching to a whale shark. Everest (77 m), 30 August 2007, morning.

DESCRIPTION: Robust, flat head; caudal peduncle thick (Paulin & Habib, 1982). Elongate, light gray to slate gray (Robertson & Allen 2015). Sucking disk with 16-20 laminae reaches to about end of pectoral fins (Schneider, 1995; Bussing & López, 2005). Size to 86 cm. Depth: 0-200 m (Robertson & Allen, 2015), recorded at more than 50 m at Isla del Coco (Starr et al., 2012b).

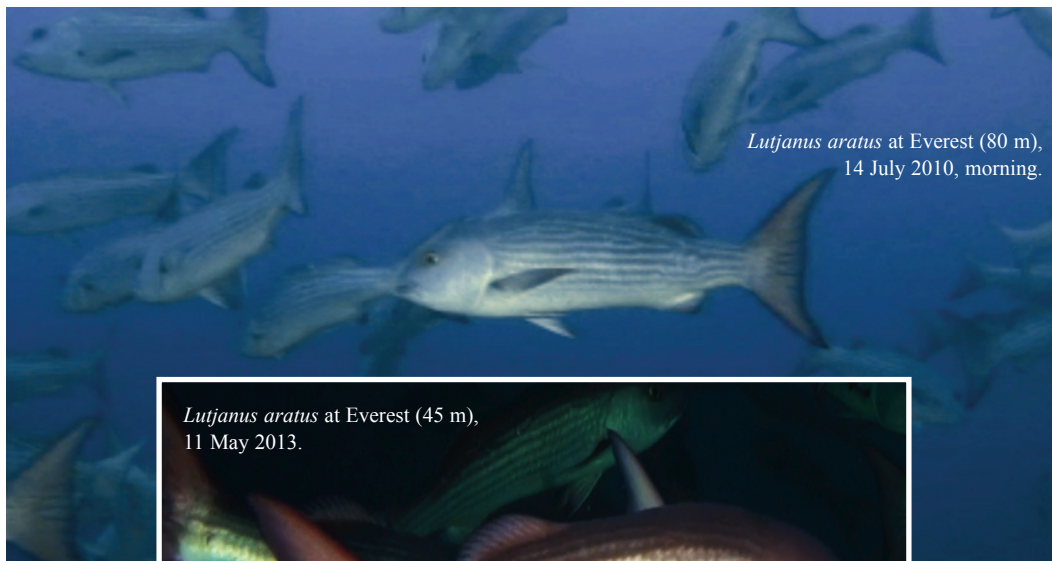
WORLDWIDE DISTRIBUTION: Circumtropical (Paulin & Habib, 1982; McCosker & Rosenblatt, 2010; Robertson & Allen, 2015); throughout the Eastern Tropical Pacific, except for the upper Gulf of California (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-300 m; Everest (45-90 m), morning; Piedra 165 (150-170 m) afternoon. Observed down to 300 m deep.

PREVIOUS REPORTS FROM ISLA DEL COCO: Occasionally in shallow waters (Bussing & López, 2005; Garrison, 2005). Starr et al. (2012b) recorded the species at more than 50 m at Isla del Coco and at Las Gemelas Seamount. Reported by Fourrière et al. (2017) as a deep-water species.

REMARKS: Extends the previous depth record 100 m deeper to 300 m.

Family Lutjanidae
Lutjanus aratus (Günther, 1864)
Mullet Snapper / Pargo raicero



Lutjanus aratus at Everest (80 m),
14 July 2010, morning.



Lutjanus aratus at Everest (45 m),
11 May 2013.

DESCRIPTION: Greenish-grey above, pink below. Fins grey, pelvic and pectoral translucent pink. Fish from deeper water mostly reddish (Allen, 1995). Dark spot located at the base of the pectoral fins, center of each scale whitish (Allen, 1995) forming alternating dark and light stripes along sides (Bussing & López, 2005). Eyes yellow (Garrison, 2005). Size: reaches about 100 cm. Depth: 0-60 m. Individual captured with hand line for commercial purposes at approximately 50 m (Allen, 1995), same maximum depth reported by Robertson and Allen (2015); reported at 60 m by Jiménez-Prado and Béarez (2004).

WORLDWIDE DISTRIBUTION: Eastern Pacific (Allen, 1995), Gulf of California to Ecuador (López & Bussing, 1982), Malpelo, Galápagos Islands and Isla de Coco (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 45-80 m; Everest (45-80 m), morning and afternoon; Bajo Manuelita (62 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005) report the species in shallow waters at Roca Sucia, Dos Amigos Grande, Manuelita, Roca Aleta de Tiburón and Roca Sumergida; Garrison (2005) at Viking Rock (Isla Cásara), and by Fourrière et al. (2017).

REMARKS: Known maximum depth increased by 20 m.

Family Haemulidae
Anisotremus interruptus (Gill, 1862)
Burrito Grunt / Burro bacoco



Anisotremus interruptus at Everest (86 m),
19 March 2007, afternoon.



Anisotremus interruptus at Everest
(80 m), 19 March 2007, afternoon.

DESCRIPTION: Body deep, compressed, silver dorsal side. Large scales above lateral line with a dark anterior border in oblique rows; fins greenish yellow (McKay & Schneider, 1995); pectoral fins long (Bussing & López, 2005). Maximum length, 90 cm. Depth: 3-30 m (Humann & Deloach, 1993; Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010). Gulf of California to Perú, including all the oceanic islands, except Clipperton (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 20-90 m, from the initial stage of descent to Everest (86-90 m), morning and afternoon; and Bajo Manuelita (65 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), from common to occasional in shallow waters (Garrison, 2005) and by Fourrière et al. (2017).

REMARKS: No published reports from deep waters for this species; depth reported in shallow waters by Humann and Deloach (1993), extended here from 30 m to 90 m.

Family Mullidae
Mulloidichthys cf. dentatus (Gill, 1862)
Mexican Goatfish / Chivo barbón



Mulloidichthys cf. dentatus at Everest (45 m),
28 April 2009, afternoon.



Mulloidichthys cf. dentatus at the top of Everest
(45 m), 28 April 2009, afternoon.

DESCRIPTION: Both *M. dentatus* and *M. vanicolensis* have elongate, cylindrical bodies; underside of head and body nearly flat; mouth small; chin with a pair of large, long barbels; two dorsal fins; yellow to greenish yellow on back and top of head, whitish on lower parts; a broad bright yellow midlateral stripe with a thinner bluish stripe immediately above; tail fin bright yellow (Robertson & Allen, 2015). These species are very similar, which makes it difficult to distinguish them based on the photographs. *Mulloidichthys vanicolensis* differs from *M. dentatus* in having more pectoral fin rays, a slightly longer pectoral fin, slightly longer barbels and more gill-rakers (Robertson & Allen, 2015). These differences are so slight that in practice it is probably not possible to separate all individuals of the two species when they are together at the same location (Robertson & Allen, 2015). *Mulloidichthys dentatus* reaches 40 cm, and *M. vanicolensis* 31 cm (Robertson & Allen, 2015). Depth range known for both species: 2-110 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: *Mulloidichthys dentatus*: Eastern Pacific (McCosker & Rosenblatt, 2010), from southern Baja and the Gulf of California to the north of Perú, including the outer islands of Revillagigedo, Galápagos, Malpelo and Isla del Coco (Robertson & Allen, 2015). *Mulloidichthys vanicolensis* is widespread throughout the Indo-Pacific, but it also can be found in the Eastern Tropical Pacific (Lessios & Robertson, 2013; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Surface down to 60 m, on the way to Everest.

PREVIOUS REPORTS FROM ISLA DEL COCO: *Mulloidichthys dentatus* reported by Bussing and López (2005) and Robertson and Allen (2015).

REMARKS: *M. vanicolensis* was until recently believed to be limited to the Indo-Pacific and the Central Pacific (Randall, 2005), but it has now been confirmed to exist on the American coast (Robertson, Grove, & McCosker, 2004; Lessios & Robertson, 2006, 2013).

Family Chaetodontidae
Johnrandallia nigrirostris (Gill, 1862)
Barberfish / Mariposa barbero



Johnrandallia nigrirostris in shallow waters at Isla del Coco. Photograph by Avi Klapfer.

DESCRIPTION: Body and fins yellow. Oblique black band from spinous dorsal fin to tail base (Bussing & López, 2005; Garrison, 2005). Eye and operculum bordered with black. Body compressed, disk-shaped. Mouth small and protrusible (Garrison, 2005). Dorsal fin with XII spines, 4th spine the longest. Maximum size: 20 cm. Depth: 5-40 m, common between 6-12 m (Schneider, 1995).

WORLDWIDE DISTRIBUTION: Central Baja to the central Gulf of California to central Perú and all the Eastern Tropical Pacific oceanic islands (Garrison, 2005).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Bajo Manuelita (40 m) and at the summit of Everest (45 m) down to 50 m, afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Garrison (2005) and Fourrière et al. (2017).

REMARKS: Known depth range expanded from 40 to 50 m.

NOTE: The images available from the deep waters are of very poor quality, reason why we use this shallow water photograph.

Prognathodes carlhubbsi Nalbant, 1995
Southern Scythe Butterflyfish / Mariposa sureña de profundidad



Prognathodes carlhubbsi at The Arch (90 m),
22 February 2007, morning.



Prognathodes carlhubbsi at The Arch (90 m),
22 February 2007, morning.

DESCRIPTION: Body high, well compressed, yellowish. Head rhomboid, with a relatively long and pointed snout. Orbit large (Nalbant, 1995). Dorsal spines, 2nd anal spine very long. Body with two dark bands, an inverted black “V” and a black band from snout to first dorsal spine. The ventral fins are black except 1st spine and ray (Hooker, 2009). Size: grows to 12 cm. Depth: 12-270 m (Robertson & Allen, 2015), possibly at an optimum of 75-100 m (Nalbant, 1995).

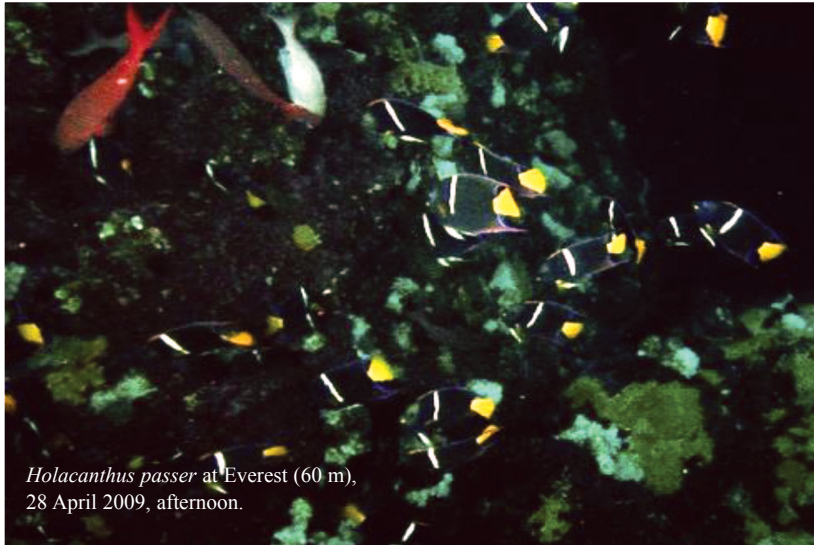
WORLDWIDE DISTRIBUTION: Galápagos Islands, Isla del Coco and Malpelo (Robertson & Allen, 2015) and Islas Lobos de Afuera, Perú (Hooker, 2009).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 90-150 m, Everest (70 m), The Arch (90 m) and deeper areas close by, morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Reported by Fourrière et al. (2017)

REMARKS: McCosker and Rosenblatt (2010) consider *P. carlhubbsi* to be a junior synonym of *P. falcifer* (Hubbs & Rehnitz, 1958). Depth range possibly limited by diet, composed mainly of coral polyps and other benthic invertebrates, especially crustaceans and polychate worms (Nalbant, 1995).

Family Pomacanthidae
Holacanthus passer Valenciennes, 1846
King Angelfish / Ángel real



Holacanthus passer at Everest (60 m),
28 April 2009, afternoon.



Holacanthus passer at Everest (60 m),
30 June 2007, afternoon.

DESCRIPTION: Deep compressed body, small mouth (Robertson & Allen, 2015). Blueish green with a white transverse band (Krupp & Schneider, 1995), from the base of the dorsal fin to the back of the pectoral fin (Bussing & López, 2005). Tail fin yellow or orange. Juveniles reddishbrown, blue stripes, pectoral band and tail fin deep orange (Krupp & Schneider, 1995). Maximum length approximately 36 cm Depth range: 1-80 m (Aburto-Oropeza & Balart-Páez, 2001; Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010). Central Baja California and Gulf of California to northern Perú, including the Revillagigedo, Galápagos, Malpelo and Coco islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): On the way and at Everest (20-60 m) morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Common in shallow waters down to approximately 42 m (Garrison, 2005), and Fourrière et al. (2017).

Family Cirrhitidae
Cirrhitichthys oxycephalus (Bleeker, 1855)
Coral Hawkfish / Halcón de coral



Cirrhitichthys oxycephalus at Bajo Manuelita (65 m), 30 June 2007, afternoon, under a black coral.

DESCRIPTION: Whitish or pinkish body with reddish brown spots, margined in red (Bussing & López, 2005), shading to white ventrally, with a fringe of cirri at the tips of dorsal fin spines (Garrison, 2005). Body oval; snout pointed. Size: grows to 10 cm. Depth: 2-40 m (Myers, 1999; Bussing & Lavenberg, 1995a).

WORLDWIDE DISTRIBUTION: Tropical Indo-Pacific and Eastern Pacific (Randall, Allen & Steene, 1990), from the Gulf of California and Cabo San Lucas to northern Peru, including Gorgona and the Galápagos Islands (Bussing & Lavenberg, 1995a).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 40-65 m, Bajo Manuelita (40-60 m), the summit of Everest (45 m) and down to 65 m; afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), common in shallow waters down to 36 m (Garrison, 2005), and Fourrière et al. (2017).

REMARKS: Observed 25 m deeper than reported previously, down to 65 m.

Oxycirrhites typus Bleeker, 1857
Longnose Hawkfish / Halcón narigón



Oxycirrhites typus within black coral and gorgonians, at Everest (84 m), 20 June 2010, morning.



Oxycirrhites typus within black coral and gorgonians, at Everest (84 m), 20 June 2010, morning.

DESCRIPTION: Long-snouted fish with horizontal and vertical red bands (Bussing & López, 2005), forming a cross-hatch pattern. Dorsal spines with 2-4 cirri near the tip (Randall et al., 1990). Size to 13 cm. Depth: 5-100 m (Bussing & Lavenberg, 1995a).

WORLDWIDE DISTRIBUTION: Indo-Pacific and Eastern Pacific (Randall et al., 1990), Gulf of California, from Cabo San Lucas to Guaymas, (Bussing & Lavenberg, 1995a), Isla del Coco, Galápagos, Revillagigedo and Malpelo Islands (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Everest at 84 m, in the morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005) and Fourrière et al. (2017).

Family Pomacentridae
Chromis alta Greenfield & Woods, 1980
Silverstripe Chromis / Castañeta alta



Chromis alta, juvenile at Everest (80 m), 28 April 2009, afternoon.

DESCRIPTION: Deep oval compressed body. Adults overall light brown with darker scale margins; juveniles blue with neon-blue stripe above and below eye, and broad whitish band along base of dorsal fin that joins diffuse pale bar across tail base (Bussing & López, 2005; Robertson & Allen, 2015). Depth: 1-200 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Southern California to southern México, all the Eastern Tropical Pacific offshore islands, to Lobos de Afuera islands off Perú (Robertson & Allen, 2015).

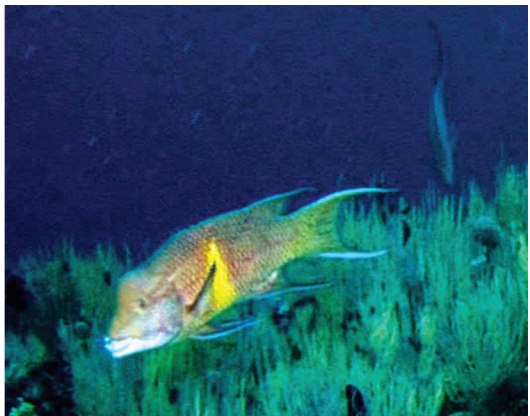
OCCURRENCES AT ISLA DEL COCO COCO (THIS STUDY): At the base of Everest (80-90 m), morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005) and Fourrière et al. (2017).

Family Labridae
Bodianus diplotaenia (Gill, 1862)
Mexican Hogfish / Vieja mexicana



A juvenil of *Bodianus diplotaenia* start life as a female, then matures into a male and changes its colors. At Everest (80 m), 13 December 2009, afternoon.



Bodianus diplotaenia, adult at Everest (85 m), 22 December 2007 (left) and at The Arch (80 m), 15 January 2008, afternoon (right).

DESCRIPTION: Moderately deep and compressed; head large, snout pointed. Adult males greyish with a yellow band immediately behind posterior edge of pectoral. Female and juveniles reddish with two longitudinal dark broken stripes (Gomon, 1995; Bussing & López, 2005). Hump between eyes and lateral line somewhat arched. Maximum size: 76 cm. Depth: shallow waters to 76 m; common between 5 and 18 m (Gomon, 1995).

WORLDWIDE DISTRIBUTION: Eastern Pacific (McCosker & Rosenblatt, 2010) from Central Baja California to the Gulf of California to northern Chile, including all the oceanic islands (Garrison, 2005), Isla del Coco (Bussing & López, 2005) and Galápagos (Baldwin & McCosker, 2001).



Bodianus diplotaenia at Everest (85 m), 8 August 2012.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 40-85 m; The Arch (60 m), afternoon; 40 m on the way to Everest and at Everest (60-85 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Common in shallow waters at Isla del Coco. Juveniles observed at the end of June and beginning of July (Garrison, 2005) and Fourrière et al. (2017).

REMARKS: Maximum known depth reported increased to 85 m.

Decodon melasma Gomon, 1974
Blackspot Wrasse / Vieja manchada



DESCRIPTION: Body compressed, head relatively large, lateral line slightly arched (Gomon, 1995). Pink above, white below, a black spot above tip of pectoral fin and 3 yellow stripes on head (Bussing & López, 2005). Size: 23 cm. Depth: Gomon (1995) reports 4-120 m deep. Aburto-Oropeza et al. (2010) report the occurrence of the species at 80-220 m at the Gulf of California.

WORLDWIDE DISTRIBUTION: Gulf of California (Lea & Rosenblatt, 2000) to Perú and Isla del Coco and Galápagos (Baldwin & McCosker, 2001; McCosker & Rosenblatt, 2010).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 150-300 m, Piedra 165 (150-170 m), The Edge (200-300 m), Argo 2 (205 m) and The Wall 475 (300 m), morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: In shallow waters (Bussing & López, 2005) and in deep waters at more than 50 m (Starr et al., 2012b), and Fourrière et al. (2017).

REMARKS: Maximum depth expanded 80 m deeper to 300 m.

Polylepidion cruentum Gomon, 1977
Bleeding Wrasse / *Vieja sangradora*



Polylepidion cruentum at Las Gemelas 1 (250 m), 13 September 2009, afternoon.

DESCRIPTION: Body moderately slender, tapering markedly at rear; head large and pointed, forehead and snout profile straight except for convexity above eyes in small specimens; nape nearly straight in juveniles to moderately arched in adults (Gomon, 1977; Robertson & Allen, 2015). Dorsal fin continuous, origin slightly anterior to a vertical at axis of pectoral fin (Gomon, 1977). Body color mostly pink; chest, belly and underside of head white; with a horizontal single stripe reaching from posterodorsal extent of opercular flap to below fourth segmented dorsal fin ray (Gomon, 1977). Head with many yellow stripes and marks, narrow black border present on dorsal side of eye (Gomon, 1977). Large oval spot on upper caudal base black in juveniles, becoming red in adults and diffuse in large individuals (Gomon, 1977). Anal fin white with distal yellow stripe, pectoral fins transparent with broad blood red band on fleshy base, pelvic fins white, membrane of spinous dorsal fin black (Gomon, 1977; Bussing & López, 2005). Size reaches 25 cm, depth range: 150-200 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Baja California to Colombia, including Isla del Coco (Bussing & López, 2005; Robertson & Allen, 2015).



Polylepion cruentum at Everest (80 m), 12 September 2009, afternoon.

OCCURRENCES AT ISLA DEL COCO AND LAS GEMELAS SEAMOUNT (THIS STUDY): 80-305 m; Everest (80 m) and The Wall 475 (305 m), morning; Las Gemelas 3 (163-182), Piedra 165 (170 m), Las Gemelas 1 (250 m) and Piedra Drop (300 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), Robertson and Allen (2015), and Fourrière et al. (2017).

REMARKS: Maximum depth increased by 105 m, new maximum depth record is 305 m. Minimum depth decreased from 150 to 80 m.

Family Uranoscopidae

Kathetostoma averruncus Jordan & Bollmann, 1890

Smooth Stargazer / Miracielo bulldog



Kathetostoma averruncus
at Kili 2 (180 m),
29 June 2007,
in the morning.



Kathetostoma averruncus
at Kili 2 (180 m),
29 June 2007, in the morning.

DESCRIPTION: Body short, thick, progressively becoming more compressed posteriorly; head broad, high, hard and heavily boned, eyes placed anteriorly and somewhat dorsally, mouth large, strongly oblique to vertical (Bussing & Lavenberg, 1995b). Color black, greenish-brown to grey above, paler below; tips of the opercular spines yellowish; white dots on head; white spots and blotches on body, and on dorsal, tail and pectoral fins (Robertson & Allen, 2015). *Kathetostoma averruncus* reaches 32 cm, and is known from a depth range of 15-600 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: California to the mouth of the Gulf of California to Perú, and the Galápagos (McCosker & Rosenblatt, 2010; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 180-311 m; at Kili 2 (180 m), morning, and at Boulders (250-311 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: None.

REMARKS: This is the first report for Isla del Coco.

Family Callionymidae
Synchiropus atrilabiatus (Garman, 1899)
Blacklip Dragonet / Dragoncillo de asta



Synchiropus atrilabiatus at Piedra 165 (155 m), footage taken in 2012.

DESCRIPTION: Blacklip dragonets are found on sand, mud or rubble; have an elongate body; long and slightly depressed head; eyes large, on top of head; mouth small; preopercular spine large (Robertson & Allen, 2015). Upper body and head red brown, with numerous small dark dots; dark oval ocellus on the anterior dorsal fin (larger and brighter in males); anal fin white, a broad red-black band near outer edge, margin white; margin of top jaw black (Robertson & Allen, 2015). Size: 12 cm. Depth: 3-235 m, usually deeper than 40 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Southern California to the mouth of the Gulf of California to Peru, also Galapagos, Cocos and Malpelo islands (Robertson & Allen, 2015).

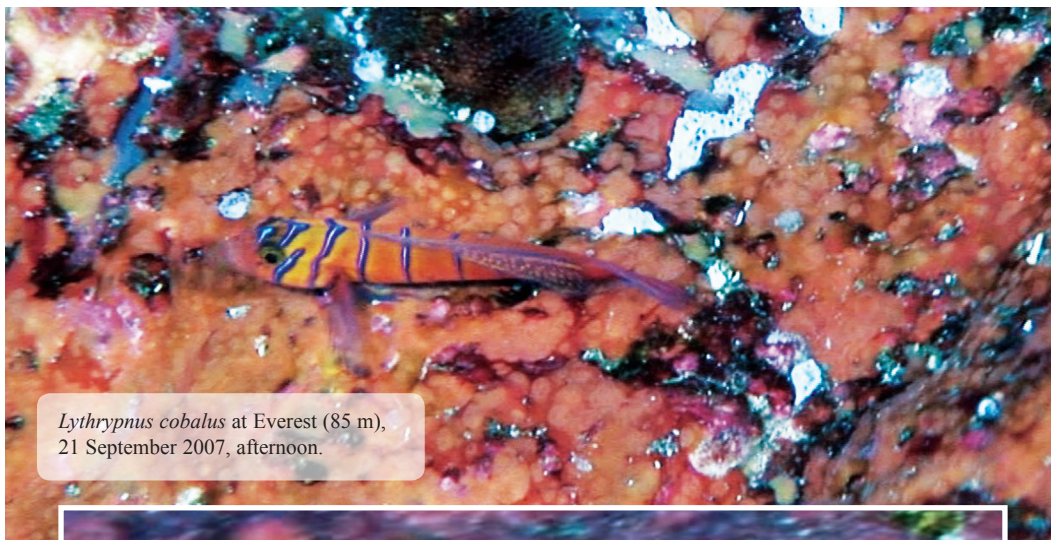
OCCURRENCES AT ISLA DEL COCO (THIS STUDY): At 155 m deep at Piedra 165.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005) and reported by Fourrière et al. (2017) as a deep-water species.

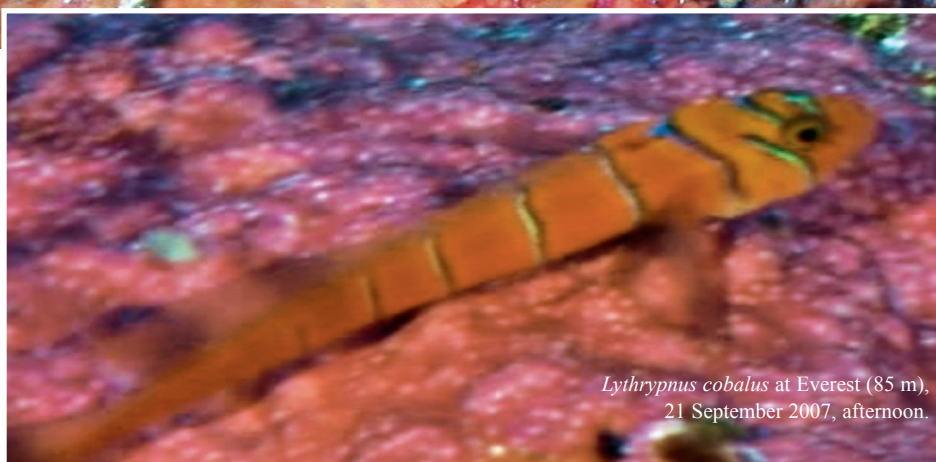
Family Gobiidae

Lythrypnus cobalus Bussing, 1990

Cocos Blue Banded Goby / Gobio pícaro



Lythrypnus cobalus at Everest (85 m),
21 September 2007, afternoon.



Lythrypnus cobalus at Everest (85 m),
21 September 2007, afternoon.

DESCRIPTION: Head and body orange-red with blue dark-edged crossbars, laterally compressed (Bussing, 1990). First dorsal fin spines are long (Garrison, 2005). Head without pores; nape without predorsal scales (Hoese, 1995); dorsal, tail and anal fins orange; pectoral and pelvic blue-grey. Size: 2.6 cm. Depth: 30-93 m (Bussing, 1990).

WORLDWIDE DISTRIBUTION: Species endemic to Isla del Coco (Garrison, 2005).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): At Everest 60-90 m, morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: At Bahía Chatham (Bussing, 1990) and Alcyone, Roca Sucia, Roca Aleta de Tiburón, Manuelita, Roca Sumergida (Garrison, 2005), and Fourrière et al. (2017).

REMARKS: In deep waters observed only at Everest.

Family Acanthuridae
Prionurus laticlavus (Valenciennes, 1846)
Razor Surgeonfish / Cochinito barbero



Prionurus laticlavus at Bajo Manuelita (65 m), 18 December 2006, afternoon.

DESCRIPTION: Body oval and compressed. Dorsal fin with 27 branched rays, plain gray body, with three pairs of bony plates with cutting keels along middle of tail base. Snout pointed, small protrusible mouth. Up to 32 cm. Depth range: Inhabits shallow waters and forms large schools (Krupp & Schneider, 1995). Depth: 0-30 m (Robertson & Allen, 2015).

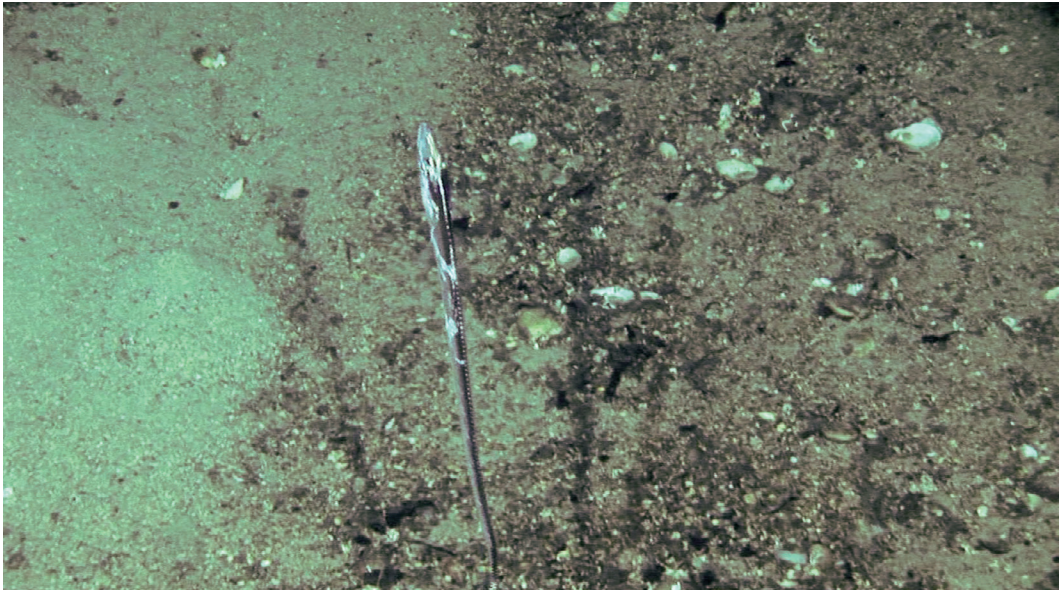
WORLDWIDE DISTRIBUTION: From the Southwest Gulf of California to Ecuador, including Galapagos Islands, Isla del Coco, Malpelo, Revillagigedo and some places around the mouth of the Gulf of California (Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 40-65 m at Bajo Manuelita, afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Starr et al. (2012b) reported this species at more than a 50 m at Isla del Coco. Reported by Fourri re et al. (2017) from shallow waters.

REMARKS: The known maximum depth reported by Robertson and Allen (2015) is increased by 35 m, to 65 m.

Family Trichiuridae
Trichiuridae, unidentified
Cutlassfish / Peces sable o cinta



Trichiuridae, unidentified at The Wall 475 (300 m), 30 December 2009, afternoon.

DESCRIPTION: Cutlassfishes are large fishes (1-2 m) with thin ribbon-like bodies. They have a large mouth, dorsal and anal fins extremely long-based and low (Robertson & Allen, 2015). It is necessary to examine the caudal fin for proper identification. The genus *Trichiurus* has no caudal fin, while *Lepidopus* has (Nakamura, 1995). Our images are not sufficient to determine the genus.

WORLDWIDE DISTRIBUTION: The family occurs in all temperate and tropical seas.

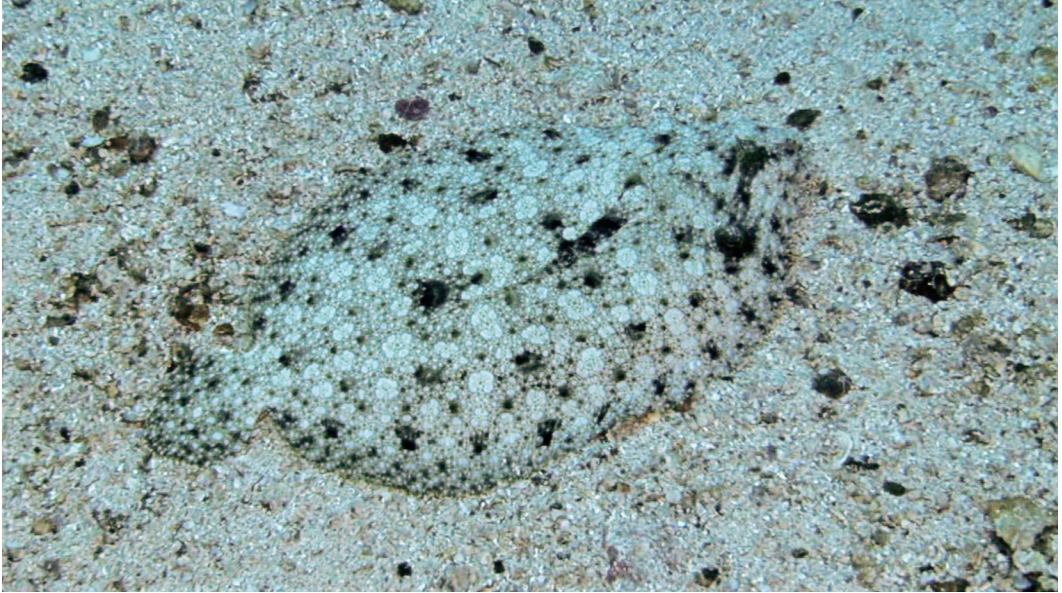
OCCURRENCES AT ISLA DEL COCO (THIS STUDY): The Wall 475 (300 m).

REMARKS: *Trichiurus lepturus* is circumglobal and is known in the Eastern Tropical Pacific from California to Peru and the Galápagos Islands. *Lepidopus manis* is known only from Galápagos, *Lepidopus caudatus* has widespread distribution and *Lepidopus tenuis* is a circumglobal species (Robertson & Allen, 2015; Eschmeyer et al., 2017).

ORDER PLEURONECTIFORMES

Family Bothidae

Bothus mancus (Broussonet, 1782)
Tropical Flounder / Lenguado tropical



Bothus mancus at Bajo Manuelita (50 m), 28 August 2007, afternoon.

DESCRIPTION: Eyes on left side of head, wide and flat between eyes, much wider eye in males; lower eye well before upper eye; male with very elongate pectoral fin on eyed side (Robertson & Allen, 2015). Color brown with numerous white to pale blue spots, some of them forming partial circles; dark brown spots also present; three dark blotches along lateral line (Robertson & Allen, 2015). Size: reaches 42 cm, depth: 0-150 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Tropical Indo-Pacific, Panamá, Costa Rica, the mouth of the Gulf of California; the Revillagigedos, Clipperton, Isla del Coco, Malpelo and Galapagos (Bussing & López, 2005; Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO: Bajo Manuelita (40-60 m).

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), and by Fourrière et al. (2017) as a deep-water species.

Family Cynoglossidae
Symphurus diabolicus Mahadeva & Munroe, 1990
Devil's Tonguefish / Lengua diabólica



Symphurus diabolicus at Canyons (308 m),
24 July 2010, afternoon.

Symphurus diabolicus
at The Wall 475 (300 m),
6 May 2010, afternoon.



DESCRIPTION: Solid olive green or brown with dark rectangular blotches along body and at the bases of the dorsal and anal fins. Dorsal and anal fins with dark blotches. Elongate body; narrow head with pointed snout. No pupillary operculum; large, prominent eyes, with migrated eye near dorsal margin of head. Size: reaches around 12.5 cm. Relatively common (captured for research) at depths of 308 to 757 m, observed as shallow as 245 m (Munroe & McCosker, 2001).

WORLDWIDE DISTRIBUTION: Observations and captures from submersibles showed this species is common in deep waters at the Galápagos (Munroe & McCosker, 2001).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 250-316 m, Canyons (308 m) and The Wall 475 (250-316 m), morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: This is the first published report from Isla del Coco. Reported previously by Fourriére et al. (2017) based on Robertson and Allen (2015) website, who obtained the information of the record for Isla del Coco during the preparation of the present work.

REMARKS: Previously assumed to be endemic from the Galápagos (Munroe & McCosker, 2001); this and Fourriére et al. (2017) records for Isla del Coco widens its known distribution. It was observed during the morning as well as in the afternoon. Munroe and McCosker (2001) suggest that natural light levels at greater depths are low enough such that during daytime tonguefishes do not bury themselves in the substrate until frightened, as opposed to *Symphurus* from shallow waters that lie buried in the substrate during daylight.

Pleuronectiformes, unidentified
Flatfish / Lenguado



Pleuronectiformes, unidentified
at Kili 2 (180 m),
20 February 2007, morning.



Pleuronectiformes,
unidentified
at Kili 2 (180 m),
20 February 2007,
morning.

DESCRIPTION: Photographed specimens have enlarged eyes on left side of head, with a brown margin, and the eye lobules have brown spots or blotches. Body greyish brown with numerous dark brown blotches and relatively rounded whitish spots, mostly on the upper and lower part of the body on the ocular side. Light blue elongate spots and lighter rounded blotches with a dark margin all over the head and body. Dorsal, anal, caudal and pelvic fins mottled.

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 180-190 m, Kili 2 (180 m) and at the slope to a depth of 190 m, morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: An unidentified pleuronectiform individual was reported by Starr et al. (2012b) at depths greater than 50 m.

ORDER TETRAODONTIFORMES

Family Tetraodontidae

Arothron hispidus (Linnaeus, 1758)

Stripebelly Puffer / Botete panza rayada



Arothron hispidus at Everest (50 m),
footage taken in 2014.



Arothron hispidus
at Everest (80 m),
19 March 2007, afternoon.

DESCRIPTION: Head and body gray with white spots vanishing ventrally, white stripes below and the ventral region; pectoral fin circled by white and black stripes (Bussing & López, 2005). A single dorsal fin; no pelvic fins, caudal fin rounded. Size: reaches 50 cm. Depth: 1-90 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Eastern Pacific, Baja California to Colombia; also, western Pacific (Bussing, 1995) and Indo-Pacific (Garrison, 2005).

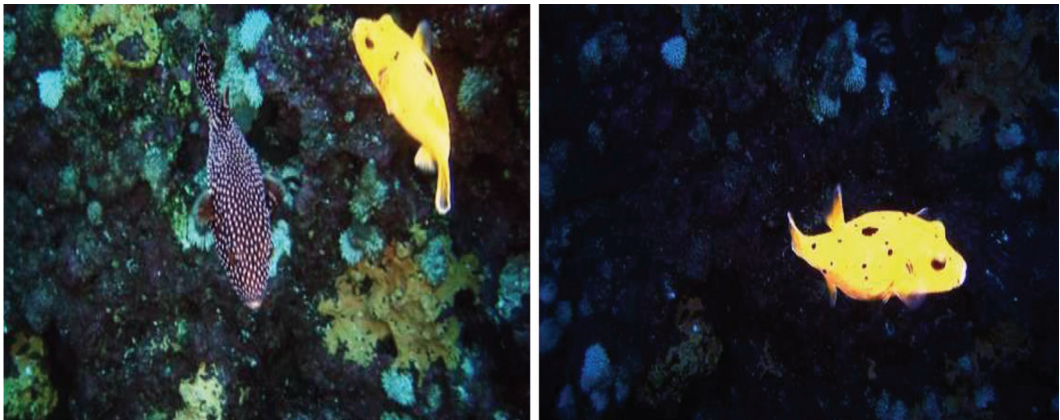
OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 10-80 m, descending to Everest and at Everest (45-80 m) morning and afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: From 6 m to depths of at least 40 m (Bussing & López, 2005); in shallow waters at Bahía Chatam, Roca Sucia, Manuelita, Punta María, Roca Aleta de Tiburón and Ulloa (Garrison, 2005), and by Fourriére et al. (2017) as a shallow water species.

Arothron meleagris (Lacepède, 1798)
Guineafowl Puffer / Botete aletas punteadas



Arothron meleagris at Everest (60 m), 31 January 2007, morning.



Left, *Arothron meleagris* two color phases at Everest (60 m), 11 February 2007, morning. Right, *A. meleagris* yellow phase, at Everest (80 m), 11 February 2007, morning.

DESCRIPTION: Head, body and all fins black with white dots in the spotted phase, or yellow (Bussing & López, 2005; Garrison, 2005) with a few black spots in the golden phase (Garrison, 2005). Body robust, capable of inflation by taking in water or air (Bussing, 1995), tail rounded, mouth beak-like and terminal (Garrison, 2005). Depth: 1-73 m (Randall & Cea, 2011).

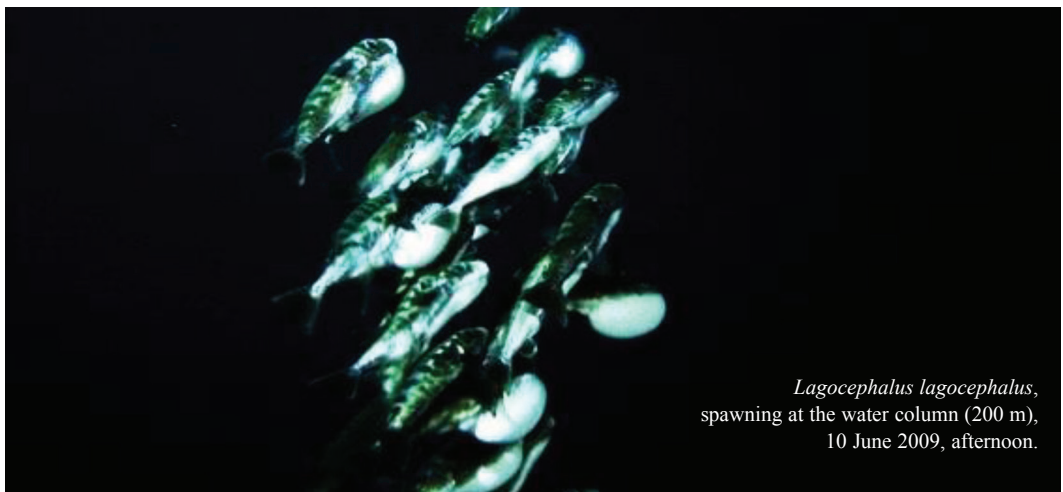
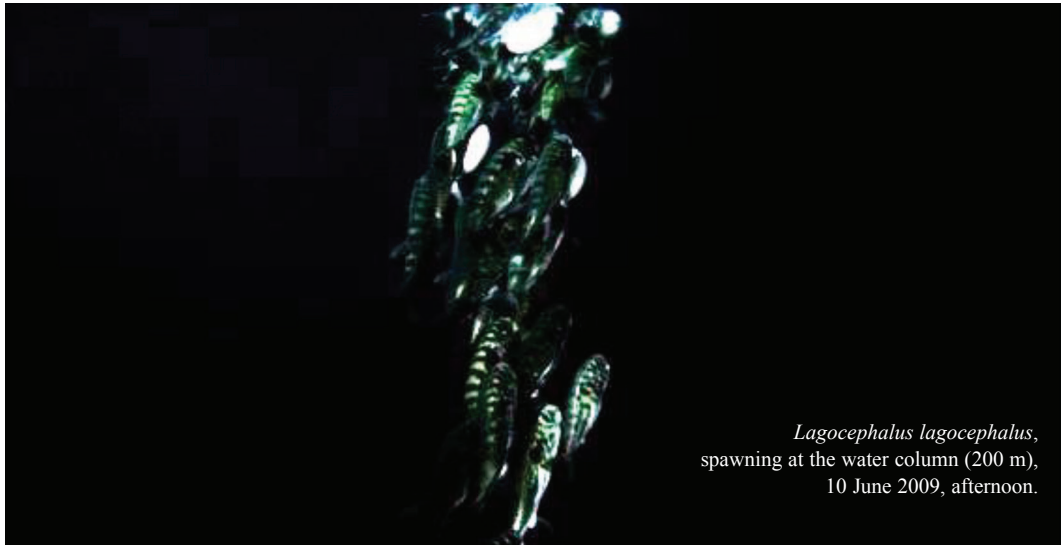
WORLDWIDE DISTRIBUTION: Tropical Indo-Pacific and Eastern Tropical Pacific, from México to Ecuador, including all oceanic islands (Bussing, 1995; Garrison, 2005).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): 10-80 m, descending to Everest and at Everest (45-80 m), morning; at Bajo Manuelita (55 m), afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Bussing and López (2005), common in shallow waters from 1 m to at least 20 m (Garrison, 2005), and by Fourrière et al. (2017) as shallow water species.

REMARKS: Known maximum depth increases from 73 m to 80 m.

Lagocephalus lagocephalus Linnaeus, 1758
Oceanic Puffer / Botete oceánico



DESCRIPTION: Elongate body with tough scaleless skin, flanks silver with black spots, white ventrally. Upper body and head dark green, brownish gray or dark blue; fins dark. Size: 61 cm (Robertson & Allen, 2015). Depth: 0-475 m (Robertson & Allen, 2015).

WORLDWIDE DISTRIBUTION: Circumtropical; California to Ecuador and oceanic islands (Robertson & Allen, 2015).

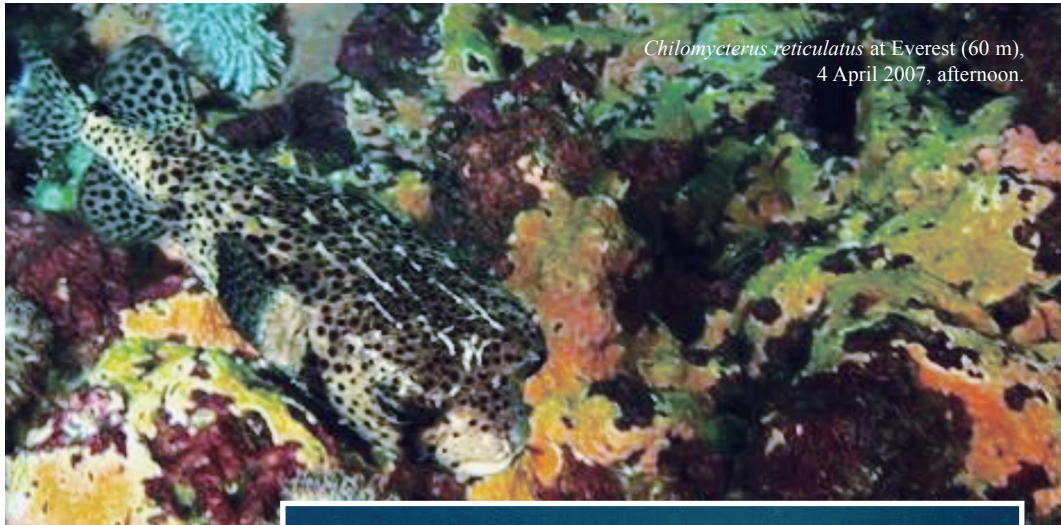
OCCURRENCES AT ISLA DEL COCO (THIS STUDY): From the surface to 200 m at the water column on the north side of the island, at Everest and The Wall 475, in the afternoon.

PREVIOUS REPORTS FROM ISLA DEL COCO: Robertson and Allen (2015) report this species for the oceanic islands of the Eastern Tropical Pacific, and by Fourrière et al. (2017) as shallow water species.

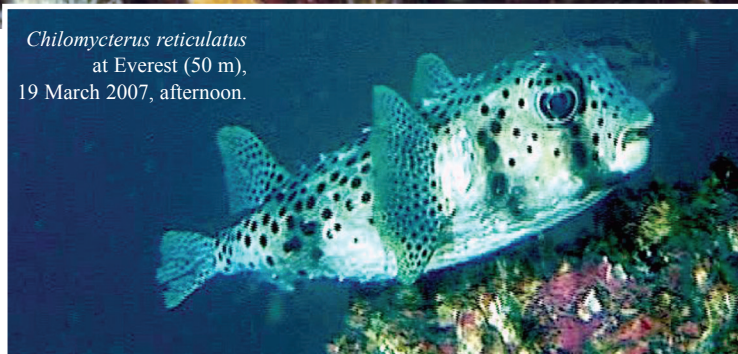
Family Diodontidae

Chilomycterus reticulatus (Linnaeus, 1758)

Spotfin Burrfish / Pez erizo enano



Chilomycterus reticulatus at Everest (60 m),
4 April 2007, afternoon.



Chilomycterus reticulatus
at Everest (50 m),
19 March 2007, afternoon.

DESCRIPTION: Small spine dorsally on caudal peduncle; no tentacles over eyes (Leis, 2007). No movable spines; body covered with black spots (Bussing & López, 2005). Dusky brown bars on head and body. Dorsal and anal fins small; pelvic fin absent (Garrison, 2005). Size: grows to about 75 cm. Depth: to 141 m (Robertson & Allen 2015).

WORLDWIDE DISTRIBUTION: Circumtropical and with a largely temperate distribution (Garrison, 2005; Leis, 2007). In the Eastern Tropical Pacific from California to Chile (Garrison, 2005, Robertson & Allen, 2015).

OCCURRENCES AT ISLA DEL COCO (THIS STUDY): Everest (45-60 m), afternoon and morning.

PREVIOUS REPORTS FROM ISLA DEL COCO: At Isla del Coco (Bussing & López, 2005), 6 m to at least 36 m, sightings at practically every site in shallow waters (Garrison, 2005), and by Fourrière et al. (2017) as shallow water species.

REMARKS: Maximum depth reported by Garrison (2005) for this species at Isla del Coco is now almost doubled, to 60 m.