Assessment of deep demersal fish fauna diversity of the Colombian Caribbean Sea

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ABSTRACT. We compiled georeferenced records of deep demersal fishes from the Colombian Caribbean Sea in order to assess the level of survey coverage and geographic completeness of species richness inventories at a scale of 15 min by 15 min cells, in view of threats from fishing and oil and natural gas exploration. We identified a rich fauna with a minimum of 362 species registered. Areas with high observed and predicted species richness were identified. Survey coverage and geographic richness completeness resulted in being deficient with no cell reaching the status of well-sampled spatial unit, being 83% of the Colombian Caribbean Exclusive Economic Zone bottoms unexplored, particularly depths beyond 1,000 m. A plea is made for renewed survey efforts with a focus on the protection of the Colombian Caribbean deep-sea biota.

Key words: Colombian Caribbean, deep fishes, records, soft-bottoms, species richness.

INTRODUCTION

With the migration of the fishing frontier into deeper waters and the offshore search for oil and natural gas it is now more important than ever to improve the knowledge on the deep sea biota, particularly with regard to...
fishes, since they are candidates for exploitation (e.g., Páramo et al. 2017; Grijalba-Bendeck et al. 2019) or might be affected as bycatch (e.g., Páramo et al. 2012). In Colombian Caribbean waters deep sea research has been sporadic, but three main periods can be distinguished. In the late sixties and early seventies during the past century, research vessels like the Oregon, Oregon II (U.S. Fish and Wild Life Service) and Pillsbury (University of Miami, U.S.A.), as well as several others, conducted trawling both on the continental shelf and notably on the continental slope, plus some trawls occurred at depths beyond 1,000 m. Later on, from the early part of the 20th century, interest in continental slope fauna gained momentum with the Macrofauna I and II campaigns that trawled down to a depth of 500 m (see for instance Saavedra-Díaz et al. 2000; Roa-Varón et al. 2003; Saavedra-Díaz et al. 2004; Roa-Varón et al. 2007). A decade later in the context of exploration for oil and natural gas, demersal fish samples were taken in deeper waters around 800 m (ANH I and II campaigns, Polanco et al. 2010). In searching for new fishery resources, Páramo et al. (2011) conducted trawling at depths between 200 and 550 m during years 2009 and 2010. Since then, to our knowledge, no mayor deep sea trawling surveys have been undertaken in Colombian Caribbean waters.

Paramount in diversity studies (and with a focus on conservation) is the characterization of the geographic distribution of diversity, which goes hand in hand with the assessment of the completeness of sampling of surveys, i.e., whether an asymptote in the species accumulation curve has been reached (Soberón et al. 2007; Hortal et al. 2015). The composition of species lists is necessary but not sufficient for effective diversity management and conservation. In this study we assess the level of survey coverage and geographical completeness of species richness inventories by constructing a spatialized estimate of deep soft-bottom demersal fish fauna diversity in Colombian Caribbean waters, including the San Andrés and Providencia archipelago and in the process we highlight areas that have been well- and poorly surveyed and those that have never been visited.

MATERIALS AND METHODS

Georeferenced records of demersal deep fishes were obtained from Polanco (2015), García and Armenteras (2015, see sources cited), García (2017a), Acero et al. (2018), Polanco et al. (2019) and the Global Biodiversity Information Facility (GBIF 2020). Only records with associated depth registers deeper than 200 m were included. Validity of taxonomic names was checked against the Catalog of Fishes (Fricke et al. 2019). A database was constructed with the software ModestR (García-Roselló et al. 2013) which allowed further filtering in order to lessen redundancy in the geographic records. Because our interests focused on Colombian Caribbean waters, records in our sources outside the current Colombian Exclusive Economic Zone (EEZ, obtained from Flanders Marine Institute 2019) were excluded.

ModestR produces files directly usable for the module KnowBR (Lobo et al. 2018; Guisande and Lobo 2019) of the application RWizard (Guisande et al. 2014) designed to conduct a search of both well and poorly surveyed spatial units. The study area, i.e. the Colombian Caribbean EEZ, was divided into spatial cells of size 15 min (circa 28 km) by 15 min. We chose this size as being consistent with previous similar analyses (García 2017b, 2018). Further settings were as follow: curve = ‘Rational’ (Ratkowski 1990) one of the options for adjusting a function to the accumulation of species with records that function as surrogates for effort (Lobo 2008; Lobo et al. 2018); estimator = 1, meaning that we constructed the species accumulation curve using the formula from Ugland et al. (2003); cutoff = 1, meaning that if the quotient
between number of records and number of species is 1 in a given spatial unit it is considered non-informative and completeness is not calculated; cutoffCompleteness = 0, meaning that if the value of completeness is below this value of completeness is not calculated and cutoffSlope = 1, meaning that if the final slope of the accumulation curve is higher than this value, completeness is not calculated.

We used the function SurveyQ (survey quality) of KnowBR to depict well- and poorly-surveyed equal area cells geographically. Default values were used. For well sampled spatial units a slope < 0.02, completeness > 90% and R/S (records over species) > 15. For poorly sampled cells a slope > 0.3, completeness < 50% and R/S < 3.

RESULTS

After filtering, we included a total of 362 species and 6,211 records in the database, these being the basis of the analysis (Appendix 1). A map of the study area, records and the shape of the Parque Nacional Natural Corales de Profundidad (http://www.parquesnacionales.gov.co) is shown in Figure 1. The bulk of the records were located between 200 m and 1,000 m representing 98% of all records. In turn, records between 200 m and 300 m represented 52% of all records. Apart from a couple of records in the San Andrés and Providencia archipelago, sampling was concentrated on

![Figure 1. Deep demersal fishes record locations inside the Colombian Caribbean Exclusive Economic Zone and Parque Nacional Natural Corales de Profundidad.](image-url)
the continental slope with a few records from the abyssal plains (Figure 1). Table 1 shows those species with more than 100 records in the database.

The division of the study area in equal area cells (15 min by 15 min) resulted in 85 cells. Records from each cell revealed some areas where sampling was concentrated. The Gulf of Salamanca, Guajira, Palomino and mixed coralline bottoms showed cells with an elevated number of records while most of the cells received fewer records (Figure 2). Taking into account that cells depicted were the ones with at least one record, it was clear that most of the study area had never been visited (Figure 2). The Colombian Caribbean EEZ below 200 m amounts to circa 385,000 km² while the added cell area is 65,072 km², so around 83% of the deep sea bottom has never been visited. The scarcity of records resulted in 31 out of the 85 cells for which completeness could not be calculated as the R/S quotient was one. Not surprisingly, the observed richness (Figure 3) closely followed the distribution pattern of records in cells with a correlation of 0.9 (Pearson index, \(p < 0.001\)). The Darien area is added as harboring a high number of demersal fish species (Figure 3).

Completeness ranged from 6.9% to 76.9% in cells with 75.9% of them (41 out of 54 informative cells) showing completeness above 50%; but notice that no cell reached 100% completeness (Figure 4). The ten cells showing completeness above 70% were well-distributed along the coastline (Figure 4), suggesting that the survey effort was not spatially biased in terms of completeness.

No cell attains the status of ‘high quality survey’ (Figure 5); but most cells were labeled as ‘fair quality survey’ cells with a number of interdispersed ‘poor quality survey’ cells that is in line with the image in Figure 4.

## DISCUSSION

Our focus on the current Colombian EEZ caused 32 species and associated records to be dropped from the database (Appendix 2). These records are located to the west of the San Andrés and Providencia archipelago and offshore Panama outside of Colombian EEZ. Thus, it is doubtful whether the species concerned should be included in deep sea fishes national biodiversity

| Species                        | Records | Min depth (m) | Max depth (m) | Mean depth (m) |
|-------------------------------|---------|---------------|---------------|---------------|
| Dibranchus atlanticus         | 207     | 198           | 1,440         | 412           |
| Nezumia aequalis              | 150     | 223           | 1,143         | 392           |
| Coelorinchus caelorhincus     | 134     | 200           | 810           | 327           |
| Laemonema goodebeanorum       | 126     | 223           | 777           | 348           |
| Chauliodus sloani             | 125     | 191           | 4,151         | 433           |
| Synagrops bellus              | 122     | 192           | 810           | 352           |
| Poecilopsetta inermis         | 113     | 229           | 750           | 292           |
| Chlorophthalmus agassizi      | 109     | 200           | 776           | 301           |
| Malacocephalus occidentalis   | 106     | 200           | 801           | 314           |
| Neoscopelus macrolepidotus    | 104     | 276           | 900           | 475           |
| Chaunax sutkusi               | 103     | 223           | 801           | 333           |
lists, although their presence in waters of the archipelago that belong to Colombia is likely. Notice that Bolaños-Cubillos et al. (2015) and Acero et al. (2019) mention several of the species excluded here in their species lists for the San Andrés and Providencia archipelago.

The scarceness of surveys and samples east of the archipelago and in depths beyond 1,000 m
shown here clearly points to the need of increased survey efforts, including for those unexplored areas as well as renewed survey efforts in areas visited in the past, as even the upper slope that has received most records is at best ‘fairly-sampled’, according to the criteria here and at our

Figure 4 Percentage completeness of deep demersal fishes inventories in cells of 15 min by 15 min in the Colombian Caribbean Exclusive Economic Zone.

Figure 5 Survey quality status of deep demersal fishes in cells of 15 min by 15 min in the Colombian Caribbean Exclusive Economic Zone.
spatial scale. Nevertheless, this study reveals a rich deep sea fish fauna taking into account that the 362 species in our database are a lower limit of species richness. Considering the values of percentage completeness and the current geographic coverage of surveys, more records for species already in the database, i.e., extension of their presently observed distribution, and more species currently not in the database, are to be expected in future campaigns.

The distribution of records with species follows the usual patterns for large diversity databases: few species with many records and many species with few records. Thus, 49.2% of the species (178 out of 362) show five or fewer records while just 3.0% of the species (11 out of 362) show more than one hundred records (Appendix 1). Interestingly *Epigonus occidentalis* (Goode and Bean 1896) and *E. pandionis* (Goode and Bean 1881), postulated as possible candidates for fishing due to their frequency in trawls (Páramo et al. 2017) do not belong to the most common species in the database but rank low to intermediary in terms of records (Appendix 1). Our time window spans decades while Páramo et al. (2017) are just snap shots of deep demersal fish presence and abundance in a limited depth range. This contrast highlights the usefulness and, indeed, a need for monitoring over long periods and extended areas if we are to understand the dynamics of ecosystems and the biology of the species.

In view of the results it is probably risky to postulate areas for conservation purposes. Observed richness suggests continental slope areas adjacent to the Gulf of Salamanca, Rosario Island archipelago (mixed coralline bottoms), slope areas to the north of Guajira Peninsula and Darien as locations of accumulation of species. Interestingly, the Gulf of Salamanca shelf (< 200 m), since here the slope (> 200 m) is known to harbor significant numbers of elasmobranchs and bony fish species (García 2017b, 2018; but notice that García 2018 includes some slope records). The ecological and biological reasons for these findings are an open question worth investigating.

The only national natural park dedicated to deep sea biota in the Colombian Caribbean is the Parque Nacional Natural Corales de Profundidad established to protect deep sea coral species. The park includes soft and mixed bottoms from 34 m to 1,240 m depth. Using the module MRFinder of ModestR a species list was composed for the park resulting in 106 species with records inside the park area (Appendix 3). Thus, although not intentionally, Corales de Profundidad might also be protecting a significant fraction of deep demersal fishes in the Colombian Caribbean. The attractive effect of structures on fishes is well-known, thus the presence of coral formations in the general area of the park is probably conducive of high species richness. Notice that cells in the park area and in their vicinity show high observed richness.

This research is one of the first steps in endeavors of studying the diversity of deep sea demersal fish species beyond the compilation of species’ names. Much work remains to be done both for scientific and practical purposes with a focus on protecting Colombian Caribbean deep sea biodiversity as derived from this assessment.

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APPENDIX 1

Deep demersal fish species list (> 200 m depth) of the Colombian Caribbean Sea with records and depth ranges.

| Class       | Order               | Family               | Species                          | Records | Min depth | Max depth | Mean depth |
|-------------|---------------------|----------------------|----------------------------------|---------|-----------|-----------|------------|
| Actinopterygi | Anguilliformes     | Chlopoideae           | Robinia catarinae                 | 1       | 300       | 300       | 300        |
| Actinopterygi | Anguilliformes     | Colocnemiidae         | Colocnemus meadi                  | 60      | 218       | 777       | 361        |
| Actinopterygi | Anguilliformes     | Congridae             | Ariosa balearicu                  | 3       | 532       | 857       | 706        |
| Actinopterygi | Anguilliformes     | Congridae             | Bathycnoconger bullisi           | 26      | 229       | 366       | 286        |
| Actinopterygi | Anguilliformes     | Congridae             | Bathycnoconger vicinalis          | 1       | 366       | 366       | 366        |
| Actinopterygi | Anguilliformes     | Congridae             | Bathyrhynchus vicinus             | 9       | 515       | 732       | 627        |
| Actinopterygi | Anguilliformes     | Congridae             | Japonobathycnoconger caribbeus    | 22      | 269       | 549       | 358        |
| Actinopterygi | Anguilliformes     | Congridae             | Parabathycnoconger oregoni        | 2       | 314       | 315       | 315        |
| Actinopterygi | Anguilliformes     | Congridae             | Pseudophichthys splendens         | 57      | 204       | 803       | 392        |
| Actinopterygi | Anguilliformes     | Congridae             | Notothyrus flavus                 | 3       | 732       | 732       | 732        |
| Actinopterygi | Anguilliformes     | Congridae             | Xenomystax australis              | 23      | 458       | 732       | 509        |
| Actinopterygi | Anguilliformes     | Congridae             | Xenomystax bidentatus             | 16      | 296       | 698       | 405        |
| Actinopterygi | Anguilliformes     | Congridae             | Xenomystax congroides            | 18      | 210       | 352       | 237        |
| Actinopterygi | Anguilliformes     | Moringuidae           | Neocentrocanthus macronotus       | 3       | 200       | 265       | 243        |
| Actinopterygi | Anguilliformes     | Muraenidae            | Cynopsus savanna                  | 2       | 746       | 746       | 746        |
| Actinopterygi | Anguilliformes     | Muraenidae            | Gymnothorax conspersus            | 9       | 256       | 307       | 262        |
| Actinopterygi | Anguilliformes     | Muraenidae            | Gymnothorax polyprionus           | 2       | 200       | 203       | 202        |
| Actinopterygi | Anguilliformes     | Nemichthyidae         | Avicennia infantis                | 3       | 350       | 445       | 360        |
| Actinopterygi | Anguilliformes     | Nemichthyidae         | Labichthys carinatus              | 1       | 940       | 940       | 940        |
| Actinopterygi | Anguilliformes     | Nemichthyidae         | Neomichthys scolopaces            | 6       | 300       | 3,978     | 654        |
| Actinopterygi | Anguilliformes     | Nettastomatidae       | Hoplunnis diomediana              | 1       | 453       | 453       | 453        |
| Actinopterygi | Anguilliformes     | Nettastomatidae       | Hoplunnis megista                 | 2       | 366       | 366       | 366        |
| Actinopterygi | Anguilliformes     | Nettastomatidae       | Hoplunnis tenus                   | 5       | 201       | 201       | 201        |
| Actinopterygi | Anguilliformes     | Nettastomatidae       | Nettastoma melanura               | 5       | 503       | 732       | 621        |
| Actinopterygi | Anguilliformes     | Nettastomatidae       | Venefica procerus                 | 3       | 613       | 860       | 834        |
| Actinopterygi | Anguilliformes     | Ophichthidae          | Ophichthys crucifiger             | 4       | 496       | 699       | 548        |
| Actinopterygi | Anguilliformes     | Ophichthidae          | Ophichthys puncticeps             | 4       | 295       | 900       | 448        |
| Actinopterygi | Anguilliformes     | Synaphobranchidae     | Atractodesychys phryx             | 2       | 393       | 500       | 447        |
| Actinopterygi | Anguilliformes     | Synaphobranchidae     | Dystomina rugosa                  | 2       | 365       | 450       | 429        |
| Actinopterygi | Anguilliformes     | Synaphobranchidae     | Illyophis brunneus                | 8       | 515       | 1143      | 692        |
| Actinopterygi | Anguilliformes     | Synaphobranchidae     | Synaphobranchus affinis           | 1       | 732       | 732       | 732        |
| Actinopterygi | Anguilliformes     | Synaphobranchidae     | Synaphobranchus oregoni           | 8       | 265       | 515       | 301        |
| Actinopterygi | Anguilliformes     | Ateleopodiformes      | Ilmenaia analis                   | 30      | 329       | 698       | 423        |
| Actinopterygi | Anguilliformes     | Ateleopodidae         | Ilmenaia lopesi                   | 1       | 503       | 503       | 503        |
| Actinopterygi | Aulopiformes       | Bathysauridae         | Bathysaurus mollis                | 2       | 1,800     | 4,151     | 2,976      |
| Actinopterygi | Aulopiformes       | Chlorophthalmidae     | Chlorophthalmus agassizi          | 109     | 200       | 776       | 301        |
| Actinopterygi | Aulopiformes       | Chlorophthalmidae     | Paraspidiscus truculenta          | 34      | 223       | 561       | 311        |
| Actinopterygi | Aulopiformes       | Ipnopidae             | Bathypeteros bigelovi             | 38      | 223       | 940       | 456        |
| Actinopterygi | Aulopiformes       | Ipnopidae             | Bathypeteros-grallator            | 5       | 1,627     | 4,151     | 2,435      |
| Actinopterygi | Aulopiformes       | Ipnopidae             | Bathypeteros phenax               | 6       | 821       | 1,800     | 1,230      |
| Actinopterygi | Aulopiformes       | Ipnopidae             | Bathypeteros quadrifilis          | 5       | 515       | 900       | 683        |
| Actinopterygi | Aulopiformes       | Ipnopidae             | Bathypeteros viridensis           | 17      | 276       | 900       | 475        |
| Actinopterygi | Aulopiformes       | Ipnopidae             | Bathyscyphus marioni               | 1      | 1,251     | 1,251     | 1,251      |
| Actinopterygi | Aulopiformes       | Ipnopidae             | Ipnopis murrayi                   | 3       | 821       | 1,800     | 1,416      |
| Actinopterygi | Aulopiformes       | Notosudidae           | scoopellus-smithii                | 2       | 622       | 622       | 622        |
| Actinopterygi | Aulopiformes       | Symodontidae          | Saurida brasiliensis              | 5       | 270       | 613       | 427        |
| Actinopterygi | Aulopiformes       | Symodontidae          | Saurida caribicaea                | 9       | 200       | 303       | 219        |
| Actinopterygi | Aulopiformes       | Symodontidae          | Saurida normani                   | 3       | 198       | 298       | 251        |
### Appendix 1. Continued.

| Class             | Order             | Family            | Species                      | Records | Min depth | Max depth | Mean depth |
|-------------------|-------------------|-------------------|------------------------------|---------|-----------|-----------|------------|
| Actinopterygii   | Aulopiformes     | Synodontidae      | Synodus poeyi                | 1       | 198       | 198       | 198        |
| Actinopterygii   | Batrachoidiformes| Batrachoididae    | Porichthys proctor          | 5       | 200       | 370       | 241        |
| Actinopterygii   | Beloniformes     | Hemiramphidae     | Hemirhamphus balzo           | 2       | 276       | 803       | 406        |
| Actinopterygii   | Beryciformes     | Anoplogastridae   | Anoplogaster cornuta         | 1       | 300       | 300       | 300        |
| Actinopterygii   | Beryciformes     | Berycidae         | Beryx decadactylus          | 1       | 378       | 378       | 378        |
| Actinopterygii   | Beryciformes     | Berycidae         | Beryx splendidiss           | 2       | 366       | 369       | 367        |
| Actinopterygii   | Beryciformes     | Deitremidae       | Deitremidae pauciradiatus    | 9       | 200       | 732       | 268        |
| Actinopterygii   | Beryciformes     | Deitremidae       | Deitremas argenteus          | 6       | 205       | 792       | 454        |
| Actinopterygii   | Beryciformes     | Holocentridae     | Ostichthys trachypoma       | 6       | 200       | 274       | 236        |
| Actinopterygii   | Beryciformes     | Trachichthyidae   | Gephyroberyx arwini         | 8       | 300       | 375       | 322        |
| Actinopterygii   | Beryciformes     | Trachichthyidae   | Hoplostethus mediterraneus   | 2       | 288       | 435       | 362        |
| Actinopterygii   | Beryciformes     | Trachichthyidae   | Hoplostethus occidentalis    | 64      | 329       | 558       | 350        |
| Actinopterygii   | Cetomimiformes   | Barbourisiidae    | Barbourista rufa             | 1       | 1,080     | 1,080     | 1,080      |
| Actinopterygii   | Gadiformes       | Bregmacerothida   | Bregmaceros atlanticus       | 53      | 200       | 801       | 319        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Bathygadus favoss            | 21      | 515       | 1,440     | 758        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Bathygadus macrops          | 96      | 269       | 810       | 422        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Bathygadus melanobranchus    | 28      | 365       | 900       | 634        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Cetonus globiceps           | 5       | 613       | 1,097     | 906        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Coelorinchus cuerburgunci   | 134     | 200       | 810       | 327        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Coelorinchus caribbaeus      | 96      | 200       | 503       | 276        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Coryphaenoides mexicanus     | 12      | 198       | 1,296     | 884        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Coryphaenoides zanitophorus  | 25      | 518       | 940       | 636        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Gadomus arcatus             | 17      | 477       | 1,080     | 665        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Gadomus dispar               | 4       | 457       | 622       | 490        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Gadomus longifilis          | 23      | 365       | 1,251     | 644        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Hynemocephalus aetrimus      | 1       | 576       | 576       | 576        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Hynemocephalus bilscam       | 2       | 223       | 373       | 361        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Hynemocephalus tectalis     | 91      | 269       | 940       | 368        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Kuronezumia buson           | 3       | 515       | 732       | 586        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Malacosteus laevis           | 13      | 329       | 612       | 387        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Malacosteus occidentalis     | 106     | 200       | 801       | 314        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Nezumia aequalis            | 150     | 223       | 1,143     | 392        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Nezumia cyrano              | 16      | 453       | 960       | 630        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Nezumia suilla              | 5       | 365       | 640       | 572        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Sphagmacentrus brachyurus   | 6       | 684       | 1,143     | 779        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Squalogadus modicatus       | 4       | 1,080     | 1,251     | 1,139      |
| Actinopterygii   | Gadiformes       | Macrouridae       | Trachonurus salutatus       | 10      | 612       | 1,251     | 814        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Trachonurus villosus        | 3       | 515       | 814       | 714        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Ventrisoss macropogon       | 7       | 223       | 640       | 411        |
| Actinopterygii   | Gadiformes       | Macrouridae       | Ventrisoss macmpholus       | 5       | 450       | 732       | 481        |
| Actinopterygii   | Gadiformes       | Merluccidae       | Merluccius albidos          | 47      | 219       | 662       | 297        |
| Actinopterygii   | Gadiformes       | Merluccidae       | Steindachneria argentea     | 66      | 200       | 770       | 298        |
| Actinopterygii   | Gadiformes       | Moridae           | Gadella imberbis            | 32      | 223       | 801       | 374        |
| Actinopterygii   | Gadiformes       | Moridae           | Laemonema goodbeaneorum     | 126     | 223       | 777       | 348        |
| Actinopterygii   | Gadiformes       | Moridae           | Physicus fulvus            | 6       | 275       | 503       | 341        |
| Actinopterygii   | Gadiformes       | Physidae          | Urophycis cirrata           | 11      | 270       | 470       | 331        |
| Actinopterygii   | Lophiiformes     | Antennariidae     | Fowlerichthys radiossus     | 1       | 192       | 192       | 192        |
| Actinopterygii   | Lophiiformes     | Chaunacidae       | Chaunax pictus             | 57      | 270       | 810       | 417        |
| Actinopterygii   | Lophiiformes     | Chaunacidae       | Chaunax saltatus           | 103     | 223       | 801       | 333        |
| Actinopterygii   | Lophiiformes     | Diceraeidae       | Bifococrias wedli           | 4       | 405       | 493       | 478        |
| Actinopterygii   | Lophiiformes     | Lophidiidae       | Lophioides beroe           | 2       | 512       | 512       | 512        |
## Appendix 1. Continued.

| Class               | Order               | Family                | Species                          | Records | Min depth | Max depth | Mean depth |
|---------------------|---------------------|-----------------------|----------------------------------|---------|-----------|-----------|------------|
| Actinopterygii      | Lophiiformes        | Lophiidae             | Lophiodes monodi                 | 7       | 313       | 520       | 346        |
| Actinopterygii      | Lophiiformes        | Lophiidae             | Lophiodes reticulatus            | 11      | 200       | 500       | 240        |
| Actinopterygii      | Lophiiformes        | Lophiidae             | Lophius gastrophysus             | 17      | 286       | 561       | 347        |
| Actinopterygii      | Lophiiformes        | Lophiidae             | Lophius piscatorius              | 4       | 200       | 500       | 240        |
| Actinopterygii      | Lophiiformes        | Melanocetidae         | Melanocetus murrayi              | 7       | 523       | 857       | 562        |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Dibranchus atlanticus            | 207     | 198       | 1,440     | 412        |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Dibranchus tremendus             | 6       | 1,006     | 1,463     | 1,107      |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Haliacanthys aculeatus           | 20      | 286       | 295       | 291        |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Malthopsis gnome                 | 12      | 280       | 491       | 301        |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Ogocephalus decivirostris        | 3       | 365       | 223       | 221        |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Ogocephalus parvus               | 6       | 270       | 360       | 308        |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Ogocephalus pumilus              | 1       | 290       | 290       | 290        |
| Actinopterygii      | Lophiiformes        | Ogcocephalidae        | Zaleutes megynyi                 | 29      | 201       | 498       | 246        |
| Actinopterygii      | Lophiiformes        | Onerodidae            | Dolichichthys pullatus           | 1       | 4,029     | 4,029     | 4,029      |
| Actinopterygii      | Lophiiformes        | Thaumatichthyidae     | Thaumatichthys hinghimi          | 1       | 1,251     | 1,251     | 1,251      |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Böltichthys supralateralis       | 26      | 195       | 792       | 361        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Dasyseoplos seleneops            | 2       | 275       | 520       | 396        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus adenomus                 | 1       | 567       | 567       | 567        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus bertesi                 | 2       | 200       | 200       | 200        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus dumerilii               | 26      | 200       | 727       | 299        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus eflulgens                | 2       | 223       | 365       | 330        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus garmani                 | 24      | 200       | 1,829     | 409        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus lucidus                 | 23      | 191       | 755       | 327        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus minus                   | 1       | 270       | 270       | 270        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus rafinesqui              | 5       | 320       | 1,800     | 633        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus splendidas              | 13      | 200       | 857       | 262        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Diaphus taunying                | 1       | 270       | 270       | 270        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Lampadina luminosa              | 9       | 200       | 730       | 422        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Lepidiophanes guentheri          | 21      | 200       | 857       | 302        |
| Actinopterygii      | Myctophiformes      | Myctophidae           | Myctophum nitidulum             | 16      | 200       | 727       | 340        |
| Actinopterygii      | Myctophiformes      | Neoscopidae           | Neoscopelus macrolepidotus       | 104     | 276       | 900       | 475        |
| Actinopterygii      | Myctophiformes      | Neoscopidae           | Neoscopelus microchir            | 23      | 223       | 803       | 372        |
| Actinopterygii      | Notacanthiformes    | Halosauridae          | Aldrovandia affinis             | 5       | 515       | 1,097     | 559        |
| Actinopterygii      | Notacanthiformes    | Halosauridae          | Aldrovandia gracilis            | 8       | 395       | 1,710     | 1,039      |
| Actinopterygii      | Notacanthiformes    | Halosauridae          | Halosauria guentheri            | 32      | 276       | 1,143     | 433        |
| Actinopterygii      | Notacanthiformes    | Halosauridae          | Halosauras ovini                | 88      | 276       | 803       | 406        |
| Actinopterygii      | Notacanthiformes    | Notacanthidae         | Notacanthus chemnitizii          | 1       | 724       | 724       | 724        |
| Actinopterygii      | Notacanthiformes    | Notacanthidae         | Polyacanthonotus merretti       | 2       | 679       | 857       | 738        |
| Actinopterygii      | Ophiidiiformes      | Aphyonidae            | Barathronus bicolor             | 22      | 365       | 1,251     | 625        |
| Actinopterygii      | Ophiidiiformes      | Bythitidae            | Calamopteryx rhinorhomsor       | 2       | 200       | 201       | 201        |
| Actinopterygii      | Ophiidiiformes      | Bythitidae            | Cataetys laticeps               | 7       | 732       | 1,800     | 1,119      |
| Actinopterygii      | Ophiidiiformes      | Bythitidae            | Diplocanthopoma brachysoma      | 62      | 274       | 776       | 401        |
| Actinopterygii      | Ophiidiiformes      | Bythitidae            | Saccogaster staigeri            | 1       | 356       | 356       | 356        |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Acanthos armatus                 | 13      | 2,215     | 2,564     | 2,366      |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Bassozetus robustus             | 1       | 1,240     | 1,240     | 1,240      |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Bathymus laticeps              | 2       | 1,627     | 2,983     | 2,531      |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Benthocometes robustus          | 4       | 223       | 303       | 287        |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Dicrolene introner              | 37      | 395       | 1,296     | 715        |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Lamprogrammus brunswigii        | 2       | 1,371     | 1,377     | 1,377      |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Lamprogrammus niger             | 4       | 515       | 3978      | 1,105      |
| Actinopterygii      | Ophiidiiformes      | Ophidiidae            | Lepophidium brevisarbe          | 18      | 210       | 505       | 277        |
Appendix 1. Continued.

| Class               | Order                 | Family       | Species                     | Records | Min depth | Max depth | Mean depth |
|---------------------|-----------------------|--------------|-----------------------------|---------|-----------|-----------|------------|
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Lepophidium cultratum*     | 2       | 210       | 210       | 210        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Lepophidium kallion*       | 1       | 219       | 219       | 219        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Lepophidium profundorum*   | 8       | 207       | 404       | 288        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Lepophidium robustum*      | 1       | 200       | 200       | 200        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Lepophidium zophochar*     | 3       | 210       | 210       | 210        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Luciobrotula core bromycter* | 16     | 540       | 821       | 612        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Monomitus agassizii*       | 47      | 365       | 1,251     | 528        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Neobryichthys gilli*       | 78      | 200       | 500       | 320        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Neobryichthys margnatus*   | 68      | 205       | 670       | 305        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Neobryichthys monocellatus*| 4       | 229       | 334       | 257        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Neobryichthys ocellatus*   | 19      | 192       | 366       | 234        |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Penopsis microphthalmus*    | 1       | 1,006     | 1,006     | 1,006      |
| Actinopterygii      | Ophidiiformes         | Ophidiidae   | *Xyleicya myersi*           | 5       | 1,251     | 1,440     | 1,301      |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Alepocephalus australis* | 8       | 1,097     | 1,317     | 1,146      |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Bathypteroctes microlepis* | 2       | 1,097     | 1,097     | 1,097      |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Conocara macropterus*     | 10      | 821       | 1,463     | 1,125      |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Lepidoderma macrops*     | 1       | 690       | 690       | 690        |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Narceus stomias*          | 7       | 558       | 1,829     | 1,509      |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Rouleina atrina*          | 4       | 686       | 1,271     | 828        |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Talasmania antillarum*    | 2       | 457       | 457       | 457        |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Talasmania homoptera*     | 5       | 515       | 640       | 593        |
| Actinopterygii      | Osmeriformes          | Alepocephalidae | *Xenodermacichthys copei*  | 23      | 360       | 640       | 433        |
| Actinopterygii      | Osmeriformes          | Argentinidae  | *Argentina brueci*          | 33      | 198       | 439       | 266        |
| Actinopterygii      | Osmeriformes          | Argentinidae  | *Argentina striata*         | 72      | 200       | 500       | 266        |
| Actinopterygii      | Osmeriformes          | Bathylagidae  | *Dolicholophus longirostris*| 6       | 445       | 857       | 699        |
| Actinopterygii      | Osmeriformes          | Microstomatidae | *Xenophthalmichthys danae* | 7       | 205       | 505       | 323        |
| Actinopterygii      | Osmeriformes          | Opisthoproctidae | *Opisthopuctor soleatus*   | 1       | 374       | 374       | 374        |
| Actinopterygii      | Perciformes           | Acropomatidae | *Carabips trispinosus*      | 15      | 192       | 523       | 220        |
| Actinopterygii      | Perciformes           | Acropomatidae | *Synagrops bellus*          | 122     | 192       | 810       | 352        |
| Actinopterygii      | Perciformes           | Acropomatidae | *Verilus atlanticus*       | 10      | 192       | 496       | 250        |
| Actinopterygii      | Perciformes           | Acropomatidae | *Verilus pseudomicrolepis* | 12      | 247       | 308       | 262        |
| Actinopterygii      | Perciformes           | Acropomatidae | *Verilus sordidus*         | 2       | 201       | 201       | 201        |
| Actinopterygii      | Perciformes           | Arionmatidae  | *Arimona bondi*             | 3       | 351       | 428       | 383        |
| Actinopterygii      | Perciformes           | Arionmatidae  | *Arimona melanum*           | 2       | 298       | 366       | 355        |
| Actinopterygii      | Perciformes           | Bathycurupeidae | *Bathycurupea argentea*    | 24      | 402       | 732       | 448        |
| Actinopterygii      | Perciformes           | Bathycurupeidae | *Bathycurupea Schroederi*  | 16      | 205       | 810       | 387        |
| Actinopterygii      | Perciformes           | Callionymidae | *Synchropus agassizii*      | 8       | 274       | 352       | 306        |
| Actinopterygii      | Perciformes           | Callionymidae | *Synchropus dagmarae*       | 1       | 229       | 229       | 229        |
| Actinopterygii      | Perciformes           | Caproidae     | *Antigonia capros*          | 37      | 198       | 505       | 240        |
| Actinopterygii      | Perciformes           | Caproidae     | *Antigonia combattia*       | 51      | 192       | 520       | 243        |
| Actinopterygii      | Perciformes           | Carangidae    | *Decapterus macarellus*     | 3       | 198       | 235       | 226        |
| Actinopterygii      | Perciformes           | Carangidae    | *Decapterus tabl*           | 21      | 200       | 507       | 229        |
| Actinopterygii      | Perciformes           | Carangidae    | *Selar crumenophthalmus*    | 7       | 246       | 2,195     | 575        |
| Actinopterygii      | Perciformes           | Carangidae    | *Selene browni*             | 3       | 200       | 504       | 403        |
| Actinopterygii      | Perciformes           | Carangidae    | *Trachurus lathami*         | 2       | 207       | 207       | 207        |
| Actinopterygii      | Perciformes           | Emmelichthidae | *Erythrocles monodi*       | 1       | 201       | 201       | 201        |
| Actinopterygii      | Perciformes           | Epigonidae    | *Epigonus macrops*          | 13      | 200       | 914       | 613        |
| Actinopterygii      | Perciformes           | Epigonidae    | *Epigonus occidentalis*     | 28      | 366       | 823       | 434        |
| Actinopterygii      | Perciformes           | Epigonidae    | *Epigonus pandionis*       | 55      | 223       | 720       | 343        |
| Actinopterygii      | Perciformes           | Gempylidae    | *Diplostomus multistriatus* | 8       | 200       | 445       | 298        |
| Actinopterygii      | Perciformes           | Gempylidae    | *Lepidocycium flavobrunneum*| 2       | 1,251     | 1,271     | 1,261      |
### Appendix 1. Continued.

| Class               | Order                | Family          | Species                        | Records | Min depth | Max depth | Mean depth |
|---------------------|----------------------|-----------------|-------------------------------|---------|-----------|-----------|------------|
| Actinopterygii      | Perciformes          | Gempylidae      | Neolotus tripes               | 5       | 205       | 360       | 249        |
| Actinopterygii      | Perciformes          | Gempylidae      | Neopinnula americana          | 13      | 229       | 333       | 249        |
| Actinopterygii      | Perciformes          | Gymnothoridae   | Promethichthys prometheus    | 17      | 298       | 807       | 386        |
| Actinopterygii      | Perciformes          | Gempylidae      | Ruvettus pretiosus            | 3       | 396       | 558       | 461        |
| Actinopterygii      | Perciformes          | Haemulidae      | Haemulon aurolineatum         | 2       | 286       | 286       | 286        |
| Actinopterygii      | Perciformes          | Haemulidae      | Haemulon boschmai             | 2       | 286       | 295       | 291        |
| Actinopterygii      | Lutjanidae           | Lutjanus vivanus|                               | 1       | 324       | 324       | 324        |
| Actinopterygii      | Lutjanidae           | Pristipomoides  | aquilonarum                   | 1       | 198       | 198       | 198        |
| Actinopterygii      | Lutjanidae           | Pristipomoides  | macrophthalmus                | 3       | 201       | 280       | 220        |
| Actinopterygii      | Mullidae             | Mullus           | Penaeus parvus                | 7       | 219       | 792       | 417        |
| Actinopterygii      | Perciformes          | Opistognathidae | Lonchopithys lemur            | 32      | 200       | 300       | 242        |
| Actinopterygii      | Perciformes          | Opistognathidae | Lonchopithys micrognathus     | 2       | 265       | 265       | 265        |
| Actinopterygii      | Perciformes          | Percophidae     | Bembrops anatirostris         | 41      | 198       | 500       | 314        |
| Actinopterygii      | Perciformes          | Percophidae     | Bembrops gobioides            | 6       | 360       | 540       | 439        |
| Actinopterygii      | Perciformes          | Percophidae     | Bembrops magnisquamis         | 1       | 540       | 540       | 540        |
| Actinopterygii      | Perciformes          | Percophidae     | Bembrops occellatus           | 22      | 223       | 670       | 410        |
| Actinopterygii      | Perciformes          | Percophidae     | Bembrops quadrisella          | 3       | 290       | 384       | 380        |
| Actinopterygii      | Priacanthidae        | Heteropriacanthus| cruentatus                    | 4       | 333       | 432       | 406        |
| Actinopterygii      | Priacanthidae        | Protosciatinae  | bathytatoo                    | 12      | 240       | 512       | 340        |
| Actinopterygii      | Priacanthidae        | Protosciatinae  | trewavaeae                    | 8       | 191       | 201       | 199        |
| Actinopterygii      | Perciformes          | Scombrolabracidae| Scombrolabra heterolepis      | 1       | 396       | 396       | 396        |
| Actinopterygii      | Serranidae           | Baldivinella    | aureorubens                   | 25      | 198       | 351       | 249        |
| Actinopterygii      | Serranidae           | Baldivinella    | eos                            | 1       | 316       | 316       | 316        |
| Actinopterygii      | Serranidae           | Bathyanthias    | cubensis                      | 7       | 192       | 280       | 209        |
| Actinopterygii      | Serranidae           | Bathyanthias    | mexicanus                     | 1       | 300       | 300       | 300        |
| Actinopterygii      | Serranidae           | Bullisichthys   | caribbaeae                    | 1       | 219       | 219       | 219        |
| Actinopterygii      | Serranidae           | Hyporthodus     | flavolimbatus                 | 1       | 270       | 270       | 270        |
| Actinopterygii      | Serranidae           | Hyporthodus     | nigratus                      | 2       | 200       | 333       | 267        |
| Actinopterygii      | Serranidae           | Hyporthodus     | niveatus                      | 1       | 316       | 316       | 316        |
| Actinopterygii      | Serranidae           | Plecanthrus     | garrupellus                   | 2       | 200       | 200       | 200        |
| Actinopterygii      | Serranidae           | Pronootogrammus | martiniicensis                | 1       | 219       | 219       | 219        |
| Actinopterygii      | Serranidae           | Serranus        | atrobranchus                 | 3       | 300       | 370       | 323        |
| Actinopterygii      | Sparidae             | Pagrus          | pagrus                        | 1       | 207       | 207       | 207        |
| Actinopterygii      | Symphysanodontidae   | Symphysanodon   | bryeri                        | 3       | 200       | 280       | 216        |
| Actinopterygii      | Symphysanodontidae   | Synagropidae    | Parascombrospis spinosus      | 28      | 192       | 750       | 243        |
| Actinopterygii      | Trichiuridae         | Benthodesmus    | simonyi                       | 15      | 223       | 659       | 302        |
| Actinopterygii      | Trichiuridae         | Benthodesmus    | tenais                        | 45      | 223       | 732       | 371        |
| Actinopterygii      | Trichiuridae         | Lepidopus       | alitritos                     | 8       | 320       | 366       | 334        |
| Actinopterygii      | Trichiuridae         | Lepidopus       | caudatus                      | 6       | 240       | 404       | 293        |
| Actinopterygii      | Trichiuridae         | Trichurus       | lepturus                      | 3       | 220       | 250       | 239        |
| Actinopterygii      | Pleuronectiformes    | Bothidae        | Chaceanepetra laghbris        | 7       | 366       | 576       | 417        |
| Actinopterygii      | Pleuronectiformes    | Bothidae        | Monolene atrimax             | 2       | 223       | 373       | 298        |
| Actinopterygii      | Pleuronectiformes    | Bothidae        | Monolene megalepis           | 10      | 206       | 505       | 235        |
| Actinopterygii      | Pleuronectiformes    | Bothidae        | Trichopsetta caribbacea      | 7       | 192       | 300       | 209        |
| Actinopterygii      | Pleuronectiformes    | Bothidae        | Trichopsetta ventralis       | 2       | 198       | 252       | 225        |
| Actinopterygii      | Pleuronectiformes    | Cynoglossidae   | Symphurus diomedeanus         | 2       | 290       | 316       | 303        |
| Actinopterygii      | Pleuronectiformes    | Cynoglossidae   | Symphurus ginsburgi           | 11      | 296       | 491       | 348        |
| Actinopterygii      | Pleuronectiformes    | Cynoglossidae   | Symphurus horendaezi          | 12      | 204       | 300       | 228        |
| Actinopterygii      | Pleuronectiformes    | Cynoglossidae   | Symphurus marginatus          | 62      | 265       | 698       | 355        |
| Actinopterygii      | Pleuronectiformes    | Cynoglossidae   | Symphurus piper              | 17      | 203       | 750       | 276        |
| Actinopterygii      | Pleuronectiformes    | Cynoglossidae   | Symphurus stigmatus          | 1       | 274       | 274       | 274        |
### Appendix 1. Continued.

| Class               | Order                   | Family          | Species                          | Records | Min depth | Max depth | Mean depth |
|---------------------|-------------------------|-----------------|----------------------------------|---------|-----------|-----------|------------|
| Actinopterygi       | Pleuronectiformes       | Paralichthyidae | *Ancylopsetta cycloidea*         | 9       | 192       | 269       | 207        |
| Actinopterygi       | Pleuronectiformes       | Paralichthyidae | *Citharichthys cornutus*         | 5       | 192       | 300       | 207        |
| Actinopterygi       | Pleuronectiformes       | Pleuronectidae  | *Poecilopsetta beani*            | 4       | 223       | 333       | 283        |
| Actinopterygi       | Pleuronectiformes       | Pleuronectidae  | *Poecilopsetta inermis*          | 113     | 229       | 750       | 292        |
| Actinopterygi       | Polymixiformes          | Polymixidae     | *Polymixia lowei*                | 72      | 200       | 940       | 282        |
| Actinopterygi       | Polymixiformes          | Polymixidae     | *Polymixia nobilis*              | 7       | 366       | 512       | 412        |
| Actinopterygi       | Scorpaeniformes         | Peristidae      | *Peristion ecuadorense*          | 34      | 223       | 810       | 374        |
| Actinopterygi       | Scorpaeniformes         | Peristidae      | *Peristion gracile*              | 27      | 191       | 940       | 270        |
| Actinopterygi       | Scorpaeniformes         | Peristidae      | *Peristion greyae*               | 53      | 265       | 803       | 334        |
| Actinopterygi       | Scorpaeniformes         | Peristidae      | *Peristion imberbe*              | 1       | 219       | 219       | 219        |
| Actinopterygi       | Scorpaeniformes         | Peristidae      | *Peristion longispina*           | 38      | 223       | 766       | 414        |
| Actinopterygi       | Scorpaeniformes         | Peristidae      | *Peristion miniatum*             | 42      | 229       | 720       | 291        |
| Actinopterygi       | Scorpaeniformes         | Peristidae      | *Peristion truncaturn*           | 18      | 223       | 731       | 348        |
| Actinopterygi       | Scorpaeniformes         | Scorpaenidae    | *Neomerinthe beanorum*           | 3       | 200       | 300       | 260        |
| Actinopterygi       | Scorpaeniformes         | Scorpaenidae    | *Phenococcusus nebris*           | 2       | 300       | 300       | 300        |
| Actinopterygi       | Scorpaeniformes         | Scorpaenidae    | *Pontinus longispinus*           | 65      | 200       | 491       | 254        |
| Actinopterygi       | Scorpaeniformes         | Scorpaenidae    | *Pontinus nematophilus*          | 9       | 200       | 698       | 288        |
| Actinopterygi       | Scorpaeniformes         | Scorpaenidae    | *Pontinus rathbuni*              | 6       | 200       | 324       | 227        |
| Actinopterygi       | Scorpaeniformes         | Sebastidae      | *Helicolenus dactylopterus*       | 3       | 293       | 662       | 366        |
| Actinopterygi       | Scorpaeniformes         | Sebastidae      | *Trachycorpa cristulata*         | 1       | 540       | 540       | 540        |
| Actinopterygi       | Scorpaeniformes         | Setarchidae     | *Ectreposeastes imus*            | 5       | 400       | 732       | 550        |
| Actinopterygi       | Scorpaeniformes         | Setarchidae     | *Setarches guentherii*           | 53      | 200       | 510       | 273        |
| Actinopterygi       | Scorpaeniformes         | Trigidae        | *Bellator brachyrr*              | 3       | 200       | 300       | 209        |
| Actinopterygi       | Scorpaeniformes         | Trigidae        | *Bellator egretta*               | 2       | 200       | 203       | 201        |
| Actinopterygi       | Scorpaeniformes         | Trigidae        | *Prionotus beanii*               | 1       | 219       | 219       | 219        |
| Actinopterygi       | Scorpaeniformes         | Trigidae        | *Prionotus stearnsi*             | 10      | 213       | 351       | 273        |
| Actinopterygi       | Stephanoberyciformes    | Gibberichthyidae| *Gibberichthys pumilus*          | 3       | 720       | 732       | 728        |
| Actinopterygi       | Stephanoberyciformes    | Stephanoberyidae| *Stephanoberyx monae*            | 10      | 395       | 1,143     | 786        |
| Actinopterygi       | Stomiiformes            | Gonostomatidae  | *Gonostoma atlanticum*           | 16      | 200       | 792       | 255        |
| Actinopterygi       | Stomiiformes            | Gonostomatidae  | *Signops elongatus*              | 72      | 200       | 2341      | 452        |
| Actinopterygi       | Stomiiformes            | Gonostomatidae  | *Triplotus hemingi*              | 28      | 300       | 732       | 424        |
| Actinopterygi       | Stomiiformes            | Phosichthyidae  | *Ichthyoscopeus ovatus*          | 5       | 210       | 755       | 288        |
| Actinopterygi       | Stomiiformes            | Phosichthyidae  | *Pollichthys maudi*              | 38      | 191       | 857       | 341        |
| Actinopterygi       | Stomiiformes            | Phosichthyidae  | *Polymetme corythaeola*          | 19      | 275       | 857       | 478        |
| Actinopterygi       | Stomiiformes            | Phosichthyidae  | *Polymetme thaeocoryla*          | 13      | 223       | 274       | 272        |
| Actinopterygi       | Stomiiformes            | Phosichthyidae  | *Yarrella blackfordi*            | 26      | 283       | 1,143     | 625        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Argyriusus atlanticus*          | 1       | 260       | 260       | 260        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Argyroleucus aculeatus*         | 48      | 205       | 857       | 479        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Argyroleucus gigan*             | 1       | 540       | 540       | 540        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Maurolucus maulleri*            | 2       | 234       | 493       | 364        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Polypus asteroides*             | 50      | 205       | 567       | 338        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Polypus claus*                  | 4       | 205       | 265       | 259        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Polypus lateranus*              | 2       | 366       | 549       | 412        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Sternoptyx diaphana*            | 43      | 197       | 4,151     | 585        |
| Actinopterygi       | Stomiiformes            | Sternoptychidae | *Sternoptyx pseudoscura*         | 3       | 445       | 857       | 585        |
| Actinopterygi       | Stomiiformes            | Stomidae        | *Aristostomias grimaldi*         | 2       | 640       | 640       | 640        |
| Actinopterygi       | Stomiiformes            | Stomidae        | *Aristostomias schmidti*         | 3       | 600       | 792       | 708        |
| Actinopterygi       | Stomiiformes            | Stomidae        | *Aristostomias schmidti*         | 9       | 225       | 1,710     | 412        |
| Actinopterygi       | Stomiiformes            | Stomidae        | *Chauliodus sloani*              | 125     | 191       | 4,151     | 431        |
| Actinopterygi       | Stomiiformes            | Stomidae        | *Eustomias schmidti*             | 2       | 450       | 857       | 586        |
| Actinopterygi       | Stomiiformes            | Stomidae        | *Heterophotus ophistoma*         | 3       | 640       | 732       | 671        |
### Appendix 1. Continued.

| Class                | Order                | Family            | Species                                      | Records | Min depth | Max depth | Mean depth |
|----------------------|----------------------|-------------------|----------------------------------------------|---------|-----------|-----------|------------|
| Actinopterygii       | Stomiformes          | Stomiidae         | *Malacosteus niger*                          | 10      | 400       | 732       | 502        |
| Actinopterygii       | Stomiformes          | Stomiidae         | *Melanostomias macrophtus*                   | 1       | 404       | 404       | 404        |
| Actinopterygii       | Stomiformes          | Stomiidae         | *Stomias afinity*                            | 32      | 205       | 857       | 420        |
| Actinopterygii       | Stomiformes          | Stomiidae         | *Stomias longibarbatis*                      | 3       | 225       | 755       | 358        |
| Actinopterygii       | Tetradontiformes     | Triacanthodidae   | *Hollardia hollardi*                         | 6       | 329       | 558       | 350        |
| Actinopterygii       | Tetradontiformes     | Triacanthodidae   | *Parahollardia lineata*                      | 1       | 369       | 369       | 369        |
| Actinopterygii       | Tetradontiformes     | Triacanthodidae   | *Parahollardia schmidtii*                    | 5       | 200       | 360       | 222        |
| Actinopterygii       | Zeiformes            | Grammicolepididae | *Grammicolepis brachiusculus*                | 8       | 324       | 662       | 442        |
| Actinopterygii       | Zeiformes            | Grammicolepididae | *Xenolepidichthys dalglesi*                  | 25      | 200       | 439       | 245        |
| Actinopterygii       | Zeiformes            | Parazenidae       | *Cytopis rosea*                              | 95      | 223       | 732       | 324        |
| Actinopterygii       | Zeiformes            | Parazenidae       | *Parazen pacificus*                          | 2       | 274       | 352       | 281        |
| Actinopterygii       | Zeiformes            | Zeidae            | *Zenopsis conchifer*                         | 2       | 270       | 298       | 284        |
| Actinopterygii       | Zeiformes            | Zenimidae         | *Zenion hololepis*                           | 72      | 200       | 540       | 385        |
| Elasmobranchii       | Carcharhiniformes    | Carcharhinidae    | *Galeocerdo cuvier*                          | 1       | 365       | 365       | 365        |
| Elasmobranchii       | Carcharhiniformes    | Carcharhinidae    | *Apiritus canutus*                           | 2       | 530       | 777       | 592        |
| Elasmobranchii       | Carcharhiniformes    | Scyliorhinidae    | *Apiritus parvipinnis*                       | 2       | 719       | 719       | 719        |
| Elasmobranchii       | Carcharhiniformes    | Scyliorhinidae    | *Apiritus river*                             | 3       | 860       | 860       | 889        |
| Elasmobranchii       | Carcharhiniformes    | Scyliorhinidae    | *Galeus arear*                               | 4       | 193       | 512       | 374        |
| Elasmobranchii       | Carcharhiniformes    | Scyliorhinidae    | *Galeus caderati*                            | 4       | 256       | 512       | 436        |
| Elasmobranchii       | Carcharhiniformes    | Scyliorhinidae    | *Schoederichthys maculatus*                  | 1       | 275       | 542       | 274        |
| Elasmobranchii       | Carcharhiniformes    | Scyliorhinidae    | *Scoliorhinus boa*                           | 19      | 223       | 540       | 298        |
| Elasmobranchii       | Carcharhiniformes    | Scyliorhinidae    | *Scoliorhinus hesperius*                     | 9       | 290       | 549       | 341        |
| Elasmobranchii       | Carcharhiniformes    | Triakidae         | *Mastactis canis*                            | 2       | 298       | 316       | 307        |
| Elasmobranchii       | Rajiformes           | Anacanthobatidae  | *Schoederobatis americana*                   | 51      | 307       | 803       | 475        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Brevaraja nigroventralis*                   | 18      | 367       | 732       | 512        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Brevaraja spinosa*                          | 4       | 540       | 612       | 575        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Cruvaraja rugosa*                           | 7       | 365       | 732       | 449        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Dactylolobus clarkii*                       | 18      | 366       | 512       | 421        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Dipturus bullisi*                           | 9       | 201       | 334       | 302        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Dipturus garricki*                          | 3       | 283       | 307       | 301        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Dipturus oregoni*                           | 1       | 396       | 396       | 396        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Dipturus tevani*                            | 3       | 240       | 576       | 407        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Fenestraja plutonia*                        | 1       | 428       | 428       | 428        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Fenestraja sinusmexicanus*                  | 2       | 485       | 485       | 485        |
| Elasmobranchii       | Rajiformes           | Rajidae           | *Gergesia atlantica*                         | 34      | 223       | 698       | 498        |
| Elasmobranchii       | Squaliformes         | Centrophoridae    | *Centrophorus granulosus*                    | 4       | 200       | 732       | 333        |
| Elasmobranchii       | Squaliformes         | Centrophoridae    | *Centrophorus squamosus*                     | 1       | 670       | 670       | 670        |
| Elasmobranchii       | Squaliformes         | Dalatidae         | *Sissius brasilensis*                        | 1       | 621       | 621       | 621        |
| Elasmobranchii       | Squaliformes         | Etmopteridae      | *Etmopterus bullisi*                         | 1       | 274       | 274       | 274        |
| Elasmobranchii       | Squaliformes         | Etmopteridae      | *Etmopterus careri*                          | 8       | 283       | 343       | 292        |
| Elasmobranchii       | Squaliformes         | Etmopteridae      | *Etmopterus hilianus*                        | 6       | 180       | 540       | 351        |
| Elasmobranchii       | Squaliformes         | Etmopteridae      | *Etmopterus perryi*                          | 22      | 283       | 375       | 297        |
| Elasmobranchii       | Squaliformes         | Etmopteridae      | *Etmopterus pusillus*                        | 1       | 288       | 288       | 288        |
| Elasmobranchii       | Squaliformes         | Etmopteridae      | *Etmopterus schultzi*                        | 43      | 269       | 823       | 422        |
| Elasmobranchii       | Squaliformes         | Etmopteridae      | *Etmopterus vires*                           | 25      | 288       | 503       | 331        |
| Elasmobranchii       | Squaliformes         | Somniosidae       | *Somniosus cf microcephalus*                 | 1       | 200       | 200       | 200        |
| Elasmobranchii       | Squaliformes         | Squalidae         | *Squalus cabensis*                           | 4       | 198       | 274       | 263        |
| Elasmobranchii       | Squaliformes         | Squatinidae       | *Squatinus david*                            | 2       | 198       | 305       | 252        |
| Elasmobranchii       | Torpediniformes      | Torpedinidae      | *Tetranezus nobiliana*                       | 6       | 292       | 369       | 329        |
| Holocentrii           | Chimaeriformes       | Chimaeridae       | *Chimaera cabana*                            | 1       | 234       | 234       | 234        |
| Holocentrii           | Chimaeriformes       | Chimaeridae       | *Hydrolagus alberti*                         | 27      | 223       | 1,143      | 477        |
### Appendix 1. Continued.

| Class                      | Order       | Family       | Species               | Records | Min depth | Max depth | Mean depth |
|----------------------------|-------------|--------------|-----------------------|---------|-----------|-----------|------------|
| Holocephali                | Chimaeriformes | Chimaeridae  | *Hydrolagus mirabilis* | 3       | 720       | 1,296     | 995        |
| Holocephali                | Chimaeriformes | Rhinichimaerida | *Neoharriotta carri*  | 14      | 288       | 485       | 329        |
| Holocephali                | Chimaeriformes | Rhinichimaerida | *Rhinichimaera atlantica* | 2       | 914       | 917       | 916        |
| Myxini                     | Myxiniformes | Myxidae      | *Eptatretus acroei*    | 2       | 705       | 705       | 705        |
| Myxini                     | Myxiniformes | Myxidae      | *Eptatretus ancon*     | 8       | 476       | 670       | 513        |
| Myxini                     | Myxiniformes | Myxidae      | *Eptatretus wayuu*     | 5       | 300       | 303       | 301        |
| Myxini                     | Myxiniformes | Myxidae      | *Myxine mossikeri*     | 72      | 269       | 801       | 446        |
| Myxini                     | Myxiniformes | Myxidae      | *Myxine robinsorum*    | 2       | 783       | 821       | 793        |

### APPENDIX 2

Species excluded from data base because records fall outside the Colombian Caribbean Exclusive Economic Zone.

| Class              | Order      | Family       | Species                        |
|--------------------|------------|--------------|--------------------------------|
| Actinopterygii     | Anguilliformes | Congridae | *Acromyxter atlanticus*        |
| Actinopterygii     | Anguilliformes | Congridae | *Bathyconger thysonochilas*    |
| Actinopterygii     | Anguilliformes | Congridae | *Rhynchoconger gracilior*     |
| Actinopterygii     | Anguilliformes | Nettastomatidae | *Hoplunnis similis*          |
| Actinopterygii     | Aulopiformes | Giganturidae | *Gigantura chuni*            |
| Actinopterygii     | Aulopiformes | Ipnopidae  | *Bathytyphlops sewelli*       |
| Actinopterygii     | Aulopiformes | Paralepididae | *Listropops intermedia*     |
| Actinopterygii     | Aulopiformes | Paralepididae | *Stemonosusis rothschildi*   |
| Actinopterygii     | Aulopiformes | Batrachoididae | *Porichthys bathoiketes*   |
| Actinopterygii     | Aulopiformes | Batrachoididae | *Porichthys bathoiketes*   |
| Actinopterygii     | Ophidiiformes | Ophidiidae | *Lepophidium entomelan*      |
| Actinopterygii     | Ophidiiformes | Ophidiidae | *Lepophidium marmoratum*     |
| Actinopterygii     | Ophidiiformes | Ophidiidae | *Lepophidium staurophor*     |
| Actinopterygii     | Ophidiiformes | Argentinidae | *Argentina stewarti*        |
| Actinopterygii     | Ophidiiformes | Argentinidae | *Glossanodon pygmaeus*      |
| Actinopterygii     | Ophidiiformes | Argentinidae | *Parocheilus affinis*       |
| Actinopterygii     | Perciformes | Labridae    | *Decodon puellaris*          |
| Actinopterygii     | Perciformes | Lutjanidae  | *Rhomboplites aurorubens*    |
| Actinopterygii     | Perciformes | Percophidae | *Bembrops macromma*          |
| Actinopterygii     | Perciformes | Serranidae  | *Serranus phoebe*            |
| Actinopterygii     | Perciformes | Uranoscopidae | *Kathetostoma cubana*        |
| Actinopterygii     | Pleuronectiformes | Paralichthysidae | *Anyltopsella microtenuis*  |
| Actinopterygii     | Pleuronectiformes | Paralichthysidae | *Citharichthys dinozeros* |
| Actinopterygii     | Stomiiformes | Sternoptychidae | *Somodo megaposphalmia* |
| Actinopterygii     | Stomiiformes | Stomiidae   | *Echiostoma barbatum*        |
| Actinopterygii     | Stomiiformes | Stomiidae   | *Eustomias acinosus*         |
| Elasmobranchii      | Rajiformes  | Rajidae     | *Breviraja mouldi*           |
| Elasmobranchii      | Rajiformes  | Rajidae     | *Fenestraja ishiyamai*      |
| Elasmobranchii      | Rajiformes  | Rajidae     | *Leucoraja garnani*         |
| Elasmobranchii      | Squaliformes | Etmopteridae | *Etmopterus robinisi*       |
| Elasmobranchii      | Squaliformes | Squalidae   | *Squalus mitsukuri*         |
| Myxini              | Myxiniformes | Myxidae     | *Eptatretus caribbeaus*      |
| Myxini              | Myxiniformes | Myxidae     | *Eptatretus multifidens*     |
### APPENDIX 3

Deep demersal species (> 200 m depth) recorded inside the Parque Nacional Natural Park Corales de Profundidad in the Colombian Caribbean.

| Class                  | Order                  | Family               | Genus               | Species                          |
|------------------------|------------------------|----------------------|---------------------|----------------------------------|
| Actinopterygii         | Anguilliformes         | Colocongridae        | Coloconger          | Coloconger meadi                 |
| Actinopterygii         | Anguilliformes         | Congridae            | Bathycodus          | Bathycodus bulisi                |
| Actinopterygii         | Anguilliformes         | Congridae            | Pseudophichthys     | Pseudophichthys splendidis       |
| Actinopterygii         | Anguilliformes         | Congridae            | Xenomystax          | Xenomystax congoides             |
| Actinopterygii         | Aulopiformes           | Chlorophthalmidae    | Chlorophthalmus     | Chlorophthalmus agassizii        |
| Actinopterygii         | Aulopiformes           | Chlorophthalmidae    | Parasodus           | Parasodus truculenta             |
| Actinopterygii         | Aulopiformes           | Ipnomidae            | Bathypetrois        | Bathypetrois bigelowi            |
| Actinopterygii         | Aulopiformes           | Synodontidae         | Saurida             | Saurida brasiliensis             |
| Actinopterygii         | Beryciformes           | Trachichthyidae      | Hoplostethus        | Hoplostethus occidentalis        |
| Actinopterygii         | Gadiformes             | Bremecarotidae       | Bathygadus          | Bathygadus macrops               |
| Actinopterygii         | Gadiformes             | Macrouridae          | Coelorinchus        | Coelorinchus Capekysin           |
| Actinopterygii         | Gadiformes             | Macrouridae          | Coelorinchus        | Coelorinchus caribbaeus          |
| Actinopterygii         | Gadiformes             | Macrouridae          | Gadomus             | Gadomus arcuatus                 |
| Actinopterygii         | Gadiformes             | Macrouridae          | Hymenocephalus      | Hymenocephalus billisam          |
| Actinopterygii         | Gadiformes             | Macrouridae          | Hymenocephalus      | Hymenocephalus italicus          |
| Actinopterygii         | Gadiformes             | Macrouridae          | Malacocephalus      | Malacocephalus laevis            |
| Actinopterygii         | Gadiformes             | Macrouridae          | Malacocephalus      | Malacocephalus occidentalis      |
| Actinopterygii         | Gadiformes             | Macrouridae          | Nezumia             | Nezumia aquilis                  |
| Actinopterygii         | Gadiformes             | Macrouridae          | Ventrifossa         | Ventrifossa macrogon             |
| Actinopterygii         | Gadiformes             | Merlucciidae         | Steindachneria      | Steindachneria argentea          |
| Actinopterygii         | Gadiformes             | Moridae              | Gadella             | Gadella imberis                  |
| Actinopterygii         | Gadiformes             | Moridae              | Laemonema           | Laemonema goodbeleanorum         |
| Actinopterygii         | Gadiformes             | Moridae              | Physiculus          | Physiculus fulvas                |
| Actinopterygii         | Lophiiformes           | Chaunacidae          | Chaunax             | Chaunax pictus                   |
| Actinopterygii         | Lophiiformes           | Chaunacidae          | Chaunax             | Chaunax saithiasi                |
| Actinopterygii         | Lophiiformes           | Lophiidae            | Lophiodes           | Lophiodes monodi                 |
| Actinopterygii         | Lophiiformes           | Ogocephalidae        | Debranchus          | Debranchus atlanticus            |
| Actinopterygii         | Lophiiformes           | Ogocephalidae        | Haileutiya          | Haileutiya aculeatus             |
| Actinopterygii         | Lophiiformes           | Ogocephalidae        | Maltopsis           | Maltopsis gnomastes              |
| Actinopterygii         | Lophiiformes           | Ogocephalidae        | Ogocephalus         | Ogocephalus declivirostris       |
| Actinopterygii         | Myctophiformes         | Myctophidae          | Diaphus             | Diaphus selenops                 |
| Actinopterygii         | Myctophiformes         | Myctophidae          | Diaphus             | Diaphus effulgens                |
| Actinopterygii         | Myctophiformes         | Myctophidae          | Diaphus             | Diaphus garmani                  |
| Actinopterygii         | Myctophiformes         | Myctophidae          | Diaphus             | Diaphus lucidus                  |
| Actinopterygii         | Myctophiformes         | Neoscopelidae        | Neoscopelus         | Neoscopelus macrolepidotus       |
| Actinopterygii         | Myctophiformes         | Neoscopelidae        | Neoscopelus         | Neoscopelus microchir            |
| Actinopterygii         | Notacanthiformes       | Halosauridae         | Halosaurus          | Halosaurus guentheri             |
| Actinopterygii         | Notacanthiformes       | Halosauridae         | Halosaurus          | Halosaurus ovenii                |
| Actinopterygii         | Notacanthiformes       | Notacanthidae        | Notacanthus         | Notacanthus chemnitzii           |
| Actinopterygii         | Ophidiformes           | Bythitidae           | Calamoptyx         | Calamoptyx robinorum             |
| Actinopterygii         | Ophidiformes           | Bythitidae           | Diplocanthopoma     | Diplocanthopoma brachysoma       |
| Actinopterygii         | Ophidiformes           | Ophidiidae           | Benthocometes       | Benthocometes robustus           |
| Actinopterygii         | Ophidiformes           | Ophidiidae           | Monomitopus         | Monomitopus agassizii            |
| Actinopterygii         | Ophidiformes           | Ophidiidae           | Neobythites         | Neobythites gilli                |
| Actinopterygii         | Ophidiformes           | Ophidiidae           | Neobythites         | Neobythites marginatus           |
| Actinopterygii         | Osmeriformes           | Argentinidae         | Argentina           | Argentina striata                |
| Actinopterygii         | Perciformes            | Acropomatidae        | Caraihops           | Caraihops trispinosus            |
Appendix 3. Continued.

| Class                  | Order             | Family                  | Genus                  | Species                  |
|------------------------|-------------------|-------------------------|------------------------|--------------------------|
| Actinopterygii         | Perciformes       | Acropomatidae           | Synagrops              | Synagrops bellus         |
| Actinopterygii         | Perciformes       | Acropomatidae           | Verilus                | Verilus atlanticus       |
| Actinopterygii         | Perciformes       | Acropomatidae           | Verilus                | Verilus pseudomicrolepis |
| Actinopterygii         | Perciformes       | Bathyclupeidae          | Bathyclupea            | Bathyclupea argentea     |
| Actinopterygii         | Perciformes       | Bathyclupeidae          | Bathyclupea            | Bathyclupea schroederi   |
| Actinopterygii         | Perciformes       | Caproidae               | Antigonia              | Antigonia capros         |
| Actinopterygii         | Perciformes       | Caproidae               | Antigonia              | Antigonia combatia       |
| Actinopterygii         | Perciformes       | Carangidae              | Decapterus             | Decapterus tabl          |
| Actinopterygii         | Perciformes       | Carangidae              | Salar                  | Salar crumenophthalmus   |
| Actinopterygii         | Perciformes       | Epigonidae              | Epigonus               | Epigonus macrosp         |
| Actinopterygii         | Perciformes       | Epigonidae              | Epigonus               | Epigonus occidentalis    |
| Actinopterygii         | Perciformes       | Epigonidae              | Epigonus               | Epigonus pandonis       |
| Actinopterygii         | Perciformes       | Lutjanidae              | Pristipomoides         | Pristipomoides macrophthalus |
| Actinopterygii         | Perciformes       | Opistognathidae         | Lonchopisthias         | Lonchopisthias lemur     |
| Actinopterygii         | Perciformes       | Percophidae             | Bembrops               | Bembrops anatitans       |
| Actinopterygii         | Perciformes       | Percophidae             | Bembrops               | Bembrops gobioides       |
| Actinopterygii         | Perciformes       | Percophidae             | Bembrops               | Bembrops ocellatus       |
| Actinopterygii         | Perciformes       | Serranidae              | Bathythysin            | Bathythysin cebusiss     |
| Actinopterygii         | Perciformes       | Serranidae              | Hyporthodus             | Hyporthodus nigritos     |
| Actinopterygii         | Perciformes       | Symphysanodontidae      | Symphysanodon           | Symphysanodon berrys     |
| Actinopterygii         | Perciformes       | Trichiuridae            | Benthodesmus           | Benthodesmus simonyi     |
| Actinopterygii         | Perciformes       | Trichiuridae            | Benthodesmus           | Benthodesmus tenuis      |
| Actinopterygii         | Pleuronectiformes | Bothiidae               | Monolene               | Monolene megalopus       |
| Actinopterygii         | Pleuronectiformes | Bothiidae               | Monolene               | Monolene megalopus       |
| Actinopterygii         | Pleuronectiformes | Cynoglossidae           | Symphurus              | Symphurus marginals      |
| Actinopterygii         | Pleuronectiformes | Paralichthyidae         | Ancylotetta             | Ancylotetta cycloidea    |
| Actinopterygii         | Pleuronectiformes | Pleuronectidae          | Poecilopsetta           | Poecilopsetta bennisi    |
| Actinopterygii         | Pleuronectiformes | Pleuronectidae          | Poecilopsetta           | Poecilopsetta inermis    |
| Actinopterygii         | Polynemiformes    | Polyodontidae           | Polyneida              | Polyneida lowi           |
| Actinopterygii         | Scorpaeniformes   | Peristidae              | Peristion               | Peristion ecuadorens     |
| Actinopterygii         | Scorpaeniformes   | Peristidae              | Peristion               | Peristion gracile        |
| Actinopterygii         | Scorpaeniformes   | Peristidae              | Peristion               | Peristion greyae         |
| Actinopterygii         | Scorpaeniformes   | Peristidae              | Peristion               | Peristion longopapha     |
| Actinopterygii         | Scorpaeniformes   | Peristidae              | Peristion               | Peristion truncatum      |
| Actinopterygii         | Scorpaeniformes   | Scorpaenidae            | Neomerinthes           | Neomerinthes beaurum     |
| Actinopterygii         | Scorpaeniformes   | Scorpaenidae            | Pontina                 | Pontina nematopilinum    |
| Actinopterygii         | Scorpaeniformes   | Olerchidae              | Olerches               | Olerches guentheri       |
| Actinopterygii         | Stomiiformes      | Phosichthyidae          | Polypterus             | Polypterus corythaeola   |
| Actinopterygii         | Stomiiformes      | Phosichthyidae          | Polypterus             | Polypterus thaeocoryla   |
| Actinopterygii         | Stomiiformes      | Sternoptychidae         | Argyprinus             | Argyprinus atlanticus    |
| Actinopterygii         | Stomiiformes      | Sternoptychidae         | Argyroplecos           | Argyroplecos aculeatus   |
| Actinopterygii         | Stomiiformes      | Sternoptychidae         | Argyroplecos           | Argyroplecos gigas       |
| Actinopterygii         | Stomiiformes      | Sternoptychidae         | Maurolicus             | Maurolicus muelleri      |
| Actinopterygii         | Stomiiformes      | Sternoptychidae         | Polypterus             | Polypterus asteroides    |
| Actinopterygii         | Stomiiformes      | Sternoptychidae         | Polypterus             | Polypterus lateratus     |
| Actinopterygii         | Stomiiformes      | Stomiidae               | Chauboides             | Chauboides sloan         |
| Actinopterygii         | Tetraodontiformes | Triacanthoididae        | Parahollardia          | Parahollardia schmidtii  |
| Actinopterygii         | Zeiformes          | Grammocolepididae       | Xenolepidichthys       | Xenolepidichthys dalgiesti |
| Actinopterygii         | Zeiformes          | Parazeniidae            | Cyttopsis              | Cyttopsis rosea          |
Appendix 3. Continued.

| Class       | Order                        | Family       | Genus     | Species                      |
|-------------|------------------------------|--------------|-----------|------------------------------|
| Actinopterygii | Zeiformes                   | Zenionidae   | Zenion    | Zenion hololepis             |
| Elasmobranchii | Carcharhiniformes           | Scyliorhinidae | Scyliorhimus | Scyliorhinus boa            |
| Elasmobranchii | Rajiformes                  | Rajidae     | Breviraja | Breviraja spinosa           |
| Elasmobranchii | Rajiformes                  | Rajidae     | Dipturus  | Dipturus bullisi            |
| Elasmobranchii | Rajiformes                  | Rajidae     | Gargesiella | Gargesiella atlantica     |
| Holocephali  | Chimaeriformes              | Chimaeridae  | Hydrolagus | Hydrolagus alberti          |
| Myxini       | Myxiniformes                | Myxinidae   | Myxine    | Myxine mccoskeri            |