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Humann's Fairy-wrasse (*Cirrhilabrus humanni*), currently known only from Timor-Leste and nearby Alor, Indonesia.

Summary

- A list of fishes was compiled for 20 sites around Timor-Leste during August 2012. The survey involved approximately 75 hours of diving to a maximum depth of 70 m.
- The survey yielded a total of 741 species belonging to 61 families and 234 genera. In addition, 40 species not recorded during the present survey were noted by A.M. Ayling during a 2008 survey of the proposed Nino Konis Santana Marine Park and another 33 records were added by a September 2012 expedition from the Australian Museum. Therefore, the current known fish fauna of Timor-Leste includes 814 species.
- With the addition of historical records (123 species) from Timor-Leste and Indonesian West Timor, as well as Kupang market survey records (31 species) by B.C. Russell of the Western Australia Museum, the resultant total is raised to 968 reef fish species belonging to 316 genera and 88 families.
- A total of 275 species recorded during the current survey represent new records for the region of Timor-Leste and West Timor.
- A formula for predicting the total reef fish fauna based on the number of species in six key indicator families (Chaetodontidae, Pomacanthidae, Pomacentridae, Labridae, Scaridae, and Acanthuridae) indicates that at least 1232 species can be expected to occur in the region.

- Wrasses (Labridae), Damselfishes (Pomacentridae), and gobies (Gobiidae) are the dominant groups in the region in both number of species (104, 94, and 89 respectively) and number of individuals.

- Species numbers at visually sampled sites during the survey ranged from 66 to 294, with an average of 212. This is the second highest average (tied with Halmahera, eastern Indonesia) for any survey region to date anywhere on the globe. The top 7 sites recorded for reef fish diversity in Timor-Leste included Site 19 (Belio Barrier Reef, Pulau Atauro; 294 species); Site 4 (Loikere; 270 species); Site 11 (Ete Asa Lepek; 260 species); Site 9 (West Jako Island; 249 species); Site 16 (Tenu; 244 species); Site 13 (Com Deep Cave; 238 species); and Site 10 (Djonu Twin Rocks Tutuala; 237 species).

- 200 or more species per site is considered the benchmark for an excellent fish count. This total was achieved at 70 percent of the 2012 Timor-Leste sites - the highest percentage yet recorded by the authors anywhere in the world. Five of the seven highest species counts during the MRAP were recorded from sites within the NKS National Park.

- During the course of the survey, we photographed and collected three definite undescribed species (a damselfish in the genus *Chromis*, a goby in the genus Vanderhorstia, and a jawfish in the genus *Stalix* - noting that each of these have also been previously photographed in Indonesia) and three species that are potentially new (a dottyback in the genus *Labracinus*, another damselfish in the genus *Chromis*, and a damselfish in the genus *Chrysiptera*) but are currently being investigated with genetic techniques to determine if they do indeed represent distinct taxa. Moreover, we recorded at least 16 important range extensions of species previously not known or expected to occur in Timor-Leste - some having only been previously known from Brunei and the South China Sea. Included in these extensions are the following species: *Luzonichthys taeniatus, Pseudochromis pictus, Cirrhilabrus humanni, Cirrhilabrus tonozukai, Hoplolatilus chlupatyi, Chlorurus capistratoides, Pterapsaron longipinnis, Synchiropus tudorjonesi, Pseudanthias charlenae, Pomacentrus cheraphilus, Meiacanthus cyanopterus, Parapercis flavolineatus,* and *Trimma papayum.*

- Sharks, coral trout (*Plectropomus* species), and the highly threatened Napoleon Wrasse (*Cheilinus undulatus*) were rarely seen during the survey, an indication of significant fishing pressure and the urgent need for implementation of no-take zones within Timor-Leste's national MPA network for the purposes of fisheries replenishment.

- In summary, we were impressed with the extremely high within-site diversity of Timor-Leste's reefs, as well as the overall high diversity recorded. We have no doubt that additional survey work focused on the south coast as well as Pulau Atauro and other habitats not yet thoroughly sampled on the present MRAP would yield even more impressive diversity numbers (and likely new species and range extensions) for Timor-Leste. In the meantime, we recommend an initial focus on setting up well-enforced no-take zones and a broader zonation system with clear rules within the NKS National Park, as well as an initiative to gazette a new MPA at Pulau Atauro. We moreover note that Timor-Leste has excellent potential for development of marine tourism as a synergistic economic driver along with MPA implementation, whilst noting that it is important to set clear regulations from the outset that insure that local communities derive meaningful benefits from tourism in a way that encourages even better stewardship of their reefs.

Introduction

The East Indian Archipelago, extending from the Andaman Sea to the Solomon Islands and northward to the Philippines, is the world's premier area for marine biodiversity, mainly due to the extraordinary wealth of coral reef organisms. Allen and Erdmann (2012) recorded 2,631 species of reef fishes from this region, a total that is far richer than for any other major biological province. Although lying relatively close to the hypothetical centre of diversity, Timor-Leste represents a critical gap in our knowledge of this important region. Therefore, one of the primary goals of the current survey is to comprehensively document the reef fish fauna of an area that is expected to harbour a wealth of fishes, but has yet to be properly surveyed.The knowledge gained from the marine RAP should prove extremely valuable as a planning tool for future marine parks, as well as providing justification for those already established (e.g. Nino Santana National Park).

There is universal agreement that the centre of marine biodiversity is the Coral Triangle, an area composed of Sabah (Malaysian Borneo), Indonesia, Timor-Leste, Philippines, Papua New Guinea, and the Solomon Islands (Allen, 2008). This area contains a wealth of marine species that are most densely concentrated on coral reefs. Despite the contention that the Coral Triangle forms the heart of marine biodiversity, there is relatively poor documentation for most groups other than fishes and corals. There is also controversy regarding the precise limits of the Triangle and a lack of information that would allow the identification of the very richest faunal areas within the Coral Triangle. However, thanks to recent survey efforts by Conservation International and The Nature Conservancy, there is now a much better understanding of diversity levels within the proposed centre of the Triangle, which for fishes and corals at least appears to be centered on Halmahera and West Papua. The largest total to date is from the Raja Ampat Islands of West Papua where 1,472 species of reef fishes have been recorded to date (Allen & Erdmann, 2009 and continuing unpublished research). This number is especially remarkable considering the relatively small physical area occupied by this archipelago, which covers about 40,000 square kilometers.

Ichthyological Exploration of the Region of Timor-Leste & West Timor

There was minimal scientific interest in the fishes of Timor despite settlement by the Portuguese in 1852 and Dutch colonization beginning in 1653. However, this trend changed in the early nineteenth century during the great age of European exploration when ships regularly stopped at Kupang in order to replenish stores. Naturalists aboard these expeditions made some of the earliest known fish collections on the island. These specimens were eventually conveyed to Europe and were described by some of the great naturalists of the day.

The first recorded scientific collections of marine fishes from Timor were made by the French naturalist Françoise Péron who visited Kupang on board the Géographe between 21 August and 13 November 1801, and again between 6 May and 3 June 1803. Specimens collected by Péron were described by Cuvier and Valenciennes (1828-49). The naturalists Quoy and Gaimard aboard the French vessel Uranie also made collections of marine fishes during a visit to Kupang in 1818. An account of the fishes was given by Quoy and Gaimard (1824-25).

Timor was a focal point of major interest for Dutch scientist Pieter Bleeker (1819-1878) considered the grand master of East Indian ichthyology, based on his extensive publications and astute knowledge of the region's fishes. He was employed as an army medical officer during his tenure in Indonesia (1842-1860), based at Batavia (Jakarta). Although his own travels around the Indonesian Archipelago were limited, he had an excellent network of contacts that regularly sent specimens from remote government outposts. He devoted seven publications (Bleeker 1852, 1854, 1857, 1858, 1860 a & b, and 1863) to Timorese fishes. The first of these reported 32 species from the island and over the following 11 years the total was steadily increased to 312 species. Bleeker's Timor collections, which are now housed at Naturalis (formerly Rijksmuseum van Natuurlijke Histoire) in Leiden, Netherlands, originated from Kupang and Atapupu, (now Indonesian Timor) with the exception of six species from Dili.

Timor is the type locality for approximately 45 species, mostly described by Bleeker, Cuvier, Quoy and Gaimard, and Weber. Although many are now regarded as junior synonyms some are well known valid species including *Pseudechidna brummeri* (Muraenidae), *Cirrhitichthys aprinus* (Cirrhitidae), *Ostorhinchus wassinki* (Apogonidae), *Chaetodon ocellicaudus* (Chaetodontidae), *Chromis lepidolepis* (Pomacentridae), *Chrysiptera cyanea* and C. *unimaculata* (Pomacentridae), *Halichoeres timorensis* (Labridae), *Istigobius goldmanni* (Gobiidae), and *Naso annulatus* (Acanthuridae).

Other notable investigations included the Dutch Siboga Expedition in 1909 (Weber, 1913) and visits by the American Scripps Institution of Oceanography (*Argo* and *Naga* expeditions) between 1959 and 1961, which yielded collections of deepwater fishes. Barry Russell of the Northern Territory Museum, Darwin, Australia has long been interested in the fishes of the region and generously provided access to a manuscript currently in preparation that summarizes all historical records of Timor fishes as well as market sampling he conducted at Kupang in recent years, revealing a combined total of 614 species, representing 107 families. This total includes 462 reef-associated species with the remainder occurring either in fresh water, brackish estuaries, pelagic and deep sea habitats, and soft-bottom trawl grounds.

The only previous dive-based survey of Timor-Leste's reef fishes was conducted in November 2008 by Tony Ayling, a New Zealand marine biologist based in Australia. Ayling employed similar techniques as the present survey during an eight-day assessment of reef fishes of the proposed Nino Konis Santana Marine Park. A total of 410 species were recorded, but using a formula (CFDI, see below) based on the number of species in key indicator families, he estimated an overall total of 840 species.

Just two weeks after the present survey was completed, Timor-Leste was visited by a team from the Australian Museum in Sydney (AMS). A range of reef organisms were collected, including reef fishes. The preliminary results of this survey, including 216 species were kindly made available to us by Mark McGrouther of the Ichthyology Department of AMS and we have incorporated their additions in our list (Appendix Table 1).

Methods

The survey involved approximately 75 hours (two people) of scuba diving to a maximum depth of 70 m. A list of fishes was compiled for 20 sites (Appendix Table 1). The basic method consisted of underwater observations made usually during two, 60-100 minute dives at each site. The name of each observed species was recorded on an Excel spread sheet, using a master list of expected species from the region as a guide. The underwater technique usually involved rapid descent to 30-50 m, then a slow, meandering ascent back to the shallows. The majority of time was spent in the 5-12 m depth zone, which consistently harbors the largest number of species. Each dive included a representative sample of all major bottom types and habitat situations, for example rocky intertidal, reef flat, steep drop-offs, caves (utilizing a flashlight when necessary), rubble and sand patches. In addition to the routine inventory, we were especially vigilant for unusual/rare species, particularly in deeper sections of the reef (i.e. 30-50 m). Visual observations were supplemented with the occasional collection of cryptic, crevice-dwelling species with clove oil and rotenone. Spears were also employed for the collection of specimens of interest.

Only the names of fishes for which identification was absolutely certain were recorded. However, less than one percent of those observed could not be identified to species. This high level of recognition is based on combined diving experience (about 60 years) in the Indo-Pacific and an intimate knowledge of the reef fishes of this vast region as a result of extensive laboratory and field studies.

Results

In order to obtain a truly comprehensive list of Timor-Leste's reef fish resources we have combined the results of the current survey with several other data sources (Table 1): 1. A.M. Ayling 2008 survey of the proposed Nino Santana Marine Park; 2. September 2012 Australian Museum fish collecting expedition to Timor-Leste; 3. fish market records by B.C. Russell (Northern Territory Museum, Australia) from Kupang; 4. historical records of Timor fishes, chiefly by Bleeker (1852-1863) and Weber (1913) from Indonesian western Timor. Although Russell's fish market records and the majority of historical records are from western Timor, we predict that all of these species will eventually be recorded from Timor-Leste, and their incorporation with our data gives a much more accurate

assessment of the true fauna. The total reef fish fauna of the Timor-Leste and West Timor Region reported herein consists of 968 species belonging to 88 families and 316 genera (see Appendix Table 1). A total of 275 species observed during the current survey are new records for the region. Nearly every reef species from the region is discussed and illustrated by Allen & Erdmann (2012).

Table 1. Faunal elements of the region incorporated in this study.

Data Source	No. Spp
2012 CI MRAP survey	741
Ayling 2007 survey	40
Australian Museum Expedition 2012	33
B.C. Russell's Kupang market fishes	31
Historical records from literature	123
Current Total Fauna	968
General faunal composition	

The fish fauna of Timor-Leste consists mainly of species associated with coral reefs. The most abundant families in terms of number of species are wrasses (Labridae), damselfishes (Pomacentridae), gobies (Gobiidae), groupers (Serranidae), cardinalfishes (Apogonidae), butterflyfishes (Chaetodontidae), surgeonfishes (Acanthuridae), snappers (Lutjanidae), parrotfishes (Scaridae), and blennies (Blenniidae). These 10 families collectively account for 553 species or about 57 percent of the total reef fishes currently known from the region (Table 2).

Table 2. Most abundant families in the Greater Timor Region (Timor-Leste and Indonesian West Timor) and Timor-Leste.

Rank	Family	Species GTR	Species TL
1	Labridae	104	96
2	Pomacentridae	94	83
3	Gobiidae	89	77
4	Serranidae	60	50
5	Apogonidae	45	36
6	Chaetodontidae	36	35
7	Acanthuridae	35	33
8	Lutjanidae	33	23
9	Scaridae	30	28
10	Blenniidae	27	25

The relative abundance of Timor-Leste fish families is very similar to that found at other Indo-Pacific locations. Labridae, Pomacentridae, and Gobiidae are typically the most speciose families, although the order of these groups is variable according to location. Gobiidae is frequently the most abundant, which is not surprising given that approximately 600 species inhabit Indo-Pacific coral reefs.

The number of species found at each site during the 2012 survey is presented in Table 3. The total for each site ranged from 66 to 294, with an average of 212. This figure equals a previous survey of Halmahera as the second highest average for any survey region to date anywhere on the globe, with only the FakFak-Kaimana coastline of West Papua showing a higher average of 216 species (see Table 4).

Table 3. Number of fish species observed per site during 2012 Timor-Leste MRAP.

Site	Species	Site	Species	Site	Species	Site	Species
1	104	7	230	13	238	20	218
2	220	8	167	15	213	21	227
3	163	9	249	16	244		
4	270	10	237	17	201		
5	226	11	260	18	182		
6	199	12	66	19	294		

Two hundred or more species per site is considered the benchmark for an excellent fish count. This total was achieved at 70 percent of sites during the present survey - the highest percentage yet recorded by the authors anywhere in the world. Table 4 presents a comparison of various locations in the Coral Triangle that have been surveyed by the authors in recent years.

Table 4. Comparison of site data for marine surveys in the Coral Triangle 1997-2012.

Location	No. sites	Average spp./site	No. 200+ sites	Most spp. one site
Fak Fak-Kaimana Coast, W. Papua, Indonesia (CI 2006)	34	216	21 (62 %)	335
Timor-Leste (2012)	**20**	**212**	**14 (70 %)**	**294**
Halmahera, Indonesia (combined 2005/2008)	52	212	36 (69 %)	304
Milne Bay, PNG (CI 1997 and 2000)	110	192	46 (42 %)	270
Bird's Head, W. Papua, Indonesia (1998-2006)	161	189	83 (52 %)	335
NE Kalimantan (TNC 2003)	42	187	18 (43 %)	273
Solomon Islands (TNC 2004)	65	185	37 (57 %)	279
Raja Ampat Islands, W. Papua (CI 2001 and TNC 2002)	95	184	49 (52 %)	284
Cenderawasih Bay, W. Papua, Indonesia (CI 2006)	32	175	12 (38 %)	257
Togean/Banggai Is., Sulawesi (CI 1998)	47	173	9 (19 %)	266
Calamianes Is., Philippines (CI 1998)	21	158	4 (10.5 %)	208
Bali, Indonesia (CI 2011)	29	153	6 (21 %)	244
Anambas Islands, Indonesia (CI 2012)	20	149	2 (10 %)	240
Brunei (2008/2009)	33	123	0	186

Coral and rocky reefs were by far the richest habitats in terms of fish biodiversity. The best sites for fishes were invariably locations that harboured a rich community in relatively shallow water (> 15 m) as well as a steep outer reef slope affected by periodic strong currents. Coral reef was invariably the dominant substratum, although there was usually a mixture of other bottom types, particularly sand or rubble. Weed or seagrass habitat (e.g. site 12 at Com) and pure sand-rubble areas were comparatively poor for fishes, but were the home of a unique community of fishes, generally not seen elsewhere. Silty bays and harbors (e.g. site 18 at the Lamsana inlet or Manatuto River outlet) also had impoverished fish communities, although several species were unique to this environment.

The richest sites for fish diversity are indicated in Table 5. The outer barrier reef site at Atauro Island was the richest location and this island holds great promise for boosting Timor-Leste's fish total if further surveys are conducted. All but one of the remaining top sites are located within Nino Konis Santana National Park.

Table 5. Richest sites for fishes during 2012 survey of Timor-Leste.

Site No.	Location	Total fish spp.
19	Belio Outer Barrier Reef (Atauro Island)	294
4	Loikere	270
11	Ete Asa Lepek	260
9	West Jako Island	249
16	Tenu	244
13	Com Outer Reef	238
10	Djonu Twin Rocks	237

Coral Fish Diversity Index (CFDI)

In response to the need for a convenient method of assessing and comparing overall coral reef fish diversity between areas in the Indo-Pacific region the author (see Allen and Werner, 2002) has devised a rating system based on the number of species present belonging to the following six families: Chaetodontidae, Pomacanthidae, Pomacentridae, Labridae, Scaridae, and Acanthuridae. These families are particularly good indicators of overall fish diversity for the following reasons:

- They are taxonomically well documented.
- They are conspicuous diurnal fishes that are relatively easy to identify underwater.
- They include the "core" reef species, which more than any other fishes characterize the fauna of a particular locality. Collectively, they usually comprise more than 50 percent of the observable fishes.
- The families, with the exception of Pomacanthidae, are consistently among the 10 most speciose groups of reef fishes inhabiting a particular locality in the tropical Indo-west Pacific region.
- Labridae and Pomacentridae in particular are very speciose and utilize a wide range of associated habitats in addition to coral-rich areas.

The method of assessment consists simply of counting the total number of species present in each of the six families. It is applicable at several levels:

- single dive sites
- relatively restricted localities such as the southwestern Halmahera
- countries, major island groups, or large regions

CFDI values can be used to make a reasonably accurate estimate of the total coral reef fish fauna of a particular locality by means of a regression formula. This feature is particularly useful for large regions, such as the Philippines, where reliable totals are lacking. Because the CFDI groups can be comprehensively documented over a short period of time (usually about two weeks for areas such as Timor-Leste), the CFDI predictor value can be used to gauge the thoroughness of a particular short-term survey that is either currently in progress or already completed.

The above-mentioned regression formula was obtained from an analysis of 35 Indo-Pacific locations that have been comprehensively studied and for which reliable species lists exist. The data were first divided into two groups: those from relatively restricted localities (surrounding seas encompassing less than 2,000 km2) and those from much larger areas (surrounding seas encompassing more than 50,000 km2). Simple regression analysis revealed a highly significant difference (P = 0.0001) between these two groups. Therefore, the data were separated and subjected to an additional analysis. The Macintosh program Statview was used to perform simple linear regression analyses on each data set in order to determine a predictor formula, using CFDI as the predictor variable (x) for estimating the independent variable (y) or total coral reef fish fauna. The resultant formulae were obtained: 1. total fauna of areas with surrounding seas encompassing more than 50,000 km2 = 4.234(CFDI) - 114.446 (d.f = 15; R2 = 0.964; P = 0.0001); 2. total fauna of areas with surrounding seas encompassing less than 2,000 km2 = 3.39 (CFDI) - 20.595 (d.f = 18; R2 = 0.96; P = 0.0001).

The following CFDI values were obtained for the region (Timor-Leste and Indonesian West Timor), after combining the results of our survey with those of other recent efforts (Russell fish market records, Ayling 2007 and 2012 Australian Museum) and old historical records (primarily Bleeker and Weber): Chaetodontidae (36), Pomacanthidae (19), Pomacentridae (94), Labridae (104), Scaridae (30), and Acanthuridae (35). The total CFDI (318) was then used to predict the expected species total with the following formula: total expected fauna = 4.234 (318) – 114.446. Therefore, the expected total species for the region is 1232 species. The CFDI method is especially useful when time is limited and there is heavy reliance on visual observations, as was the case for the present survey.

Table 6 presents a comparison of the Timor-Leste and West Timor region with various Indo-west and central Pacific locations that were surveyed by the author or colleagues.

Table 6. Coral fish diversity index (CFDI) values for selected localities in the Indo-west Pacific region. The total number of fishes thus far recorded from each region and estimated total based on the CFDI regression formula (see text for details) are also indicated.

Locality	CFDI	No. reef fishes	Estim. reef fishes
Raja Ampat Islands, Indonesia	374	1471	1469
Bali and Nusa Penida, Indonesia	339	1022	1320
Milne Bay Province, Papua New Guinea	333	1109	1313
Maumere Bay, Flores, Indonesia	333	1111	1108
Halmahera, Indonesia	327	974	1271
Fakfak-Kaimana, W. Papua, Indonesia	322	1007	1249
Timor-Leste and West Timor	**318**	**967**	**1232**
Berau, E. Kalimantan, Indonesia	316	875	1051
Togean and Banggai Islands, Indonesia	308	819	1190
Cenderawasih Bay, W. Papua, Indonesia	308	1002	1190
North Sulawesi, Indonesia	307	967	1020
Solomon Islands	301	1019	1160
Calamianes Islands-N. Palawan, Philippines	292	1003	1122
Komodo Islands, Indonesia	280	722	929
Yap State, Micronesia	280	787	929
Verde Passage, Luzon, Philippines	278	750	922
Sabah, Malaysia	275	865	1050
Madang, Papua New Guinea	257	787	850
Kimbe Bay, Papua New Guinea	254	687	840
Capricorn Group, Great Barrier Reef	232	803	765
Brunei, Darussalam	230	673	759
Chuuk State, Micronesia	230	615	759
Western Thailand (Andaman Sea)	226	775	843
Ashmore/Cartier Reefs, Timor Sea	225	669	742
Kashiwa-Jima Island, Japan	224	768	738
Scott/Seringapatam Reefs, Western. Australia	220	593	725
Anambas Islands, Indonesia	216	667	801
Samoa Islands	211	852	694
Chesterfield Islands, Coral Sea	210	699	691
Christmas Island, Indian Ocean	204	592	671
Pohnpei and nearby atolls, Micronesia	202	470	664
Layang Layang Atoll, Malaysia	202	458	664
Andaman Islands	200	535	732
Bodgaya Islands, Sabah, Malaysia	197	516	647

Table 6. (continued)

Locality	CFDI	No. reef fishes	Estim. reef fishes
Pulau Weh, Sumatra, Indonesia	196	533	644
Izu Islands, Japan	190	464	623
Sipadan Island, Sabah, Malaysia	184	492	603
Rowley Shoals, Western Australia	176	505	576
Cocos-Keeling Atoll, Indian Ocean	167	528	545
North-West Cape, Western Australia	164	527	535
Lord Howe Island, Australia	139	395	450
Monte Bello Islands, W. Australia	119	447	382
Bintan Island, Indonesia	97	304	308
Kimberley Coast, Western Australia	89	367	281
Cassini Island, Western Australia	78	249	243
Johnston Island, Central Pacific	78	227	243
Midway Atoll	77	250	240
Rapa	77	209	240
Norfolk Island	72	220	223

The Timor-Leste Reef Fish Community

As mentioned above, the fish community is dominated by relatively few families, which is a typical situation on reefs throughout the Indo-Pacific region. However, the fish fauna of Timor-Leste represents a mixture of species that form a unique community when compared to other locations in the greater East Indian region. Several families in particular are very well represented on Timor-Leste's reefs, including fairy basslets (Serranidae, subfamily Anthiinae), dottybacks (Pseudochromidae), tilefishes (Malacanthidae), butterflyfishes (Chaetodontidae), damselfishes (Pomacentridae), and wrasses (Labridae).

Dramatically contrasting with the situation described in the previous paragraph, there were many species that were conspicuous by their scarcity or absence compared to most areas in the species-rich Coral Triangle. The latter group includes coral trouts (Serranidae; genus *Plectropomus*), lagoon-dwelling cardinalfishs (Apogonidae), trevallies (Carangidae), parrotfishes (Scaridae), blennies (Blenniidae), rabbitfishes (Siganidae), reef-frequenting tunas (Scombridae), and puffers (Tetraodontidae).

There was also a general lack of large commercial species, including sharks and Napoleon Wrasse (*Cheilinus undulatus*). Aside from a single sighting of a large stingray (*Taeniura myeni*), occasional sightings of certain carangids and a few sharks, large fishes were conspicuously absent at most sites. Although this trend, which is generally a direct indication of over fishing, is typical of the entire South-East Asian region, it was particularly evident at the sites surveyed at Timor-Leste.

A notable feature of Timor-Leste's reef fish fauna is the very high degree of homogeneity in species composition at the survey sites, which is a general reflection of habitat homogeneity. Typically, the survey sites consisted of a shallow, shoreline fringing reef, gradually sloping seaward to the edge of the outer slope. Due to this high degree of habitat homogeneity a suite of certain species were commonly found at most sites. For example, 87 species (12 %) were present at 75 % of sites and 41 of these (Table 7) occurred at 90 % of sites.

Table 7. Most commonly observed reef species at Timor-Leste (seen at 90% or more of total dive sites).

Species	% Sites	Species	% Sites
Pseudanthias huchtii	100.0	*Variola albimarginata*	90.0
Dascyllus trimaculatus	100.0	*Chaetodon kleini*	90.0
Lutjanus carponotatus	95.0	*Chaetodon vagabundus*	90.0
Lutjanus decussatus	95.0	*Centropyge vroliki*	90.0
Scolopsis bilineatus	95.0	*Chromis ternatensis*	90.0
Parupeneus multifasciatus	95.0	*Neoglyphidodon nigroris*	90.0
Forcipiger flavissimus	95.0	*Plectroglyphidodon lacrymatus*	90.0
Heniochus varius	95.0	*Pomacentrus coelestis*	90.0
Centropyge bicolor	95.0	*Pomacentrus lepidogenys*	90.0
Centropyge tibicen	95.0	*Pomacentrus philippinus*	90.0
Amblyglyphidodon leucogaster	95.0	*Bodianus dyctynna*	90.0
Amphiprion clarkii	95.0	*Coris gaimardi*	90.0
Dascyllus reticulatus	95.0	*Gomphosus varius*	90.0
Pomacentrus amboinensis	95.0	*Thalassoma amblycephalum*	90.0
Labroides bicolor	95.0	*Parapercis clathrata*	90.0
Labroides dimidiatus	95.0	*Zanclus cornutus*	90.0
Thalassoma lunare	95.0	*Ctenochaetus striatus*	90.0
Balistapus undulatus	95.0	*Zebrasoma scopas*	90.0
Lutjanus gibbus	90.0	*Odonus niger*	90.0
Sargocentron caudimaculatum	90.0	*Sufflamen bursa*	90.0

Zoogeographic Affinities of the Timor-Leste Fish Fauna

Timor-Leste belongs to the overall Indo-west Pacific faunal community. Its reef fishes are very similar to those inhabiting other areas within this vast region, stretching eastward from East Africa and the Red Sea to the islands of Micronesia and Polynesia. Although most families, and many genera and species are consistently present across the region, the species composition varies greatly according to locality.

Timor-Leste is part of the Indo-Australian region, the richest faunal province on the globe in terms of biodiversity. The nucleus of this region, or Coral Triangle, is composed of Indonesia, Timor-Leste, Philippines and Papua New Guinea. Species richness generally declines with increased distance from the Triangle, although the rate of attenuation is generally less in a westerly direction. The damselfish family Pomacentridae is typical in this

regard. For example, Indonesia has the world's highest total with 138 species, with the following totals recorded for other areas (Allen, 1991): Papua New Guinea (109), northern Australia (95), W. Thailand (60), Fiji Islands (60), Maldives (43), Red Sea (34), Society Islands (30), and Hawaiian Islands (15). Damselfishes also provide evidence that Timor is very close to the much-debated center of marine diversity. Its total of 94 species is one of the highest recorded for any similar-sized area in the world, being surpassed only by various Indonesian locations including the Raja Ampat Islands (114 species), Cenderawasih Bay (100 species), and far northern Sulawesi (95 species). There are very few countries that can match these totals.

The reef fish fauna of Timor-Leste no doubt shares a very similar zoogeographic composition with that of the Raja Ampat Islands, Indonesia, which was recently analyzed by Allen (unpublished). The vast majority (about 60 %) of species have wide-ranging distributions in the Indo-Pacific region. A further 17 percent are widely distributed in the tropical west Pacific. Twenty percent have a more restricted regional distribution that is confined to the Indo-Australian Archipelago, of which Timor-Leste forms an integral part.

The large number of widely distributed species is not surprising considering that most coral reef fishes have a pelagic larval stage of variable duration. Dispersal capabilities and length of larval life of a given species are usually reflected in its geographic distribution.

There is little evidence of strict endemism among Timor-Leste reef fishes, which is understandable considering the close proximity to Indonesia's Lesser Sunda islands, particularly Alor, and the strong currents that provide connectivity between them. We did however record range extensions of a number of fishes previously considered to be endemic to the Lesser Sundas. Good examples of this include the wrasse *Cirrhilabrus humanni* and the dottyback *Pseudochromis pictus*, both of which are currently known only from Timor-Leste and nearby Alor. Similarly, the recently described fang blenny *Meiacanthus cyanopterus*, previously known from Bali to Alor, was also recorded in Timor-Leste, while several likely new species that we have also recorded from Bali were also recorded from Timor-Leste (see below section). These instances of Lesser Sunda endemic fishes being recorded from Timor-Leste provides strong support for the inclusion of Timor-Leste in the Lesser Sundas marine ecoregion.

New or Rare Species and Notable Range Extensions

The following section contains brief accounts of recorded species that are either potentially new, relatively rare, or represent significant range extensions.

We note that it is increasingly difficult to find new reef fish species at depths less than 40-50 m, mainly due to the widespread use of scuba gear in the Indo-Malayan region over the past few decades. Judging from our experience, normally 1-2 new species can be expected during a typical 2-week long survey. The recent spate of more than 20 new species from the Bird's Head Peninsula of western New Guinea is atypical in this respect and is due to the remote location (hence few previous biological explorations) and unique tectonic history that has resulted in isolation events and subsequent speciation (Allen and Erdmann, 2012).

The present Timor-Leste MRAP survey resulted in a number of exciting records, including both new species and significant range extensions. Some of the more notable include:

Chromis species 1 (Pomacentridae)

This striking fish is characterized by a light blue body with brilliant yellow pelvic, anal, and soft dorsal fins. The caudal fin has a similar yellow streak on the outer edge of each lobe. The species, which likely represents an undescribed taxon, is also known from Nusa Penida Island, Indonesia. The maximum known size is only about 4.5 cm TL, indicative of a juvenile stage. It probably grows to a larger size, but adults have not been observed. The species occurs on steep outer slopes in about 70 m depth. Two specimens were collected at Com (site 4) and it was also observed at sites 10, 11 and 15.

Chromis species 2 (Pomacentridae)

This species is very similar in general appearance to *Chromis* species 1, but differs in having entirely blue pelvic and anal fins rather than yellow fins. It is also differentiated by a small dark spot on the upper pectoral-fin base. A single specimen, approximately 4.5 cm TL was collected at Pulau Atauro (site 19) in 55 m depth. It is possibly the juvenile stage of a deep-water species such as C. earina, or may represent yet another undescribed species. Further investigation of this species at Atauro is needed to gain further insight on its status.

Chrysiptera species (Pomacentridae)

This damselfish was previously identified as C. rex, but our genetic studies indicate this taxon is probably divisible into at least four distinct species. The Timor-Leste population belongs to a clade that inhabits the Java Sea and Lesser Sunda Islands. We collected tissue samples and voucher specimens, which hopefully will help elucidate the status of the Indonesian and Timor-Leste populations. The species inhabits surge channels and reef areas exposed to mild wave action in about 2-5 m depth. The maximum size is about 7 cm TL.

Vanderhorstia species (Gobiidae)

A single specimen of this shrimp goby was collected near the Com Harbour jetty in an area mainly covered by seagrass. The species was previously known only on the basis of underwater photographs from Bali and the Ryukyu Islands. It was illustrated by Allen & Erdmann (2012) as *Vanderhorstia* species 1. It inhabits sand bottoms at depths between 1-15 m and is reported to attain 6 cm TL.

Stalix species (Opistognathidae)

This is an inhabitant of sandy substrates that lives in burrows. Four specimens were collected in 20 m depth at Hera (site 1). It was also recently collected by us at the Anambas Islands, Indonesia. This undescribed species is similar to S. eremia, known on the basis of a single specimen from Madang, Papua New Guinea. The Anambas and Timor-Leste fish appears to differ in having a vivid yellow/orange marking anteriorly on the dorsal fin. Specimens were sent to opistognathid expert William Smith-Vaniz, who has confirmed this is a new species and is planning to describe it in an upcoming revision of the genus.

Labracinus species (Pseudochromidae)

This species was formerly identified as *Labracinus cyclophthalmus* (Muller & Troschel, 1849), but preliminary genetic investigations indicate this species is divisible into several cryptic taxa, each with highly restricted geographic ranges. For example, populations from Nusa Penida and Komodo in the Lesser Sunda Group of Indonesia appear to be different from those from the Raja Ampat Islands. We collected specimens and genetic samples of the Timor-Leste fish and are awaiting the results of a comparative analysis with other geographic populations. The species generally reaches a maximum TL of about 23.5 cm, but populations from Timor-Leste, Komodo, and Nusa Penida are considerably smaller, usually not exceeding about 12-15 cm TL. While the Timor-Leste fish resembles the Komodo and Nusa Penida populations in its smaller size, its colouration is yet again subtly distinctive and we're awaiting the results of genetic analysis to determine the status of this taxon. The habitat consists of live coral reefs next to shore in about 2-5 m depth.

Luzonichthys taeniatus Randall & McCosker, 1992 (Serranidae)

This rare species was formerly known only from the Lucipara Islands, Indonesia. It was relatively common at Timor-Leste on steep outer reef slopes in about 20-50 m depth. The species reaches a maximum size of about 7 cm TL.

Pseudochromis pictus Gill & Randall, 1998 (Pseudochromidae)

This rare dottyback was previously known only on the basis of two specimens from Alor Island, Indonesia. It was photographed and collected on the outer reef slope in 38 m depth at Lamsana Inlet West (site 18). The habitat consists of isolated coral and rock outcrops on relatively steep slopes. It reaches a maximum size of at least 8.3 cm TL.

Cirrhilabrus humanni Allen & Erdmann, 2012 (Labridae)

This recently described species was previously known only from Pura Island, Indonesia, where it is relatively uncommon. In contrast, it was found at the majority of sites at Timor-Leste, usually in large numbers. The typical habitat consists of outer reef slopes on rubble bottoms in 10-45 m depth. The maximum size is about 7 cm TL.

Cirrhilabrus tonozukai Allen & Kuiter, 1999 (Labridae)

This beautiful wrasse was previously known from Palau and Indonesian localities, including Raja Ampat, eastern Sulawesi, and Halmahera. A single male individual was photographed in 15 m depth at Atauro Island, which represents a significant southerly extension of the geographic range.

Hopololatilus chlupatyi Klausewitz, McCosker, Randall & Zetzsche, 1978 (Malacanthidae)

Although widely distributed in Indonesia (Bali to Banda Sea) and the Philippines, this species has rarely been photographed alive in its natural habitat. Fortunately this task was successfully achieved by MVE at Djonu Twin Rocks (site 10) in 70 m depth. The species generally occurs in pairs that occupy burrows on rubble bottoms. It is known in the marine aquarium trade as the "chameleon tilefish" due to its ability to rapidly change colours; this initially led us to believe this fish might be a new species but subsequently we've determined it to be *H. chlupatyi.*

Chlorurus capistratoides (Bleeker, 1847) (Scaridae)

This parrotfish was previously believed to be confined to the Indian Ocean, but recent surveys by the authors have considerably expanded the distribution eastward with sightings at the Anambas Islands, Sumatra, and Bali (Indonesia), Brunei, and northern Palawan (Philippines). Several individuals were sighted (and photographed) on shallow reefs during the current survey, representing the easternmost known extent of its range.

Pteropsaron longipinnis Allen & Erdmann, 2012 (Trichonotidae)

This minute (to about 3.3 cm TL) sand-diver inhabits sand/rubble bottoms of outer reef slopes in 70-75 m. It was previously known only from specimens collected by Mark Erdmann at Cenderwasih Bay, West Papua and Lembata (Alor Group), both in Indonesia. Several individuals were sighted (one collected) during the present survey at sites 10 and 15, and the first ever in situ photos were obtained of this species - also allowing us to verify that it frequently hovers and uses its elongate pelvic fins in a tripod-like fashion to support itself

Synchiropus tudorjonesi Allen and Erdmann, 2012 (Callionymidae)

A striking dragonet previously known only from deep reefs (60-70m) of West Papua and Bali. We recorded this from 65m at Atauro Island. Importantly, this fish had never been photographed live and displaying its dorsal fin, which is an important colour character.

Pseudanthias charlenae Allen and Erdmann, 2008 (Serannidae)

A colourful fairy basslet from depths of 50-70m in areas of strong currents; we recorded this again at Pulau Atauro. As with the above dragonet, previously this fish was only known from West Papua and Bali.

Pomacentrus cheraphilus Allen, Erdmann and Hiloman, 2011 (Pomacentridae)

This relatively drab damselfish inhabits silty reefs, and was recorded in Timor-Leste from only one site (Site 1, Hera West). This represents perhaps the most interesting range extension we recorded; previously this species was known only from Brunei and Palawan (Philippines).

In addition to the abovementioned range extensions, we also recorded six additional extensions for which we do not have photographs. These include:

1. *Lutjanus* sp. A beautiful red snapper with yellow fins that is currently in the process of being described and was previously only known from West Papua, Papu New Guinea and the Solomons (recorded only at Site 3, Com).
2. *Opistognathus* sp. An undescribed jawfish previously only known from Bali and Brunei; recorded here from Site 18 (Lamsana Inlet West).
3. *Pseudochromis* sp. 2. A grey coloured dottyback found living upside down in deep caves and overhangs, previously known only from Raja Ampat, recorded here at Atauro Island.
4. *Meiacanthus cyanopterus* Smith-Vaniz and Allen, 2011. A deep-dwelling fang blenny normally seen in 50-70m depths; known as a Lesser Sunda endemic species found from Bali to Alor. Recorded in the Timor-Leste MRAP at Site 10.
5. *Parapercis flavolineatus* Randall, 2008. A sand-dwelling grubfish found typically below depths of 60m and previously known only from North Sulawesi and Bali; recorded in this MRAP at sites 10, 11, 15, 18, and 19.
6. *Trimma papayum* Winterbottom, 2011. A beautiful little coral goby with orange spots, normally found below 40m depth. Previously known from Flores, Alor, and Raja Ampat; recorded in Timor-Leste at Site 17 (Lamsana Inlet East).

Conservation Potential and Future Surveys

The present MRAP survey shows that Timor-Leste has a rich and varied reef fish fauna, which is justifiably an integral part of the Coral Triangle, the world's richest region for marine biodiversity. Particularly impressive was the consistently high species counts for individual dive sites, resulting in the second highest average count (212 species) for anywhere sampled thus far in the Indo-Pacific region.

Using the CFDI methodology for predicting overall faunal totals we estimate that at least 1,232 species will eventually be recorded for the region and most of these could be expected at Timor-Leste. The current total for Timor-Leste is 814 reef fish species, but with several more weeks of survey effort there is a good possibility that a total of more than 1000 species could be achieved. This total would elevate the country to the world's elite group that have an excess of 1,000 coral reef fishes. Allen (2008) provided details of the exclusive "1000 species club", which contains Indonesia, Australia, Philippines, Papua New Guinea, Malaysia, Japan, Taiwan, Solomon Islands, Palau, Vanuatu, Fiji, New Caledonia, and the Federated States of Micronesia.

The area certainly holds great promise for conservation action, and hopefully our survey efforts will attract attention to the outstanding reef resources and act as a catalyst for additional surveys and more focused conservation action. Timor-Leste can be congratulated for already taking the initiative of declaring a significant portion of its coastline as a national park. Our survey indicates that the Nino Konis Santana National Park area was wisely selected and holds great promise as a major re-seeding area and refuge. Several sites including Jako Island, Hilapuna, and Djonu Twin Rocks (site 10) seem particularly well suited for designation as "no take zones". Indeed, the entire coastline from Tutuala to Jako Island would constitute an optimally-sized no-take area for fisheries replenishment purposes; we of course are not familiar with the local cultural situation to know if this is feasible, but recommend consideration of this entire area as a large no-take area.

While the NKS National Park represents an outstanding anchor site for the nascent Timor-Leste MPA network, we feel strongly that Atauro Island is strongly deserving of focused conservation initiatives in the near future. Though we only made 4 dives in a 1.5 day period, the island showed tremendous diversity (Site 19, the Belio Barrier Reef, had the highest diversity of any site during the MRAP at 294 species), and many of the species recorded there were not seen at any other sites. Of particular conservation interest were the lagoonal habitats near Bello Harbour (eg, Sites 21 and 22); this important habitat type was absent from Nino Konis Santana National Park and most of the other sites we surveyed. As such, in order to protect a representative sample of Timor-Leste's marine habitats (and in so doing also ensure the long-term viability of populations of the greatest diversity of fishes and other organisms), we strongly recommend the development of an MPA at Pulau Atauro in the near future.

Predictably, we detected signs of intense fishing pressure on many reefs, which is the norm throughout the Coral Triangle region. For example, we frequently witnessed previously bomb-damaged reefs and rarely saw large groupers and sharks.

The Napoleon Wrasse ranges throughout the Indo-west and central Pacific and commands a huge price in the Asian live-fish trade. It is one of the largest reef fishes, reaching a length of 230 cm and weight in excess of 190 kg. Sadly, this fish has been fished to dangerously low levels throughout the Coral Triangle, where it was formerly common. The species is an excellent indicator of fishing pressure. During the current survey only four individuals were seen with an average size of about 45 cm. No juveniles were seen during dives on sheltered inshore reefs, which is the typical habitat for young fish. This paucity of small fish may well indicate a lack of recruitment due to dangerously low population levels of adult fish.

Table 8 presents a comparison of sightings on various rapid assessment surveys between 1997 and 2012. By far the highest concentrations of this fish have been noted at the Phoenix Islands in the central Pacific, where there is an almost negligible human population and vast areas of nearly pristine reefs (although the reefs were severely affected by coral bleaching in 2002).

Table 8. Frequency of Napoleon Wrasse (Cheilinus undulatus) recorded during surveys of various locations in the Indo-Pacific (G. Allen data).

Location	No. sites where seen	% of total sites	Approx. no. seen
Phoenix Islands, Kiribati - 2002	47	83.92	412
Pohnpei, Micronesia - 2005	28	68.29	63
Milne Bay, PNG – 1997	28	52.83	85
Yap, Micronesia - 2007	23	50.00	47
Milne Bay, PNG – 2000	28	49.12	90
Northern Halmahera, Indonesia - 2008	8	33.33	11
Timor-Leste - 2012	**4**	**20.00**	**4**
Raja Ampat Islands, Indonesia – 2001	7	15.55	7
Southwestern Halmahera, Indonesia - 2005	4	14.28	4
Togean/Banggai Islands, Indonesia – 1998	6	12.76	8
Calamianes Is., Philippines – 1998	3	7.89	5
Brunei – 2008 & 2009	1	2.72	1
Anambas Islands, Indonesia - 2012	1	0.05	1
Weh Island, Sumatra, Indonesia – 1999	0	0.00	0

In summary, we were impressed with the extremely high within-site diversity of Timor-Leste's reefs, as well as the overall high diversity recorded. We have no doubt that additional survey work focused on the south coast as well as Pulau Atauro and other habitats not yet thoroughly sampled on the present MRAP would yield even more impressive diversity numbers (and likely new species and range extensions) for Timor-Leste. In the meantime, we recommend an initial focus on setting up well-enforced no-take zones and a broader zonation system with clear rules within the NKS National Park, as well as an initiative to gazette a new MPA at Pulau Atauro. We moreover note that Timor-Leste has excellent potential for development of marine tourism as a synergistic economic driver along with MPA implementation, whilst noting that it is important to set clear regulations from the outset that insure that local communities derive meaningful benefits from tourism in a way that encourages even better stewardship of their reefs.

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Annex 1: List of the Reef Fishes of Timor-Leste

This list includes all species of shallow (to 70 m depth) coral reef fishes recorded from the region covering Timor-Leste and Indonesian West Timor from the following sources:

1. 2012 Timor-Leste CI Marine RAP
2. Additional historical records, mainly from Indonesian Timor indicated by single asterisk (*)
3. Additional B.C. Russell records from Kupang fish market indicated by double asterisk (**)
4. Additional records from 2008 A.M. Ayling Survey of proposed Nino Konis Santana Marine Park
5. Additional records from 2012 Australian Museum (AMS) Timor-Leste Expedition.

The phylogenetic sequence of the families appearing in this list follows Eschmeyer (Catalog of Fishes, California Academy of Sciences, 1998) with slight modification. Genera and species are arranged alphabetically within each family. New records (not recorded in 2-4 above) for the region are indicated by blue highlight.

Column A : Historical Records
Column B : Ayling 2008
Column C : AMS 2012

Column PS : Present Survey
Column MAA : MRAP+Ayling+ AMS
Column TL & WT : Timor-Leste & West Timor

Family & Species	A	B	C	Site																				PS	MAA	TL & WT
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
GINGLYMOSTOMATIDAE (1 SPP.)																										
Nebrius ferrugineum		1														1								1	1	1
SCYLIORHINIDAE (1 SPP.)																										
Atelomycterus marmoratus*	1																							0	0	1
CARCHARHINIDAE (3 SPP.)																										
Carcharhinus amblyrhynchos		1														1								1	1	1
Carcharhinus melanopterus		1										1												1	1	1
Triaenodon obesus		1							1			1	1			1								1	1	1
SPHYRNIDAE (1 SPP.)																										
Sphyrna zygaena*	1																							0	0	1
RHYNCHOBATIDAE (1 SPP.)																										
Rhynchobatus australiae*	1																							0	0	1
DASYATIDAE (4 SPP.)																										
Himantura uarnak		1																						0	1	1
Neotrygon kuhlii		1			1				1		1													1	1	1
Taeniura lymma		1			1				1			1							1					1	1	1
Taeniura meyeni																1								1	1	1
MYLIOBATIDAE (1 SPP.)																										
Aetobatis narinari		1																						0	1	1
MOBULIDAE (1 SPP.)																										
Manta birostris														1										1	1	1
MORINGUIDAE (3 SPP.)																										
Moringua abbreviata*	1																							0	0	1
Moringua bicolor*	1																							0	0	1
Moringua javanica*	1																							0	0	1
MURAENIDAE (20 SPP.)																										
Echidna amblyodon*	1																							0	0	1
Echidna nebulosa*	1																							0	0	1
Echidna polyzona*	1																							0	0	1
Enchelycore canina*	1																							0	0	1
Gymnomuraena zebra*	1																							0	0	1
Gymnothorax buroensis			1																			1		1	1	1
Gymnothorax javanicus		1				1			1															1	1	1
Gymnothorax moluccensis											1													1	1	1
Gymnothorax pictus*	1																							0	0	1
Gymnothorax richarsonii											1													1	1	1
Gymnothorax ruepelliae*	1																							0	0	1

Column A : Historical Records
Column B : Ayling 2008
Column C : AMS 2012

Column PS : Present Survey
Column MAA : MRAP+Ayling+ AMS
Column TL & WT : Timor-Leste & West Timor

Family & Species	A	B	C	Site																				PS	MAA	TL & WT
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Gymnothorax thrysoideus*	1																							0	0	1
Gymnothorax undulatus*	1																							0	0	1
Gymnothorax zonipectis			1																			1		1	1	1
Pseudechidna brummeri*	1																							0	0	1
Rhinomuraena quaesita		1																						0	1	1
Scuticara tigrina*	1																							0	0	1
Uropterygius macrocephalus											1													1	1	1
Uropterygius micropterus*	1																							0	0	1
OPHICHTHIDAE (5 SPP.)																										
Brachysomophis crocodilus			1																					0	1	1
Muraenichthys macrostomus*	1																							0	0	1
Phyllophichthus xenodontus																						1		1	1	1
Scolecenchelys macroptera*	1																							0	0	1
Yirrkala lumbricoides*	1																							0	0	1
CONGRIDAE (3 SPP.)																										
Conger cinereus*	1																							0	0	1
Gorgasia maculata		1			1					1		1	1											1	1	1
Heteroconger hassi		1			1	1				1		1		1		1								1	1	1
CLUPEIDAE (1 SPP.)																										
Herklotsichthys quadrimaculatus*	1																							0	0	1
CHANIDAE (1 SPP.)																										
Chanos chanos*	1																							0	0	1
PLOTOSIDAE (1 SPP.)																										
Plotosus lineatus														1										1	1	1
SYNODONTIDAE (6 SPP.)																										
Saurida gracilis			1																					0	1	1
Saurida nebulosa															1									1	1	1
Synodus dermatogenys			1				1	1	1	1	1	1							1		1	1		1	1	1
Synodus jaculum			1				1				1	1	1			1		1	1			1		1	1	1
Synodus rubromarmoratus			1													1								1	1	1
Trachinocephalus myops															1									1	1	1
CARAPIDAE (2 SPP.)																										
Carapus sluiteri*	1																							0	0	1
Encheliophis homei*	1																							0	0	1
OPHIDIIDAE (1 SPP.)																										
Brotula multibarbata*	1																							0	0	1
BYTHITIDAE (1 SPP.)																										
Ungusurculus sundaensis																						1		1	1	1
BATRACHOIDIDAE (1 SPP.)																										
Halophryne diemensis*	1																							0	0	1

Family & Species	A	B	C	Site																				PS	MAA	TL & WT
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
ANTENNARIIDAE (3 SPP.)																										
Antennarius biocellatus*	1																							0	0	1
Antennarius hispidus*	1																							0	0	1
Histiophryne cryptacanthus*	1																							0	0	1
MUGILIDAE (3 SPP.)																										
Ellochelon vaigiensis*	1																							0	0	1
Moolgarda seheli								1																1	1	1
Oedalechilus labiosus*	1																							0	0	1
ATHERINIDAE (3 SPP.)																										
Atherinomorus duodecimalis*	1																							0	0	1
Atherinomorus lacunosus*	1																							0	0	1
Hypoatherina temminckii*	1																							0	0	1
BELONIDAE (3 SPP.)																										
Strongylura incisa*	1																							0	0	1
Tylosurus acus												1											1	1	1	1
Tylosurus crocodilus									1	1	1	1	1											1	1	1
HEMIRAMPHIDAE (2 SPP.)																										
Hemiramphus far*	1																							0	0	1
Hyporhamphus dussumieri*	1																							0	0	1
HOLOCENTRIDAE (19 SPP.)																										
Myripristis adusta		1		1						1				1										1	1	1
Myripristis berndti		1	1		1		1	1			1	1		1		1		1	1				1		1	1	1
Myripristis botche					1							1		1											1	1	1
Myripristis hexagona																								1	1	1	1
Myripristis kuntee		1	1	1	1	1	1	1	1	1	1	1	1	1		1			1					1	1	1	1
Myripristis murdjan		1												1											1	1	1
Myripristis pralinia		1	1		1																				1	1	1
Myripristis violacea			1											1											1	1	1
Myripristis vittata																		1				1		1	1	1	1
Neoniphon sammara		1			1		1	1		1		1		1		1		1	1			1	1	1	1	1	1
Sargocentron caudimaculatum		1	1		1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Sargocentron cornutum*	1																							0	0	1
Sargocentron diadema		1	1		1									1		1						1			1	1	1
Sargocentron microstoma																		1						1	1	1	1
Sargocentron punctatissimum																						1			1	1	1
Sargocentron rubrum*	1																							0	0	1
Sargocentron spiniferum		1	1							1								1		1		1		1	1	1	1
Sargocentron tieroides			1																					0	1	1
Sargocentron violaceum														1											1	1	1
AULOSTOMIDAE (1 SPP.)																										
Aulostomus chinensis		1																						0	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
FISTULARIIDAE (1 SPP.)																											
Fistularia commersonii		1						1																	1	1	1
CENTRISCIDAE (2 SPP.)																											
Aeoliscus strigatus														1											1	1	1
Centriscus scutatus*	1																								0	0	1
SOLENOSTOMIDAE (2 SPP.)																											
Solenostomus cyanopterus			1																			1			1	1	1
Solenostomus paradoxus			1												1										1	1	1
SYNGNATHIDAE (7 SPP.)																											
Acentronura breviperula															1						1				1	1	1
Bhanotia fasciolata																				1					1	1	1
Corythoichthys haematopterus*	1																								0	0	1
Doryrhamphus melanopleura*	1																								0	0	1
Dunckerocampus boylei			1																						0	1	1
Halicampus mataafae*	1																								0	0	1
Hippocampus taeniopterus																				1					1	1	1
SCORPAENIDAE (16 SPP.)																											
Dendrochirus biocellatus						1																			1	1	1
Parascorpaena bandanensis*	1																								0	0	1
Parascorpaena mossambica																				1					1	1	1
Parascorpaena picta*	1																								0	0	1
Pterois antennata		1	1	1		1		1					1					1			1				1	1	1
Pterois volitans		1	1			1		1							1				1					1	1	1	1
Rhinopias frondosa*	1																								0	0	1
Scorpaenodes albaiensis			1																						0	1	1
Scorpaenodes guamensis																						1			1	1	1
Scorpaenopsis diabolus		1									1														1	1	1
Scorpaenodes kelloggi			1																						0	1	1
Scorpaenodes parvipinnis			1																						0	1	1
Scorpaenodes varipinnis			1																						0	1	1
Scorpaenopsis neglecta			1																						0	1	1
Scorpaenopsis possi																					1	1	1		1	1	1
Scorpaenopsis vittipinna			1																						0	1	1
Sebastapistes strongia			1								1														1	1	1
SYNANCEIIDAE (1 SPP.)																											
Synanceia verrucosa*	1																								0	0	1
TETRAROGIDAE (1 SPP.)																											
Ablabys taenianotus*	1																								0	0	1
PLATYCEPHALIDAE (4 SPP.)																											
Cociella punctata*	1																								0	0	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Onigocia pedimacula								1																1	1	1
Thysanophrys celebicus			1																					0	1	1
Thysanophrys chiltonae			1																					0	1	1
CARACANTHIDAE (1 SPP.)																										
Caracanthus unipinna										1	1		1					1				1			1	1	1
LATIDAE (1 SPP.)																										
Psammoperca waigiensis*	1																							0	0	1
SERRANIDAE (60 SPP.)																										
Aethaloperca rogaa		1				1		1	1	1	1	1	1			1						1		1	1	1
Anyperodon leucogrammicus		1					1	1															1	1	1	1
Cephalopholis argus		1	1					1	1	1		1	1	1		1		1				1		1	1	1
Cephalopholis cyanostigma														1												
Cephalopholis leopardus		1	1				1	1		1	1	1		1		1		1	1		1	1	1		1	1	1
Cephalopholis miniata		1	1		1	1	1		1	1	1	1	1			1		1	1		1	1		1	1	1	1
Cephalopholis polleni																		1				1			1	1	1
Cephalopholis sexmaculata			1										1					1				1		1	1	1	1
Cephalopholis sonnerati			1		1	1	1	1				1													1	1	1
Cephalopholis spiloparaea		1	1		1	1	1	1					1	1		1		1	1	1		1	1	1	1	1	1
Cephalopholis urodeta		1	1		1		1	1	1	1	1	1	1	1		1		1	1	1		1	1	1	1	1	1
Diploprion bifasciatum*	1																							0	0	1
Epinephelus areolatus*	1																							0	0	1
Epinephelus bleekeri**	1																							0	0	1
Epinephelus caeruleopunctatus		1	1		1	1				1	1	1												1	1	1
Epinephelus coioides**	1																							0	0	1
Epinephelus corallicola*	1																							0	0	1
Epinephelus fasciatus		1	1		1	1	1							1		1			1	1		1	1	1	1	1	1
Epinephelus fuscoguttatus										1												1			1	1	1
Epinephelus hexagonatus		1	1																					0	1	1
Epinephelus lanceolatus													1											1	1	1
Epinephelus macrospilos		1																						0	1	1
Epinephelus maculatus		1	1		1																			1	1	1
Epinephelus malabaricus		1																						0	1	1
Epinephelus merra		1	1		1		1	1	1	1	1	1	1	1		1			1	1	1	1	1	1	1	1	1
Epinephelus ongus		1	1																					1	1	1
Epinephelus quoyanus*	1																							0	0	1
Epinephelus rivulatus*	1																							0	0	1
Epinephelus spilotoceps		1											1											1	1	1
Epinephelus tauvina																			1					1	1	1
Epinephelus tukula																			1					1	1	1
Epinephelus undulosus*	1																							0	0	1
Gracila albomarginata		1	1				1					1	1	1		1		1	1				1	1	1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Grammistes sexlineatus*	1																							0	0	1
Liopropoma mitratum			1																					0	1	1
Luzonichthys taeniatus		1																1						1	1	1
Plectranthias longimanus			1										1											1	1	1
Plectropomus areolatus			1																			1		1	1	1
Plectropomus laevis		1	1																					0	1	1
Plectropomus oligocanthus																							1	1	1	1
Pogonoperca punctata		1					1	1	1		1	1						1	1	1		1		1	1	1
Pseudanthias bicolor					1		1	1	1			1	1		1	1		1						1	1	1
Pseudanthias charlenae																					1			1	1	1
Pseudanthias cooperi									1			1												1	1	1
Pseudanthias dispar		1	1				1	1		1		1	1					1				1	1	1	1	1
Pseudanthias flavoguttatus																					1			1	1	1
Pseudanthias huchtii		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1
Pseudanthias hypselosoma					1	1	1	1				1		1	1					1			1	1	1	1
Pseudanthias lori		1					1	1					1			1		1						1	1	1
Pseudanthias luzonensis		1												1						1				1	1	1
Pseudanthias parvirostris							1															1		1	1	1
Pseudanthias pleurotaenia		1	1		1	1	1	1					1	1		1		1	1	1			1	1	1	1
Pseudanthias randalli																1		1				1		1	1	1
Pseudanthias smithvanizi		1										1	1					1	1			1		1	1	1
Pseudanthias squamipinnis		1	1				1	1	1	1	1	1	1			1		1	1			1	1	1	1	1
Pseudanthias tuka		1	1			1	1	1						1				1		1		1	1	1	1	1
Pseudogramma polyacanthus			1																1					1	1	1
Serranocirrhitus latus																						1		1	1	1
Variola albimarginata		1	1		1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1
Variola louti		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1		1	1	1	1	1
CENTROGENIIDAE (1 SPP.)																										
Centrogenys vaigiensis*	1																							0	0	1
CIRRHITIDAE (8 SPP.)																										
Cirrhitichthys aprinus											1													1	1	1
Cirrhitichthys falco								1											1					1	1	1
Cirrhitichthys oxycephalus		1								1	1	1	1			1		1	1	1		1	1	1	1	1
Cirrhitus pinnulatus		1							1															1	1	1
Cyprinocirrhites polyactis					1	1	1	1	1	1			1							1		1	1	1	1	1
Oxycirrhites typus		1												1				1						1	1	1
Paracirrhites arcatus		1										1						1						1	1	1
Paracirrhites forsteri		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1		1	1		1	1
PLESIOPIDAE (4 SPP.)																										
Calloplesiops altivelis			1																					0	1	1
Plesiops cephalotaenia			1																					0	1	1

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Plesiops coeruleolineatus											1											1			1	1	1
Plesiops corallicola											1														1	1	1
TERAPONTIDAE (3 SPP.)																											
Pelates quadrilineatus*	1																								0	0	1
Terapon jarbua*	1																								0	0	1
Terapon theraps*	1																								0	0	1
OPISTOGNATHIDAE (6 SPP.)																											
Opistognathus randalli			1				1					1		1				1		1		1		1	1	1	1
Opistognathus solorensis																				1					1	1	1
Opistognathus sp. 5																					1				1	1	1
Opistognathus variabilis			1							1															1	1	1
Opistognathus wassi						1																			1	1	1
Stalix sp.				1																					1	1	1
PRIACANTHIDAE (2 SPP.)																											
Priacanthus blochii														1											1	1	1
Priacanthus hamrur	1		1																						1	1	1
APOGONIDAE (45 SPP.)																											
Apogon crassiceps			1					1	1		1							1	1	1		1			1	1	1
Apogon doryssa			1																						0	1	1
Apogon semiornatus			1		1																		1		1	1	1
Archamia biguttata			1				1																		1	1	1
Archamia fucata							1																		1	1	1
Archamia macroptera							1																		1	1	1
Archamia melasma							1																		1	1	1
Cheilodipterus alleni			1																						0	1	1
Cheilodipterus artus					1		1							1											1	1	1
Cheilodipterus macrodon							1				1			1							1				1	1	1
Cheilodipterus quinquelineatus			1	1	1		1							1							1	1		1	1	1	1
Foa brachygramma															1										1	1	1
Neamia octospina			1																						0	1	1
Nectamia bandanensis*	1																								0	0	1
Nectamia fusca											1									1					1	1	1
Nectamia luxuria			1																						0	1	1
Nectamia savayensis			1																			1			1	1	1
Nectamia similis							1																		1	1	1
Nectamia viria																						1			1	1	1
Ostorhinchus angustatus			1								1	1													1	1	1
Ostorhinchus apogonides							1					1													1	1	1
Ostorhinchus aureus					1							1													1	1	1
Ostorhinchus bryx															1										1	1	1
Ostorhinchus ceramensis*	1																								0	0	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Ostorhinchus chrysotaenia			1		1	1	1																	1	1	1
Ostorhinchus dispar			1													1		1				1		1	1	1	1
Ostorhinchus fasciatus															1									1	1	1
Ostorhinchus fleurieu												1												1	1	1
Ostorhinchus fraenatus							1					1		1					1					1	1	1
Ostorhinchus franssedai																1								1	1	1
Ostorhinchus hartzfeldii															1									1	1	1
Ostorhinchus hoevenii															1									1	1	1
Ostorhinchus kallopterus			1				1					1		1		1			1				1	1	1	1
Ostorhinchus moluccensis															1									1	1	1
Ostorhinchus multilineatus			1																					0	1	1
Ostorhinchus nigrofasciatus			1			1	1	1		1	1	1		1		1		1	1	1	1	1	1	1	1	1
Ostorhinchus novemfasciatus																			1				1	1	1	1
Ostorhinchus ocellicaudus												1												1	1	1
Ostorhinchus talboti			1																					0	1	1
Ostorhinchus taeniophorus											1											1		1	1	1
Ostorhinchus wassinki											1	1		1										1	1	1
Pseudamiops gracilicauda			1													1								1	1	1
Rhabdamia gracilis												1												1	1	1
Siphamia cyanopththalma			1																					0	1	1
Siphamia tubifer															1									1	1	1
MALACANTHIDAE (8 SPP.)																										
Hoplolatilus chlupatyi													1					1						1	1	1
Hoplolatilus cuniculus		1			1	1	1	1		1				1								1		1	1	1
Hoplolatilus marcosi		1			1	1	1	1					1					1				1		1	1	1
Hoplolatilus purpureus							1	1																1	1	1
Hoplolatilus randalli							1						1	1				1				1		1	1	1
Hoplolatilus starcki		1					1		1									1				1	1	1	1	1
Malacanthus brevirostris		1			1	1	1	1	1	1	1	1	1	1		1		1	1			1	1	1	1	1
Malacanthus latovittatus		1					1			1														1	1	1
SILLAGINIDAE (1 SPP.)																										
Sillago sihama*	1																							0	0	1
ECHENEIDAE (1 SPP.)																										
Echeneis naucrates		1																						0	1	1
CARANGIDAE (21 SPP.)																										
Alectes ciliaris*	1																							0	0	1
Alectes indicus**	1																							0	0	1
Carangoides bajad					1																			1	1	1
Carangoides coeruleopinnatus															1									1	1	1
Carangoides fulvoguttatus**	1																							0	0	1
Carangoides oblongus							1																	1	1	1

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Caranx ignobilis		1											1			1			1						1	1	1
Caranx lugubris													1												1	1	1
Caranx melampygus		1	1	1		1	1	1	1	1	1	1	1	1		1		1	1	1		1	1	1	1	1	1
Caranx papuensis		1																							0	1	1
Caranx sexfasciatus									1	1		1													1	1	1
Caranx tille**	1																								0	0	1
Decapterus macarellus			1										1									1	1	1	1	1	1
Elagatis bipinnulata		1						1	1	1	1	1	1			1									1	1	1
Gnathanodon speciosus													1												1	1	1
Scomberoides commersonnianus**	1																								0	0	1
Scomberoides lysan		1											1												1	1	1
Scomberoides tol*	1																								0	0	1
Seriola dumerili**	1																								0	0	1
Trachinotus blochii**	1																								0	0	1
Ulua mentalis																			1						1	1	1
LEIOGNATHIDAE (2 SPP.)																											
Gazza minuta*	1																								0	0	1
Photopectoralis bindus*	1																								0	0	1
LUTJANIDAE (33 SPP.)																											
Aphareus furca		1	1				1	1		1		1		1		1		1				1	1	1	1	1	1
Aprion virescens		1			1		1		1	1	1	1	1					1						1	1	1	1
Lutjanus argentimaculatus		1																							0	1	1
Lutjanus biguttatus**	1																								0	0	1
Lutjanus bohar		1			1	1	1	1	1	1	1	1	1	1		1		1	1			1	1	1	1	1	1
Lutjanus boutton*	1																								0	0	1
Lutjanus carponotatus					1																				1	1	1
Lutjanus decussatus		1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Lutjanus ehrenbergii		1	1							1		1	1												1	1	1
Lutjanus erythropterus**	1																								0	0	1
Lutjanus fulviflamma		1		1	1	1			1	1		1		1						1	1				1	1	1
Lutjanus fulvus		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1				1	1	1
Lutjanus gibbus		1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1	1
Lutjanus kasmira		1			1																				1	1	1
Lutjanus lemniscatus**	1																								0	0	1
Lutjanus lutjanus		1			1							1	1					1							1	1	1
Lutjanus lunulatus		1			1																				1	1	1
Lutjanus madras														1											1	1	1
Lutjanus malabaricus**	1																								0	0	1
Lutjanus monostigma		1			1		1	1	1		1	1	1	1		1		1	1		1		1		1	1	1
Lutjanus "papuensis"					1																				1	1	1

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Lutjanus quinquelineatus						1									1										1	1	1
Lutjanus rivulatus		1			1		1	1				1		1		1		1							1	1	1
Lutjanus russelli**	1																								0	0	1
Lutjanus timorensis*	1																								0	0	1
Lutjanus vitta**	1																								0	0	1
Macolor macularis		1			1	1						1	1	1		1		1	1			1	1	1	1	1	1
Macolor niger		1			1					1		1				1						1	1		1	1	1
Paracaesio sordida		1											1									1		1	1	1	1
Paracaesio xanthura													1											1	1	1	1
Pinjalo lewisi**	1																								0	0	1
Pinjalo pinjalo		1																							0	1	1
Symphorichthys spilurus**	1																								0	0	1
CAESIONIDAE (11 SPP.)																											
Caesio caerulaurea		1	1									1		1											1	1	1
Caesio cuning**	1																								0	0	1
Caesio lunaris		1			1	1	1		1		1	1	1	1							1	1	1	1	1	1	1
Caesio teres		1	1		1		1	1		1		1	1	1				1			1	1	1	1	1	1	1
Pterocaesio chrysozona**	1																								0	0	1
Pterocasesio digramma**	1																								0	0	1
Pterocasesio marri**	1																								0	0	1
Pterocaesio pisang					1									1						1					1	1	1
Pterocaesio randalli			1													1								1	1	1	1
Pterocaesio tessellata			1																						0	1	1
Pterocaesio tile		1	1		1		1	1	1	1	1	1	1	1		1			1		1	1	1	1	1	1	1
GERREIDAE (3 SPP.)																											
Gerres filamentosus**	1																								0	0	1
Gerres oblongus*	1																								0	0	1
Gerres oyena*	1																								0	0	1
HAEMULIDAE (11 SPP.)																											
Diagramma melanacrum												1	1						1						1	1	1
Diagramma pictum		1		1						1															1	1	1
Plectorhinchus albovittatus		1																							0	0	1
Plectorhinchus chaetodontoides		1		1			1																1		1	1	1
Plectorhinchus chrysotaenia					1							1		1		1					1		1		1	1	1
Plectorhinchus gibbosus										1			1					1							1	1	1
Plectorhinchus lessonii		1			1														1						1	1	1
Plectorhinchus lineatus		1		1					1	1		1		1									1	1	1	1	1
Plectorhinchus picus																			1						1	1	1
Plectorhinchus polytaenia																					1				1	1	1
Plectorhinchus vittatus		1			1		1									1			1					1	1	1	1

Family & Species	A	B	C	Site																				PS	MAA	TL & WT
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
LETHRINIDAE (18 SPP.)																										
Gnathodentex aurolineatus		1	1		1	1			1	1		1												1	1	1
Gymnocranius elongatus**	1																							0	0	1
Gymnocranius griseus										1														1	1	1
Lethrinus atkinsoni		1																						0	1	1
Lethrinus erythracanthus		1			1									1										1	1	1
Lethrinus erythropterus			1																			1		1	1	1
Lethrinus harak			1	1				1	1					1	1			1	1		1			1	1	1
Lethrinus lentjan			1																					0	1	1
Lethrinus microdon			1				1																	1	1	1
Lethrinus nebulosus**	1																							0	0	1
Lethrinus obsoletus		1			1			1											1		1			1	1	1
Lethrinus olivaceus		1								1		1	1	1				1	1			1	1	1	1	1
Lethrinus ornatus		1	1											1					1					1	1	1
Lethrinus rubrioperculatus**	1																							0	0	1
Lethrinus variegatus															1									1	1	1
Lethrinus xanthochilus		1						1	1				1	1								1	1	1	1	1
Monotaxis grandoculis		1	1		1		1			1	1	1	1	1		1		1	1	1		1	1	1	1	1
Monotaxis heterodon				1	1	1		1		1	1	1	1	1		1			1		1	1	1	1	1	1	1
NEMIPTERIDAE (15 SPP.)																										
Pentapodus aureofasciatus				1										1							1			1	1	1
Pentapodus bifasciatus*	1																							0	0	1
Pentapodus emeryii**	1																							0	0	1
Pentapodus trivittatus			1	1																				1	1	1
Scolopsis affinis		1			1	1		1			1					1			1	1	1			1	1	1
Scolopsis auratus**	1																							0	0	1
Scolopsis bilineatus		1		1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1
Scolopsis ciliatus				1																1	1			1	1	1
Scolopsis lineatus		1							1				1	1					1	1			1	1	1	1
Scolopsis margaritifer				1																				1	1	1
Scolopsis monogramma				1	1	1									1				1					1	1	1
Scolopsis taeniopterus**																								0	0	1
Scolopsis trilineatus			1																			1		1	1	1
Scolopsis vosmeri															1									1	1	1
Scolopsis xenochrous		1		1	1	1	1	1	1	1	1		1	1		1		1	1	1				1	1	1
MULLIDAE (14 SPP.)																										
Mulloidichthys flavolineatus			1			1																1		1	1	1
Mulloidichthys vanicolensis		1	1	1	1			1	1			1		1		1								1	1	1
Parupeneus barberinoides																							1	1	1	1
Parupeneus barberinus		1		1	1	1				1	1	1	1	1		1			1	1	1	1	1		1	1	1
Parupeneus crassilabris		1			1	1	1	1	1	1		1	1	1		1		1	1	1	1	1	1		1	1	1

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Family & Species	A	B	C	Site																				PS	MAA	TL & WT
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Parupeneus cyclostomus		1	1		1	1	1	1	1	1			1	1		1				1			1		1	1	1
Parupeneus heptacanthus															1						1				1	1	1
Parupeneus indicus		1		1		1		1		1									1			1			1	1	1
Parupeneus macronemus									1	1		1													1	1	1
Parupeneus multifasciatus		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Parupeneus pleurostigma		1	1													1			1						1	1	1
Upeneus sulphureus*	1																								0	0	1
Upeneus tragula				1																	1				1	1	1
Upeneus vittatus			1																						0	1	1
PEMPHERIDAE (4 SPP.)																											
Parapriacanthus ransonneti												1				1									1	1	1
Pempheris oualensis										1								1						1	1	1	1
Pempheris schwencki**	1																								0	0	1
Pempheris vanicolensis				1	1			1		1		1						1	1					1	1	1	1
KYPHOSIDAE (2 SPP.)																											
Kyphosus cinerascens		1	1										1			1		1							1	1	1
Kyphosus vaigensis										1		1	1	1		1									1	1	1
TOXOTIDAE (1 SPP.)																											
Toxotes jaculatrix*	1																								0	0	1
CHAETODONTIDAE (36 SPP.)																											
Chaetodon adiergastos		1							1	1		1	1			1									1	1	1
Chaetodon auriga		1							1		1	1				1			1				1	1	1	1	1
Chaetodon baronessa		1		1	1	1	1	1	1	1	1	1	1	1		1						1	1		1	1	1
Chaetodon bennetti		1										1										1			1	1	1
Chaetodon citrinellus		1			1								1	1		1					1				1	1	1
Chaetodon decussatus										1															1	1	1
Chaetodon ephippium		1					1	1		1			1	1		1			1	1	1	1	1		1	1	1
Chaetodon kleinii		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1		1	1	1	1
Chaetodon lineolatus		1												1					1						1	1	1
Chaetodon lunula		1				1	1	1	1		1	1	1	1		1			1	1	1		1	1	1	1	1
Chaetodon lunulatus		1	1		1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Chaetodon melanotus		1		1	1		1	1	1	1		1	1	1										1	1	1	1
Chaetodon meyeri		1					1	1	1	1	1	1	1	1		1			1	1	1				1	1	1
Chaetodon ocellicaudus		1		1																		1		1	1	1	1
Chaetodon ornatissimus		1	1	1		1			1	1	1	1		1		1									1	1	1
Chaetodon oxycephalus		1			1															1	1				1	1	1
Chaetodon punctatofasciatus		1		1	1	1	1	1	1					1								1			1	1	1
Chaetodon rafflesi		1					1	1	1					1		1				1	1	1	1	1	1	1	1
Chaetodon selene		1																							0	1	1
Chaetodon semion		1					1			1															1	1	1
Chaetodon speculum		1					1	1	1	1		1		1											1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Chaetodon trifascialis		1					1			1	1		1			1		1			1	1	1		1	1	1
Chaetodon ulietensis		1			1				1	1		1	1	1					1				1	1	1	1	1
Chaetodon unimaculatus		1	1	1		1	1	1					1			1			1		1	1	1	1	1	1	1
Chaetodon vagabundus		1		1	1	1	1	1	1	1	1	1		1		1		1	1	1	1	1	1	1	1	1	1
Chaetodon xanthurus		1			1	1	1									1		1						1	1	1	1
Coradion chrysozonus																		1			1				1	1	1
Coradion melanopus		1																							0	1	1
Forcipiger flavissimus		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Forcipiger longirostris		1			1		1		1				1	1		1		1				1		1	1	1	1
Hemitaurichthys polylepis		1		1	1											1						1	1		1	1	1
Heniochus acuminatus		1								1		1													1	1	1
Heniochus chrysostomus		1			1					1		1		1				1	1	1		1	1	1	1	1	1
Heniochus diphreutes																							1		1	1	1
Heniochus singularius		1					1			1															1	1	1
Heniochus varius		1		1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
POMACANTHIDAE (19 SPP.)																											
Apolemichthys trimaculatus		1			1	1	1	1	1	1	1	1	1	1		1		1	1		1	1		1	1	1	1
Centropyge bicolor		1		1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Centropyge bispinosa		1					1	1	1	1	1	1	1	1				1	1	1		1	1	1	1	1	1
Centropyge fisheri		1			1	1	1	1		1		1	1	1		1		1	1			1			1	1	1
Centropyge multifasciata			1																			1			1	1	1
Centropyge nox			1										1	1				1				1	1	1	1	1	1
Centropyge tibicen		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Centropyge vroliki		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1		1	1	1	1
Chaetodontoplus melanosoma									1																1	1	1
Genicanthus bellus																						1			1	1	1
Genicanthus lamarck		1			1	1	1	1	1					1		1			1	1	1	1	1		1	1	1
Genicanthus melanospilos														1								1			1	1	1
Pomacanthus annularis		1																							0	1	1
Pomacanthus imperator		1			1	1	1	1	1	1		1	1	1		1			1	1	1	1			1	1	1
Pomacanthus navarchus		1			1																				1	1	1
Pomacanthus semicirculatus		1			1	1										1			1	1		1			1	1	1
Pomacanthus sexstriatus							1																				
Pomacanthus xanthometopon					1																		1		1	1	1
Pygoplites diacanthus		1		1	1	1	1	1	1	1			1	1		1		1	1		1	1	1	1	1	1	1
POMACENTRIDAE (94 SPP.)																											
Abudefduf septemfasciatus		1																							0	1	1
Abudefduf sexfasciatus		1			1					1		1	1							1					1	1	1
Abudefduf sordidus		1																							0	1	1
Abudefduf vaigiensis		1					1		1	1	1	1	1			1		1	1	1	1	1	1	1	1	1	1
Acanthochromis polyacanthus		1	1	1	1	1			1	1	1	1	1	1						1	1	1	1	1	1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Amblyglyphidodon aureus		1		1	1	1	1	1		1		1	1	1		1		1	1	1	1	1	1	1	1	1	1
Amblyglyphidodon curacao		1					1	1				1	1	1					1	1	1	1		1	1	1	1
Amblyglyphidodon leucogaster		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Amblypomacentrus breviceps															1									1	1	1
Amphiprion clarkii		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Amphiprion melanopus		1	1	1	1	1		1										1				1	1		1	1	1
Amphiprion ocellaris		1		1	1	1	1		1	1		1		1		1					1	1	1	1	1	1	1
Amphiprion perideraion		1	1	1	1	1	1	1						1		1		1	1			1	1	1	1	1	1
Amphiprion polymnus															1										1	1	1
Amphiprion sandaracinos		1					1															1	1		1	1	1
Cheiloprion labiatus																						1			1	1	1
Chromis alpha		1	1				1	1						1		1		1	1		1	1	1	1	1	1	1
Chromis amboinensis		1	1				1	1						1		1		1	1	1	1	1	1	1	1	1	1
Chromis analis		1	1				1	1					1			1		1	1	1	1	1	1	1	1	1	1
Chromis atripectoralis		1			1		1	1				1		1						1	1	1		1	1	1	1
Chromis atripes		1	1		1	1	1	1	1	1		1	1	1		1		1	1	1	1	1	1	1	1	1	1
Chromis caudalis		1	1		1		1	1	1	1	1	1	1	1				1	1			1	1	1	1	1	1
Chromis cinerascens*	1																								0	0	1
Chromis delta		1	1		1		1	1					1			1		1		1	1	1	1	1	1	1	1
Chromis earina																						1			1	1	1
Chromis elerae		1											1			1		1	1			1	1	1	1	1	1
Chromis lepidolepis		1		1	1	1	1	1						1		1		1	1	1	1	1	1	1	1	1	1
Chromis lineata		1						1		1															1	1	1
Chromis margaritifer		1	1	1	1	1	1		1	1			1	1		1		1	1			1	1	1	1	1	1
Chromis retrofasciata		1	1				1	1						1					1			1	1	1	1	1	1
Chromis sp. (blue & yellow juvenile)							1						1	1				1				1			1	1	1
Chromis ternatensis		1	1		1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Chromis viridis		1	1					1		1		1								1		1		1	1	1	1
Chromis weberi		1		1	1	1	1	1			1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Chromis xanthochira		1	1		1	1	1	1		1	1	1	1	1		1		1	1			1	1	1	1	1	1
Chromis xanthura		1			1		1	1	1	1			1	1		1		1	1	1	1	1	1	1	1	1	1
Chrysipera biocellata		1																							0	1	1
Chrysiptera brownriggii		1					1	1	1	1			1	1				1	1						1	1	1
Chrysiptera caeruleolineata		1					1																		1	1	1
Chrysiptera cyanea		1					1		1				1	1						1					1	1	1
Chrysiptera glauca		1									1														1	1	1
Chrysiptera hemicyanea																								1	1	1	1
Chrysiptera oxycephala*	1																								0	0	1
Chrysiptera rex		1			1		1	1	1	1			1	1		1		1	1	1	1	1	1	1	1	1	1
Chrysiptera rollandi			1	1										1							1	1	1	1	1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Chrysiptera talboti		1	1	1	1	1	1	1	1	1		1		1		1		1	1	1	1	1	1	1	1	1	1
Chrysiptera unimaculata		1					1				1		1	1						1				1	1	1	1
Dascyllus aruanus		1												1	1					1		1			1	1	1
Dascyllus melanurus																						1			1	1	1
Dascyllus reticulatus		1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Dascyllus trimaculatus		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Dischistodus fasciatus*	1																								0	1	1
Dischistodus melanotus			1																			1			1	1	1
Dischistodus perspicillatus																						1			1	1	1
Dischistodus prosopotaenia*	1																								0	0	1
Hemiglyphidodon plagiometopon																					1			1	1	1	
Lepidozygus tapeinosoma		1	1							1	1	1						1				1			1	1	1
Neoglyphidodon crossi		1					1	1	1			1							1	1	1		1		1	1	1
Neoglyphidodon melas		1		1	1	1	1	1	1	1			1	1					1	1	1	1	1	1	1	1	1
Neoglyphidodon nigroris		1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1
Neoglyphidodon thoracotaeniatus		1					1							1								1		1	1	1	1
Neopomacentrus azysron		1					1						1		1				1						1	1	1
Neopomacentrus violascens															1										1	1	1
Plectroglyphidodon dickii		1					1	1	1	1	1	1	1					1		1	1	1	1	1	1	1	1
Plectroglyphidodon johnstonianus		1																							0	1	1
Plectroglyphidodon lacrymatus		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Plectroglyphidodon leucozona		1																1							1	1	1
Pomacentrus adelus							1							1						1	1				1	1	1
Pomacentrus alexanderae			1																					1	1	1	1
Pomacentrus amboinensis		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Pomacentrus auriventris		1				1	1	1	1		1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Pomacentrus bankanensis		1				1	1	1	1	1	1	1	1	1					1	1	1	1			1	1	1
Pomacentrus brachialis		1	1	1	1	1	1	1						1		1		1	1	1	1	1	1	1	1	1	1
Pomacentrus cheraphilus				1																					1	1	1
Pomacentrus chrysurus		1																				1			1	1	1
Pomacentrus coelestis		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1		1	1	1
Pomacentrus lepidogenys		1	1	1	1	1	1	1	1	1		1	1	1		1		1	1	1	1	1	1	1	1	1	1
Pomacentrus littoralis*	1																								0	0	1
Pomacentrus melanochir*	1																								0	0	1
Pomacentrus moluccensis		1	1	1	1	1	1	1	1	1		1	1	1				1	1	1	1	1	1	1	1	1	1
Pomacentrus nagasakiensis		1		1																1	1				1	1	1
Pomacentrus nigromanus			1																						0	1	1
Pomacentrus nigromarginatus			1		1	1	1	1	1	1		1	1	1		1		1	1		1	1	1	1	1	1	1
Pomacentrus pavo															1										1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Pomacentrus philippinus		1	1	1	1	1	1	1	1	1		1	1	1		1		1	1	1	1	1	1	1	1	1	1
Pomacentrus reidi		1	1	1	1	1	1	1					1	1		1		1		1	1	1	1	1	1	1	1
Pomacentrus tripunctatus		1																							0	1	1
Pomacentrus vaiuli		1		1	1	1	1	1	1	1	1	1	1	1		1				1	1	1	1	1	1	1	1
Premnas biaculeatus		1			1	1								1		1						1	1	1	1	1	1
Pristotis obtusirostris			1																						0	1	1
Stegastes albifasciatus		1									1														1	1	1
Stegastes fasciolatus		1					1	1		1								1	1						1	1	1
Stegastes nigricans																						1			1	1	1
Stegastes punctatus*	1																								0	0	1
LABRIDAE (104 SPP.)																											
Anampses caeruleopunctatus		1								1				1		1			1						1	1	1
Anampses geographicus		1																							0	1	1
Anampses melanurus		1			1	1			1			1	1			1			1	1					1	1	1
Anampses meleagrides		1																	1			1		1	1	1	1
Anampses twistii		1		1	1	1		1	1	1		1	1	1		1			1			1	1	1	1	1	1
Bodianus anthioides		1			1				1	1						1		1							1	1	1
Bodianus axillaris		1		1	1	1	1	1	1	1	1	1	1			1			1	1	1	1		1	1	1	1
Bodianus bilunulatus		1					1		1										1						1	1	1
Bodianus bimaculatus									1				1	1		1		1	1			1		1	1	1	1
Bodianus dyctynna		1	1	1	1		1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Bodianus mesothorax		1	1			1	1	1	1	1		1		1		1		1	1	1	1	1	1	1	1	1	1
Cheilinus chlorourus								1							1					1					1	1	1
Cheilinus fasciatus		1		1		1	1	1	1					1		1			1	1		1	1	1	1	1	1
Cheilinus oxycephalus		1				1	1						1	1					1	1	1	1			1	1	1
Cheilinus trilobatus		1			1		1							1		1			1		1	1	1		1	1	1
Cheilinus undulatus		1								1			1			1			1						1	1	1
Cheilio inermis		1											1		1										1	1	1
Choerodon anchorago			1																			1			1	1	1
Choerodon zamboangae			1																						0	1	1
Cirrhilabrus exquisitus		1				1	1				1	1				1		1	1			1	1	1	1	1	1
Cirrhilabrus filamentosus						1	1									1						1			1	1	1
Cirrhilabrus flavidorsalis				1			1							1											1	1	1
Cirrhilabrus lubbocki			1	1			1							1				1				1	1	1	1	1	1
Cirrhilabrus humanni					1	1	1	1		1	1	1		1		1						1		1	1	1	1
Cirrhilabrus pylei							1											1							1	1	1
Cirrhilabrus rubrimarginatus		1					1	1	1	1				1		1		1	1			1	1	1	1	1	1
Cirrhilabrus solorensis		1	1	1	1	1	1	1	1	1		1	1			1		1	1	1	1	1	1	1	1	1	1
Cirrhilabrus tonozukai																						1			1	1	1
Coris aygula		1																							0	1	1
Coris batuensis		1		1	1		1	1	1	1	1	1	1						1	1	1		1		1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Coris dorsomacula		1									1					1								1	1	1
Coris gaimardi		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Coris pictoides							1					1												1	1	1
Diproctacanthus xanthurus		1																						0	1	1
Epibulus brevis														1						1			1	1	1	1	1
Epibulus insidiator		1	1		1	1	1		1	1		1		1		1		1					1		1	1	1
Gomphosus varius		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Halichoeres argus*	1																							0	0	1
Halichoeres biocellatus					1	1			1									1	1			1	1		1	1	1
Halichoeres binotopsis*	1																							0	0	1
Halichoeres chloropterus*	1																							0	0	1
Halichoeres chrysus		1			1	1	1	1	1	1	1	1	1	1		1		1		1	1	1	1		1	1	1
Halichoeres claudia		1							1										1				1		1	1	1
Halichoeres hartzfeldii		1										1													1	1	1
Halichoeres hortulanus		1	1		1	1	1		1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Halichoeres leucurus*	1																							0	0	1
Halichoeres margaritaceus		1														1			1						1	1	1
Halichoeres marginatus		1			1		1		1	1		1	1	1						1	1	1	1	1	1	1	1
Halichoeres melanochir		1	1											1						1	1				1	1	1
Halichoeres melanurus		1		1																					1	1	1
Halichoeres melasmapomus							1									1		1	1						1	1	1
Halichoeres miniatus		1					1	1	1	1	1	1	1						1	1					1	1	1
Halichoeres nebulosus		1					1		1	1		1	1	1											1	1	1
Halichoeres nigrescens*	1																							0	0	1
Halichoeres pallidus																		1	1						1	1	1
Halichoeres papilionaceus*	1																							0	0	1
Halichoeres podostigma		1																	1	1		1			1	1	1
Halichoeres prosopeion		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1			1	1	1
Halichoeres richmondi		1						1						1					1	1		1		1	1	1	1
Halichoeres scapularis		1			1	1		1	1			1		1		1				1	1	1			1	1	1
Halichoeres solorensis		1								1															1	1	1
Halichoeres timorensis		1																		1					1	1	1
Halichoeres trimaculatus		1			1				1			1								1	1				1	1	1
Hemigymnus fasciatus		1					1	1		1	1	1	1	1		1				1			1		1	1	1
Hemigymnus melapterus		1			1		1			1		1	1	1		1			1	1	1	1	1	1	1	1	1
Hologymnosus annulatus		1							1	1	1	1	1			1									1	1	1
Hologymnosus doliatus		1			1		1	1	1	1		1				1			1						1	1	1
Labrichthys unilineatus		1					1	1						1		1				1	1	1	1	1	1	1	1
Labroides bicolor		1		1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Labroides dimidatus		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Labroides pectoralis		1			1		1	1	1	1		1	1	1				1	1	1	1	1	1	1	1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Labropsis alleni		1			1			1	1	1				1								1		1	1	1	1
Labropsis manabei		1					1		1					1								1			1	1	1
Labropsis xanthonota		1																1							1	1	1
Leptojulis cyanopleura										1		1								1					1	1	1
Macropharyngodon meleagris		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1		1	1	1
Macropharyngodon negrosensis		1	1							1		1	1			1						1			1	1	1
Novaculichthys taeniourus		1			1							1				1									1	1	1
Oxycheilinus arenatus																						1			1	1	1
Oxycheilinus bimaculatus				1		1	1	1		1		1		1	1				1	1	1		1		1	1	1
Oxycheilinus celebicus													1	1										1	1	1	1
Oxycheilinus digramma		1	1	1	1	1	1	1				1	1	1		1			1	1	1	1	1	1	1	1	1
Oxycheilinus unifasciatus							1	1				1	1	1		1			1	1		1			1	1	1
Paracheilinus flavianalis		1	1	1	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1	1	1		1	1	1
Pseudocheilinus evanidus		1	1				1	1	1	1	1	1				1		1	1	1	1	1	1	1	1	1	1
Pseudocheilinus hexataenia		1	1			1	1		1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Pseudocheilinus octotaenia		1			1	1	1		1	1	1	1	1						1					1	1	1	1
Pseudocoris bleekeri																							1		1	1	1
Pseudocoris heteroptera		1																	1				1		1	1	1
Pseudocoris yamashiroi		1			1		1						1	1		1									1	1	1
Pseudodax moluccanus		1		1		1	1	1								1			1						1	1	1
Pseudojuloides kaleidos							1																		1	1	1
Pseudojuloides mesostigma								1														1			1	1	1
Pteragogus cryptus		1																					1		1	1	1
Pteragogus enneacanthus		1	1											1					1						1	1	1
Stethojulis bandanensis		1			1		1		1	1	1	1	1	1				1	1	1	1	1			1	1	1
Stethojulis interrupta		1														1			1			1			1	1	1
Stethojulis strigiventer		1													1					1					1	1	1
Stethojulis trilineata		1						1								1									1	1	1
Thalassoma amblycephalus		1	1	1	1	1	1	1	1	1		1	1	1		1		1	1	1	1	1	1	1	1	1	1
Thalassoma hardwicke		1			1		1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Thalassoma jansenii		1			1		1	1	1	1		1		1		1		1	1			1	1	1	1	1	1
Thalassoma lunare		1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Thalassoma purpureum		1						1	1	1		1													1	1	1
SCARIDAE (30 SPP.)																											
Bolbometopon muricatum																			1						1	1	1
Calotomus carolinus			1											1				1							1	1	1
Calotomus spinidens*	1																								0	0	1
Cetoscarus ocellatus		1				1		1		1		1	1	1		1						1			1	1	1
Chlorurus bleekeri		1		1	1	1	1	1		1				1		1			1	1	1	1	1		1	1	1
Chlorurus capistratoides		1						1																	1	1	1

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Chlorurus japanensis		1											1			1				1					1	1	1
Chlorurus microrhinos		1			1	1				1		1	1	1		1			1			1	1		1	1	1
Chlorurus oedema		1																							0	0	1
Chlorurus sordidus		1	1		1	1		1	1	1	1	1	1	1		1		1	1	1	1	1		1	1	1	1
Hipposcarus longiceps		1																1							1	1	1
Leptoscarus vaigiensis*	1																								0	0	1
Scarus chameleon		1																							0	1	1
Scarus dimidatus		1						1			1	1				1									1	1	1
Scarus festivus		1																					1		1	1	1
Scarus flavipectoralis		1			1				1			1												1	1	1	1
Scarus forsteni		1				1	1	1	1		1	1		1		1		1	1	1	1	1	1		1	1	1
Scarus frenatus		1			1							1											1		1	1	1
Scarus fuscocaudalis																						1			1	1	1
Scarus globiceps		1																							0	1	1
Scarus niger		1	1		1	1	1	1	1	1				1		1	1	1	1	1	1	1	1		1	1	1
Scarus oviceps		1	1			1	1							1		1						1			1	1	1
Scarus prasiognathos		1			1																		1		1	1	1
Scarus psittacus		1	1											1											1	1	1
Scarus quoyi		1														1									1	1	1
Scarus rivulatus		1														1									1	1	1
Scarus rubroviolaceus		1					1				1					1		1	1				1		1	1	1
Scarus schlegeli		1	1													1						1	1		1	1	1
Scarus spinus		1	1										1						1						1	1	1
Scarus tricolor		1			1			1	1	1	1	1	1			1		1				1			1	1	1
TRICHONOTIDAE (2 SPP.)																											
Pteropsaron longipinnis													1					1							1	1	1
Trichonotus sp.													1												1	1	1
PINGUIPEDIDAE (10 SPP.)																											
Parapercis clathrata			1		1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Parapercis cylindrica			1																	1					1	1	1
Parapercis flavolineata													1	1				1			1	1			1	1	1
Parapercis lineopunctata				1																					1	1	1
Parapercis millepunctata					1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1
Parapercis multiplicata			1																			1		1	1	1	1
Parapercis schauinslandii					1	1	1	1	1	1	1	1	1					1				1			1	1	1
Parapercis snyderi																				1	1				1	1	1
Parapercis tetracantha																1			1		1				1	1	1
Parapercis xanthozona																				1	1				1	1	1
TRIPTERYGIIDAE (8 SPP.)																											
Enneapterygius bahasa													1												1	1	1
Enneapterygius flavoccipitis														1					1						1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Enneapterygius tutuilae											1														1	1	1
Helcogramma gymnauchen*	1																								0	0	1
Helcogramma obtusirostre?													1												1	1	1
Helcogramma sp.																		1							1	1	1
Helcogramma striatum							1	1	1	1	1	1	1		1	1		1	1	1	1	1		1	1	1	1
Ucla xenogrammus								1																	1	1	1
BLENNIIDAE (27 SPP.)																											
Aspidontus taeniatus			1								1														1	1	1
Atrosalarias fuscus														1								1			1	1	1
Blenniella chrysospilos																		1							1	1	1
Cirripectes filamentosus														1											1	1	1
Cirripectes springeri									1																1	1	1
Cirripectes stigmaticus																							1		1	1	1
Ecsenius bicolor					1		1					1	1			1							1		1	1	1
Ecsenius midas												1													1	1	1
Ecsenius pictus																		1							1	1	1
Ecsenius trilineatus							1	1		1	1	1		1					1						1	1	1
Ecsenius yaeyamaenis							1	1					1						1						1	1	1
Entomacrodus caudofasciatus													1												1	1	1
Entomacrodus striatus													1												1	1	1
Istiblennius dussumieri*	1																								0	0	1
Istiblennius edentulus											1		1												1	1	1
Meiacanthus atrodorsalis					1	1	1	1		1	1	1	1	1		1		1	1			1	1	1	1	1	1
Meiacanthus cyanopterus													1												1	1	1
Meiacanthus grammistes				1			1															1		1	1	1	1
Nannosalarias nativitatus														1				1		1					1	1	1
Petroscirtes mitratus															1										1	1	1
Petroscirtes variabilis															1										1	1	1
Petroscirtes xestus															1										1	1	1
Plagiotremus laudanus																							1		1	1	1
Plagiotremus rhinorhynchus			1		1	1	1		1	1	1	1	1						1				1		1	1	1
Plagiotremus tapeinosoma																1									1	1	1
Salarias fasciatus																					1				1	1	1
Salarias guttatus*	1																								0	0	1
CALLIONYMIDAE (3 SPP.)																											
Callionymus annulatus*	1																								0	0	1
Synchiropus ocellatus*	1																								0	0	1
Synchiropus tudorjonesi																					1				1	1	1
GOBIIDAE (89 SPP.)																											
Amblyeleotris fontanesii															1										1	1	1
Amblyeleotris guttata							1							1					1	1	1				1	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Amblyeleotris masuii																				1					1	1	1
Amblyeleotris periophthalma																					1				1	1	1
Amblyeleotris wheeleri			1				1				1					1			1	1	1		1	1	1	1	1
Amblyeleotris yanoi																1									1	1	1
Amblygobius nocturnus															1										1	1	1
Amblygobius phalaena															1										1	1	1
Amblygobius sphynx															1										1	1	1
Asterropteryx ensifera					1	1	1	1		1	1	1			1										1	1	1
Asterropteryx spinosa							1																		1	1	1
Asterropteryx striata						1		1		1	1	1	1	1						1	1				1	1	1
Bathygobius coalitius											1														1	1	1
Bathygobius cotticeps													1												1	1	1
Bathygobius petrophilus*	1																								0	0	1
Bryaninops amplus															1										1	1	1
Callogobius okinawae			1										1												1	1	1
Cryptocentrus cinctus			1																	1					1	1	1
Cryptocentrus sericus				1																1	1				1	1	1
Ctenogobiops feroculus				1																					1	1	1
Ctenogobiops maculosus																					1				1	1	1
Ctenogobiops pomastictus																				1	1				1	1	1
Drombus sp.															1										1	1	1
Eviota atriventris							1		1									1			1			1	1	1	1
Eviota distigma														1											1	1	1
Eviota guttata								1			1	1							1		1		1	1	1	1	1
Eviota latifasciata										1															1	1	1
Eviota "fallax"													1						1						1	1	1
Eviota prasites			1																					1	1	1	1
Eviota punctulata																								1	1	1	1
Eviota sebreei							1	1		1	1	1	1					1							1	1	1
Eviota sp. 1 (white spots on head)								1			1			1				1					1	1	1	1	1
Eviota sp. 2 (cf punctulata)																		1							1	1	1
Eviota sp. 3 (cf "jewettae")																						1			1	1	1
Eviota zonura*	1																								0	0	1
Fusigobius aurea																		1							1	1	1
Fusigobius duospilus																			1				1		1	1	1
Fusigobius neophytus					1														1				1		1	1	1
Fusigobius signipinnis			1				1		1	1	1	1	1	1						1	1	1	1		1	1	1
Gnatholepis cauerensis			1				1	1			1		1					1	1	1	1		1		1	1	1
Gobiodon acicularis																						1			1	1	1
Gobiodon erythrospilus*	1																								0	0	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Gobiodon quinquestrigatus																							1	1	1	1
Gobiodon sp. 3 (E. Indies book)																						1		1	1	1	1
Istigobius decoratus			1								1								1		1			1	1	1
Istigobius goldmanni*	1																							0	0	1
Istigobius nigrocellus															1									1	1	1
Istigobius ornatus*	1																							0	0	1
Lotilia graciliosa																						1		1	1	1
Mahidolia mystacinus				1											1									1	1	1
Paragobiodon echinocephalus*	1																							0	0	1
Paragobiodon melanosoma			1					1																1	1	1
Paragobiodon xanthosoma*	1																							0	0	1
Periophthalmus argentilineatus			1																					0	1	1
Pleurosicya labiata																			1					1	1	1
Pleurosicya micheli							1	1		1														1	1	1
Pleurosicya mossambica							1	1		1														1	1	1
Priolepis cinctus																			1					1	1	1
Priolepis semidoliatus*	1																							0	0	1
Stonogobiops xanthorhinica																			1					1	1	1
Tomiyamichthys tanyspilus															1									1	1	1
Trimma anaima							1		1	1								1						1	1	1
Trimma annosum																			1					1	1	1
Trimma caudomaculatum																				1		1		1	1	1
Trimma emeryi																						1		1	1	1
Trimma halonevum							1													1	1			1	1	1
Trimma macrophthalma										1	1		1										1	1	1	1
Trimma marinae																						1		1	1	1
Trimma okinawae							1		1	1	1	1							1					1	1	1
Trimma papayum																				1				1	1	1
Trimma rubromaculatus							1	1																1	1	1
Trimma sp. (yellow with ear spot)																						1	1	1	1	1
Trimma stobbsi																				1		1		1	1	1
Trimma taylori																1		1				1		1	1	1
Trimma tevegae																1		1						1	1	1
Trimma yanoi																			1			1	1	1	1	1
Trimma xanthocrum																							1	1	1	1
Tryssogobius colini																				1				1	1	1
Tryssogobius sarah													1					1				1		1	1	1
Valenciennea helsdingenii												1												1	1	1
Valenciennea longipinnis*	1																							0	0	1
Valenciennea muralis*	1																							0	0	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Valenciennea puellaris					1							1								1	1				1	1	1
Valenciennea sexguttata															1	1				1					1	1	1
Valenciennea strigata					1		1	1	1	1		1		1	1				1						1	1	1
Vanderhorstia ambanoro	1														1										1	1	1
Vanderhorstia dorsomacula	1																								1	1	1
Vanderhorstia phaeosticta				1											1										1	1	1
Vanderhorstia sp. (E. Indies book)															1										1	1	1
MICRODESMIDAE (2 SPP.)																											
Gunnellichthys curiosus							1																		1	1	1
Gunnellichthys viridescens				1																					1	1	1
PTERELEOTRIDAE (10 SPP.)																											
Nemateleotris decora		1			1	1	1	1	1	1	1	1	1			1		1	1			1		1	1	1	1
Nemateleotris magnifica		1			1		1	1	1				1			1		1	1			1	1	1	1	1	1
Oxymetopon typus*	1																								0	0	1
Parioglossus philippinus															1										1	1	1
Ptereleotris evides		1			1			1	1	1			1	1		1						1	1		1	1	1
Ptereleotris grammica								1					1					1							1	1	1
Ptereleotris hanae					1																				1	1	1
Ptereleotris heteroptera		1			1	1	1	1	1	1	1	1	1	1		1		1	1					1	1	1	1
Ptereleotris rubristigma												1													1	1	1
Ptereleotris zebra		1											1					1							1	1	1
EPHIPPIDAE (4 SPP.)																											
Platax batavianus															1										1	1	1
Platax boersi		1		1								1		1		1									1	1	1
Platax pinnatus		1		1	1																	1			1	1	1
Platax teira		1																							0	1	1
SCATOPHAGIDAE (1 SPP.)																											
Scatophagus argus*	1																								0	0	1
SIGANIDAE (14 SPP.)																											
Siganus argenteus		1	1													1			1	1					1	1	1
Siganus canaliculatus			1												1										1	1	1
Siganus corallinus		1	1	1																			1		1	1	1
Siganus guttatus		1		1										1				1		1					1	1	1
Siganus javus**	1																								0	0	1
Siganus labyrinthodes**	1																								0	0	1
Siganus margaritiferus*	1																								0	0	1
Siganus puellus		1	1													1									1	1	1
Siganus punctatissimus					1									1		1		1					1	1	1	1	1
Siganus punctatus		1								1										1				1	1	1	1
Siganus spinus		1																							0	1	1

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				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Siganus vermiculatus*	1																							0	0	1
Siganus virgatus		1	1			1																		1	1	1
Siganus vulpinus		1	1		1	1		1	1			1		1					1	1	1	1	1	1	1	1
ZANCLIDAE (1 SPP.)																										
Zanclus cornutus		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1
ACANTHURIDAE (35 SPP.)																										
Acanthurus auranticavus		1																						0	1	1
Acanthurus barine		1																	1					1	1	1
Acanthurus blochii		1																						0	1	1
Acanthurus leucocheilus		1																1	1					1	1	1
Acanthurus lineatus		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1		1	1	1
Acanthurus maculiceps		1																						0	1	1
Acanthurus mata		1			1	1	1		1			1	1	1		1			1	1	1	1	1		1	1	1
Acanthurus nigricans		1			1	1	1	1	1	1				1		1		1	1			1		1	1	1
Acanthurus nigricauda		1						1	1	1														1	1	1
Acanthurus nigrofuscus		1					1	1						1				1	1			1	1	1	1	1
Acanthurus olivaceus		1			1	1				1	1	1	1			1			1					1	1	1
Acanthurus pyroferus		1	1		1	1	1	1	1	1		1	1	1		1			1	1	1	1	1	1	1	1
Acanthurus thompsoni		1			1		1		1	1		1	1	1		1		1	1			1	1	1	1	1
Acanthurus triostegus		1	1				1		1	1		1	1					1	1	1				1	1	1
Acanthurus xanthopterus		1																						0	1	1
Ctenochaetus binotatus		1	1		1	1	1	1	1	1	1	1	1	1					1	1	1		1	1	1	1
Ctenochaetus cyanocheilus		1	1				1	1	1	1			1	1				1		1	1			1	1	1
Ctenochaetus striatus		1	1		1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1
Ctenochaetus tominiensis		1												1									1	1	1	1
Naso annulatus		1									1					1							1	1	1	1
Naso brachycentron		1									1	1		1				1	1				1	1	1	1
Naso brevirostris		1					1			1									1			1	1		1	1	1
Naso caeruleacauda		1										1												1	1	1
Naso caesius		1																						0	1	1
Naso hexacanthus		1								1	1	1	1						1			1	1	1	1	1	1
Naso lituratus		1			1	1	1	1	1	1	1	1	1	1		1			1	1	1	1	1	1	1	1	1
Naso lopezi		1					1	1	1	1		1	1					1					1	1	1	1	1
Naso minor		1			1				1	1												1		1	1	1
Naso tonganus		1																						0	1	1
Naso thynnoides		1			1				1	1		1									1	1	1		1	1	1
Naso unicornis		1																			1				1	1	1
Naso vlamingii		1			1					1						1			1			1	1	1	1	1	1
Paracanthurus hepatus		1										1				1								1	1	1
Zebrasoma scopas		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1
Zebrasoma veliferum		1					1			1	1	1								1			1		1	1	1

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SPHYRAENIDAE (4 SPP.)																										
Sphyraena barracuda												1		1											1	1	1
Sphyraena forsteri*	1																								0	1	1
Sphyraena jello																1									1	1	1
Sphyraena qenie																1									1	1	1
SCOMBRIDAE (6 SPP.)																										
Euthynnus affinis		1																							0	1	1
Grammatorcynus bilineatus									1	1	1	1												1	1	1	1
Gymnosarda unicolor		1							1			1	1												1	1	1
Rastrelliger brachysoma**	1																								0	0	1
Rastrelliger kanagurta*	1																								0	0	1
Scomberomorus commerson		1					1		1			1	1												1	1	1
BOTHIDAE (1 SPP.)																										
Asterorhombus filifer			1																						0	1	1
SOLEIDAE (4 SPP.)																										
Aseraggodes suzumotoi							1																		1	1	1
Brachirus heterolepis*	1																								0	0	1
Heteromycteris hartzfeldii*	1																								0	0	1
Soleichthys heterorhinus*	1																								0	0	1
SAMARIDAE (1 SPP.)																										
Samariscus triocellatus			1																						0	0	1
BALISTIDAE (16 SPP.)																										
Balistapus undulatus		1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Balistoides conspicillum		1			1	1	1		1	1			1			1			1	1			1	1	1	1	1
Balistoides viridescens		1			1	1		1	1	1	1	1	1	1		1							1	1	1	1	1
Canthidermis maculatus*	1																								0	0	1
Melichthys niger		1	1				1	1	1	1	1	1	1					1		1	1			1	1	1	1
Melichthys vidua		1	1				1	1	1	1	1	1	1			1		1	1	1	1	1	1	1	1	1	1
Odonus niger		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Pseudobalistes flavimarginatus		1			1	1		1		1						1								1	1	1	1
Pseudobalistes fuscus											1														1	1	1
Rhinecanthus aculeatus															1										1	1	1
Rhinecanthus rectangulus		1																							0	1	1
Rhinecanthus verrucosus		1																		1					1	1	1
Sufflamen bursa		1			1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Sufflamen chrysopterus		1			1		1		1	1	1	1			1	1			1	1	1	1	1		1	1	1
Sufflamen fraenatus		1			1		1																		1	1	1
Xanthichthys auromarginatus		1																				1	1	1	1	1	1
MONACANTHIDAE (8 SPP.)																										
Acreichthys tomentosus*	1																								0	0	1
Aleuterus scriptus		1																							0	1	1

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Amanses scopas			1				1	1		1						1					1				1	1	1
Cantherhines pardalis		1		1	1			1	1	1	1	1		1								1	1		1	1	1
Oxymonacanthus longirostris		1																							0	1	1
Paraluteres prionurus			1																			1			1	1	1
Pervagor janthinosoma			1											1				1					1		1	1	1
Pervagor melanocephalus		1	1																			1			1	1	1
OSTRACIIDAE (4 SPP.)																											
Lactoria cornuta*	1																								0	0	1
Ostracion cubicus		1																	1			1			1	1	1
Ostracion meleagris								1	1							1		1			1	1			1	1	1
Ostracion solorensis													1	1							1	1	1	1	1	1	1
TETRAODONTIDAE (13 SPP.)																											
Arothron hispidus																						1			1	1	1
Arothron immaculatus															1										1	1	1
Arothron manilensis															1										1	1	1
Arothron mappa													1					1							1	1	1
Arothron nigropunctatus		1								1	1	1				1			1	1	1	1			1	1	1
Arothron stellatus																				1					1	1	1
Canthigaster axilogus																					1				1	1	1
Canthigaster bennetti															1					1					1	1	1
Canthigaster compressa*	1																								0	0	1
Canthigaster epilamprus														1								1			1	1	1
Canthigaster leoparda																									1	1	1
Canthigaster papua			1	1																1				1	1	1	1
Canthigaster valentini																				1		1	1		1	1	1
DIODONTIDAE (3 SPP.)																											
Diodon holocanthus*	1																								0	0	1
Diodon hystrix*	1																								0	0	1
Diodon liturosus			1																						0	1	1
TOTALS	154	410	216	104	220	163	270	226	199	230	167	249	237	260	66	238	0	213	244	201	182	294	218	227	741	814	968

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