MAJOR CORAL REEF FISH SPECIES OF THE SOUTH PACIFIC WITH BASIC INFORMATION ON THEIR BIOLOGY AND ECOLOGY.

Kulbicki Michel[1] , MouTham Gérard[2], Vigliola Laurent[2], Wantiez Laurent[3], Manaldo Esther[1], Labrosse Pierre[5], Letourneur Yves[4]

1-IRD- UR 227-Laboratoire Arago-BP.44 – 66651 Banyuls/mer-France
2- IRD- UR 227 – BP A5 – 98848 – Nouméa Nouvelle Calédonie
3- UNC – BP R4 – 98851 – Nouméa; Aquarium des Lagons, BP 8185 98807 Nouméa– Nouvelle Calédonie
4- Université de Nouvelle Calédonie- Laboratoire « LIVE » – BP R4 – 98851 – Nouméa- Nouvelle Calédonie
5- Université de Djibouti - B.P. 1904, Djibouti

Suggested reference : Kulbicki M. , MouTham G., Vigliola L., Wantiez L., Manaldo E., Labrosse P., Letourneur Y. 2011 Major Coral Reef Fish Specie of the South Pacific with basic information on their biology and ecology. CRISP-IRD report. Noumea SPC. 107 pp. + Annexes

TABLE OF CONTENT

GENERAL INTRODUCTION

Reef fishes are an important resource in most countries in the South Pacific (Figure 1). At present there are still huge gaps in our knowledge of the geographical distribution, biology and ecology of these fishes. Such information is often essential to managers and scientists working on these resources. Much of this information is already available in books or in FISHBASE. However, most of this information is not available per country and is scattered. In addition this information is not easily available for many species.

The objective of the present report is to give for 14 South Pacific countries or territories a list of the most common reef fish species and indications on some of their basic life-history traits. The species targeted in this report are commercial species and/or species which are supposed to be ecologically important, but we attempted to include other species as well. Only species found on reefs or strongly associated to reefs are considered. In particular species found inshore in habitats such as mangroves, estuaries or pelagic species are not included. Species living in deeper water (more than 80m) are not considered either (e.g. the deep water Lutjanidae or Serranidae). A limited number of references is provided (globally and for each country) to assist in finding additional information on each species.

The species lists in this report **should NOT be considered as checklists** because a number of records could not be verified and the data available for many countries or territories is still very incomplete. In addition a number of species, in particular small and cryptic ones, are not included for most countries. In some instances, when the degree of information was low, some interpolation was performed with the presence/absence from nearby countries in order to indicate for some major species if their presence was likely.

The taxonomy used in this report follows the taxonomy used in the 2010 version of FISHBASE. For species not listed in FISHBASE 2010 (recently described species or species waiting for a final status) a reference will be given. Un-described species were not retained.

A detailed chapter is given for each country or territory (Cook Islands, Federate States of Micronesia, Fiji, Marshall Islands, Nouvelle Calédonie, Palau, Papua New Guinea, Pitcain, Polynésie-Française, Samoa, Solomon Islands, Tonga, Vanuatu, Wallis et Futuna). These chapters will be either in English or French depending on the official language in these countries.

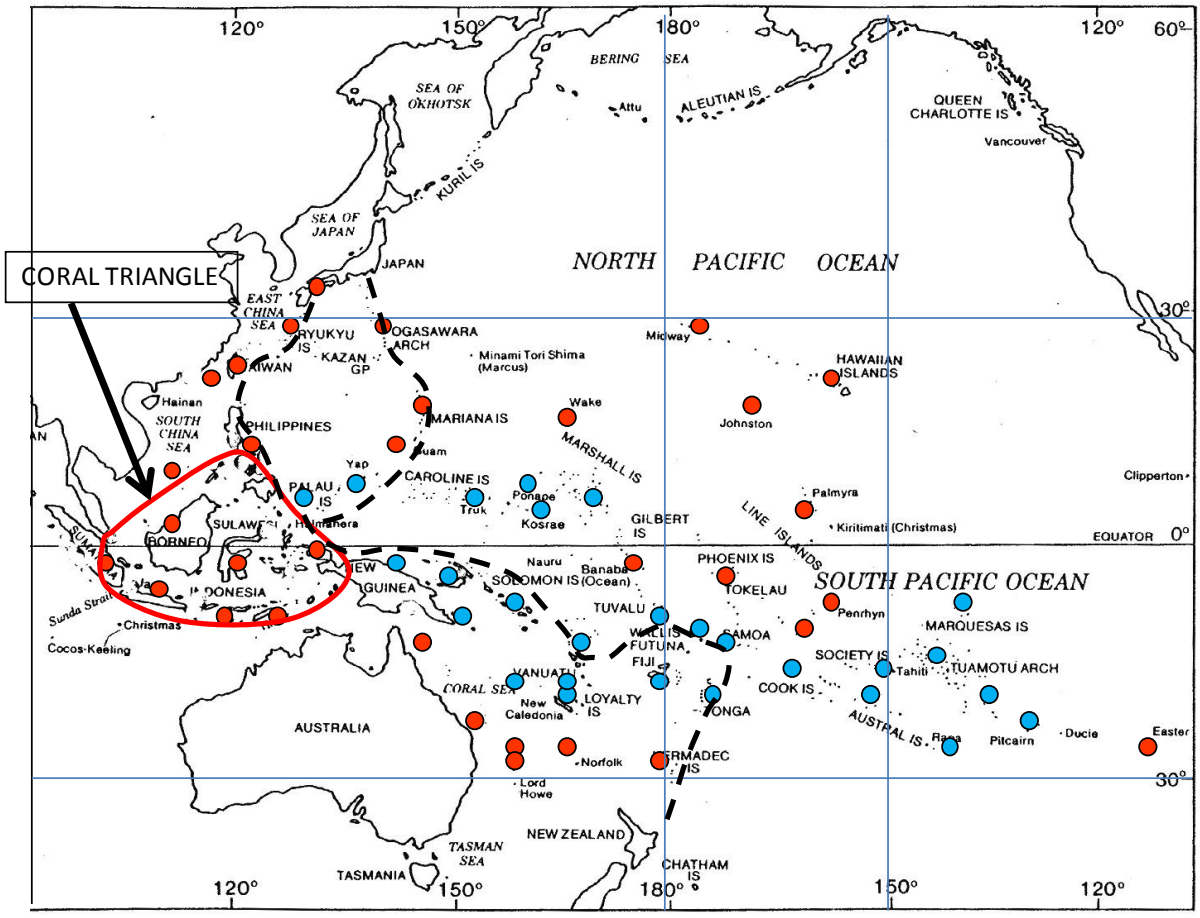


Figure 1: map of the Pacific. Dots represent known checklists of Pacific reef fishes. Dots are in blue for the area considered by this report. The black dotted line represents approximate limits of tectonic plates. The red line represents the limits of the “Coral Triangle” or Pacific biodiversity center.

GENERAL INFORMATION

This general information is given for the entire Western and Central Pacific as the 14 countries and territories covered by this report do not constitute by themselves a biogeographical entity. If not specified “**Pacific**” will mean the Western and Central Pacific (Fig.1) and excludes the Tropical Eastern Pacific (TEP).

A total of 2690 species are discussed in this report. This represents a large proportion (72 %) of the reef fish species found in the Western and Central Pacific (fig.1) and also a large proportion of the Indo-Pacific for which approximately 5000 reef fish species are known so far.

Reef fish species in the Pacific are characterized by:

- A few dominant families, seven of them making 50 % of the total diversity
- The existence of strong gradients in the regional and local distributions of species
- The existence of several biogeographical regions
- A high similarity in species composition from one country to another
- A low level of endemism

- Little variation in the structure of reef fish assemblages at the regional or local level

1 – The major Families

The Indo-Pacific reef fish fauna is dominated by a restricted number of families. This may be illustrated for the Western and Central Pacific (Figure 2), where 50.2% of all species are found in 7 families out of 165 families known to have species associated to coral reefs. The main families are given in Table 1. For many families the number of species described at present is much lower than what exists. This is mainly true for either families represented by small species such as the Gobiidae, Apogonidae, Pseudochromidae, Tripterygiidae or for species which are difficult to catch or observe such as Scorpaenidae, Muraenidae, Ophichtidae. There are also many families which have a large proportion of their species which are not fond on reefs. This is the case for instance of most flat fish, rays, several families of sharks, of pelagic species (e.g. Clupeidae, Atherinidae, Centropomidae, Leiogantidae), of mullets (Mugilidae) and other shore or soft bottom associated families (e.g. catfish, Sciaenidae, Gerreidae, Nemipteridae).

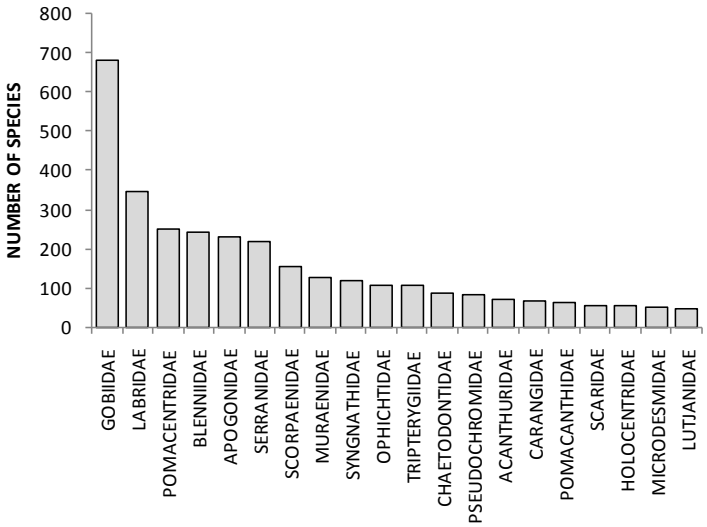


Figure 2: families with more than 50 reef associated species in the Western and Central Pacific.

The Gobiidae are the most speciose family with at present nearly 700 reef associated species described in the Pacific, but with many more found in adjacent habitats (shore, freshwater, soft bottoms). A very large proportion of these fish are still undescribed and the number of species associated to reefs in the Pacific is estimated at ~1000. These fish are usually not abundant but they could play an important role as preliminary data suggest that they may have a fast turnover. Another important but overlooked family is the Apogonidae. Many of these species are seldom observed *in situ* but they often make a very significant proportion of the fish on a reef as indicated by rotenone stations. Very little is known on the biology and ecology of Apogonidae, but they often also constitute a very large share of the larvae and recruiting juvenile fish observed on or near reefs which suggests that these fish could play an important role in reef ecosystem functioning.

Table 1: list of the major families of reef associated fish species in the Western and Central Pacific. The numbers are the species described at present for each family. Families shaded in grey have a large proportion of still undescribed species. Families in italic are difficult to sample and may be under-represented in many checklists. Families in bold may have many other species which are not associated to coral reefs. * : families which will be analyzed more in detail

Family	# of Species	Family	# of Species	Family	# of Species	Family	# of Species	Family	# of Species
GOBIIDAE	681	MONACANTHIDAE*	43	*PEMPHERIDAE*	18	*XENOCONGRIDAE*	10	**HETERODONTIDAE**	4
LABRIDAE*	347	PINGUIPEDIDAE*	41	CAESIONIDAE*	17	BELONIDAE	9	ISONIDAE	4
POMACENTRIDAE*	252	TETRAODONTIDAE*	40	*CARAPIDAE*	16	**CLUPEIDAE**	8	*KRAEMERIIDAE*	4
BLENNIIDAE	241	LETHRINIDAE*	34	*SYNANCEIDAE*	16	GIRELLIDAE	8	*SOLENOSTOMIDAE*	4
APOGONIDAE	230	MULLIDAE*	33	***MORINGUIDAE***	15	HEMISCYLLIDAE	8	CARACANTHIDAE	3
SERRANIDAE*	219	PLESIOPIDAE	33	**DASYATIDAE**	14	ORECTOLOBIDAE	8	CENTRISCIDAE	3
SCORPAENIDAE	155	**CONGRIDAE**	32	*GRAMMISTIDAE*	14	PLATACIDAE	8	ECHENEIDAE	3
MURAENIDAE	128	BYTHITIDAE	31	CHEILODACTYLIDAE	12	SCYLIORHINIDAE	8	GLAUCOSOMATIDAE	3
SYNGNATHIDAE	120	HAEMULIDAE*	28	OSTRACIIDAE	12	*BATRACHOIDIDAE*	7	**LEIOGNATHIDAE**	3
OPHICHTIDAE	107	**SYNODONTIDAE***	27	SPHYRAENIDAE	12	***BOTHIDAE***	7	*MORIDAE*	3
TRIPTERYGIIDAE	106	BALISTIDAE*	25	**MUGILIDAE**	11	**GERREIDAE**	7	***PLEURONECTIDAE***	3
CHAETODONTIDAE*	87	GOBIESOCIDAE	25	***SOLEIDAE***	11	KYPHOSIDAE	7	*XENISTHMIDAE*	3
PSEUDOCHROMIDAE	84	**NEMIPTERIDAE***	25	**ATHERINIDAE**	10	**MYLIOBATIDIDAE**	7	*AMMODYTIDAE*	2
ACANTHURIDAE*	71	SIGANIDAE*	25	*CREEDIIDAE*	10	*CLINIDAE*	6	ANAMOLOPIDAE	2
CARANGIDAE*	66	MALACANTHIDAE	24	DIODONTIDAE	10	*LABRACOGLOSSIDAE*	6	***APLOACTINIDAE***	2
POMACANTHIDAE*	64	CARCHARHINIDAE*	23	ENGRAULIDAE	10	*OPHIDIIDAE*	6	CHIROCENTRIDAE	2
SCARIDAE*	56	CIRRHITIDAE*	23	HEMIRAMPHIDAE	10	SCOMBRIDAE	6	EPHIPPIDIDAE	2
HOLOCENTRIDAE*	53	*ANTENNARIIDAE*	22	*OPISTOGNATHIDAE*	10	SPHYRNIDAE	5	FISTULARIIDAE	2
MICRODESMIDAE	50	*CALLIONYMIDAE*	21	PRIACANTHIDAE	10	*TRICHONOTIDAE*	5	KUHLIIDAE	2
LUTJANIDAE*	45	*PLATYCEPHALIDAE*	21	SPARIDAE	10	ALBULIDAE	4	MICROCANTHIDAE	2

Other families which influence is probably well underestimated in the functioning of reefs are Muraenidae, Ophichthidae and Holocentridae. The first two are usually only detected by using poison and even then their numbers are not so important. However the recent analysis of sea snake gut content in New Caledonia (Ineich et al. 2007) has indicated that eel like fish were far more numerous and diverse on reefs than previously thought. Similarly rotenone stations in New Caledonia and French Polynesia suggest that Holocentridae (squirrelfish) are probably far more abundant than previously thought, reaching 10% of the abundance on a number of reefs.

To give a crude indication of the relative importance of the various families on reefs in the South Pacific, some indications are given for New Caledonia and French Polynesia where similar methods were used and therefore yield comparable results (Fig. 3; Table 2). There is an important convergence at the family level between the two regions for either regional diversity or abundance and biomass (Fig.3). Only a few families which are found in the Western Pacific but which are very poorly represented in the Central Pacific generate outliers. In the present case these are Nemipteridae, Plesiopidae and Haemulidae for diversity and Caesionidae for abundance and biomass.

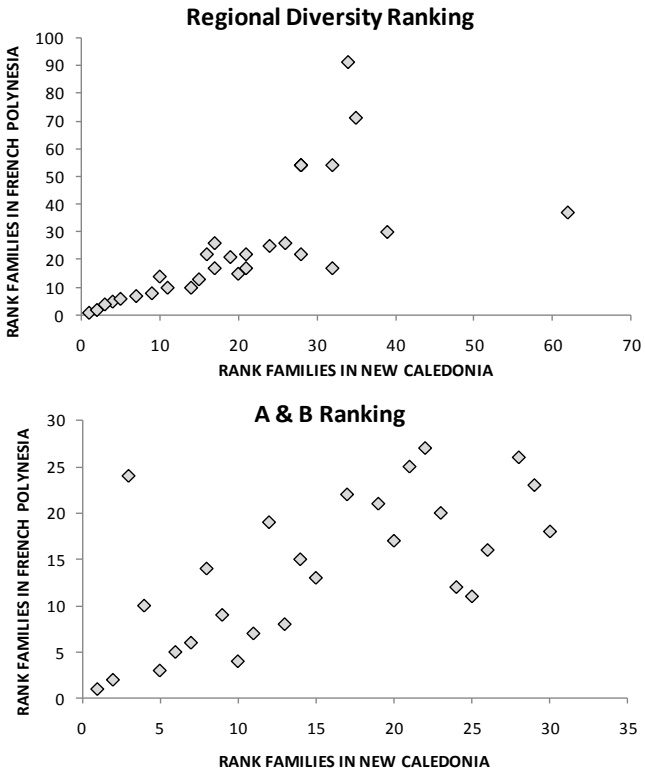


Figure 3: comparison of the ranks of reef fish families between New Caledonia and French Polynesia based on regional diversity (left graph) and combining abundance and biomass (bottom graph)

On the opposite there is little correlation between the ranking by diversity and the ranking by abundance and biomass in either region (Figure 4; Table 2), some families having any species (e.g. Gobiidae and Blenniidae) but a low importance in abundance and biomass, whereas other families may be important in abundance or biomass but have a low number of species (e.g. Caesionidae, sharks). A restricted number of families are both important in diversity and in abundance and biomass, in particular Pomacentridae, Acanthuridae, Labridae, Scaridae, Apogonidae, Serranidae.

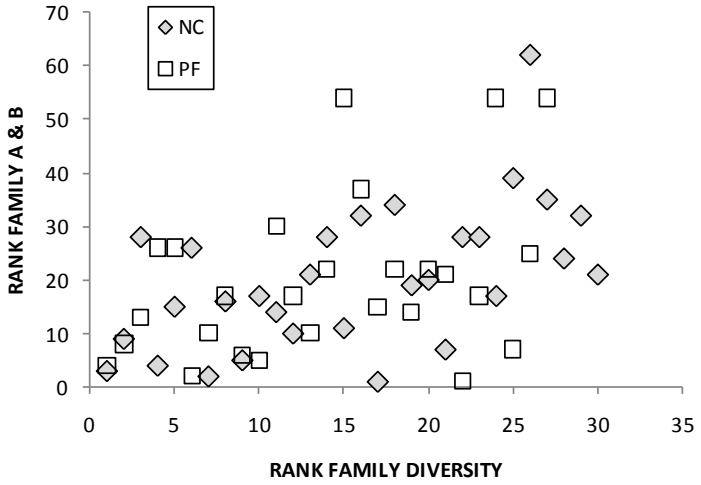


Figure 4: relationship between the rank in diversity and the rank in abundance and biomass for New Caledonia (NC) and French Polynesia (PF) (based on Table 2)

Table 2: comparison of the order of the major reef fish families in New Caledonia and French Polynesia based on visual censuses (UVC) and rotenone versus the regional diversity in each region. %A: % of the abundance; %B: % of the biomass; A & B Rank: ranking based on the average %A and %B across methods. D Rank: ranking according to the number of species known for each family at the regional level.

	New Caledonia						French Polynesia					
	UVC		Rotenone				UVC		Rotenone			
	% A	% B	% A	% B	A & B Rank	D Rank	% A	% B	% A	% B	A & B Rank	D Rank
ACANTHURIDAE	9.8	24.1	1.3	15.9	2	9	8.9	10.9	23.8	16.5	2	8
APOGONIDAE	0.3	0.02	28.0	7.3	4	4	1.5	0.05	7.8	1.3	10	5
BALISTIDAE	0.2	0.4	0.02	1.4	20	20	1.4	2.9	0.1	0.7	17	15
BLENNIIDAE	0.4	0.04	0.9	0.2	21	7	0.0	0.0	0.4	0.03	25	7
CAESIONIDAE	18.2	6.7	9.7	10.2	3	28	0.4	0.1	0.04	0.02	24	54
CARANGIDAE	0.4	6.1	0.01	0.1	12	10	0.4	3.9	0.1	0.1	19	14
CARCHARHINIDAE	0.0	13.2			6	26	0.1	23.5	0.01	2.1	5	26
CHAETODONTIDAE	2.1	0.7	1.2	1.8	15	11	2.6	1.2	1.6	1.8	13	10
CIRRHITIDAE	0.1	0.04	0.1	0.0	29	32	0.2	0.03	0.3	0.1	23	17
GOBIIDAE	0.3	0.1	3.7	0.3	17	1	0.2	0.01	1.1	0.03	22	1
HAEMULIDAE	0.0	0.6	0.1	4.1	16	32						54
HEMIRAMPHIDAE	0.1	0.2	0.1	0.2	26	62	0.2	0.1	2.8	2.3	16	37
HOLOCENTRIDAE	0.7	0.7	1.9	5.8	11	14	0.9	0.7	10.1	8.9	7	10
LABRIDAE	9.1	5.1	1.6	2.4	7	2	12.5	3.9	5.5	3.4	6	2
LETHRINIDAE	3.7	6.4	0.5	3.3	10	17	3.8	11.9	3.9	14.6	4	26
LUTJANIDAE	2.2	4.4	1.1	10.4	8	16	0.9	3.9	0.3	1.4	14	22
MICRODESMIDAE	0.03	0.003	0.001	0.000	30	21	2.2	0.2			18	22
MONACANTHIDAE	0.2	0.1	0.03	0.01	28	24	0.01	0.00	0.1	0.2	26	25
MUGILIDAE	0.2	0.1			25	39	0.4	0.6	0.5	7.2	11	30
MUGILOIDIDAE	0.4	0.1	0.6	0.2	22	28	0.01	0.001	0.1	0.04	27	54
MULLIDAE	2.3	2.4	0.3	1.0	13	21	3.8	5.4	3.0	6.0	8	17
NEMIPTERIDAE	0.9	0.7	0.1	0.4	18	34						91
PLESIOPIDAE	0.04	0.0005	0.4	0.1	27	35						71
POMACANTHIDAE	1.1	0.2	0.3	0.5	19	19	0.6	0.1	0.7	0.2	21	21
POMACENTRIDAE	36.5	4.1	35.7	7.4	1	3	45.3	2.9	18.1	4.7	1	4
SCARIDAE	8.3	16.5	0.6	4.5	5	15	9.3	18.4	2.3	9.2	3	13
SERRANIDAE	0.5	3.1	0.9	12.7	9	5	1.1	4.8	2.0	6.3	9	6
SIGANIDAE	1.4	0.5	1.0	3.0	14	28	1.2	1.5	1.0	2.4	15	54
SYNODONTIDAE	0.1	0.04	0.4	0.4	23	28	0.02	0.005	0.8	0.9	20	22
TETRAODONTIDAE	0.2	0.03	0.3	0.3	24	17	0.6	0.1	6.2	0.9	12	17

2- Diversity gradients

2-1 Regional gradients

Going eastwards in the Pacific islands tend to decrease in size and increase in isolation. This phenomena is correlated to tectonic plate limits (Figure 1). Coral reefs also extend from high latitudes (35° N and 33°S) to the equator with important differences in temperature patterns along this latitudinal gradient. The question is to know if reef fish diversity is affected by these factors or not.

A map of the known reef fish diversity (Figure 5) suggests that reef fish diversity decreases going eastward or as latitude increases. The highest diversities are found in the Indonesia-Philippines-China Sea area, often called “Coral Triangle” or “Biodiversity Centre” (see Green and Mous, 2008 for a recent definition). The reasons behind this higher diversity remain a point of contentious debate. Generally, it is accepted that the Coral Triangle is not necessarily a region where speciation (generation of new species) is very high, but rather an area of species accumulation.

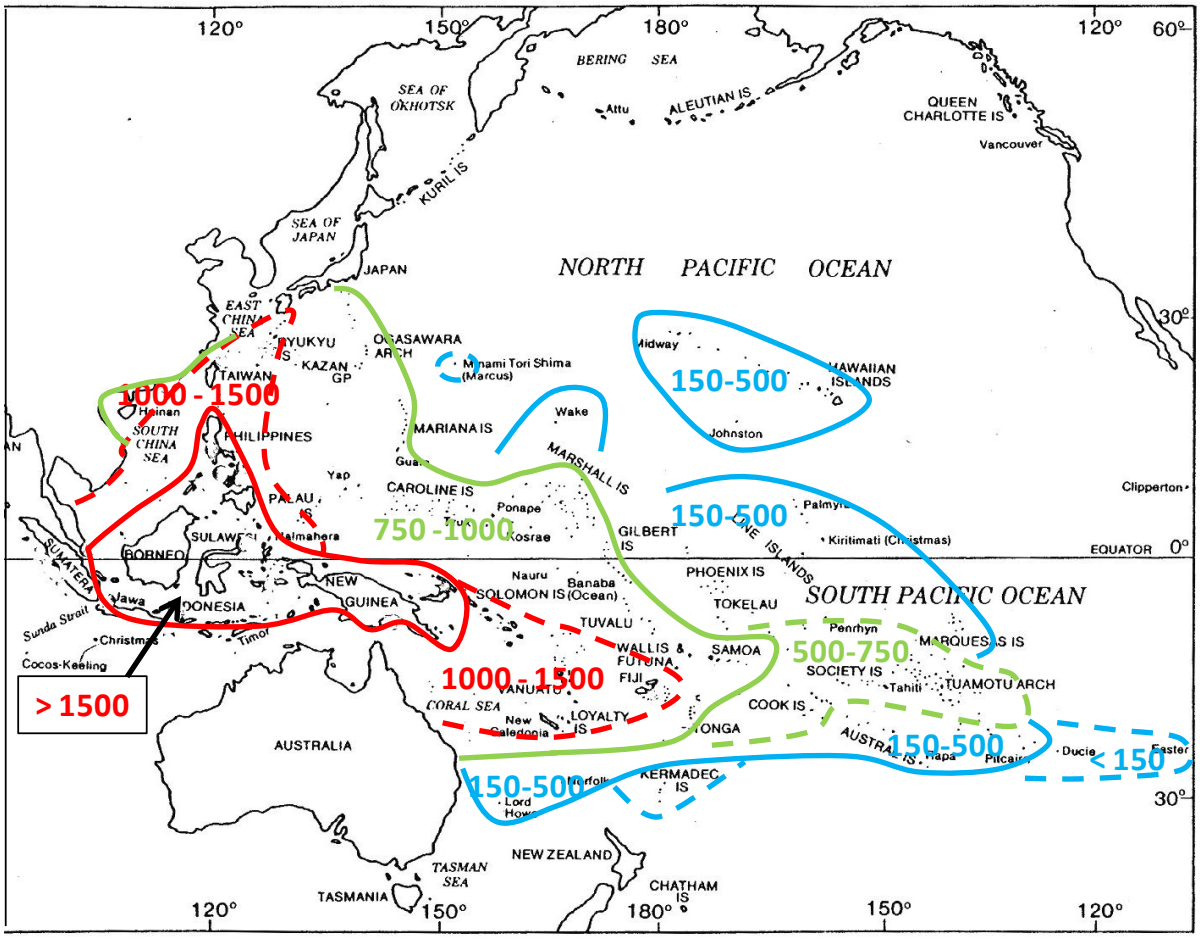


Figure 5: approximate distribution of reef fish diversity in the Pacific. Numbers indicate the number of described species per checklist

An analysis of the large scale distribution of reef fish diversity indicates that several factors contribute significantly to differences amongst regions (Table 3). Island size is the most significant factor, with nearly always a highly significant increase in the number of species as island size increases, except for Cheilodactylidae, a family restricted to the limits of the tropical area. The number of species decreased significantly as the distance to the Coral Triangle increased. This is mainly true for the largest species and for families that are linked to soft bottoms (Lethrinidae, Nemipteridae, Lutjanidae). Generally, latitude and diversity are positively correlated. This increase is however limited to some families. For a given latitude there are more species in the Southern hemisphere compared to the northern one. This is mainly true for small plankton-feeding species, but also for two families of bottom dwelling species (Lethrinidae and Nemipteridae). The number of species decreases also as isolation increases. This effect is seldom strong (see however

Pomacentridae and Siganidae) and affects mainly the smaller species, especially those feeding on plankton or invertebrates.

Table 3: effects of large scale factors on several components of reef fish diversity in the Pacific. From GLMs including all the factors (backward stepwise). Based on 71 checklists. ***: p < 0.001; ** : p < 0.01; * p < 0.05 ; + increase with the factor; - decrease with the factor. Distance and island size are on a log e scale.

	Island Size	Distance to Coral Triangle	Latitude	Hemisphere	Isolation	Hemisphere x Isolation
Total	*** +	* -			* -	
Size-1 : < 6 cm	*** +				* -	
Size-2 : 6-10 cm	*** +			* S>N	* -	
Size-3 : 11-20 cm	*** +	* -			* -	
Size-4 : 20 – 40 cm	*** +	** -				
Size-5 : 40 -80 cm	*** +	*** -				
Size-6 : > 80 cm	*** +	* -			* -	
Carnivores	*** +	* -			* -	
Herbivores	*** +					
Piscivores	*** +	* -				
Plankton Feeders	*** +	* -		* S>N	* -	
ACANTHURIDAE	*** +		* -			
BALISTIDAE	*** +	* -				
CAESIONIDAE	*** +	*** -	***-	*** S>N	* -	**
CARANGIDAE	*** +	** -			* -	
CARCHARHINIDAE	*** +					
CHAETODONTIDAE	*** +	** -				
CHEILODACTYLIDAE			*** +			
CIRRHITIDAE	*** +					
HAEMULIDAE	*+	* -	**+		** -	
HOLOCENTRIDAE	***+					
LABRIDAE	***+	*-			* -	
LETHRINIDAE	***+	***-		** S >N	* -	
LUTJANIDAE	***+	***-			* *-	
MONACANTHIDAE	***+	** -	** +			
MULLIDAE	***+	** -	*+			
NEMIPTERIDAE	***+	*** -		** S >N	** -	
PINGUIPEDIDAE	*+	* -	*+		** -	
POMACANTHIDAE	***+					
POMACENTRIDAE	***+			** S >N	*** -	
SCARIDAE	***+					
SERRANIDAE	***+				* -	
SIGANIDAE	***+	** -			*** -	
SYNODONTIDAE	***+	* -	*** +			**
TETRAODONTIDAE	***+	** -	*+			

Considering the relative importance of the various families or the diet and size classes, results are rather different (Table 4). Bellwood and Hughes (2001) found that for the entire Indo-Pacific the proportion of a given family within the species pool of a region tended to remain constant for regions with over 200 species. These authors concluded that since diet is usually homogeneous within a family the trophic structure should also remain constant. The present results clearly show that this is not the case when restricting the analysis to the Pacific Ocean (Table 4). In particular, there are larger proportions of small species on large islands compared to small ones. The proportion of carnivorous species tends to increase in proportion as latitude increases and the opposite is true for herbivores and plankton feeders. There tends to be larger proportions of piscivores and plankton feeders on isolated islands. Latitude has a strong effect on the relative importance of the various families. A first group of families (Acanthuridae, Balistidae, Caesionidae, Lutjanidae, Pomacentridae) are most important near the Equator, whereas the relative importance of a second group of families increases as latitude increases (Cheilodactylidae, Haemulidae, Synodontidae).

Table 4: effects of large scale factors on several components of reef fish relative diversity in the Pacific. From GLMs including all the factors (backward stepwise). Based on 71 checklists. ***: $p < 0.001$; ** : $p < 0.01$; * $p < 0.05$; + increase with the factor; - decrease with the factor. Distance and island size are on a log e scale.

	Island Size	Distance to Coral Triangle	Latitude	Hemisphere	Isolation	Hemisphere x Isolation
% Size-1 : < 6 cm	** +					
% Size-2 : 6-10 cm	** +		* -	* +		
% Size-3 : 11-20 cm			** +			
% Size-4 : 20 – 40 cm	*** -		* -	* -	* -	* +
% Size-5 : 40 -80 cm					* +	* +
% Size-6 : > 80 cm						
% Carnivores	* +		*** +			* -
% Herbivores	*** -	* +	*** -			
% Piscivores					* +	
% Plankton Feeders	** +		* -		* +	
% ACANTHURIDAE	** -	** +	*** -	* -	*** +	
% BALISTIDAE	* -		*** -	* -	** +	
% CAESIONIDAE			*** -			
% CARANGIDAE			* +		*** +	
% CARCHARHINIDAE		* +				
% CHAETODONTIDAE						* +
% CHEILODACTYLIDAE	** -		*** +			
% CIRRHITIDAE	* -	*** +	** -		** +	
% HAEMULIDAE		** -	*** +		* -	
% HOLOCENTRIDAE		** +		** -		
% LABRIDAE	* -					
% LETHRINIDAE		** -				
% LUTJANIDAE			*** -			
% MONACANTHIDAE						
% MULLIDAE	* -			** -		
% NEMIPTERIDAE	* +	*** -			** -	
% PINGUIPEDIDAE		* -	* +			
% POMACANTHIDAE				* -		
% POMACENTRIDAE	* -		*** -	* +	* -	
% SCARIDAE						** +
% SERRANIDAE	* +		* +			** -
% SIGANIDAE					*** -	
% SYNODONTIDAE			*** +			
% TETRAODONTIDAE	** +		* +	** -	*** +	

2-2 Local gradients

The reef fish assemblages are also sensitive to a number of local gradients. It is beyond the scope of this report to explore the effects of most of them, such as the effects of fishing or of the benthic structure. However two factors are supposed to induce important spatial differences in the structure of reef fish assemblages, these are reef type and depth. Data from UVC indicate little difference in the ranking of the first families (Table 5). Similarly there is little variation in the proportion of the various families with depth or reef type (Table 5).

Table 5: Percent (%) and ranking of the diversity of the major families according to reef type and depth on reefs from the South Pacific (based on underwater visual censuses data from New Caledonia, Fiji, Tonga and French Polynesia). Numbers indicate the proportion then the rank of the family, per column. Increasing values are indicated in bold, decreasing values are indicated by underlining.

	<4m -%	4-8m -%	8-12m -%	>12m -%	<4m-Rank	4-8m-Rank	8-12m-Rank	>12m-Rank		fringing -%	intermediate -%	inner-barrier-reef -%	outer-barrier-reef -%	fringing-Rank	intermediate-Rank	inner-barrier-reef-Rank	outer-barrier-reef-Rank
LABRIDAE	12	18	14	15	1	1	1	1	LABRIDAE	12	16	15	17	1	1	1	1
POMACENTRIDAE	12	12	13	14	2	2	2	2	POMACENTRIDAE	**11**	**13**	**13**	**15**	2	2	2	2
ACANTHURIDAE	5	7	5	5	4	3	4	3	CHAETODONTIDAE	**6**	**7**	**7**	**9**	3	3	3	3
CHAETODONTIDAE	4	6	5	6	7	5	3	4	ACANTHURIDAE	5	6	6	8	4	4	4	4
GOBIIDAE	6	3	5	3	**3**	**4**	**8**	**10**	SCARIDAE	5	6	5	7	5	5	5	5
SERRANIDAE	4	5	5	5	6	6	4	6	SERRANIDAE	3	4	4	4	7	6	6	6
SCARIDAE	3	6	4	4	9	7	6	5	BLENNIIDAE	3	2	2	3	9	13	13	7
APOGONIDAE	5	3	4	3	4	7	7	11	HOLOCENTRIDAE	2	3	3	2	12	7	7	11
BLENNIIDAE	3	2	3	3	8	10	13	16	MULLIDAE	3	3	3	3	10	8	9	9
CARANGIDAE	3	2	3	3	10	11	9	13	GOBIIDAE	4	3	2	1	**6**	**9**	**15**	**21**
HOLOCENTRIDAE	3	2	3	2	11	9	14	16	APOGONIDAE	3	3	3	1	7	9	8	28
LUTJANIDAE	3	3	3	2	12	12	14	8	LUTJANIDAE	2	3	3	3	11	9	10	8
LETHRINIDAE	2	3	2	3	13	13	10	8	LETHRINIDAE	2	3	2	2	13	12	11	13
MULLIDAE	2	3	2	3	13	15	11	7	BALISTIDAE	2	2	2	2	14	14	12	10
BALISTIDAE	2	3	2	3	16	15	11	11	CARANGIDAE	2	2	2	2	15	14	13	15
TETRAODONTIDAE	2	2	2	2	15	14	14	14	POMACANTHIDAE	1	2	2	2	17	17	17	11
POMACANTHIDAE	2	2	2	2	17	17	14	14	TETRAODONTIDAE	2	2	2	1	16	16	16	20
SIGANIDAE	1	1	2	2	21	18	18	18	SIGANIDAE	1	1	2	2	21	19	17	13
CAESIONIDAE	1	1	1	1	21	19	20	18	MONACANTHIDAE	1	1	1	1	22	20	19	17
SYNODONTIDAE	1	1	1	1	25	20	20	18	CAESIONIDAE	1	1	1	2	18	24	21	15

An analysis of the trophic or size structure with reef type or depth (Table 6) indicates that the structure of reef fish diversity changes little with these gradients. In addition values are very similar from one region to the next; however, there are some differences. The proportion of piscivores tends to decrease as depth increases. There are differences between Fiji-New Caledonia with Tonga-French Polynesia for the size and trophic structures. In the west (Fiji-New Caledonia) there is an increase in

herbivores and a decrease of piscivores with depth, and also a decrease of both the smallest and largest size classes with depth. In the Central Pacific (Tonga, French Polynesia) there is a decrease in small-medium size species as the ocean influence increases.

Table 6: ranking and proportion of the major trophic groups and size classes according to reef type and depth on reefs from the South Pacific (based on underwater visual censuses data from New Caledonia, Fiji, Tonga and French Polynesia). Numbers indicate the rank or the percentage of the trophic group or the size class, per column. Increasing values are indicated in bold, decreasing values are indicated by underlining.

	Fringing - Rank	intermediate - Rank	inner-barrier-reef - Rank	outer-barrier-reef - Rank	Fringing - %	intermediate - %	inner-barrier-reef - %	outer-barrier-reef - %	<4m - Rank	4-8m - Rank	8-12m - Rank	>12m - Rank	<4m - %	4-8m - %	8-12m - %	>12m - %
Fiji																
Carnivores	1	1	1	1	46	49	49	46	1	1	1	1	47	47	49	45
Herbivores	2	2	2	2	23	20	23	23	2	3	2	2	**20**	**21**	**24**	**36**
Piscivores	4	4	4	4	12	11	10	11	4	4	4	4	13	11	10	1
Plankton Feeders	3	3	3	3	19	20	19	20	3	2	3	3	19	21	18	17
Nouvelle-Calédonie																
Carnivores	1	1	1	1	52	51	48	44	1	1	1	1	**50**	**50**	**52**	**53**
Herbivores	3	3	3	2	**16**	**18**	**18**	**26**	3	3	3	2	**16**	**17**	**18**	**18**
Piscivores	4	4	4	4	13	13	15	8	4	4	4	4	15	13	11	11
Plankton Feeders	2	2	2	3	19	19	19	22	2	2	2	2	19	20	20	18
Polynésie Française																
Carnivores	1	1	1	1	53	48	50	46	1	1	1	1	50	48	48	49
Herbivores	2	2	2	2	26	25	22	24	2	2	2	2	23	24	21	24
Piscivores	4	3	4	4	9	14	14	12	3	3	4	3	14	14	15	13
Plankton Feeders	3	4	3	3	**12**	**13**	**14**	**17**	4	4	3	3	13	14	16	13
Tonga																
Carnivores	1	1	1	1	46	51	49	49	1	1	1	1	49	47	48	50
Herbivores	2	2	2	2	22	21	24	27	2	2	2	2	23	21	22	26
Piscivores	4	4	4	4	11	10	8	5	4	4	4	4	11	11	9	5
Plankton Feeders	3	3	3	3	20	18	18	19	3	3	3	3	17	20	21	19

	Fringing - Rank	intermediate - Rank	inner-barrier-reef - Rank	outer-barrier-reef - Rank	Fringing - %	intermediate - %	inner-barrier-reef - %	outer-barrier-reef - %	<4m - Rank	4-8m - Rank	8-12m - Rank	>12m - Rank	<4m - %	4-8m - %	8-12m - %	>12m - %
Fiji																
Size-1 : < 6 cm	5	5	6	6	6	6	3	4	5	5	5	6	6	6	3	0
Size-2 : 6-10 cm	1	1	1	2	31	32	34	30	2	1	1	2	31	31	34	26
Size-3 : 11-20 cm	2	2	2	1	30	31	33	32	1	2	2	1	**31**	**31**	**33**	**43**
Size-4 : 20 – 40 cm	3	3	3	3	22	18	20	21	3	3	3	3	19	20	18	25
Size-5 : 40 -80 cm	4	4	4	4	8	9	7	9	4	4	4	4	9	9	9	6
Size-6 : > 80 cm	6	6	5	5	3	4	4	4	6	6	6	6	4	3	3	0
Nouvelle-Calédonie																
Size-1 : < 6 cm	4	6	6	6	11	5	4	3	4	5	5	6	10	7	5	3
Size-2 : 6-10 cm	1	1	1	1	32	31	29	34	1	1	1	1	31	30	32	32
Size-3 : 11-20 cm	2	2	2	2	**27**	**29**	**29**	**33**	2	2	2	2	**27**	**28**	**29**	**30**
Size-4 : 20 – 40 cm	3	3	3	3	18	18	19	18	3	3	3	3	17	19	19	19
Size-5 : 40 -80 cm	5	4	4	4	8	10	10	8	5	4	4	4	**8**	**9**	**10**	**11**
Size-6 : > 80 cm	6	5	5	5	4	6	8	4	6	6	6	5	7	7	5	5
Polynésie Française																
Size-1 : < 6 cm	6	6	6	6	2	2	5	4	6	6	6	6	4	6	4	2
Size-2 : 6-10 cm	2	2	2	2	25	23	24	24	2	2	2	3	25	23	25	23
Size-3 : 11-20 cm	1	1	1	1	37	37	33	33	1	1	1	1	32	34	31	30
Size-4 : 20 – 40 cm	3	3	3	3	24	20	21	22	3	3	3	2	21	21	21	24
Size-5 : 40 -80 cm	4	4	4	5	8	10	10	8	4	4	4	4	10	8	10	13
Size-6 : > 80 cm	5	5	5	4	**4**	**8**	**8**	**9**	5	4	4	5	7	8	10	8
Tonga																
Size-1 : < 6 cm	5	5	5	5	5	4	3	4	5	6	5	5	6	3	4	4
Size-2 : 6-10 cm	1	1	2	2	32	33	29	27	2	1	1	1	31	34	32	31
Size-3 : 11-20 cm	2	2	1	1	32	31	34	37	1	2	2	2	34	31	31	29
Size-4 : 20 – 40 cm	3	3	3	3	**19**	**20**	**23**	**23**	3	3	3	3	**20**	**20**	**21**	**24**
Size-5 : 40 -80 cm	4	4	4	4	9	8	8	8	4	4	4	4	**8**	**8**	**9**	**10**
Size-6 : > 80 cm	6	6	6	6	3	3	3	0	6	5	6	6	2	4	3	1

3- Biogeographical regions

Species are not distributed at random across the Pacific. There are similarities in the species composition of islands close to one another. These similarities are the result of a long history of colonization by species over geological times. Based on these similarities it is possible to define “biogeographical regions” which group islands or countries which have similar reef fish fauna. This analysis was performed using “reliable” species. Not all species are easily detected when conducting checklists. In particular cryptic species such as moray eels, squirrel fish (Holocentridae) or small species such as Gobiidae, Blenniidae, Apogonidae are not well sampled without a very large sampling effort. As many countries have only been lightly sampled, using species which are easily detected and which pose little identification problems yields more robust results.

The checklists were grouped using a cluster analysis (Wards aggregating method and Euclidian distances). Checklists are first separated into two major groups (Figure 6), the first group includes checklists from continental areas in the western part of the Pacific Ocean and the second group gathers checklists of most islands away from continental areas. These two groups are rather well separated by the eastern limit of the Australian and Eurasian tectonic plates (Figure 7). These two major groups may be split into several subgroups (Figure 6). Three continental regions may be defined (Figure 8), the Coral Triangle (mainly Indonesia), the western Pacific which includes the China Sea, Philippines, Taiwan and Japan, the SW Pacific which groups most of Melanesia (PNG, Fiji, New Caledonia, Solomon Islands and Vanuatu), Palau and the Coral Sea. The islands, or central Pacific regions, can be split into four major regions (Figure 8). Micronesia groups most of the islands of Micronesia plus Samoa, Wallis, Rotuma and Tonga. The latter four archipelagoes have also similarities with the SW Pacific region. There are two Polynesian regions, North Polynesia with the Line Islands, Phoenix, Baker, Howland and Tokelau and South Polynesia with the Society islands, Marquesas, Tuamotu, Gambier, Australes islands, Rapa, Cook islands and Pitcairn-Dulcie. The last group is split into two geographical entities, north the Hawaiian archipelago and south the South Pacific which groups Elizabeth-Middleton reef, Lord Howe, Norfolk, Kermadec and Easter Island.

Opposite to what is indicated in the literature (e.g. Santini and Winterbottom, 2002; Connolly et al., 2003; Carpenter and Springer, 2005) it is not the Coral Triangle which gathers the largest number of species, but the SW Pacific with over 2900 species of described reef fish species (Figure 8).It is followed by the West Pacific region with nearly 2500, the Coral Triangle being only third with 2220 species. There may be several explanations. The SW Pacific and the West Pacific may not represent homogeneous regions. For instance there is a strong latitude gradient in both of these regions. Southern Japan and Taiwan-Pescadores may be separated from the China Sea-Philippines area (Figure 6) and in the SW Pacific there are three sub regions, Melanesia (Fiji, Vanuatu and New Caledonia), the Coral Sea (north and south GBR) and the PNG sub-region which includes PNG, Palau and the Solomon islands. In the central Pacific, the Micronesia region is not very homogeneous as it gathers two subgroups. The first sub group (blue squares – Figures 6 and 7) are mainly dispersed atolls and very small islands, whereas the second sub group includes mainly high islands (southern and northern Marianas, Samoa, Tonga) but also the Marshalls and Tuvalu-Gilbert which are atolls which bridge the Marianas in the north to the Samoa-Tonga in the south. This Micronesia region has over 1700 species of reef fish species but the “high islands” subgroup has more species (1570) than the small island sub-group (1330). South Polynesia is the next most speciose region with over 1100 species. The southern-most islands (Australes and Rapa) show affinities with the South Pacific group. Northern Polynesia has a lower diversity than south Polynesia with only 740 species known so far. This region has mainly atolls, whereas south Polynesia is more diverse with high islands (Society, Marquesas, Gambier, Australes) and atolls (Tuamotu). The south Pacific region groups islands which are at the southern limit of coral reefs. Most of the diversity in this region is found in its western part (Lord Howe, Elizabeth-Middleton reefs, Norfolk), Easter island having the lowest diversity (120 reef fish species). The Hawaiian region is the least diverse region with 560 species. Diversity decreases in that region going from the large Hawaiian islands in the East towards the north-west where most islands have less than 300 species each. There is a strong similarity between this Hawaian region and the South Pacific region due to a low number of specific families (e.g. Cheilodactylidae).

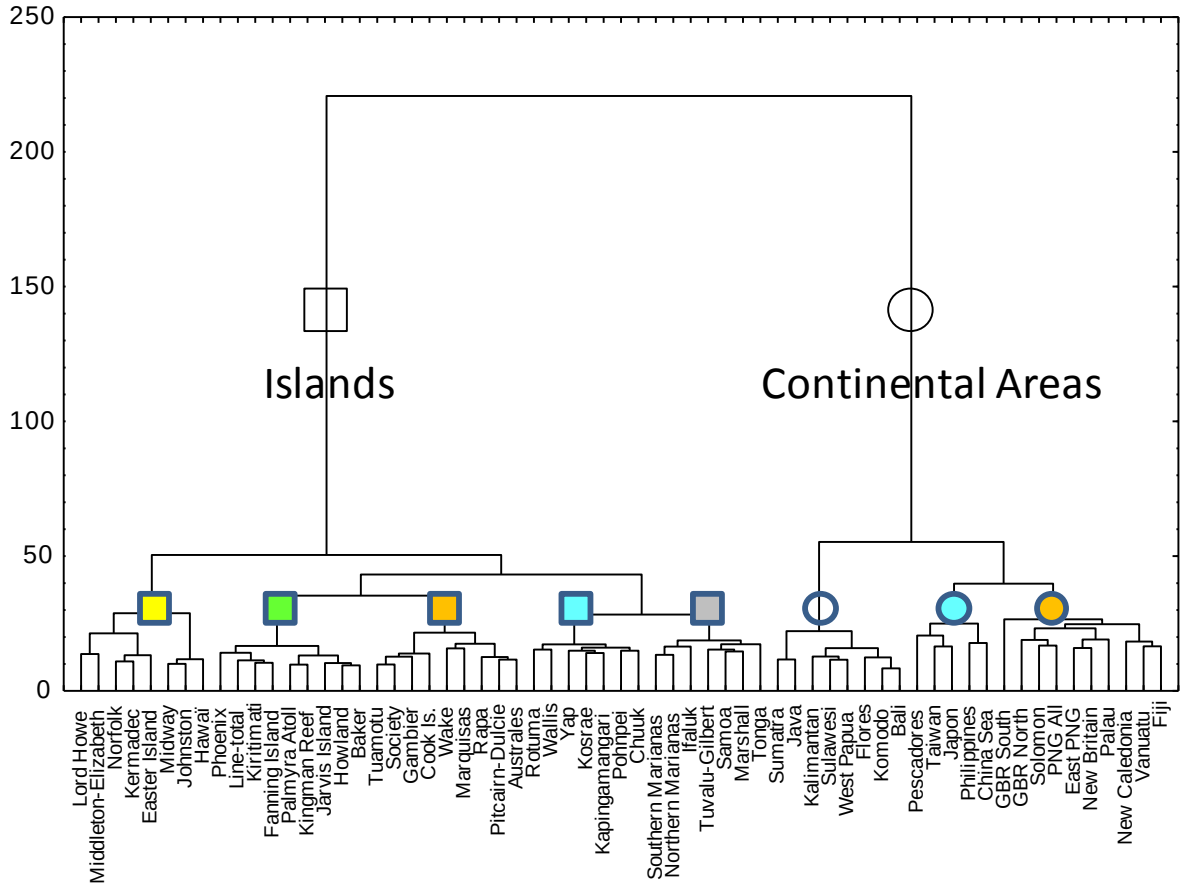


Figure 6 : cluster analysis of checklists of reef fish species in the Pacific. Only “reliable” (see text) species were used in this analysis.

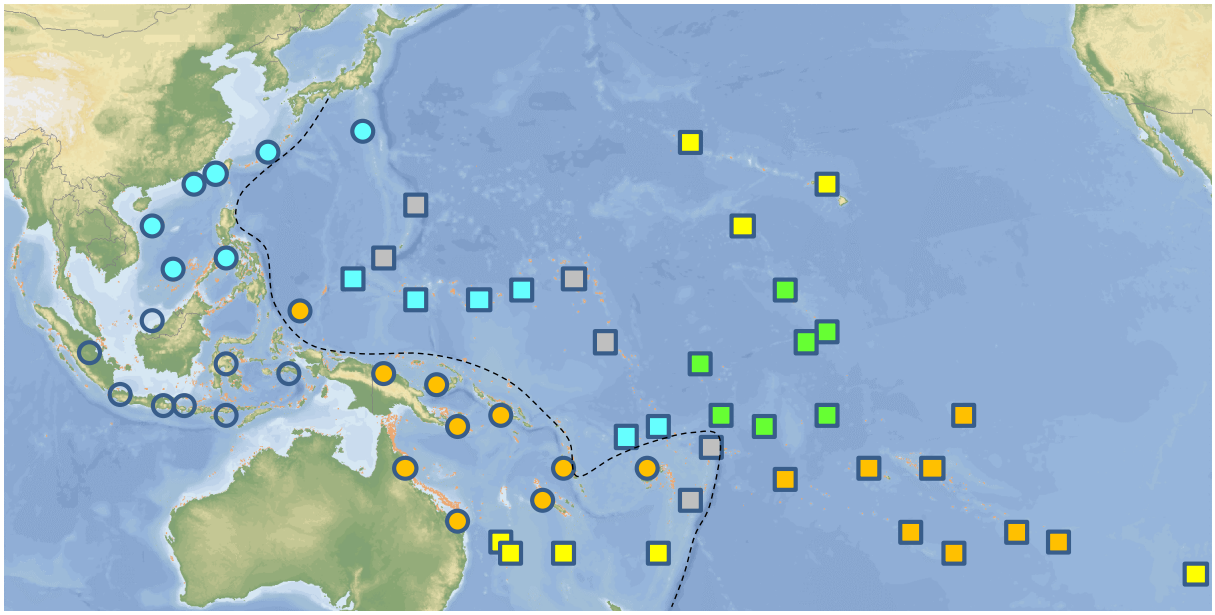


Figure 7: map of the groups defined on figure 6. The dotted line is the approximate eastern limit of the Eurasian and Australian tectonic plates.

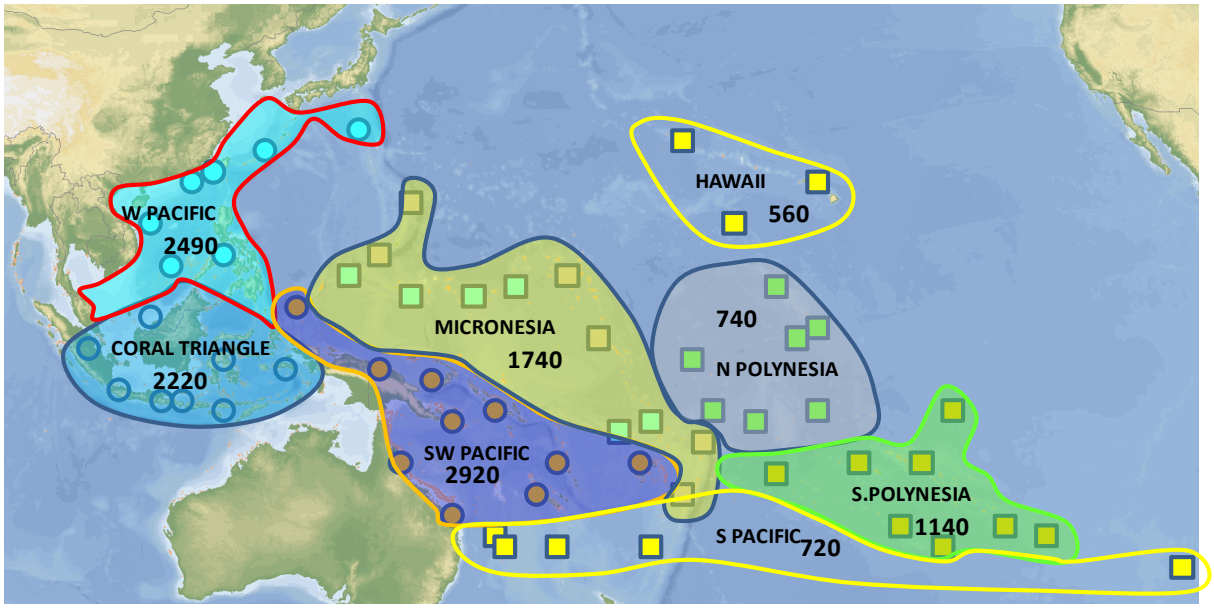


Figure 8: major bio-geographic regions defined from figure 6. Numbers are the diversity of reef fish species for each of these regions.

4- Endemism

Many species in the Indo-Pacific have a large geographical range which induces a high level of similarity, although it is difficult to assess the true geographical range of a marine species. A convenient way to estimate geographic range is to count the number of checklists in which each species is recorded. At present there are approximately 140 checklists of reef fish species across the Indo-Pacific. Based on these lists it was possible to analyze the geographical distribution of reef fish species in the Pacific (Figure 9). A large number of species are either local endemics (7% - species known from only one checklist) or regional endemics (18.4% - species known from 2 to 5 checklists). Species recorded in 30 or less checklists represent 52.2% of the total diversity.

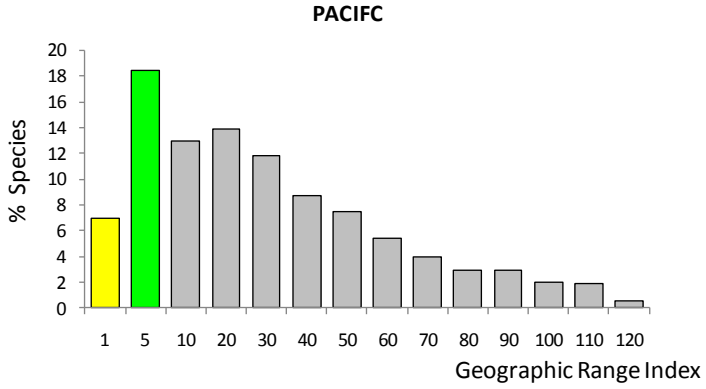


Figure 9: Distribution of the geographical range of reef fish species across the Pacific. The geographical range index is based on the presence/absence of each species amongst 142 checklists across the Indo-Pacific. Only described species are taken into account. 1 (yellow bar): species known from only one checklist (local endemics); 5: species known from 2 to 5 checklists (regional endemics or limited range species); 10 to 120: index class, e.g. 30 groups species with an index between 30 and 40 checklists.

The frequency distribution of the geographic range of species changes from one biogeographic region to another (Figure 10). An important feature is the increasing contribution to regional diversity of species with a wide geographical range as one goes from the western to the central Pacific regions. The latter regions are characterized by a larger proportion of small and isolated islands. This suggests that species which are able to maintain wide geographical distributions will be found more frequently in remote areas than in areas with an easy access. This may have important implications for management because, as will be documented further, there are links between geographical range and life-history traits. The second important feature is the variable level of endemism from one region to another. The lowest proportions of endemic species (both local and regional endemics) are found in the Coral Triangle and in North Polynesia. In these regions local endemics represent respectively 0.2 and 0.3% of the regional species pools and regional endemics 3.0 and 2.7%. The situation is opposite for Hawaii and the South Pacific where local endemics reach respectively 4.4 and 4% and the regional endemics 18.6 and 14.1%. This is a 20 fold difference for local endemics and a 5 to 6 fold increase for regional endemics compared to the Coral Triangle or North Polynesia. The reasons behind such differences are still not understood, but a combination of isolation and low temperatures could be important. Another area of high endemism is the SW Pacific with 3% local endemics and 12.6% of regional endemics. The West Pacific and South Polynesia have a nearly similar contribution of the local and regional diversities combined with respectively 11.2 and 11.1% of their regional diversity represented by these endemics.

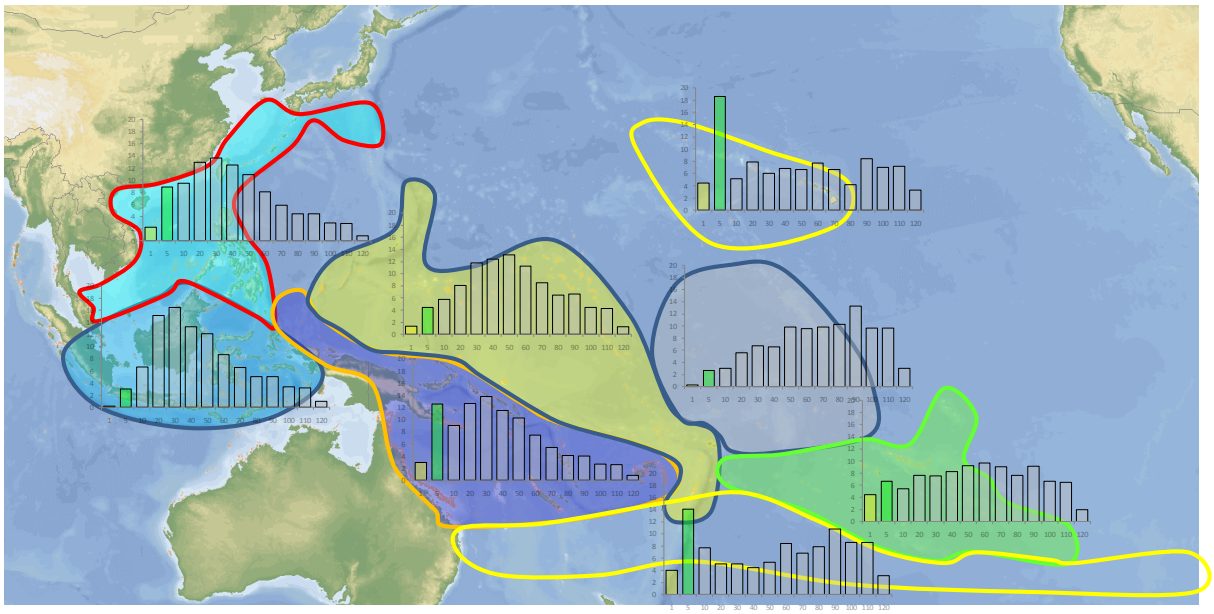


Figure 10: distribution of the geographical range index of coral reef fish species (as defined in Figure 9) for the 8 bio-geographic regions of the Pacific. All histograms are at the same scale.

Species which have a large geographical range tend to have larger body sizes than those with a restricted range (Figure 11). The proportion of species less than 5 cm reaches 40% amongst the local endemics, this proportion dropping to less than 10% for species with a wide geographical range. There are little variations in the diet of species with geographical range (Figure 12), with however a slight increase in the proportion of piscivores and decrease in the proportion of carnivores as geographical range increases.

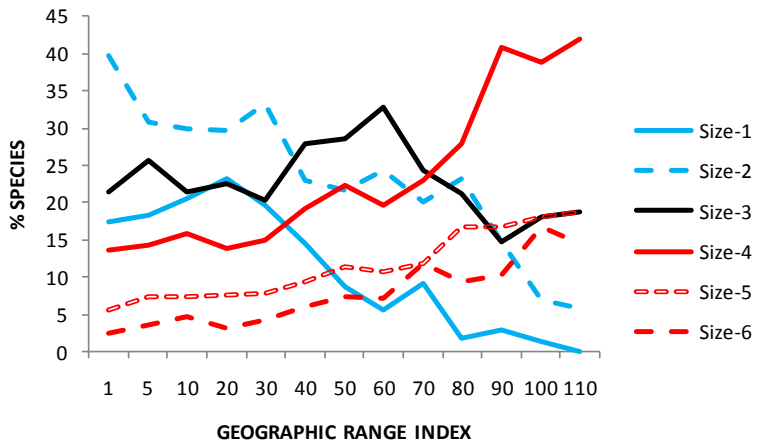


Figure 11: reef fish species size distribution according to their geographical range

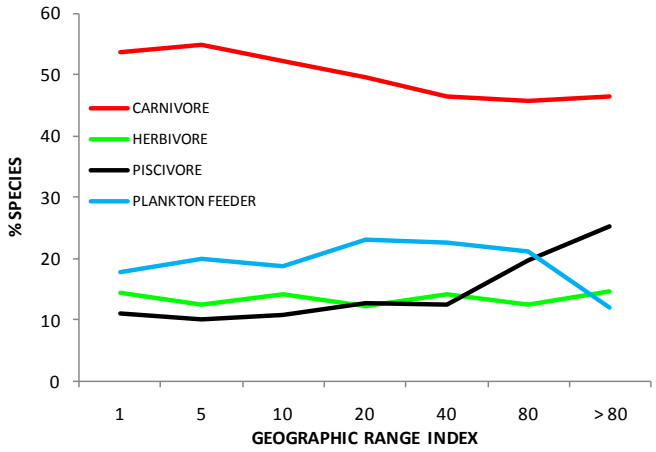


Figure 12 : reef fish species diet distribution according to their geographical range

The structure of the reef fish faunas is specific to each region. For instance the size, trophic and geographical range structures of the South Pacific regions reef fish faunas exhibit important differences between the regions (Figure 13), but little difference amongst countries within a biogeographical region.

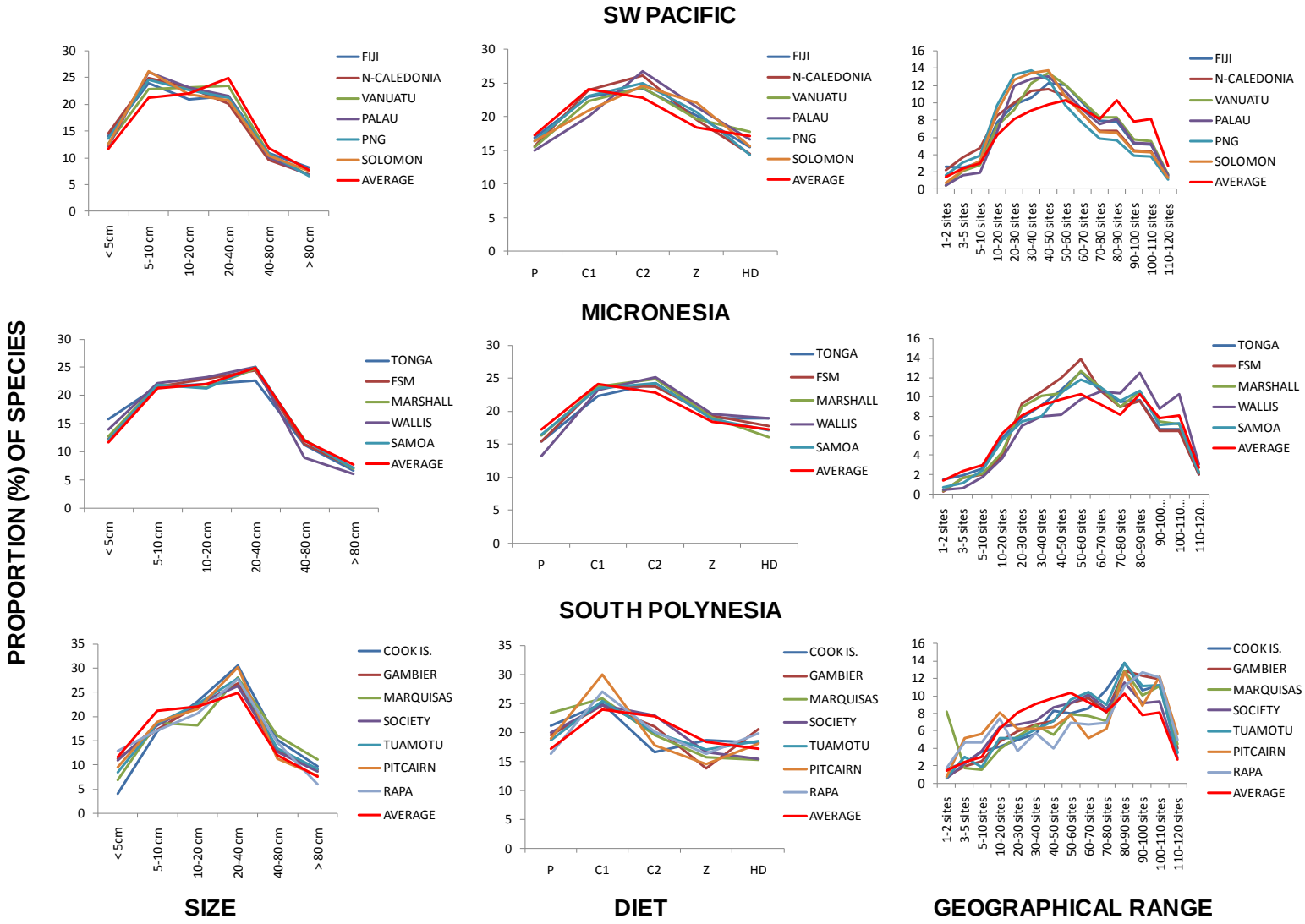


Figure 13: Proportion of the reef fish fauna of each country (or region) according to species size, diet and geographical range.
P: piscivores; C1 : macro-invertebrate feeders; C2: micro-invertebrate feeders; Z: plankton feeders; HD: herbivores and detritus feeders

COUNTRY REPORTS

General Information

The country reports are given by alphabetical order. Each country report is constructed in a similar fashion. After a brief introduction on the characteristics of the country or territory a summary of the major taxonomic and life-history patterns is given. These summaries are based on 2 tables (Table CR-1 and CR-2) given at the end of this report. A list of the major species is given at the end of this report for each country, and in some cases for several regions within these countries (Table CR-3). For each species the following information is given:

Presence/Absence:

For each country or region a record of the presence of a species is indicated by "1". No record or doubtful records are indicated by "0". For some countries or regions it was possible from the analysis of species distribution to indicate for some species if their presence is "Likely". Species recorded as "Likely" are not included in the analyses.

Size:

The average adult size and the maximum known size (cm). Two sources are indicated, FISHBASE 2010 and "other sources " (see the reference Size is also indicated by a size group as follows: 1: less than 6 cm (adult size); 2: 6-10 cm; 3: 11-20 cm; 4: 21-40 cm; 5: 41-80 cm; 6: > 80 cm

Diet:

The two major known components of the species' diet are indicated. Food items were classified into 8 major categories:

P: fish or nekton
C1: large benthic invertebrates
C2: small benthic invertebrates
Z: plankton
H1: macro-algae and sea grass
H2: micro-algae (turf), blue-green algae
Co: sessile invertebrates (coral and sponge mainly)
D: detritus or unidentified organic matter (either of animal or vegetal origin)
C: indicates that either the species eats both C1 and C2 or that the size of the invertebrates eaten is not known
H: indicates that either macro and micro algae are eaten or that the algal composition of the diet is not known

Notice: For many species the precise diet is not known and the food items indicated are based either on behavior and morphology (teeth, jaw, gut length, species size) or on what is known from species within the same genus or family. Therefore this diet information should be considered as indicative only. For more precise information it is advised to search the literature, a list of specific references is given at the end of this report. It is reminded that most reef fishes are rather versatile in their diet and their food items may shift considerably according to food availability.

Species are also grouped according to their major food item into 4 classes: C: mainly carnivorous species; H: mainly herbivorous species (also includes species eating mainly detritus); P: species feeding mainly on nekton; Z: species feeding mainly on plankton

The diet information available in FISHBASE 2010 is also indicated. The diet categories are the same as above. The number in front of each food item indicates how many times this item is found in FISHBASE 2010 for that species. For instance "2P-1C1-3C2" indicates that nekton is indicated 2 times as a food item, macro-invertebrates once and micro-invertebrates 3 times.

Diet information from other sources is also indicated in another column, using the same codes for the food items.

Home range:

Most reef fish species spawn eggs which later give birth to larvae which stay in the water column for a period which may vary between less than a week up to over 100 days, depending on the species and environmental conditions. There are of course exceptions, such as sharks and rays which give birth to fully grown juveniles and also the case of a few species of teleosts which are ovoviviparous (e.g. Bythididae). These larvae will end up settling on a reef at the end of their pelagic phase. Once the larvae are established on a reef they transform into juveniles. From there on, most species have a specific type of home range. Species were grouped into three categories: 1- S: sedentary species, i.e. species which tend to stay within a very restricted range from less than 1 m^2 up to a few 100's m^2. This category groups both "territorial" species, i.e. species which defend a territory against intruders (either conspecific or other species, examples may be found amongst damselfishes or gobies for instance) and sedentary species which occupy a restricted space on the reef but which do not necessarily defend this space against intruders; 2- M: mobile species, i.e. species which will stay for long periods (from several days to several months) within a restricted but rather large (from 100s m^2 up to several hectares) range. This category may include species which home during the day or night into refuges (e.g. many Apogonidae and Holocentridae take refuge in the same reef structure every day but forage over a wide range of reef at night; opposite Scaridae or Acanthuridae will forage during the day over wide expenses of reefs but take refuge at night in the same reef structure night after night); W: wide ranging species circulate over large to very large expenses of reefs and may change from one reef to another within the same day or over a short period of time. Typical examples are Carangidae or Lethrinidae. This classification is however only based on observation in the field. In the coming years there could be major changes in our perception of reef fish home range. In particular the use of tracking devices show that some species which were thought to be sedentary may migrate over time from one reef to another (recent examples may be found amongst Acanthuridae, Scaridae and Labridae) or on the opposite species which were thought to move over a wide area (e.g. reef sharks) are found to be rather sedentary (staying over a restricted part of a reef) over long periods.

Activity:

Reef fish species can be active only during the day (D), only during the night (N) or be active at all time of day or night (B). This activity may however slightly change from one region to another. For instance *Diagrama pictum* (Haemulidae) is described as being only active during the day on the GBR, whereas in New Caledonia this species is active both day and night (being caught regularly by handlines at night and longlines during the day in New Caledonia). On the opposite *Lethrinus nebulosus* which has the reputation of being active mainly at night was the major catch during experimental daytime long-lining in New Caledonia.

Schooling:

Reef fish species can be more or less gregarious. This behavior is in great part linked to the species, but it should be reminded that it is also a function of individual size, season and environmental conditions. Species were classified into 5 groups: 1- solitary: species which individuals tend to be found single; 2- paired: species which are usually found living in pairs. The individuals forming the pair may not necessarily be one by the other at all time (e.g. Chaetodons) but they stay in close contact most of the time; 3: small groups: species which will stay in small schools or groups (an aggregation of individuals which stay together but do not have a schooling behavior such as swimming all in the same direction at all time), usually less than 20 individuals at a time; 4: medium size groups, e.g. species found in schools or groups of 20 to 50 individuals (on average); 5: large groups, species forming large schools or groups with usually more than 50 individuals at a time.

Level in the water column:

Most reef fish species tend to stay at the same level in the water column most of the time. Species were divided into 3 categories. 1- B: species which stay most of the time right on the bottom; 2: L: species staying just above the bottom, but usually not laying on the bottom; 3: H: species swimming high above the bottom

Length-weight relationship:

The weight (W) of a fish can be predicted from its length (L) according to the relationship:

$W = a L^b$ where a and b are two coefficients which vary according to species. The coefficients a and b depend on the units used to measure weight and length. In the present report weights are expressed in g and lengths in cm.

Fish length may be given as SL (standard length), TL (total length), FL (fork length) or W (disk width for rays).

Length-weight relationships are not available for all species. Therefore when the information was not available at the species level a formula based on the genus or the family was given instead. When neither genus nor family level information was available the information from a “look alike” species was given.

Depth range:

When available a depth range is indicated, the first number indicating the shallowest depth at which the species has been recorded and the second number indicating the deepest depth. If only one number is indicated this means an average depth at which the species is known to occur. Depth ranges are indicated for the entire region. There may be some exceptions, for instance some species may be found only in deep waters in some parts of their range and found in shallow depths elsewhere (e.g. *Chaetodon guntheri* usually a deep water butterfly fish, but found in shallow waters on the border of its geographical range).

FISHBASE species code:

In FISHBASE each species has a code which usually does not change over time. This number is very useful if there is a revision in the species name as the species will keep its code even if its name changes.

Geographical range index:

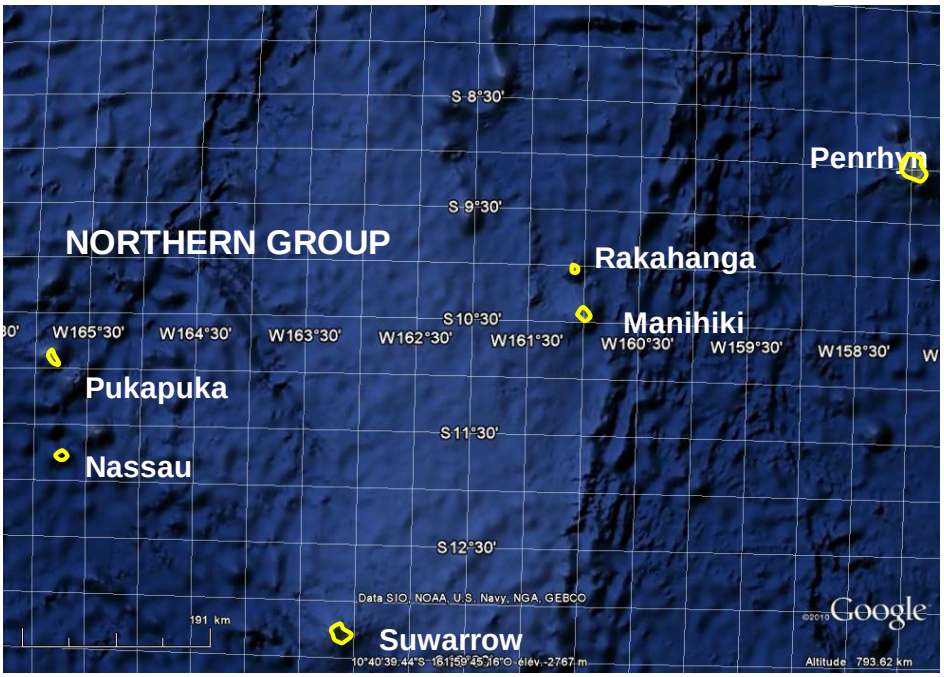
Each species has a specific geographical range. At one end some species are “endemic” which means that they are found in only one location. At the other end of the spectrum some species may be found in the four oceanic basins where coral reefs are found (Indian Ocean, West and Central Pacific Ocean, Tropical East Pacific, Atlantic). We have access to 124 checklists of coral reef fish species in the tropical Indo-Pacific. The geographical range index (GRI) is the number of these checklists where a given species is present, a GRI of 1 indicating an endemic species and a GRI of over 100 indicating a wide ranging species.

Under water visual census index:

A common method to evaluate reef fish populations and assemblages is by underwater visual censuses (UVC). Unfortunately not all species are detected with the same reliability by this method. Some species are easy to identify, are neither scared nor attracted by the observer to a point of strongly biasing the counts. At the other end some species are very seldom detected by UVC either because they hide in the reef structure, or they are very shy, or well camouflaged or very difficult to identify. An indicative index is proposed, ranking species from 1: easily detected and identified up to 4 : species seldom detected. This index is mainly indicative and may not be applicable everywhere and in all circumstances. For instance in a marine reserve some species which are never observed normally by UVCs may be detected because they no longer fear the observer. On the opposite in an area where spear fishing is very intense some species which are usually easy to detect may become very shy and stay too far from the observer to be recorded. This is in particular true for commercially important species such as Lethrinidae, Lutjanidae, Scaridae, Acanthuridae, Kyphosidae, Haemulidae or Carangidae.

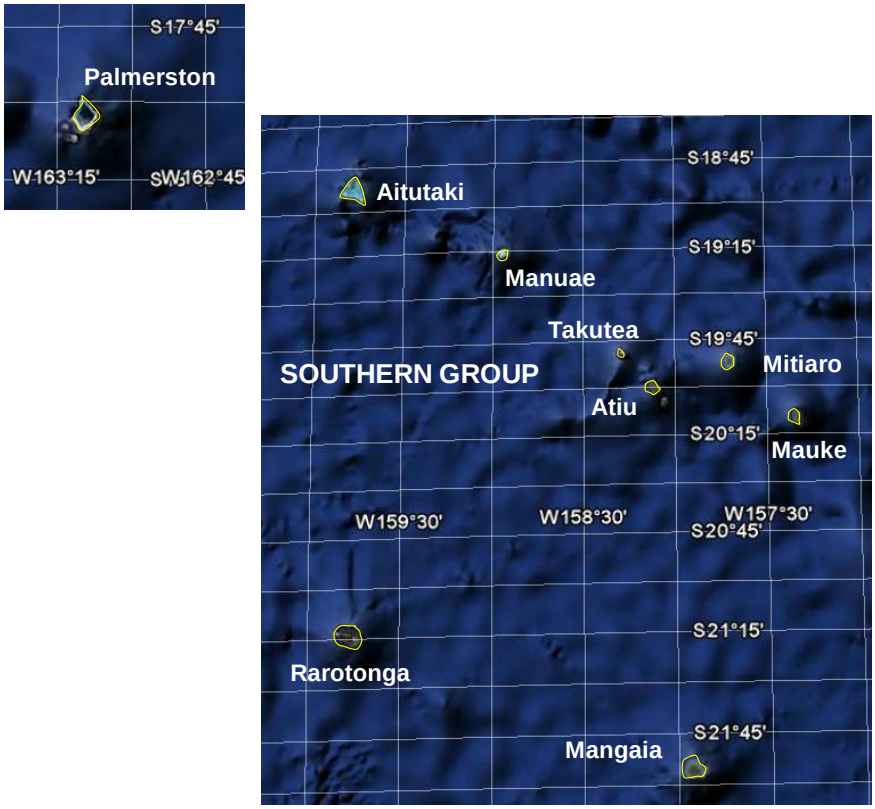
COOK ISLANDS

The Cook islands are comprised of 15 islands divided into two groups, northern and southern group. The Cook islands have a small land mass (236.2 km²), most islands being atolls or low islands with the exception of Rarotonga in the southern group. The reef area is relatively large compared to the land mass (1100 km², five times the land area), as most islands are atolls. Reefs are mainly developed on the atolls, the low islands and Rarotonga in the south being mainly surrounded by a fringing reef. The Cook islands are east of the limit of the Pacific tectonic plate. The data presently available classifies the Cook islands as being part of the South Polynesia biogeographical region (Figure 8). However it is very likely that the northern group of Cook islands (Suwarrow, Nassau, Manihiki, Rakahanga, Pukapuka, Penrhyn) belongs to North Polynesia (Figure 8), whereas the southern group (Palmerston, Aitutaki, Manuae, Rarotonga, Takutea, Atiu, Mangaia, Mauke, Mitiaro) belongs to South Polynesia (Figure 8). The northern group is between 9 and 13°S and located at 8800km from the Coral Triangle, the southern group is between 15 and 21°S and at 8900 km from the Coral Triangle. Coral diversity is not much lower (51/172[1] species) than in Tonga (na/218 species) and similar to French Polynesia (174/168 species).



Map of Cook Islands- Northern group: extracted and adapted from Google Earth (http : //earth.google.com/)

[1] Coral diversity : the first number is an estimation from UNEP-WCMC data base ; second number estimated from Veron (2000) data base. These numbers are extracted from the "World Atlas of Coral Reefs " by Spalding et al. 2001.



Map of Cook Islands- Southern group: extracted and adapted from Google Earth (http : //earth.google.com/)

Previous reef fish inventories

There has been relatively little work on the reef fish fauna of the Cook islands. To our knowledge there is presently no official check list of marine fish for this country. Most of the information in the present report comes from the Cook Island Biodiversity data base (http://cookislands.bishopmuseum.org/) (681 marine species of which 581 were kept for the present list) in combination with a personal communication by M.Francis (259 species recorded) and isolated records from the literature and the SPC reef fish surveys (Procfish program: http://www.spc.int/DigitalLibrary/FAME/Collection/PROCFish_C). The low level of knowledge is evidenced when comparing the diversity of some families with the Society archipelago (which should have less species than the Cook islands because it is further from the Coral Triangle). For instance 10 species of Apogonidae are recorded from Cook islands, 28 in the Society, 24 species of Gobiidae are recorded from the Cook islands, 56 in the Society, 22 species of Muraenidae in the Cook islands, 50 in the Society (Table CR1). It is therefore likely that the number of reef fish species in the Cook islands is over 800 species.

Major characteristics of the reef fish fauna

The present list is probably very incomplete with 623 species recorded and 137 species very likely to be found in the Cook archipelago but presently unrecorded there (these species are common to Tonga, Fiji and French Polynesia). The number of species is very similar to the nearby Society islands (728 species) if true records and “likely” species are combined (760 species). This diversity is much lower than Tonga (1030 species) or Samoa (962 species) both countries being located on the western

side of the Pacific tectonic plate margin. The major difference lies in the species composition with important changes with countries to the west. For instance there are 39 species of Pomacentridae recorded from the Cook islands, 76 in Tonga, 4 species of Syngnathidae in the Cook islands, 19 in Tonga and 18 in Samoa. The relative diversity of Apogonidae and Gobiidae is less than half the average for the entire South Pacific (Table CR2) but this could be a sampling problem, as there has been few collections of reef fish performed in the Cook islands compared to most other countries in the South Pacific. The size structure of the reef fishes of the Cook islands is characterized by a low proportion of small species (Table CR2; Figure 13). This is probably a combined effect of low sampling and the fact that the Cook islands are small and isolated which favors such proportions (Table 4). This low proportion of small species is reflected by the low proportion of species eating small invertebrates (C2 in their diet) and the higher proportion of piscivorous species (Table CR2; Figure 13). The other structures (home range, schooling, nycthemeral behavior) are not different from average. The biogeographic index (Table CR2; Figure 13) indicates that endemism is slightly above average and surprisingly the proportion of ubiquitous species is also above average (Table CR2; Figure 13).

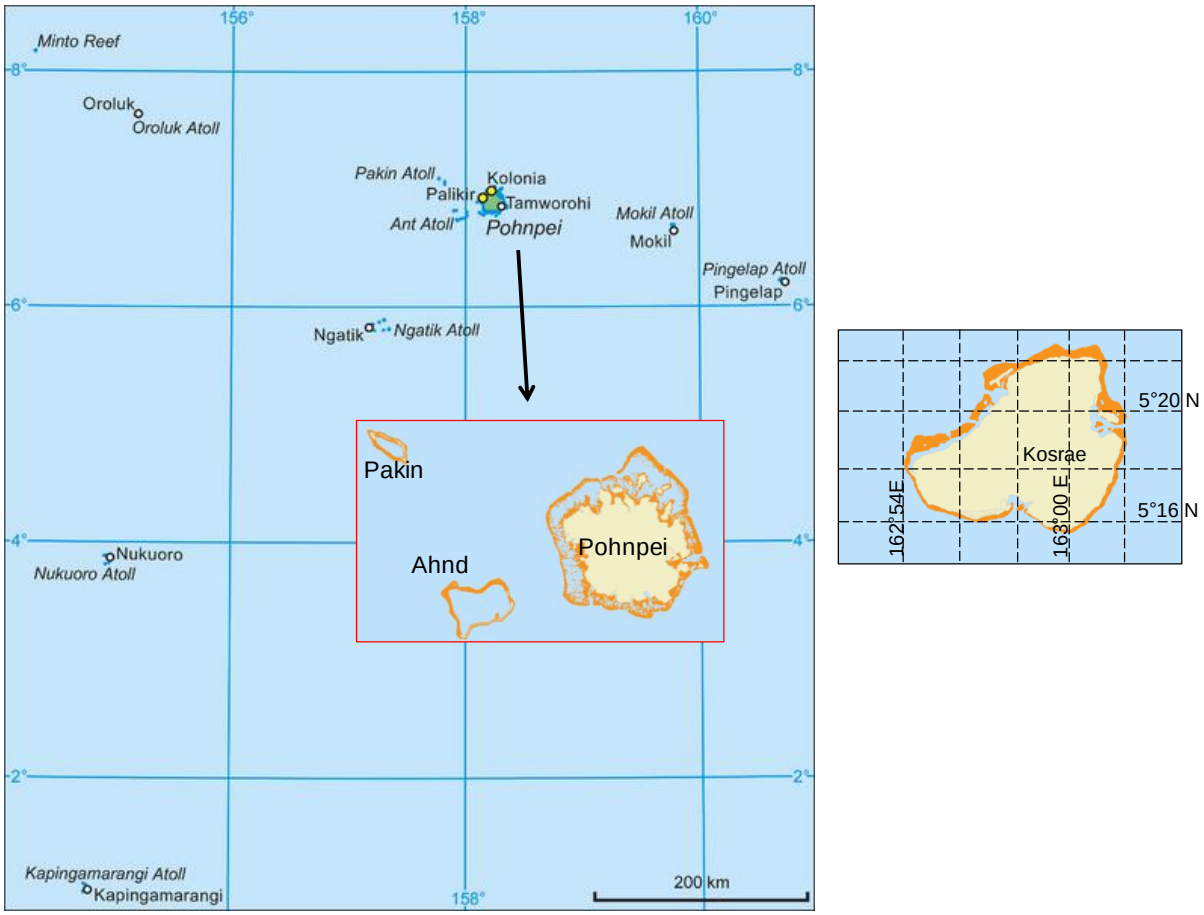
Some references

ANON. 1994 Cook Islands, Fisheries Resources Profiles, Research and Information Division, Cook Islands Ministry Of Marine Resources. FFA Report 93/25: 114 p.

PINCA S., BOBLIN P., FRIEDMAN K.J., KRONEN M., MAGRON F., AWIRA R., PAKOA K., LASI F., TARDY E., CHAPMAN L.B. 2009. Cook Islands country report: profiles and results from survey work at Aitutaki, Palmerston, Mangaia and Rarotonga (February and October 2007). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). xxxiv, 339 p.

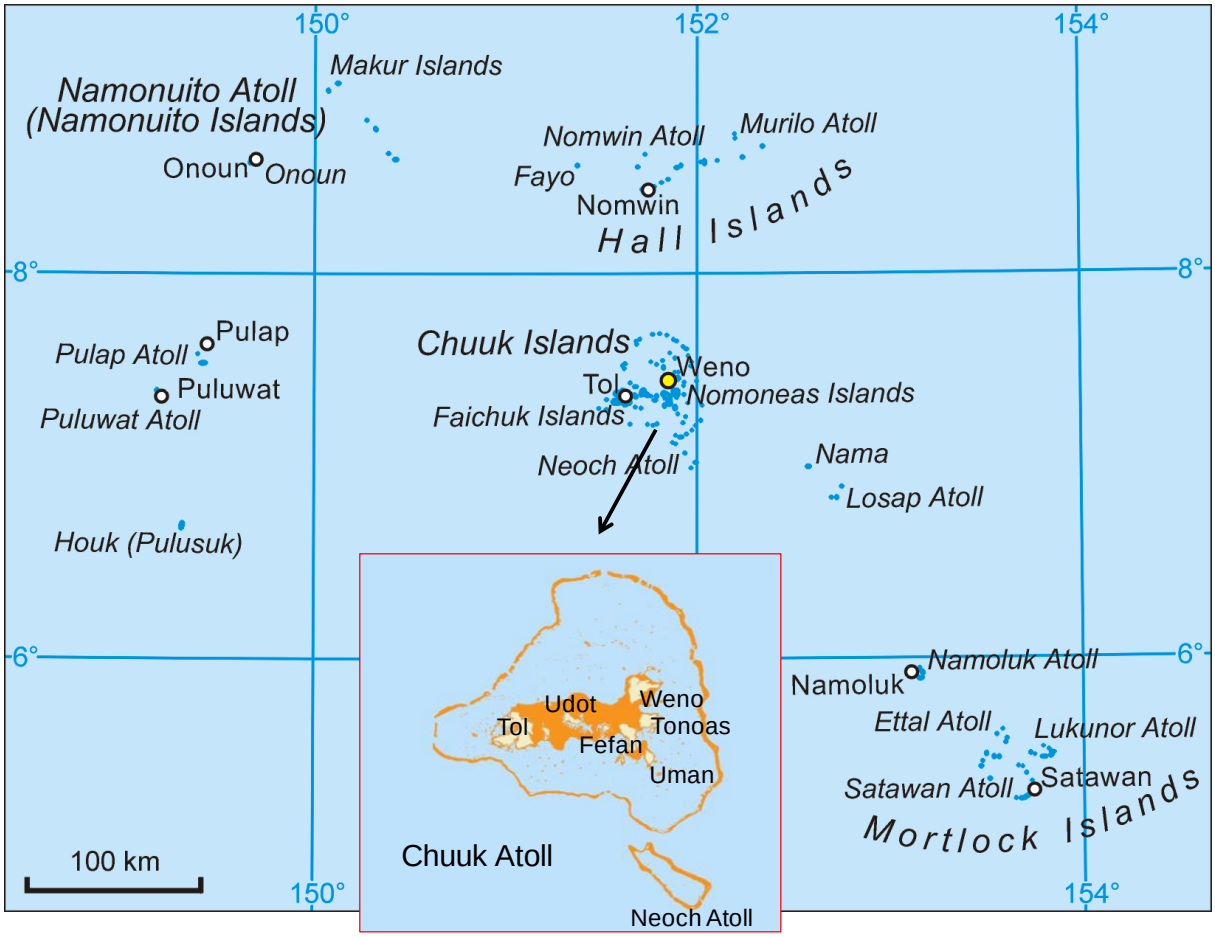
FEDERATE STATES OF MICRONESIA (FSM)

The FSM comprise over 607 islands, mostly atolls and low islands. Land area covers 701 km² and coral reefs more than four times than area with 2980 km². Most islands are small atolls, the largest atolls being Nomwin, Oroluk and Satawan and there are 3 high islands, Yap, Pohnpei and Kosrae. Chuuk is nearly an atoll with a number of high islands surrounded by a large lagoon (nearly 1500 km²). In most cases islands are clustered in small groups, each group being separated by large expenses of ocean. These islands stretch over nearly 2700 km from west to east. They are in the northern Hemisphere between 4 and 10°N, except for Kapingamarangi which is at 1°04N. The FSM are between 3300 km (Yap) and 5900 km (Kosrae) from the Coral Triangle. Coral diversity is high with 92/391[2] species known from this region. All the islands of the FSM are located in the Micronesia biogeographical region (Figure 8).



Maps of Pohnpei and Kosrae: extracted and adapted from Wikipedia and ReefBase

[2] Coral diversity : the first number is an estimation from UNEP-WCMC data base ; second number estimated from Veron (2000) data base. These numbers are extracted from the "World Atlas of Coral Reefs " by Spalding et al. 2001.



Maps of Yap and Chuuk: extracted and adapted from Wikipedia and ReefBase

Previous checklists:

Most of the species recorded in this report are indicated by Myers (1999). G.Allen has since 2005 conducted surveys in Chuuk, Pohnpei and Yap and a team (Donaldson et al. 2007) has also conducted a survey in Kosrae but these works could not be taken into account for the present report. Some isolated records come from recently described species and revisions of families or genera. We follow Myers in dividing the records according to the four states of the FSM: Yap, Chuuk, Pohnpei and

Kosrae and also two separate islands, Ifalik (part of the state of Yap) and Kapingamarangi (part of the state of Pohnpei). We provide also a global list for the "Caroline islands" as we had records which could not be tracked to a single state.

Major characteristics of the reef fish fauna:

There are nearly 1180 reef fish species recorded from the entire FSM (Table CR1). However there is less than 700 species for each separate list. This either indicates that sampling has not been very intense or that habitat diversity is low, but this latter hypothesis seems unlikely due to the high coral diversity found in this region. The total diversity of the FSM is intermediate between Palau 1280 species) to the west and the Marshal islands to the east (910 species). Endemism is the lowest of the South Pacific (Table CR2). The structure of the reef fish regional assemblage of the FSM is strikingly similar to the average for the entire South Pacific (Table CR2). This means that these assemblages have no exceptional feature compared to what is found in the other countries in the South Pacific. Differences amongst states within the FSM are more important. These differences are likely to be due mainly to differences in sampling effort. For instance in Yap the proportion of Chaetodontidae, an easily detected species is higher than in the other states, whereas the proportions of Muraenidae or Gobiidae, which are difficult to sample, is lower than in the other states. This trend is confirmed when considering the relationship between size structure and the number of species recorded, the proportion of small species increasing as the number of species increase.

Some references

ALLEN G. 2008. Reef Fishes of Chuuk, Federated States of Micronesia. Final Report prepared for the Chuuk Rapid Ecological Assessment Program. Chuuk, Federated States of Micronesia. 22 pp.

ALLEN G.R. 2005. Reef Fishes of Pohnpei, Federated States of Micronesia. Final Report prepared for the Pohnpei Rapid Ecological Assessment. Conservation Society of Pohnpei. Pohnpei, Federated States of Micronesia. 19 pp.

ALLEN G.R. 2007. Reef Fishes of Yap, Federated States of Micronesia. Final Report prepared for the Yap Rapid Ecological Assessment. Yap Community Action Program. Yap, Federated States of Micronesia. 21 pp.

DONALDSON T.J., J. M. MARAGOS, M LUCKYMIS, S. PALIK, O. NEDLIC. 2007. Coral and fish surveys at Kosrae Island, July-August 2006, Federated States of Micronesia: a Preliminary Report prepared for the Kosrae Rapid Ecological Assessment. Prepared for Kosrae Conservation and Safety Organization and The Nature Conservancy. Pohnpei, Federated States of Micronesia. 36 pp

GEORGE A. and 19 other authors 2008. The State of Coral Reef Ecosystems of the Federated States of Micronesia. in Waddell, J.E. and A.M. Clarke (eds.), The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Technical Memorandum NOS NCCOS 73. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. P. 419-436

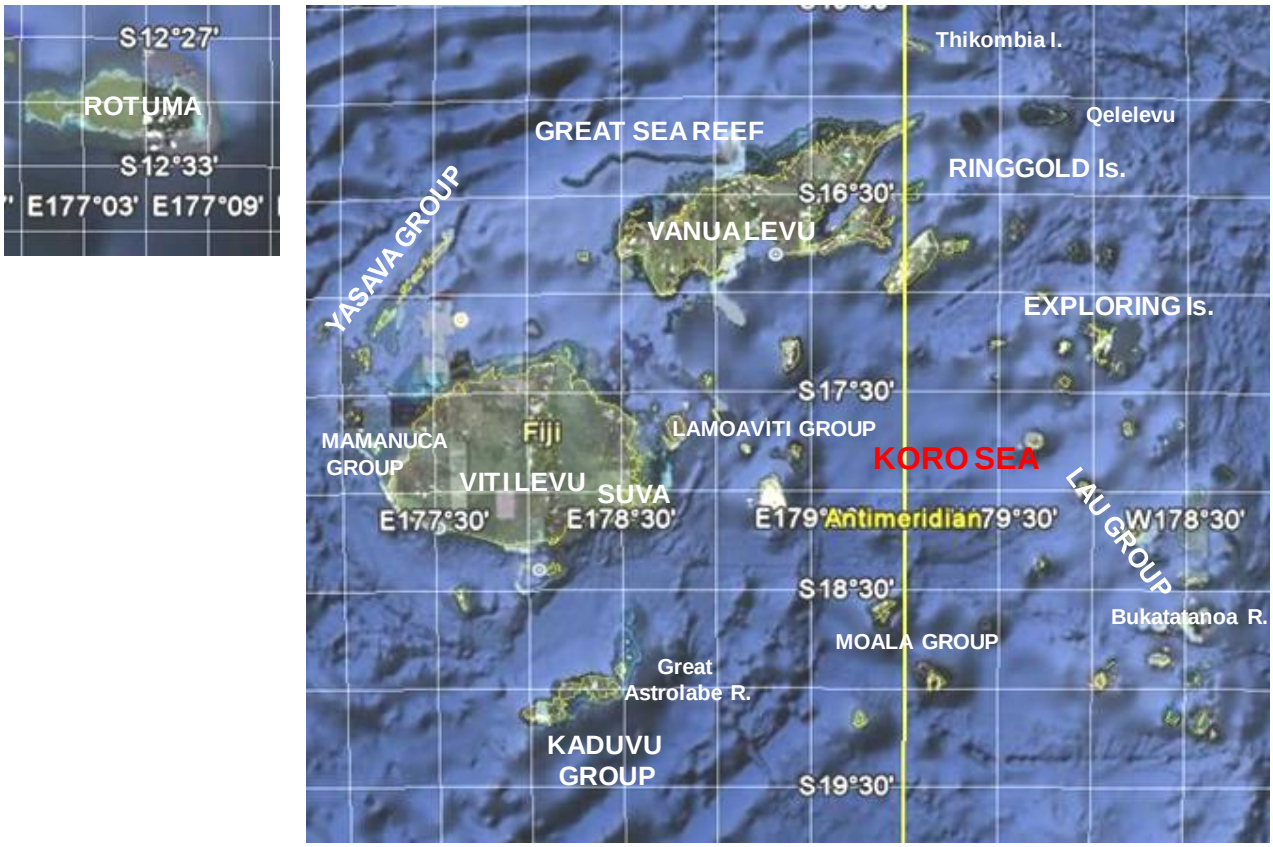
KRONEN M., BOBLIN P., FRIEDMAN K.J., PINCA S., MAGRON F., AWIRA R., PAKOA K., LASI F., TARDY E., CHAPMAN L.B., VUNISEA A. 2009. Federated States of Micronesia country report: profiles and results from survey work at Yyin and Riiken (Yap) and Piis-Panewu and Romanum (Chuuk) (April-May 2006). Pacific Regional Oceanic and Coastal Fisheries Development Programme

(PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). xxxiv, 367 p.

MYERS R. 1999 Micronesian Reef Fishes: A Comprehensive Guide to the Coral Reef Fishes of Micronesia. Coral Graphics. Guam. ISBN-10: 0962156450; 522 p.

FIJI

Fiji has 18 274 km² of land and 322 islands. There are two major islands (Viti Levu and Vanua Levu) which make most of the land mass. Most of the smaller islands are in the south and south-west part of the country (Kaduvu group, Lau group, Moala group) with the exception of the Yasava islands in the west. A large proportion of coral reefs are found around high islands, but there are also major reef systems which are not linked to high islands. This is in particular important in the eastern part (Exploring Isles and Lau group) as well as the north-west (Great Sea Reef, Yasawa group).There is a very important diversity in reef geomorphological types, which may be important for coral and coral reef fish diversity. In particular there are large lagoons protected by continuous barrier reefs, atoll like structures, extensive fringing reefs. Coral reefs cover slightly more than 10 000 km² with 177/398[3] species of corals. The country is located in the southern Hemisphere between 16 and 20°S except for Rotuma which is further north at 12°30S. Fiji is at 7700 km from the Coral Triangle. Fiji is part of the SW Pacific biogeographical region (Figures 6 and 8), its reef fish fauna being closest to those from Vanuatu and New Caledonia.



Map of Fiji : extracted and adapted from Google Earth (http : //earth.google.com/)

[3] Coral diversity : the first number is an estimation from UNEP-WCMC data base ; second number estimated from Veron (2000) data base. These numbers are extracted from the "World Atlas of Coral Reefs " by Spalding et al. 2001.

Previous reef fish inventories

The reef fish fauna of Fiji has been intensively but unevenly sampled. It is not until recently that a comprehensive checklist of fish species from Fiji is available (Seeto and Baldwin, 2010). This work censuses records from many different sources, in particular based on the collection of several museums (e.g. Bishop museum, Australian Museum, Smithsonian Institute, Royal Ontario Museum), as well as numerous reports. It should however be noted that most of the reef fish fauna in Fiji has been sampled around Viti Levu and that many areas have not received much attention so far (see http://pbs.bishopmuseum.org/fijifish/ for an account of unexplored areas). A checklist of the reef fishes of Rotuma (north of Fiji) was established by Zug et al. (1988). The DEMECOFISH-PROCFISH program from SPC conducted a number of reef fish visual censuses in 2002-2003 which also yielded a few new records. The species found in the present report are mainly based on Seeto and Baldwin report in addition to personal observations and a few recent records from the literature. Species from Rotuma are presented separately.

Major characteristics of the reef fish fauna

At present more than 1330 species of fish are found on the coral reefs of Fiji (more than 2000 species are found in Fijian waters, marine and freshwater) with an additional 60-80 species which are very likely to be found there according to their known distribution. This is slightly less than the diversity known from nearby countries to the West (New Caledonia: 1570; Solomon Is. : 1600; Vanuatu > 1300), but larger than countries to the East or to the North (Samoa: 940; Tonga: 1030; Wallis: 620).

Fiji is located at the eastern end of the SW Pacific region (Figure 8). Its reef fish fauna has many similarities to what is found in New Caledonia, Vanuatu and Solomon Islands (Figure 6). On the opposite there is very little influence from the north (Wallis, Rotuma, Samoa, Tuvalu) or the east (Cook islands, Polynesia). Rotuma has a specific reef fish fauna and belongs to the Micronesia biogeographical region. Rotuma has similarities with Tuvalu, Wallis and to a lesser extent Samoa. The low number of species found on Rotuma is typical of small isolated islands. The level of endemism (Tables CR1, CR2) is low in Fiji (35 taxa or 2.6% of the reef fish species). The family composition of the reef fish species in Fiji shows no specific trend, with the exception of slightly less Chaetodontidae than average and more Gobiidae than average (Tables CR1, CR2). There is also a high diversity of Ophichthidae and Syngnathidae. The size structure in Fiji is characterized, like most countries with large land masses, by a high proportion of small species (< 10 cm) (Table CR2; Figure 13). The trophic, nycthemeral activity, schooling or home range structures are not different from average. The biogeographical index in Fiji is characterized by a higher proportion of species with a medium to small geographical range and on the opposite a low proportion of ubiquitous species (Tables CR1, CR2; Figure 13).

Some references

FRIEDMAN K.J, KRONEN M., VUNISEA A., PINCA S., PAKOA K., MAGRON F., CHAPMAN L., SAUNI S., VIGLIOLA L., TARDY E., LABROSSE P. 2010. Fiji Islands country report: profiles and results from survey work at Dromuna, Muaivuso, Mali and Lakeba (September to November 2002, April to June 2003, June and July 2007, and February 2009). Pacific Regional Oceanic and Coastal

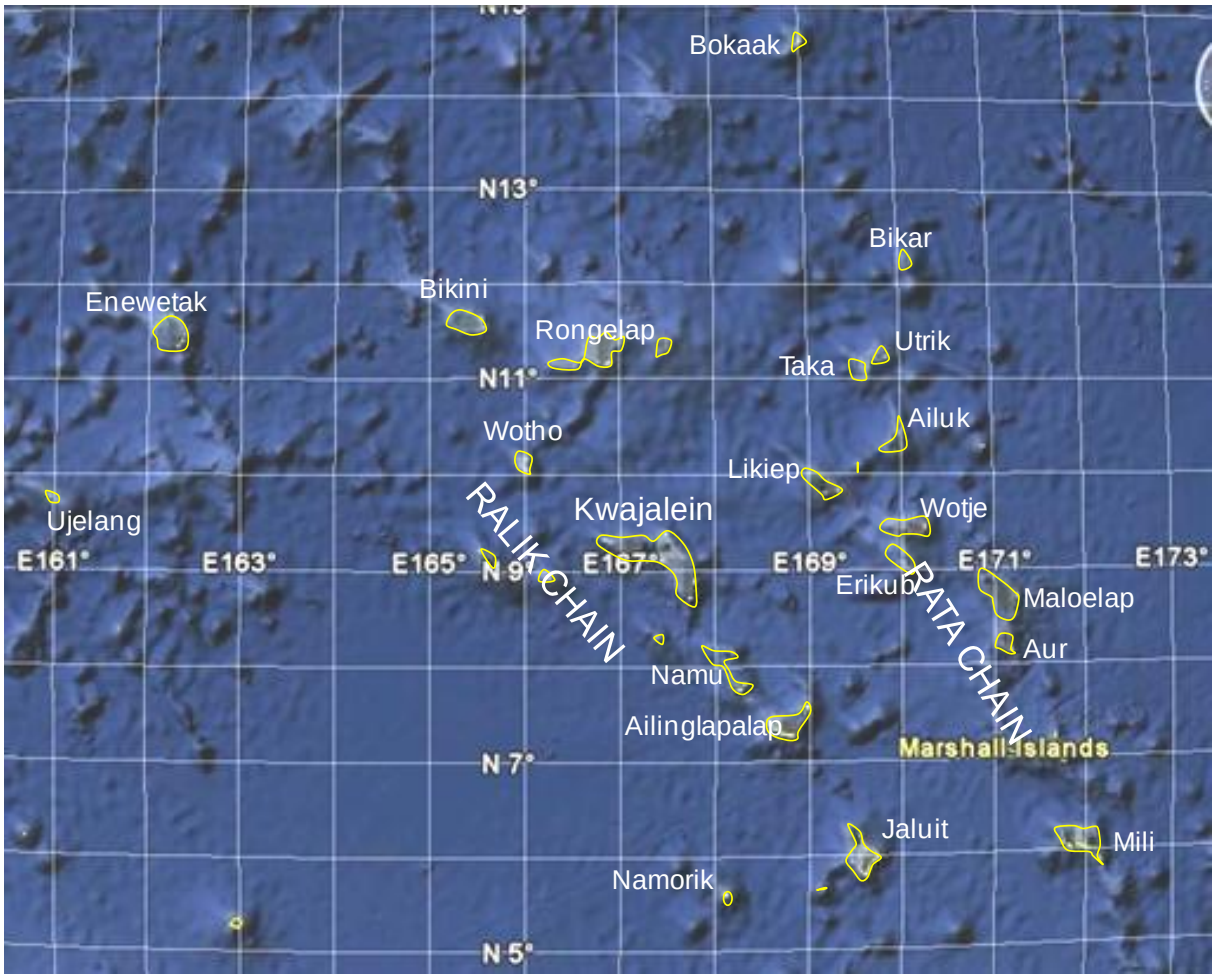
Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). xxxv, 467 p.

SEETO J., BALDWIN, W.J. 2010 A Checklist of the Fishes of Fiji and a Bibliography of Fijian Fishes. Division of Marine Studies. Technical Report 1/2010. The University of the South Pacific. Suva, Fiji. 102 p.

ZUG G.R., SPRINGER V.G., WILLIAMS J.T., JOHNSON G.D. 1988 The vertebrates of Rotuma and surrounding waters. Atoll Research Bulletin 316: 25 p.

MARSHALL ISLANDS

The Marshall Islands cover a land area of 181 km². There are 28 atolls (without Wake) and 5 small non atoll islands which are divided into 2 major groups, the Ratak group to the east (also called "Sunrise" group) and the Ralik (or "Sunset") group to the west. In addition two atolls are found further west, Enewetak and Ujelang. The atoll of Wake is claimed by the Marshall Islands but is presently administered by the USA. The reef area is of 6100 km² with approximately 222/340[4] species of corals. The country is at nearly 6500 km from the "Coral Triangle". It is in the Northern hemisphere between 5 and 14°N except for Wake atoll which is further north at 19°17N.



Map of the Marshall Islands: extracted and adapted from Google Earth (http : //earth.google.com/)

Previous reef fish inventories

There has been a number of reef fish inventories in the Marshall islands. The first important ones started in 1946-1947 with the first nuclear bomb testing with fish collections at Enewetak, Bikini, Rongelap and Rongerik. A second collection was performed in 1953 at Arno by Schultz. Randall and

[4] Coral diversity : the first number is an estimation from UNEP-WCMC data base ; second number estimated from Veron (2000) data base. These numbers are extracted from the "World Atlas of Coral Reefs " by Spalding et al. 2001.

Randall (1987) published a first comprehensive list of 817 shore and epipelagic fish species. Myers (1999) made significant additions to this list. The last major addition is from Randall et al. (2006) who added 91 new records of fish for this region.

Wake atoll has been sampled by a number of expeditions, in particular by Fowler and Ball (1925), Gosline and Randall (1953), Kauanui et al. (1956, 1957. Myers (1999) established a first list based on records from the military and most recently Lobel and Lobel (2004) who sampled in 1997 and 1999 completed this list.

Major characteristics of the reef fish fauna

There are 913 taxa of reef associated fish taxa recorded from the Marshall islands and 359 from Wake.The number of species in the Marshall islands are intermediate between the diversity found in the Carolines (1060 sp.) and the nearby Tuvalu-Gilbert (604). The diversity in Wake is low which is normal for a small isolated island, the nearest island being nearly 600 km away. The reef fish species from the Marshall islands are more closely related to those of Tuvalu-Gilbert islands, Samoa or even Tonga than the nearby FSM (Fig.6). The reef fish species from Wake have specific characteristics as they share some species with Hawaii or the West Pacific or Polynesia which are not found in the Marshall islands. This is the reason why Wake has a taxonomic structure which is closer to islands from Polynesia than from the Marshall islands.

Both the Marshall islands and Wake have larger proportions of Serranidae and lower proportions of Pomacentridae than the other countries in the South Pacific (Table CR2). The Marshall islands have more Gobiidae than average, but otherwise show very little difference with the average taxonomic composition at the family level in the South Pacific. On the opposite there are major differences in taxonomic composition for Wake. In particular there are more Acanthuridae, Holocentridae, Labridae, Mullidae and Tetraodontidae than on average, and less Gobiidae, Lethrinidae, Lutjanidae, Syngnathidae and Trypterigiidae than on average in the South Pacfic. Some of these differences could be due to a low sampling effort (case of the small species), but the lower proportions of Lethrinidae and Lutjanidae and the high proportion of Acanthuridae are unlikely to be linked to sampling. The size structure in the Marshal islands is characterized by a high proportion of small species (Table CR2; Figure 13)). This trend is reflected by a higher than average proportion of small carnivores, solitary and sedentary species (Table CR2). On Wake atoll the opposite is observed with a higher proportion than average of large species, which is in accordance with the effects of large scale factors (Table 4). This trend is translated by a higher than average proportion of species feeding on large invertebrates, mobile and schooling species (Table CR2; Figure 13). There is also a slight deficit of herbivores on Wake which is an expected trend for a small isolated island (Table 4). The average geographical range of the species in the Marshall islands is characterized by species with a medium size range and a very low level of endemism. On Wake the proportion of endemic species or species with a restricted range is also low. However, opposite to the Marshall islands, the proportion of species with a very wide geographical range is higher than average on Wake (Table CR2; Figure 13). This is to be expected from a small isolated island.

Some references

LOBEL P .S. & L. KERR LOBEL. 2004. Annotated checklist of the fishes of Wake Atoll. Pacific Science 58 (1): 65-90

MYERS R. F. 1999. Micronesian Reef Fishes, ed. 3. Coral Graphics, Guam. vi + 330 pp.

PINCA S., TARDY E., AWIRA R., PAKOA K., BOBLIN P., FRIEDMAN K.J., VUNISEA A., LASI F., MAGRON F., CHAPMAN L.B., KRONEN M. 2009. Marshall Islands country report: profiles and results from survey work at Likiep, Ailuk, Arno and Laura (August and September 2007). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). xxxii, 337 p.

RANDALL J.E., MYERS R.F., TREVOR M.N., SCOTT R., JOHNSON J.L., YOSHII S., GREENE B.D. 2005 Ninety-one new records of fishes from the Marshall Islands. Aqua 9 (3): 115-132

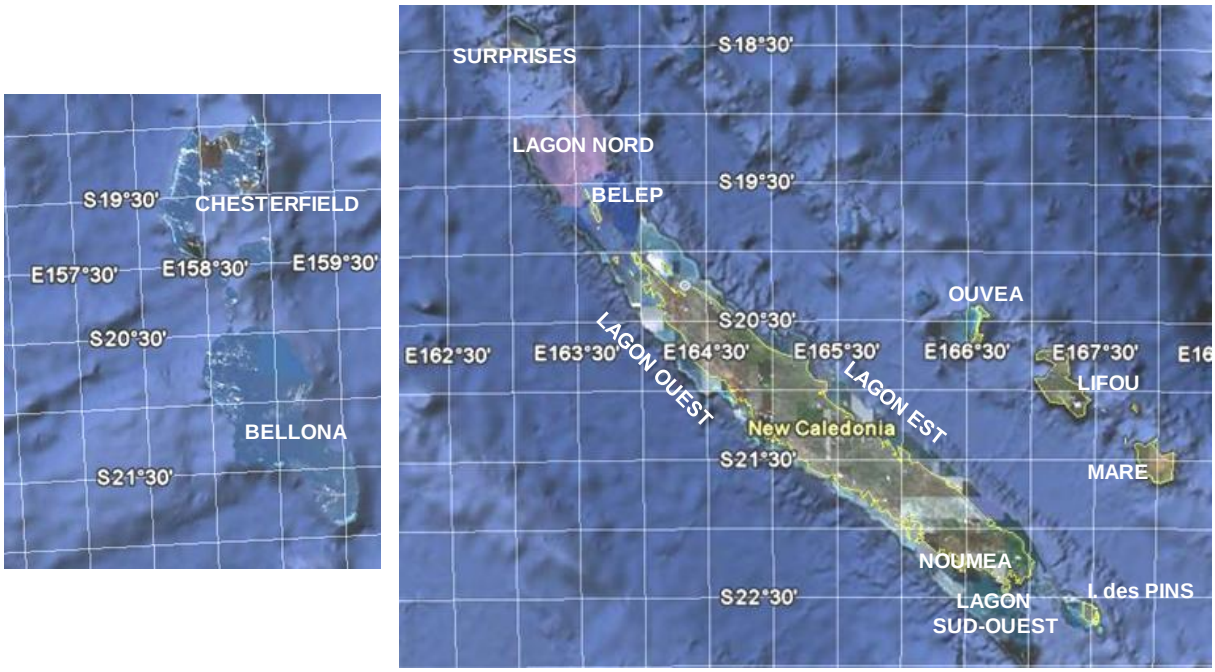
RANDALL J. E. & H. A. RANDALL. 1987. Annotated checklist of the fishes of Enewetak Atoll and other Marshall Islands. Pp. 289-324 in Devaney, D. M., E. S, Reese, B. L. Burch, and P. Helfrich (eds.). The Natural History of Enewetak Atoll. Vol. II Biogeography and Systematics. U.S. Dept. of Energy, Office of Scientific and Technical Information, Oak Ridge, TE.

RANDALL J. E. 1986. 106 new records of fishes from the Marshall Islands. Bulletin of Marine Science 38 (1): 170-252.

SCHULTZ L. P. & collaborators. 1966. Fishes of the Marshall and Marianas Islands. Bulletin of the United States National Museum 202, vol. 3: vii + 176 pp.

NOUVELLE CALEDONIE

La Nouvelle Calédonie comporte 19140 km² de terres. Elle est constituée de trois grands ensembles qui s'étendent selon un axe NW-SE : 1- au centre la Grande Terre avec au sud l'île des Pins et au nord les atolls des îles d'Entrecasteaux ; 2- à l'est les Loyautés qui s'étendent du récif Pétrie au nord jusqu'à Walpole au sud ; 3- à l'ouest les Chesterfield et les Bellona. S'y ajoutent les bancs de Landsdowne entre les Chesterfield et la Grande Terre ainsi que les îlots de Matthew et Hunter à l'est. Les formations coralliennes couvrent environ 6000 km² (Andréfouët et Torres-Pulliza, 2004) et présentent une très grande diversité géomorphologique. En effet la Nouvelle Calédonie comporte des îles hautes avec lagon, dont la plus grande, la Grande Terre, mesure 16360 km², des atolls ou pseudo-atolls (îles Surprises, Ouvéa), des récifs océaniques (ex. Chesterfield, Bellona), des lagons d'atoll surélevés (Lifou, Maré) et des îles hautes océaniques (Matthew et Hunter). La Nouvelle Calédonie s'étend de 18°30 à 23°S et situe entre 5600 (Chesterfield) et 6800 km (Loyautés) du Coral Triangle. Il existe plus de 360 espèces de coraux connus de Nouvelle Calédonie



Carte de la Nouvelle Calédonie : extrait et adapté de Google Earth (http : //earth.google.com/)

Inventaires faunistiques antérieurs

La faune des poissons coralliens de Nouvelle Calédonie est l'une des mieux échantillonnées du Pacifique Sud. Les premiers travaux importants et systématiques datent de l'après-guerre avec en particulier la mission Singer-Polignac et les travaux des Catala qui fondèrent l'aquarium de Nouméa. C'est cependant la publication en 1976 du premier ouvrage sur les poissons marins de cette région par Fourmanoir et Laboute qui y marque un tournant dans les inventaires des poissons de récif. Ces travaux furent suivis par un ensemble d'échantillonnages réalisés pour l'essentiel par l'IRD (alors ORSTOM) qui menèrent à une série de publications sur les faunes de l'ensemble de la Nouvelle Calédonie (Rivaton et al., 1990), des Chesterfield (Kulbicki et al., 1994) et de l'atoll d'Ouvéa (Kulbicki et Williams, 1997). De nombreuses espèces ont également été décrites à partir de spécimens de Nouvelle Calédonie de 1960 à nos jours, en particulier par P.Fourmanoir, J.E.Randall, R.Fricke,

R.Winterbottom, G.Allen, B.Séret, K.Amaoka. L'ensemble de ces travaux a donné lieu à une liste faunistique par Fricke et Kulbicki (2007), complétée récemment par Fricke et al. (2011). Ce travail d'inventaire s'est accompagné d'un travail sur la biologie, l'écologie et la distribution des espèces récifales par l'IRD qui est à la base de ce présent rapport.

Malgré ce très important travail d'inventaire il reste de nombreuses zones de Nouvelle Calédonie dont la faune des poissons récifaux est encore mal connue. C'est le cas en particulier des îles Surprises, des récifs du nord de la Grande Terre (récif des Français, récif Cook et récif plus au nord), les formations récifales océaniques (Pétrie, Bellona, Landsdowne, Astrolabe, Durand), les îles Loyautés (sauf Ouvéa), le SE de la Grande Terre, l'île des Pins et les petits îlots isolés (Walpole, Matthen et Hunter).

Principales caractéristiques des communautés de poissons

Plusieurs listes sont disponibles pour la Nouvelle Calédonie. Il y a d'une part une liste globale et d'autre part des listes plus localisées pour les Chesterfield, les Loyautés et la Grande Terre. Les listes des Chesterfield et des Loyautés sont probablement moins complètes que celle pour la Grande Terre, cependant cette dernière est surtout basée sur des observations dans le SW de la Grande Terre.

Un total de 1569 taxons de poissons récifaux est répertorié de l'ensemble de la Nouvelle Calédonie (NC). Ceci en fait le troisième pays après la Papouasie Nouvelle-Guinée (1824) et les îles Salomon (1595 espèces). La plupart des espèces de NC sont présentes autour de la Grande Terre (1446). En revanche le nombre d'espèces récifales connues aux Loyautés (714 espèces) ou aux Chesterfield (697 espèces) est beaucoup moins important (Tableau CR1).

La faune des poissons de récif de Nouvelle Calédonie fait partie de la région « SW Pacifique» qui regroupe la Mélanésie (PNG, Salomons, Vanuatu, Fidji et Nouvelle Calédonie) ainsi que la Grande Barrière de Corail et les îlots de la Mer du Corail. Une analyse plus détaillée de cette faune (Kulbicki, 2007) suggère que les poissons ont suivis trois chemins de colonisation : 1- par l'ouest (Grande Barrière, îlots et récifs de la Mer du Corail, Grande Terre) ; 2- par l'est (PNG, Salomons, Vanuatu) ; 3- par le sud (nord de la Nouvelle Zélande, Norfolk, Lord-Howe, Middleton et Elizabeth reefs), mais très peu d'espèces sont concernées par ce dernier chemin (ex. Cheilodactylidae, Pentacerotidae). La faune de la Grande Terre se caractérise par une diversité supérieure à la moyenne pour bon nombre de familles liées aux masses continentales, comme les Gobiidae, Caesonidae, Scorpaenidae, Platycephalidae, Haemulidae. A l'opposé certaines familles comme les Acanthuridae, Balistidae, Mullidae ou les Chaetodontidae y sont moins diversifiés que la moyenne du Pacifique Sud. Ceci se traduit par une proportion d'espèces de petite taille, souvent sédentaires et carnivores, plus forte que la moyenne (conformément au modèle du Tableau 4). Le nombre d'espèces endémiques est plus élevé que la moyenne. Les Chesterfield et les Loyautés présentent un certain nombre de différences avec la Grande Terre. En particulier plusieurs familles importantes sur la Grande Terre y sont moins représentées, en particulier les Siganidae, Haemulidae, Gobiidae et Muraenidae. A noter que certaines familles comme les Scorpaenidae, Pinguipedidae ou Syngnathidae ainsi que les espèces planctonophages y sont plus diversifiés que la moyenne du Pacifique Sud, comme sur la Grande Terre, montrant ainsi une tendance régionale. Les Chesterfield et les Loyautés diffèrent dans la répartition par taille de leurs espèces, les Loyautés, comme la Grande Terre ayant une proportion de petites espèces au-dessus de la moyenne malgré le peu d'apports terrigènes, un facteur souvent évoqué pour la présence des petites espèces. L'endémisme est faible aux Chesterfield et aux

Loyautés. En revanche sur l'ensemble de la Nouvelle-Calédonie la proportion d'espèces à grande répartition géographique est plus faible que la moyenne (Tableau CR2 ; Figure 13).

Principales références

FOURMANOIR P. & LABOUTE P. 1976 Poissons des mers tropicales. Nouvelle Calédonie. Nouvelles Hébrides, 376 pp.; Papeete (Éditions du Pacifique).

FRICKE R., KULBICKI M., WANTIEZ L. 2011 Checklist of the fishes of New Caledonia. Stuttgarter Beiträge zur Naturkunde A, Neue Serie 4: 341–463; Stuttgart, 30.IV.

FRICKE R. & KULBICKI M. 2007 Checklist of the shore fi shes of New Caledonia (2nd edition). – In: PAYRI, C. E. & RICHER DE FORGES, B. (eds.): Compendium of marine species from New Caledonia. 2nd edition. – Documents scientifiques et techniques, Institut de Recherche pour le Développement Nouméa II 7 (2), pp. 357–401, pls. 15/1 and 15/2.

KRONEN M., BOBLIN P., FRIEDMAN K.J., PINCA S., MAGRON F., AWIRA R., PAKOA K., LASI F., TARDY E., VIGLIOLA L., CHAPMAN L.B. 2009. New Caledonia country report: Profile and results from survey work at Ouassé, Thio, Luengoni, Oundjo and Moindou (March, April and November 2003 ; January, February, April, June, August and November 2004 ; April and May 2005, January to March 2006, and January and February 2007). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea: Secretariat of the Pacific Community. XXXVIII, 409 p.

KULBICKI M. 2007 Biogeography of reef fishes of the French territories in the South Pacific. Cybium 31(2):275-288

KULBICKI M. & WILLIAMS J. T. 1997 Checklist of the shorefishes of Ouvéa Atoll, New Caledonia. – Atoll Research Bulletin 444: 1–26.

KULBICKI M., RANDALL, J. E. & RIVATON, J. 1994 Checklist of the fishes of the Chesterfield Islands (Coral Sea). – Micronesica 27: 1–43.

LABOUTE P. & GRANDPERRIN R. 2000 Poissons de Nouvelle-Calédonie, 520 pp.; Nouméa (Editions Catherine Ledru).

RANDALL J. E. 2005 Reef and shore fishes of the South Pacific. New Caledonia to Tahiti and the Pitcairn Islands, XII +707 pp.; Honolulu (University of Hawai'i Press).

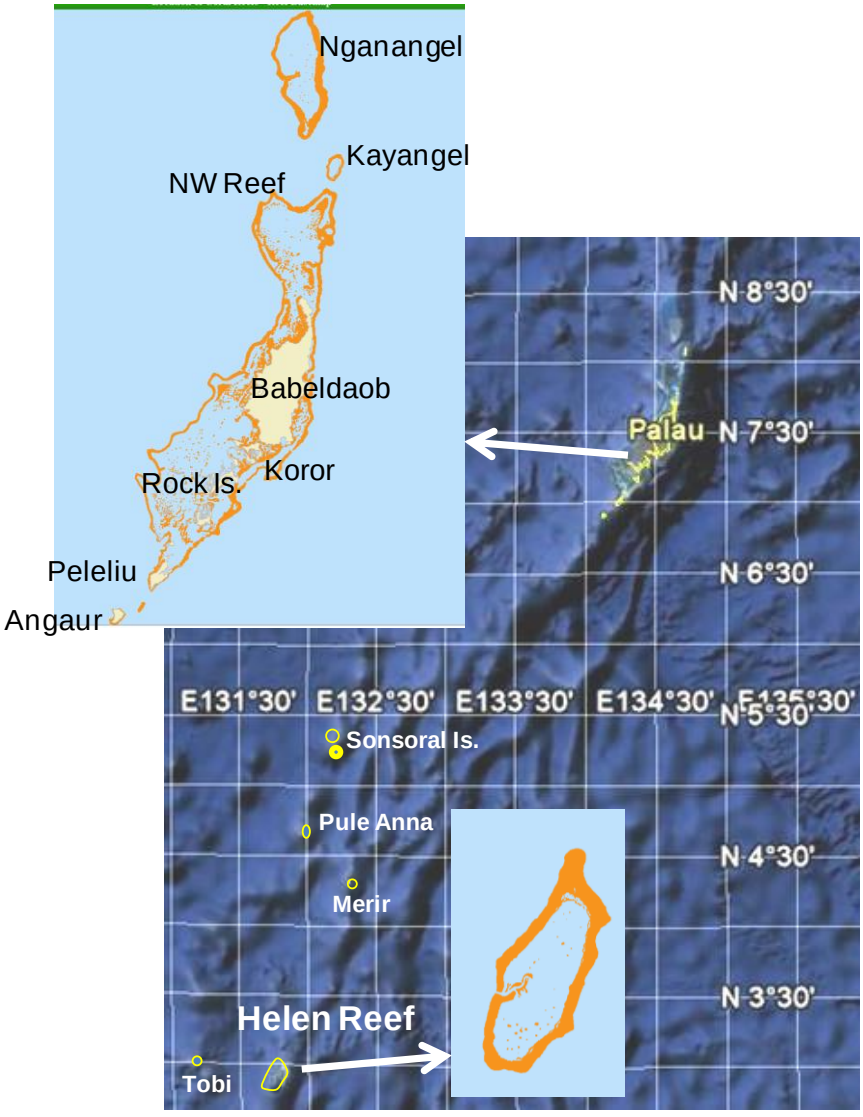
RANDALL J. E., ALLEN G. R. & STEENE R. 1997 Fishes of the Great Barrier Reef and Coral Sea. Revised and expanded edition, XX + 557 pp.; Bathurst (Crawford House).

RIVATON J. & BOURRET P. 1999 Les otolithes des poissons de l'Indo-Pacifique. – Documents scientifiques et techniques, Institut de Recherche pour le Développement, Centre de Nouméa, II 2, Volume spécial, 378 pp.

RIVATON J., FOURMANOIR P., BOURRET P. & KULBICKI M. 1990 Catalogue des poissons de Nouvelle-Calédonie. Checklist of fishes from New Caledonia. Rapport provisoire. – Catalogues, Sciences de la Mer, Biologie marine, O. R. S. T. O. M., Centre de Nouméa, III + 170 pp.

PALAU

Palau is constituted by two groups of islands. The largest group is in the north (7°N-8°N), the major island Babeldaob is in the center of this group and is surrounded by a number of small islands, the Kayangel islands (7 reefs) in the north, Koror, Malakal, Rock islands, Urukthapel, Eil Malk, Peleliu, Angaur in the south. A large barrier reef (220 km long) limits this island group to the west and south-west, the eastern side being mainly limited by a fringing reef. A 500 km² lagoon is bounded by these barrier reefs. North of Babeldaob barrier reefs bound a second smaller lagoon ("Northern lagoon" of nearly 300 km². The second group of islands is further south (3°N-5°20N) and has 6 islands, the largest being Helen reef, a 160 km² atoll, the five others being small islands (less than 1 km² each) surrounded by a narrow fringing reef. Palau stretches over 700 km. The land area is 480 km² and according to Yukihira et al. (2007) there is 525 km² of reef in Palau which may be divided into 265 km² of barrier reefs, 195 km² of fringing reefs and 65 km² of atoll habitat. However, Palau has a remarkable diversity of marine habitats, in particular its marine lakes, but also mangroves, seagrass and algae beds and large areas of soft bottoms dispersed with coral patch reefs.



Map of Palau: extracted and adapted from Google Earth (http : //earth.google.com/) and from Reef Base (http://reefgis.reefbase.org/)

Previous reef fish inventories

There has been numerous collections of reef fishes in Palau. There has been a sharp increase in the study of this reef fish fauna in the late 1980's (biological surveys in the southern lagoon) and early 1990"s after work such as collections by Helfman and Randall (1973) or Matsuura (1982). In particular there was a number of Rapid Ecological Assessments (REA) starting in 1991 (Maragos et al. 1994) which gave a first indication of the diversity of the reef fish assemblages in the northern part of Palau (7°-8°N) with species numbers available for each major island. A complementary survey was carried out in the southern islands (from Sonsoral to Helen Reef) in 1992 (Donaldson, 1996) which also gave species lists for each island. Myers (1999) built a comprehensive checklist of the shore fish of Palau (1298 species) of which nearly 1100 were reef associated. Since then there has been several collections of reef fishes. One may cite the "Palau Twilight zone Expedition" in 1997 by the Bishop Museum (R.Pyle) which discovered a number of new species or the joint expedition by the Smithsonian Institute and the Royal Ontario Museum in 2006 which also discovered a number of new records and new species. There are also a number of new records linked to reef fish resource estimates such as the work by the PROCFISH program of SPC in 2007 (Friedman et al. 2009).

Major characteristics of the reef fish fauna

At present there are 1284 taxa of reef fish recorded from Palau. This diversity is higher than in the nearby Caroline Islands (1180) in general and each FSM state in particular as none of the latter has more than 600 recorded species. In contrast Palau has a much lower diversity than nearby Philippines (1650 taxa), West Papua (1510, Allen and Erdmann, 2009) or Papua New Guinea (1930). The reef fish fauna of Palau belongs to the Melanesia biogeographical province (PNG, New Caledonia, Fiji, Vanuatu, Solomon Islands) and not Micronesia (Caroline islands, Marshal Islands, Marianas) or West Pacific (the biogeographical province which includes the nearby Philippines) (Figure 6) despite the geographical vicinity.

The reef fish fauna of Palau is characterized by an above average proportion of several families of small sedentary species, Gobiidae, Microdesmidae, Apogonidae and Syngnathidae and on the opposite a deficit in families with medium to large size species such as Acanthuridae, Labridae, Mullidae, Holocentridae, Chaetodontidae, Scorpaenidae and Muraenidae. This pattern is common with most of Melanesia (Table CR-2) in particular with PNG and Solomon islands. The most common large scale factors shared between these countries is their proximity to the Coral Triangle and their position close to the equator. On the opposite Palau has a very small land mass compared to most countries in the Melanesia biogeographical province. The reef fish fauna of Palau has a contrasted size distribution with an above average proportion of small to very small species and on the opposite a strong deficit in the proportion of large species (Table CR-2; Figure 13). Similarly the trophic structure of this reef fish fauna is characterized by an above average proportion of plankton and small invertebrate feeders and a deficit of large invertebrate feeders, piscivores, herbivores and coral feeders (table CR2; Figure 13). Endemism is below average, the geographical range distribution being characterized by an above average proportion of species in the 10-50 sites range (Table CR-2; Figure 13).

Some references

COLIN P. L. 2004 The Marine Environments of Palau, A report prepared for The Nature Conservancy by the Coral Reef Research Foundation, Koror, Palau

DONALDSON T. 1996 Fishes of the Remote Southwest Palau Islands: A Zoogeographic Perspective Pacific Science (1996), vol. 50, no. 3: 285-308

FRIEDMAN K.J., KRONEN M., PINCA S., LASI F., PAKOA K., AWIRA R., BOBLIN P., TARDY E., CHAPMAN L.B., MAGRON F. 2009 Palau country report : profiles and results from survey work at Ngarchelong, Ngatpang, Airai and Koror (April to June 2007) . Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). 411 p.

GREEN A.L. & P.J. MOUS 2006 Delineating the Coral Triangle, its ecoregions and functional seascapes. Report based on an expert workshop held at the TNC Coral Triangle Center, Bali Indonesia (April - May 2003), and on expert consultations held in June – August 2005. Version 3.1 (February 2006). Report from The Nature Conservancy, Coral Triangle Center (Bali, Indonesia) and the Global Marine Initiative, Indo-Pacific Resource Centre (Brisbane, Australia). 50 pp.

HELFMAN G.S. & RANDALL J.E. 1973 Palauan fish names. Pac. Sci. 27(2), 136-153.

MARAGOS J.E., C. BIRKELAND, C. COOK, K. DES ROCHERS, R. DI ROSA, T.J. DONALDSON, S.H. GEERMANS, M. GUILBEAUX, H. HIRSH, L. HONIGMAN, N. IDECHONG, P.S. LOBEL, E.MATTHEWS, K.J. MCDERMID, K.Z. MEIER, R. MYERS, D. OTOBED, R.H. RICH-MOND, B. SMITH, AND R. SMITH 1994 Marine and coastal areas survey of the main Palau Islands: Part 2. Rapid Ecological Assessment Synthesis Report. Republic of Palau, Ministry of Resources and Development.

MARINO S. and 14 other authors 2008 The State of Coral Reef Ecosystems of Palau. In Waddell, J.E. and A.M. Clarke (eds.), The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Technical Memorandum NOS NCCOS 73. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. P. p.511-539

MATSUURA K. 1982 A list of the fishes collected in the Palau and Yap Islands. Proc. Jap. Soc. Syst. Zool. 23, 80-89.

MYERS R.F. 1999 Micronesian reef fishes: a comprehensive guide to the coral reef fishes of Micronesia. Coral Graphics, Barrigada, Guam. 330 pp.

YUKIHIRA H., K. SHIMOIKE Y. GOLBUU, T. KIMURA, S. VICTOR, H. OHBA 2007 Coral Reef Communities and Other Marine Biotopes in Palau. pp. 10-29. In: H. Kayanne, M. Omuri, K. Fabricius. E. Verheij, P. Colin, Y. Golbuu, and H. Yukihira (eds.). Coral Reefs of Palau. Palau International Coral Reef Center. Koror, Palau. 231 pp.

PAPUA NEW GUINEA

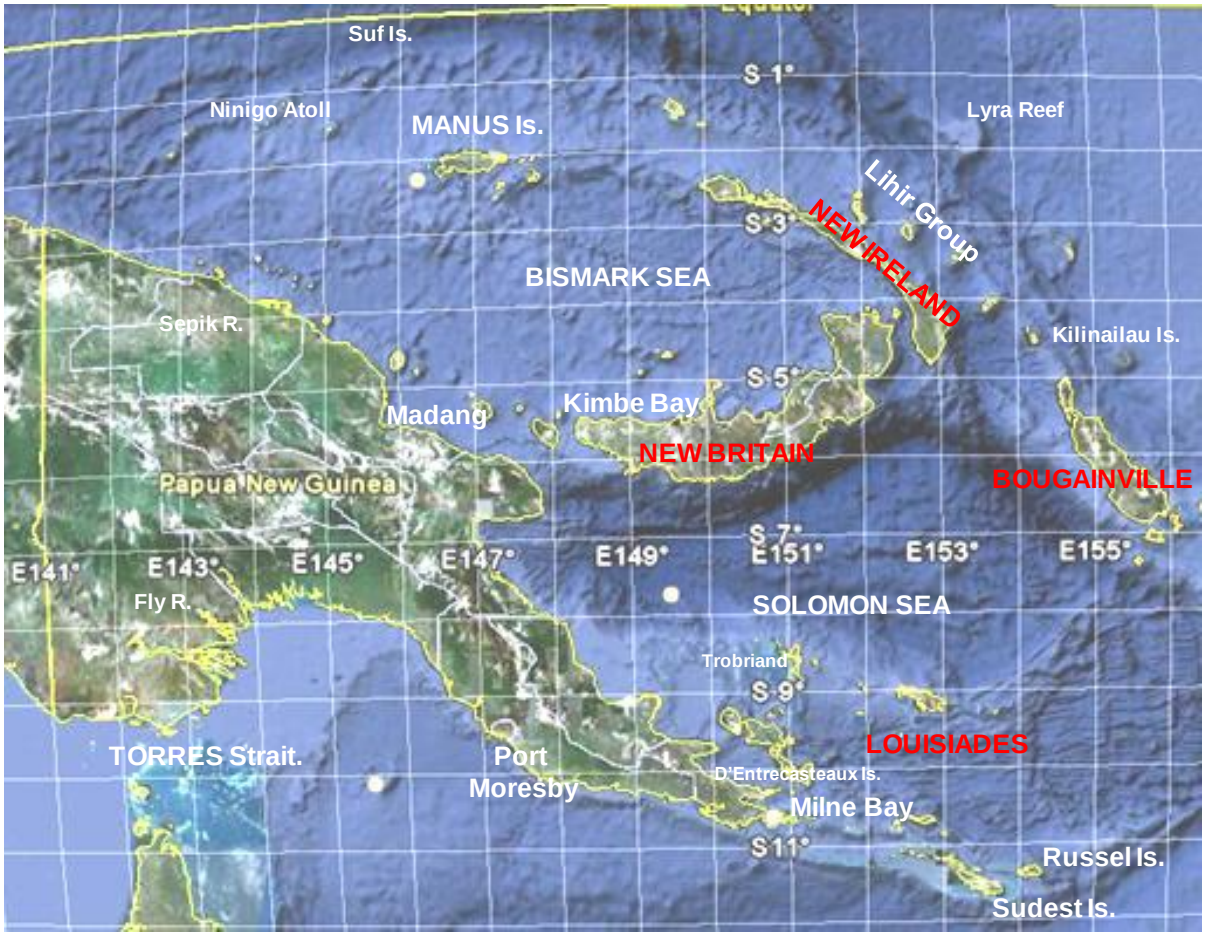
Papua New Guinea (PNG) is one of the largest coral reef regions in the Pacific. It stretches 1200 km between 1°S (Suf Island) and 11°30S (Sudest Island) and 1700 km from east (Pocklington reef) to west (border with West Papua). There is a wide range of coral reef types in PNG, linked to a complex geomorphology. Around the mainland there are three major groups of islands. In the north the Bismarck archipelago, to the east Bougainville and a number of oceanic reefs and atolls in the north-east, in the south-east the Lousiade archipelago.

Reefs around the main island are not well developed. In the northern part of the main island there are fringing reefs along most of the coast, reefs being limited by turbidity and high freshwater input at the proximity of the numerous rivers (e.g. the Sepik, Ramu and Markham rivers). There are also many small reef formations offshore, particularly near Madang. In the south part of the main island there are many rivers and mangroves systems between the Torres Strait area and Port Moresby linked to the Fly river system, the first fringing reefs being found about 100 km west of the capital. East of Port Moresby reefs are well developed all the way to the Louisiade archipelago with some kind of barrier reef (Papuan Barrier Reef) protecting a narrow lagoon.

The Louisiade archipelago comprises a large number of islands with complex reef systems. There are fringing reefs around most islands with in many cases lagoons limited by a barrier reef. In particular there are nearly 400 km of barrier reefs between Mine Bay and the south-east extremity of Sudest Island, there is also a barrier reef between the D'Entrecastaux islands and the Trobriand islands. Within these lagoons or relatively sheltered areas there are many small islets and reef formations. The Bismark of archipelago is composed of 3 major islands, New Britain, New Ireland and Manus island, with a string of smaller islands between the mainland and New Britain and a number of isolated reefs in the northern part (in particular Ninigo atoll and Hermit island). Most reefs around the large islands of the Bismark archipelago are fringing reefs, with a number of patch reefs and at times small sets of barrier reefs. Reefs are more developed around Manus island and the smaller island to the north, with many islets and patch reefs. The last group of islands is to the east, Bougainville being the most important island, with a string of smaller islands and isolated reefs bridging with New Ireland (e.g. Lyra reef, Nukumanu reef, Kilinailau island, the Lihir group). Bougainville is mainly surrounded by fringing reefs with however a little barrier reef in the north and the south-east. Most of the small islands are also surrounded by fringing reefs with a few having an atoll like structure with a barrier reef and a lagoon.

PNG is considered by some as part of the "Coral Triangle" (Green and Mous, 2008) and harbors a very high diversity of reef organisms, in particular coral (378/517 species[5]).

[5] Coral diversity : the first number is an estimation from UNEP-WCMC data base ; second number estimated from Veron (2000) data base. These numbers are extracted from the "World Atlas of Coral Reefs " by Spalding et al. 2001.



Map of Papua New Guinea: extracted and adapted from Google Earth (http : //earth.google.com/)

Previous reef fish inventories

The PNG reef fish fauna has received much attention in the past. An account of earlier studies can be found in Reef Base (at http://www.reefbase.org/global_database/dbr3,60,PNG,1.aspx) with further details in Munro (1967) and Kailola (1987a, b, 1991). The latter provided the first comprehensive list of fish from PNG with over 2100 species of which approximately 1300 were reef associated. There has been since some important surveys. In particular Allen gives an account for the Bismark sea (Allen, 2009), Allen and Munday surveyed Kimbe Bay (New Britain) in 1994 (Allen, 1994), an area which was again surveyed in 2002 (Beger, 2002), Milne Bay (Lousiades) was also surveyed by Allen (1998). Allen conducted surveys in the Madang area and unpublished checklists also exist for Bootless bay, south of Port Moresby (by N.Coleman) and Kamiali near Lae (Jenkins and Led; see also Longenecker et al. 2008). Some data has also been gathered in New Ireland (Gochfeld, 1996). The PROCFISH program from SPC studied in 2006 the reef fish resources of four villages (Friedman et al. 2009) and listed 297 taxa of commercially or ecologically important reef fish species. Wia et al. (2007) produced a comprehensive data base on reef fish recorded from PNG (available on internet and on CD from the Motupore Island Research Centre) which lists 1520 species and gives numerous references.

Major characteristics of the reef fish fauna

The PNG reef fish fauna is one of the most diverse on Earth. The present report indicates 1824 taxa for all regions of PNG (Table CR3). Separate lists for Milne Bay (Louisiades) and Kimbe Bay (New Britain) indicate respectively 1176 and 975 taxa (Table CR3). This diversity is higher than any other in the SW Pacific biogeographical province (Figure 6, 7), the Solomon islands being next with 1595 species. More interestingly the PNG reef fish fauna is more related to the faunas of Fiji, New Caledonia or Palau than nearby Indonesia. In particular, the reef fish fauna of West Papua (Bird's Head peninsula) is closer to reef fish faunas from Indonesia such as Bali, Flores or Sulawesi than PNG or Palau (Figure 6). This suggests that there could be an important ecological barrier for reef fish between West and East Papua.

The PNG reef fish fauna is characterized by the above average relative diversity of several families (Apogonidae, Gobiidae, Pseudochromidae, Syngnathidae, Tripterygiidae, Nemipteridae) of mainly small species (except Nemipteridae which can be medium size)(Tables CR1, CR2). This is nearly identical to what is observed in the Solomon islands. In addition there are several less diverse families which have above average diversity in PNG, such as Batrachoididae, Callionymidae, Hemiscillidae, Pinguipedidae, Platycephalidae or Haemulidae. The latter families are most diverse in regions with large land masses. In contrast the PNG reef fish fauna has a deficit in relative diversity for several families of medium (e.g. Chaetodontidae, Cirrithidae, Holocentridae, Mullidae) to large species (e.g. Acanthuridae, Scaridae, Balistidae, Muraenidae)(Table CR2). Consequently there is an above average proportion of small (< 10cm) species compared to the other South Pacific countries (Table CR2; Figure 13). There is also an above proportion of small invertebrate and plankton feeders. On the opposite there is a deficit in medium size species (20-40 cm), mainly carnivores, coral feeders and herbivores (feeding on micro-algae) (Table CR2; Figure 13). The proportion of endemic species and species with restricted geographical ranges (less than 10 sites) is above average (Table CR2; Figure 13). Similarly species with medium geographical range (10-40 sites) make a higher proportion of the reef fish fauna than in most of the countries in the South Pacific (Table CR-2). This indicates that a high proportion of the reef fishes from PNG have a limited geographical distribution.

Some references

ALLEN G.R., ERDMANN M.V. 2009 Reef fishes of the Bird's Head Peninsula, West Papua, Indonesia. Check List 5(3): 587–628

Allen, G.R. 2009. Coral Reef Fish Diversity. In: Hamilton, R., A. Green and J. Almany (eds.) 2009. Rapid Ecological Assessment: Northern Bismarck Sea, Papua New Guinea. Technical report of survey conducted August 13 to September 7, 2006. TNC Pacific Island Countries Report No. 1/09.

ALLEN G. R. 1998 Reef and shore fishes of Milne Bay Province, Papua New Guinea. In: Werner, T. B. and G. R. Allen (eds.). A rapid biodiversity assessment of the coral reefs of Milne Bay Province, Papua New Guinea. RAP Working Papers 11, Washington, D.C.: Conservation International. Pp. 39-49, 67-107.

ALLEN G. R. & STEENE R. 1998 Indo-Pacific coral reef field guide. Coral Sea Imagery. Townsville, Queensland.

ALLEN G. R., J. P. KINCH, S. A. MCKENNA, P. SEETO. (Eds.). 2003 A Rapid Marine Biodiversity Assessment of Milne Bay Province, Papua New Guinea—Survey II (2000). RAP Bulletin of Biological Assessment 29. Conservation International, Washington, DC, USA

ALLEN G.R., MUNDAY P. 1994 Kimbe Bay rapid ecological assessment. November – December 1994. Vol 3: Fish Diversity. Report produced for The Nature Conservancy and partners, Auckland, New Zealand. 111pp

ALLEN G.R., & SWAINSTON R. 1993 Reef fishes of New Guinea. Christensen Research Institute. Madang, Papua New Guinea. Publ. No.8.

BEGER M. 2002 The diversity and status of coral reef fishes of Eastern Kimbe Bay. Report to The Nature Conservancy as part of the Eastern Kimbe Bay Rapid Ecological Assessment, December 2002.

FRIEDMAN K., KRONEN M., PINCA S., MAGRON F., BOBLIN P., PAKOA K., AWIRA R., CHAPMAN L. 2009 Papua New Guinea country report : profiles and results from survey work at Andra, Tsoilaunung, Sideia, and Panapompom (June to November 2006). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). 471 p.

GOCHFELD, D. 1996 Coral reefs and associated fishes. In: Hair C. (ed). Lak Marine Survey an ecological assessment of the coral reef and nearshore environments of southern New Ireland, Papua New Guinea. Department of Environment and Conservation/United Nations Development Programme. 36-52

GREEN A.L. & P.J. MOUS 2006 Delineating the Coral Triangle, its ecoregions and functional seascapes. Report based on an expert workshop held at the TNC Coral Triangle Center, Bali Indonesia (April - May 2003), and on expert consultations held in June – August 2005. Version 3.1 (February 2006). Report from The Nature Conservancy, Coral Triangle Center (Bali, Indonesia) and the Global Marine Initiative, Indo-Pacific Resource Centre (Brisbane, Australia). 50 pp.

KAILOLA P. 1987a The fishes of Papua-New Guinea. A revised annotated checklist. Vol. 1. Myxinidae to Synbranchidae. Res. Bull. Dept Fish. Mar. Resour. Papua-New Guinea, 41: 1-194.

KAILOLA P. 1987b The fishes of Papua-New Guinea. A revised annotated checklist. Vol. 2. Scorpaenidae to Callyonimidae Res. Bull. Dept Fish. Mar. Resour. Papua-New Guinea, 41: 195-418

KAILOLA P. 1991 The fishes of Papua-New Guinea. A revised annotated checklist. Vol. 3. Gobiidae to Molidae Res. Bull. Dept Fish. Mar. Resour. Papua-New Guinea, 41: 419-572

LONGENECKER K., BOLICK H. & ALLISON A. 2008 A preliminary account of marine fish diversity and exploitation at Kamiali Wildlife Management Area, Papua New Guinea. Final Report. v + 116 p

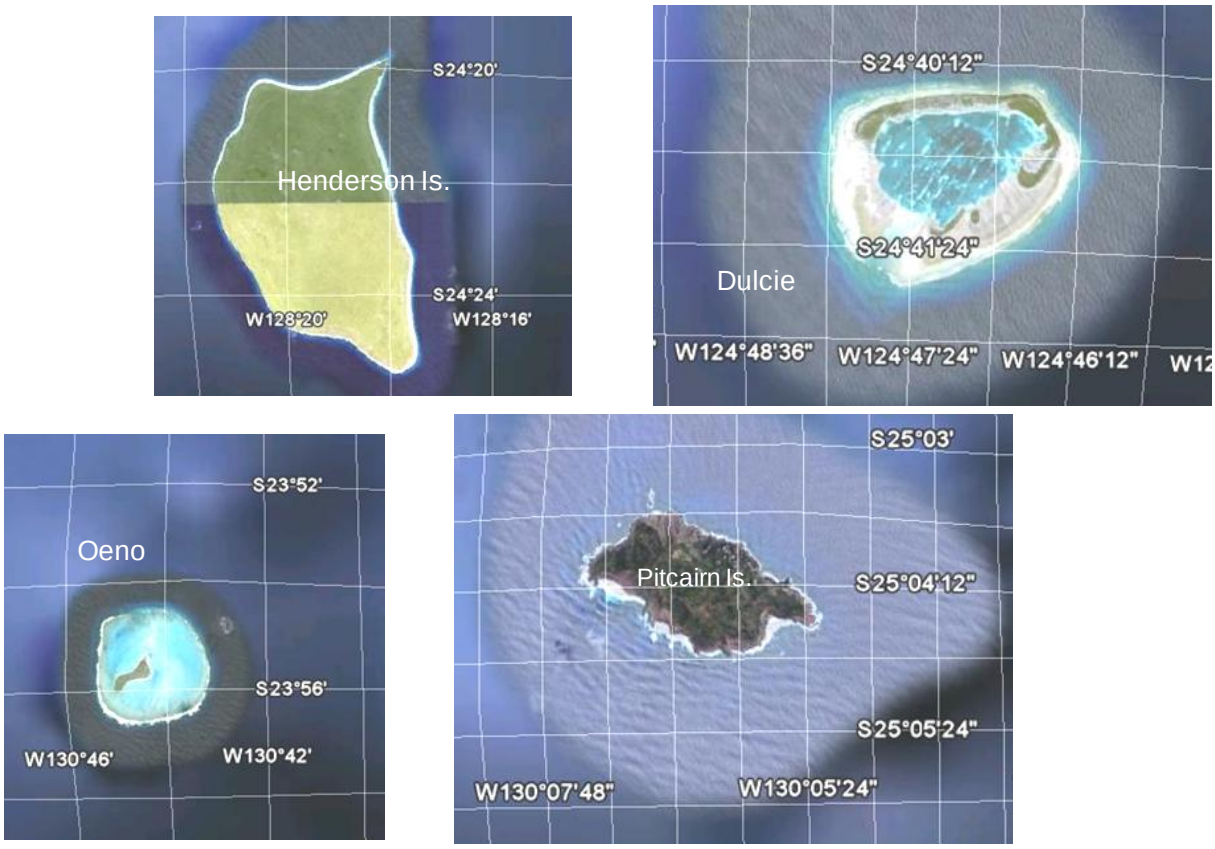
MUNRO I. S. R. 1967 The Fishes of New Guinea. Department of Agriculture, Stock & Fisheries. Port Moresby, New Guinea. 651 pp. + 78 pls.

WIA J., LIS R., BAINE M. eds 2007 The Motupore Island Marine Biodiversity Unit Papua New Guinea Marine Biodiversity Database: CD-ROM 2007. Published by the Motupore Island Research Centre, University of Papua New Guinea, Port Moresby, Papua New Guinea.

.

PITCAIRN

Pitcairn is at the south-eastern end of Polynesia, being the last archipelago before Easter Island. There are 4 islands, Pitcairn, Oeno, Henderson and Dulcie. These islands are between 24 and 25°S. The closest island group is the Gambier (French Polynesia) nearly 400 km west from Oeno. The four islands are small and isolated from one another by at least 180 km of ocean. Total land area is of 47 km². Coral reefs are represented by fringing reefs around Pitcairn and Henderson islands, Oeno and Dulcie being two small atolls of respectively 4 km and 2.5 km in diameter. The total reef area is approximately 20-25 km². At present 42 species of hard corals are reported from this archipelago.



Map of Pitcairn: extracted and adapted from Google Earth (http : //earth.google.com/)

Previous reef fish inventories

The reef fish fauna of the Pitcairn group has been mainly sampled by Randall in 1970-1971 (Randall, 1999) who reported 335 reef associated species. Additional information was collected by Irving and Jameson in 1991 (Irving et al. 1995) around Henderson island.

Major characteristics of the reef fish fauna

Because of its isolation and the small size of its islands, combined with a low latitude, the Pitcairn group has a reef fish fauna with a number of specificities (Tables CR1, CR2). First the diversity is low with 370 taxa reported at present. Many families are either absent (e.g. Dasyatidae, Haemulidae, Nemipteridae, Plesiopidae) or poorly represented (e.g. Caesionidae, Kyphosidae, Syngnathidae, Siganidae, Sphyraenidae). On the opposite some families have a relative diversity higher than the

South Pacific average. It is in particular the case of Acanthuridae, Balistidae, Labridae, Cirrhitidae, Blenniidae, Chaetodontidae, Holocentridae, Muraenidae and Scorpaenidae. For the first four families this was predictable from the effect of island size or island isolation (Table 4). A high proportion of Blenniidae, Holocentridae, Muraenidae and Scorpaenidae is found in most of Polynesia which reflects a general trend which causes are not yet understood. It should however be noted that Muraenidae are thought to have very long larval durations which could explain their success in small and isolated islands. The reef fish fauna of Pitcairn is also characterized by a slight deficit in small species, a higher proportion than average of micro-algae feeders and large solitary carnivores and piscivores which is compensated by a lower proportion of plankton feeders and small invertebrate feeders (Table CR2; Figure 13). Endemism is low (Randall, 1999 indicated that only 4 species were only recorded from that archipelago). However the reef fish fauna of the Pitcairn group is characterized by a large proportion of species with a restricted geographical range (3-20 sites) as well as by species with a wide geographical range (> 80 sites)(Table CR2; Figure 13).

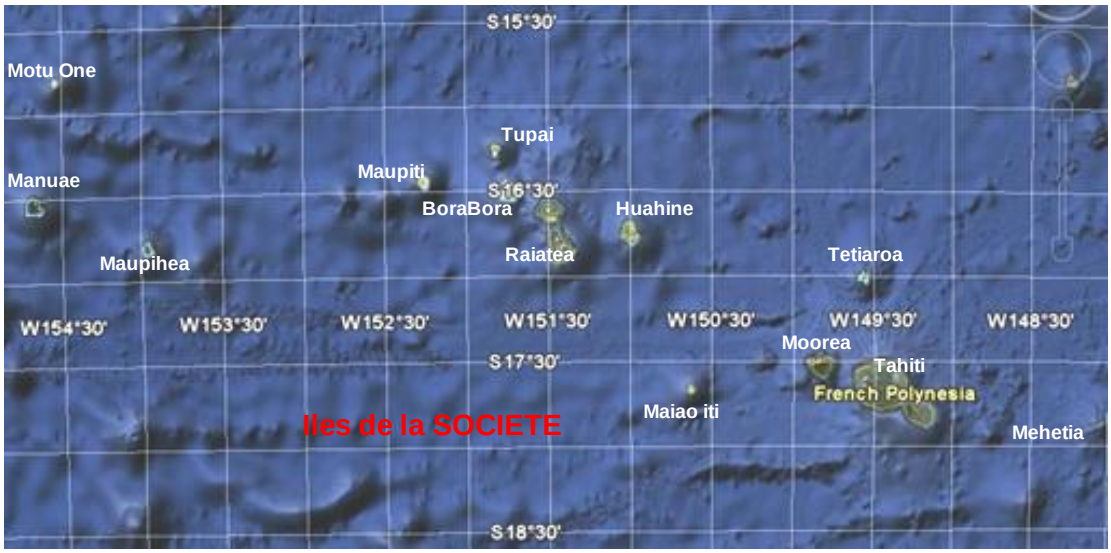
Some references

IRVING R.A., JAMIESON J., RANDALL J.E. 1995 Initial checklist of fishes from Henderson Island, Pitcairn Group.Biological Journal of the Linnean Society 56 (1-2): 329–338

RANDALL J.E. 1999 Report on fish collections from the Pitcairn Islands . Atoll Research Bulletin. 461:53 pp.

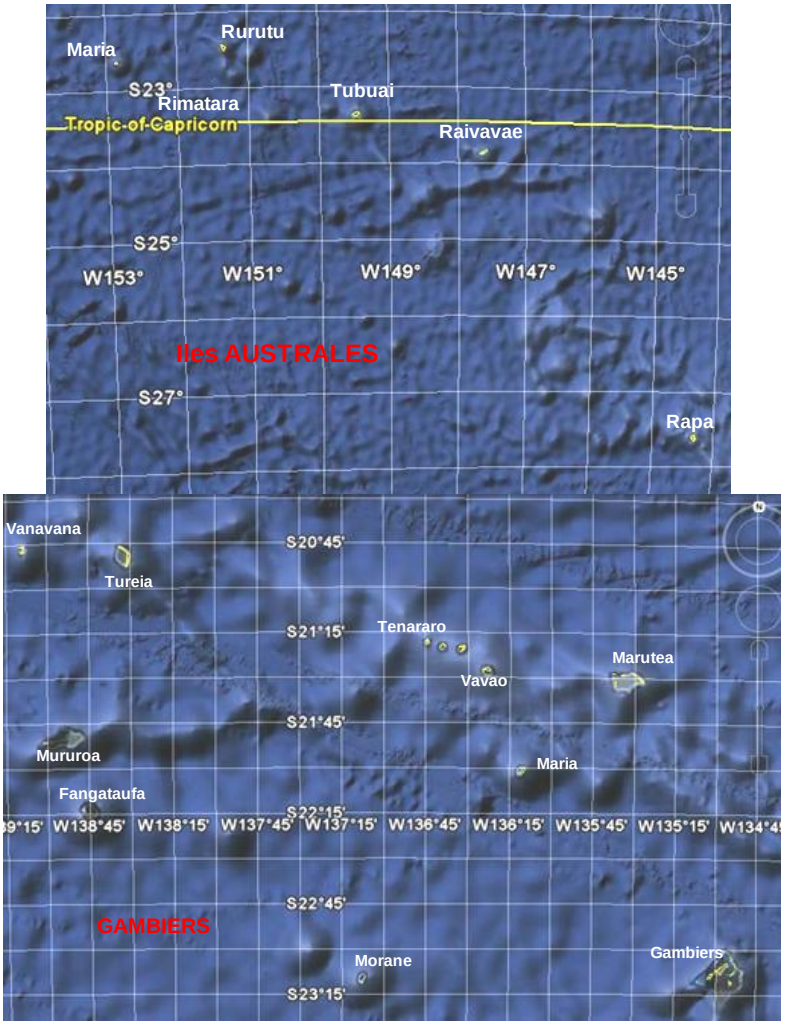
POLYNESIE-FRANÇAISE

La Polynésie Française est un archipel composite qui comporte cinq grands groupes d'îles : les îles de la Société à l'ouest, les Tuamotu à l'est, les Marquises au nord-est, les Australes au sud-ouest et les Gambiers au sud-est. Ces îles s'étalent de 8°S à 27°30S sur 2200 km du nord au sud et sur 1950 km d'ouest en est ce qui en fait l'ensemble insulaire le plus vaste du Pacifique Sud. La distance au « Coral Triangle » est de 10 600 (Société) à 12 300 km (Gambier). Les surfaces terrestres sont cependant réduites l'ensemble des terres émergées totalisant 3024 km². Les récifs couvrent une surface importante avec près de 2200 km² (Anfréfouët et al. 2005) mais les surfaces lagonaires représentent près de 10 160 km². Les récifs sont inégalement répartis suivant les archipels, une cartographie détaillée étant disponible dans Andréfouët et al. (2005). Les Marquises sont constituées de 9 îles hautes récentes (et quelques îlots). Elles sont isolées, étant à 500 à 700 km au NE des atolls les plus proches des Tuamotus. Les récifs coralliens y sont très peu développés avec juste quelques récifs frangeants par endroits. Les îles de la Société sont représentées essentiellement par des îles hautes entourées par une barrière récifale qui délimite un lagon, avec cependant plusieurs atolls à l'extrême ouest (Manuae, Motu One, Maupihaa) et deux vers le nord (Tetiaroa, Tupai). Les Tuamotu sont un vaste ensemble de 64 atolls de taille et structure très variées avec en particulier des atolls très grands (ex. Rangiroa, Fakareva, Kaukura, Tahanea) ou des atolls fermés (ex. Taiaro) s'étendant de 15°S à 22°S, soit 1300 km, et sur plus de 700 km d'est en ouest. Les Gambier sont en continuité avec les Tuamotu, étant séparés par seulement 170 km des derniers atolls au sud des Tuamotu. Ce groupe est constitué de deux entités. D'une part les Gambier au sens propre constituées de plusieurs petites îles hautes entourées d'un vaste lagon partiellement submergé dans sa partie sud. D'autre part un ensemble de 13 atolls sont associés aux Gambiers (Andréfouët et al. 2005). Les Australes sont un ensemble hétérogène d'îles au sud-ouest de la Polynésie Française constitué de 5 îles hautes et un atoll. Rapa, qui représente la limite sud de la Polynésie Française, est une île haute volcanique sans lagon alors que les deux autres îles hautes sans lagon, Rurutu et Rimatara sont des îles peu élevées. Deux autres îles hautes peu élevées, Tubuai et Raivavae, sont entourées par des lagons. Le seul atoll de ce groupe (îlots Maria) est au nord-ouest du groupe. Les îles Australes sont relativement isolées les unes des autres avec des distances variant de 130 à 520 km.

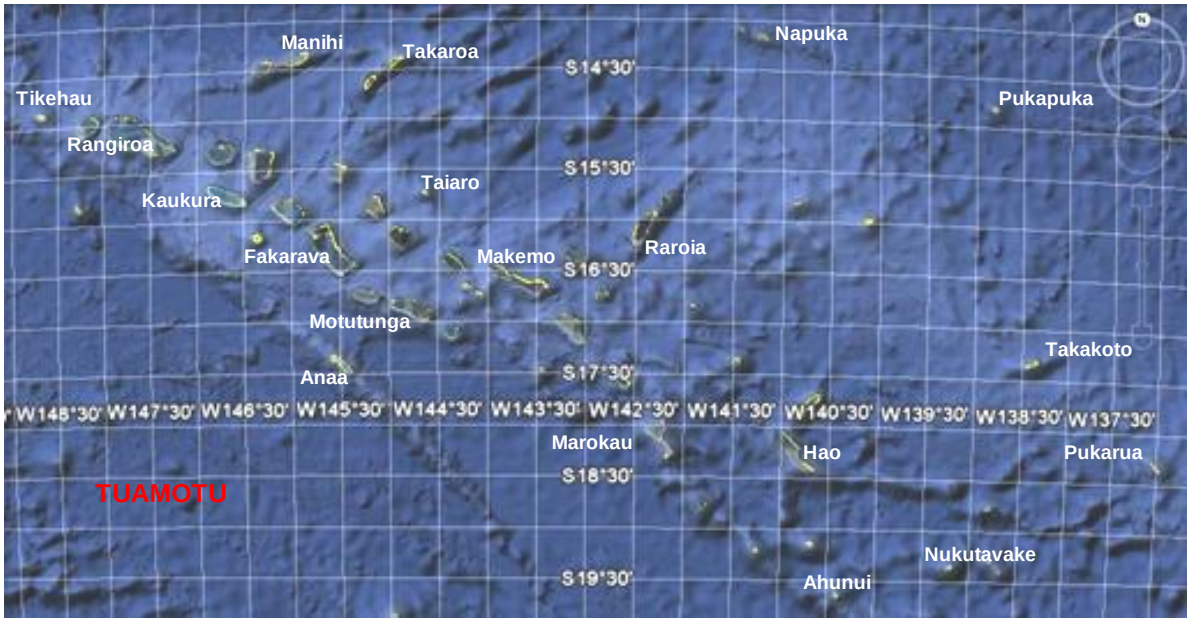


Carte des îles de la Société : extrait et adapté de Google Earth (http : //earth.google.com/)

Carte des Marquies : extrait et adapté de Google Earth (http : //earth.google.com/)



Cartes des Australes et des Gambier : extrait et adapté de Google Earth (http : //earth.google.com/)



Cartes des Tuamotu : extrait et adapté de Google Earth (http : //earth.google.com/)

Inventaires faunistiques antérieurs

Il y a eu de très nombreux travaux réalisés sur les poisons en Polynésie Française ce qui permet d'avoir pour la plupart des archipels une assez bonne image de la faune des poisons de récif. Ces travaux peuvent se scinder en deux grands types, les analyses générales à la Polynésie et les travaux concernant plus spécifiquement une île ou un archipel.

Les analyses générales ont véritablement débutées par un premier ouvrage de vulgarisation par Bagnis et al. (1976) qui donnait une première vision des espèces récifales présentes. Par la suite, Randall en 1985 fournit les premières listes faunistiques pour les Australes, Société, Marquises et Tuamotu. De 1978 à nos jours l'EPHE a recensé par comptage visuels les espèces sur plusieurs îles de la Société (Mooréa, Tahiti, Bora-Bora, Raiatea) et sur de nombreux atolls ainsi que plus récemment aux Marquises. De nombreux prélèvements de larves et juvéniles ont également été réalisés par l'EPHE et le CNRS depuis 1988 dans les îles de la Société et aux Tuamotu. Plus récemment Randall (2005) publia un ouvrage décrivant les principales espèces de poissons récifaux du Pacifique Sud dans lequel la présence de chaque espèce était précisée pour chaque archipel de Polynésie. En 2007 Bacchet et al. publiaient un livre recensant les espèces connues de tous les archipels de Polynésie Française soit plus de 1000 espèces. A noter également les travaux de la CPS dans le cadre du programme PROCFISH avec des recensements à Fakarava, Maatea, Mataiea, Raivavae et Tikehau.

Les îles de la Société ont probablement reçu le plus d'attention de la part des scientifiques en particulier suite à la présence de trois centres de recherche, celui de l'PEHE-CNRS et celui de la GUMP à Mooréa et l'IRD à Tahiti. A partir de 1975 jusqu'à nos jours l'EPHE et plus récemment le CNRS ont mené des campagnes de recensement en plongée sur plusieurs îles hautes (Mooréa, Tahiti, Raiatea, Bora-Bora) ainsi que des prélèvements par pêche, soit de larves et juvéniles soit d'adultes, ces derniers essentiellement dans le cadre du programme international « Barcod of Life ».

Un ensemble de pentes externes d'atolls des Tuamotu ont été échantillonnés également par l'EPHE et le CNRS dès la fin des années 1970. Tikehau a fait l'objet d'études par l'IRD de 1980 à 1986, puis en

2003. En 1995-1996 l'IRD, l'EPHE et le CNRS organisèrent une campagne de comptages en plongée sur 10 atolls des Tuamotu. Ces travaux avaient été précédés par une expédition dirigée par l'EPHE sur l'atoll de Taiaro qui visait à comprendre le fonctionnement des assemblages de poissons dans un atoll fermé. Cet atoll a été revisité en 2006.

Les Marquises ont fait l'objet d'une liste faunistique par Randall et Earle (2000), cette liste complétant celle de Randall de 1985. Ce travail a été suivi par des prélèvements par le CNRS et EPHE avec en 2012 une campagne prévue pour compléter cet échantillonnage.

Les Australes ont fait l'objet d'une première liste faunistique par Randall en 1985. Depuis cet archipel a reçu peu de visites d'ichthyologistes à l'exception de Rapa pour la quelle Randall établit une liste spécifique en 1990 et où se déroula une expédition en 2004 dont les résultats furent publiés par Galzin et al. en 2005. Plus récemment Raivavae a fait l'objet de recensements en plongée par la CPS ce qui a permit de confirmer certaines observations antérieures. Une mission est prévue en 2012 pour compléter les connaissances sur cet archipel.

Les Gambier et les atolls voisins ont été très peu étudiés à l'exception de Mururoa et Fangatofa qui ont fait l'objet de plusieurs recensements en plongée. Plus récemment Mururoa fut échantillonné en 2006 lors d'une expédition par l'IRD, l'EPHE et le Smithsonian Institute. La faune des îles Gambier étaient très mal connues jusqu'à une expédition fin 2010 par le CNRS, l'IRD et le Smithsonian Institute qui a permis une première liste faunistique de ce groupe d'îles.

Principales caractéristiques des communautés de poissons

A l'heure actuelle 1027 taxa de poissons de récif sont répertoriés de Polynésie Française (Tableau CR1). Il existe cependant des différences importantes suivant les archipels. Les îles de la Société ont une faune de poissons de récifs de 728 espèces (+ 25 « probables »). Elles sont suivies des Tuamotu (604 espèces + 33 « probables »), des Gambier (521 espèces + 17 « probables »), des Marquises (466 espèces), les Australes (sans Rapa) n'ayant que 349 espèces répertoriées (+59 probables) avec par ailleurs Rapa comportant 403 espèces. Il est probable que les différences de diversité entre archipels sont plus réduites car tous les archipels n'ont pas été échantillonnés avec la même intensité, les Gambier et les Australes ayant reçu une attention moindre que dans l'ordre les îles de la Société, Rapa, les Tuamotu et les Marquises. Le gradient en diversité est cependant bien réel avec moins d'espèces à mesure que l'on s'éloigne du centre de biodiversité et que la latitude augmente. Ainsi la diversité observée aux Gambier (521 espèces) est intermédiaire entre celle des Tuamotu (604) plus au nord et celle de Pitcairn (370) au SE. En revanche la diversité aux Australes est très probablement beaucoup plus élevée qu'indiqué par les chiffres actuels (349 espèces + 59 « probables ») car cette diversité ne concorde pas avec celle de Rapa (403) pourtant plus au Sud et très isolée.

Non seulement les archipels ont des diversités différentes mais la structure de leur faune de poissons de récif est différente bien que les 5 archipels appartiennent à la même région biogéographique, Polynésie Sud (Figures 6 et 7). Il est possible de distinguer 3 sous-groupes, d'une part les îles de la Société, les Tuamotu et les Gambiers (STG) qui se rapprochent des îles Cook plus à l'ouest, d'autre part les Australes et Rapa (AR) qui se regroupent avec Pitcairn pour former un ensemble subtropical, les Marquises formant un groupe à elles seules (avec des affinités avec l'île de Wake au nord des Marshall).

La faune des poissons de récif de ces 5 archipels ont en commun une proportion au dessus de la normale en Acanthuridae, Holocentridae, Kyphosidae, Muraenidae, Scorpaenidae et Mullidae et à l'opposé un déficit en Gobiidae, Pomacentridae, Siganidae et Apogonidae. Ces spécificités se retrouvent dans la plupart des archipels du Pacifique sud composés de petites îles, surtout s'il s'agit d'atolls (Tableau CR-2). Ceci se traduit par une proportion plus forte que la moyenne en grandes espèces (> 40 cm) surtout carnivores ou/et piscivores et d'activité nocturne et en revanche un déficit en espèces consommant du petit benthos ou les planctonophages (Table CR2 ; Figure 13). Les Australes-Rapa se distinguent des Société-Tuamotu-Gambier par plus de macro-carnivores et herbivores et surtout une bien plus forte proportion d'espèces à faible répartition géographique (3-10 sites) (Table CR2 ; Figure 13). Les Marquises se distinguent des deux autres archipels par un déficit en Labridae, Scaridae, Chaetodontidae et à l'opposé de plus fortes proportions de poissons anguilliformes (Muraenidae et Ophichthidae) (Table CR2 ; Figure 13). La faune des Marquises se caractérise aussi par une forte proportion de grandes espèces surtout carnviores et piscivores. Le point le plus remarquable reste cependant le niveau d'endémisme qui est 7 fois plus élevé que la moyenne pour le Pacifique Sud avec 8.2% d'espèces connues uniquement de cet archipel (Table CR2 ; Figure 13). C'est l'un des taux d'endémisme les plus élevé du Pacifique tropical après celui de la faune de l'île de Pâques et celui des îles Hawaii.

Principales références

ANDREFOUËT S., CHAUVIN C., SPRAGGINS S., TORRES-PULLIZA D, KRANENBURG C. 2005 Atlas des récifs coralliens de Polynésie française, Centre IRD de Nouméa, février 2005, 38 pages + 86 planches

BACCHET P., LEFÈVRE Y. & T. ZYSMAN, 2007 Guide des Poissons de Tahiti et ses Îles. 610 p. Papeete: Éditions Au Vent des Îles.

BAGNIS R., MAZELLIER P., BENNETT J. & E. CHRISTIAN, 1976 Poissons de Polynésie. 368 p. Tahiti, Polynésie Française: Les Éditions du Pacifique

FAO 1998 FAO Species Identification Guide for Fishery Purposes. The Living Resources of theWestern Central Pacific (Carpenter K.E. & V.H. Niem, eds). Vol. I-VI. Rome: FAO.

GALZIN R., LECCHINI D., WILLIAMS J.T., PLANES S. & J.L. MENOU, 2006 Diversité de l'ichtyofaune corallienne à Rapa (Polynésie Française). Cybium, 30(3): 221-234.

JOHNSTON R.H. 1982 Requins de Polynésie. Les éditions du Pacifique

KRONEN M., FRIEDMAN K.J., PINCA S., CHAPMAN L.B., AWIRA R., AWIRA R., PAKOA K., VIGLIOLA L., BOBLIN P., MAGRON F. 2009 French Polynesia country report : profiles and results from survey work at Fakarava, Maatea, Mataiea, Raivavae and Tikehau. Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). 383 p.

KULBICKI M. 2007 Biogeography of reef fishes of the French territories in the South Pacific. Cybium 31(2):275-288

KULBICKI M., GALZIN R., HARMELIN-VIVIEN M.L., MOU THAM G. & S. ANDRÉFOUËT, 2000 Les communautés de poissons lagonaires dans les atolls des Tuamotu, principaux résultats du programme T Y PATO L L (1995-1996). Nouméa, IRD, Doc. Sci. Tech., II3: 26-125.

KULBICKI M., GALZIN R., LISON DE LOMA T., MADI MOUSSA K., VIGLIOLA L. 2009 Caractéristiques des peuplements de poissons de récif des îles hautes de Polynésie française : une revue des données disponibles. Rapport de Convention EPHE-AAMP. Perpignan (France) R.A. 161 : 107pp.

RANDALL J.E. & EARLE J.L., 2000 Annoted checklist of the shore fishes of the Marquesas islands. Occas. Pap. Bishop Mus. 66: 1-39

RANDALL J.E. 1985 Fishes of French Polynesia. Proc. 5th Intern. Coral Reef Congr. 1: 462- 481

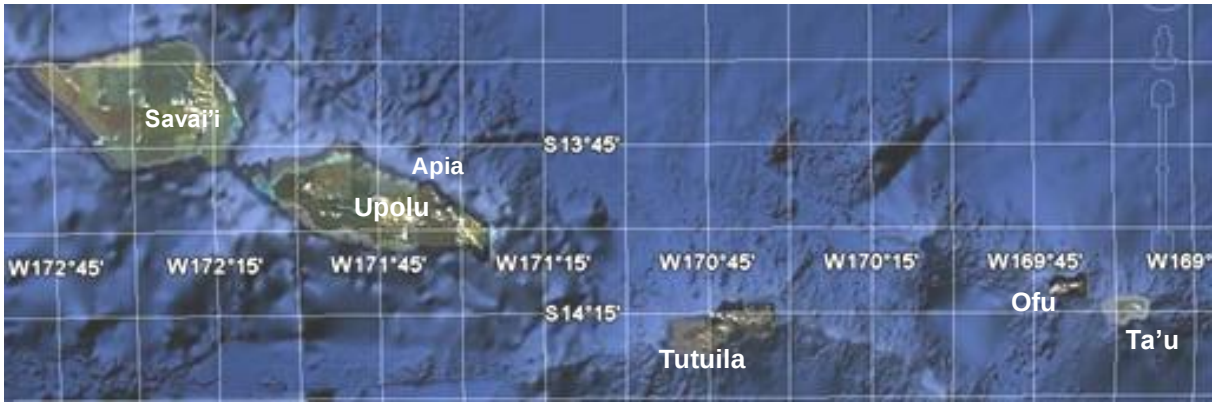
RANDALL J.E., 2005 Reef and Shore Fishes of the South Pacific: Nex Caledonia to Tahiti and the Pitcairn islands. 720 p. Honolulu: Univ. of Hawai'i Press.

RANDALL J.E., BACCHET P., WINTERBOTTOM R., WROBEL L., 2002 Fifty new records of shore fishes from the Society islands and Tuamotu archipelago. Aqua 5(4): 153-156

RANDALL J.E., SMITH C.L. & M.N. FEINBERG, 1990 Report on fish collections from Rapa, French Polynesia. Am. Mus. Novit., 2966: 42 p.

SAMOA

The Samoa archipelago is politically divided into Samoa (called here after "Western Samoa") and the American Samoa. Most of the Samoa archipelago lies between 13°S and 15°S with the exception of Swains reefs (11°S). This archipelago is at 8000-8500 km from the Coral Triangle and is located on the western limit of the Pacific tectonic plate (Figure 1). Most of the land mass is concentrated in Western Samoa with two major islands, Upolu and Savai'i (2940 km²), whereas in the American Samoa most of the land (199 km²) is found on five volcanic islands (Tutuila, Aunu'u, Ofu, Olosega, and Ta'u) . The Samoa archipelago has also one atoll (Rose atoll) and an isolated oceanic reef (Swains Atoll). Most reefs in the Samoa archipelago are fringing reefs, with 490 km² for the Western Samoa and 220 km² for the American Samoa. Rose atoll is a small (4 km²) nearly square shaped atoll with a lagoon and nearly no emerged land. Swains Atoll is in fact a flat coralline island (approx. 4 km²) surrounded by a narrow fringing reef (200m wide on average).



Map of Samoa: extracted and adapted from Google Earth (http : //earth.google.com/)

Previous reef fish inventories

Wass (1984) published a comprehensive list of shore fishes for the entire Samoa archipelago. This work was a compilation of previous collections since the mid nineteenth century. This list had 991 species of which a little less than 900 were reef associated. Most of the work on the reef fish fauna of the Samoa archipelago has since been conducted in the American Samoa. However there is information specific to the Western Samoa in particular the list of fishes by Zann (1989), the work by Samoilys and Carlos (1991) and the SPC program PROCFISH in 2005 (Vunisea et al. 2008). One may also cite the work by Thollot (1993) on mangrove fish of which some species are found on nearby reefs. Since the work by Wass (1984) most of the information collected in the American Samoa has been reef fish surveys (see review by Fenner et al. 2008), in particular only a few species have been added to the list provided by Wass (Brown and Allen, 2008).

Major characteristics of the reef fish fauna

At present 962 taxa (+ 21 "likely") of reef fish are reported from Samoa. This is nearly similar to Tonga (1031) and intermediate between Fiji (1337) and Cook Islands (603) or Tuvalu (615). Fiji is located further west, closer to the "Coral Triangle" and is characterized by much larger land masses and it lies on the Australian tectonic plate, whereas Cook islands are on the same tectonic plate (Pacific plate), are characterized by low land masses and are further from the Coral Triangle. Tuvalu is more isolated than the Samoa, it has only atolls and is on the same side of the Pacific tectonic plate. Tonga is nearly at the same distance of the Coral Triangle and has similar land masses. The reef fish fauna of the Samoa is close to the ones of Tonga, Tuvalu, Marshall and Marianas (Figure 6) which are all at the eastern limit of the "Micronesia" biogeographical province (Figure 7).

The reef fish fauna of Samoa is characterized by a higher than average proportion of families with small sedentary species, Gobiidae, Blenniidae and Tripterygiidae as well as eel like fishes, Muraenidae and Ophichthidae (Table CR2). On the opposite there is a deficit in small schooling species such as Pomacentridae and Apogonidae as well as in Acanthuridae, Chaetodontidae and Labridae (Table CR-2). This translates in an above average representation of small species (< 10 cm) and species feeding on small invertebrates and a below average representation of herbivores. There is very low endemism in Samoa and species with restricted range (< 10 sites) (Table CR-2; Figure 13). This is similar to what is observed over most of the Micronesia biogeographical province where endemism is low. Species with a medium geographical range (40-80 sites) are more diverse than on average in the South Pacific (Table CR-2; Figure 13).

Some references

BROWN D.P. & ALLEN G.R. 2008 GIS derived spatial analysis as a tool to predict nearshore coral reef fish species presence in American Samoa. Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, 7-11 July 2008: 598-601

FENNER D., M. SPEICHER, S. GULICK, et al. 2008 The State of Coral Reef Ecosystems of American Samoa. pp. 307-351. In: The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. J.E. Waddell and A.M. Clarke (eds.) NOAA Technical Memorandum NOS NCCOS 73. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 569 pp. http://www.sprep.org/att/IRC/eCOPIES/Countries/American_Samoa/16.pdf

GREEN A. 1996 Status of the coral reefs of the Samoan Archipelago. Department of Marine and Wildlife Resources (American Samoa). Biological Report Series. 125 pp.

GREEN A. 2002 Status of coral reefs on the main volcanic islands of American Samoa: a resurvey of long-term monitoring sites. No. 96799. Report to Department of Marine and Wildlife Resources, Pago Pago, American Samoa. 135 pp.

GREEN A., C. BIRKELAND, R. RANDALL 1999 Twenty years of disturbance and change in Fagatele Bay National Marine Sanctuary, American Samoa. Pacific Science 53: 376-400.

SABATER M.G., S. TOFAEONO 2006 Spatial variation in biomass, abundance, and species composition of "key reef species" in American Samoa. Department of Marine and Wildlife Resources, Government of American Samoa. Pago Pago, American Samoa. 62 pp.

SABATER, M.G., S. TOFAEONO 2007 Effects of scale and benthic composition on biomass and trophic group distribution of reef fishes in American Samoa. Pac. Sci. 61(4): 503-520.

SAMOILYS M., CARLOS, G. 1991 A Survey of reef fish stocks in Western Samoa: Application of underwater visual census methods- Report- Available in ReefBase

THOLLOT P. 1993 Western Samoa mangrove fish survey. Sciences de la mer. Biologie Marine 23. ORSTOM, Noumea, New Caledonia. 28 pp.

VUNISEA A., FRIEDMAN K.J., AWIRA R., KRONEN M., PINCA S., CHAPMAN L.B., MAGRON F., SAUNI S., PAKOA K., LASI F. 2008 Samoa country report : profiles and results from survey work at Manono-Uta, Salelavalu, Vailoa and Vaisala (june 2005 and August/September 2005). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). 383 p.

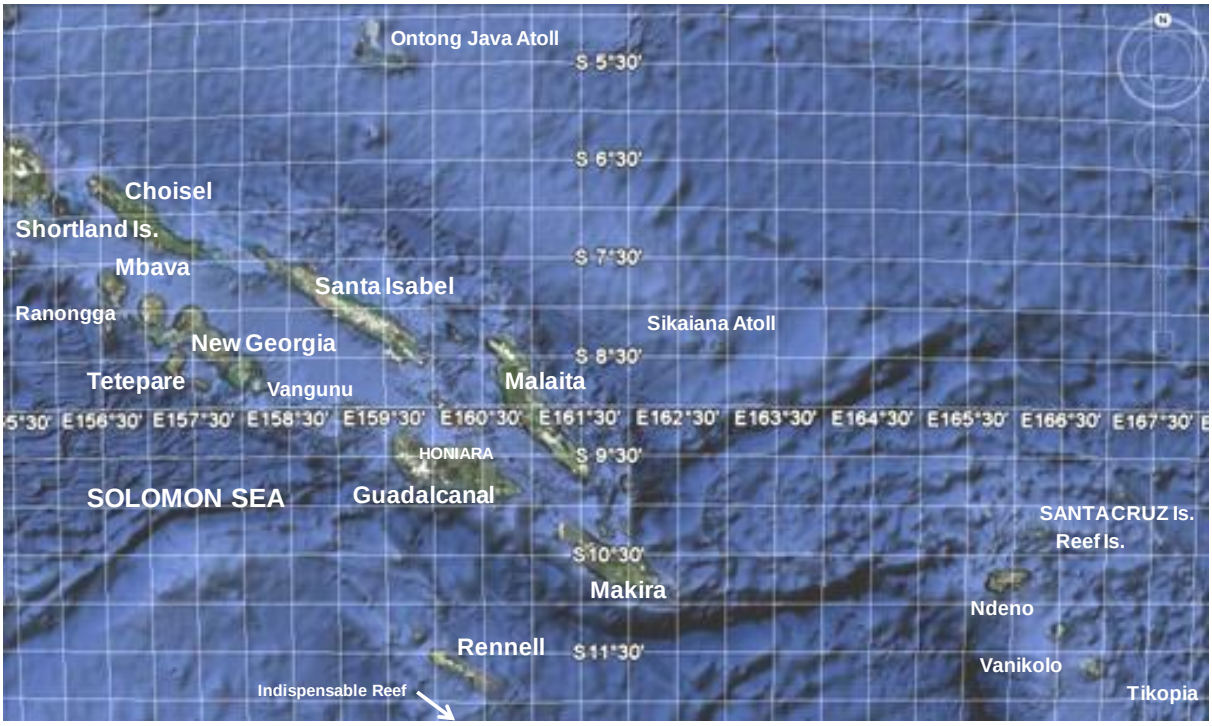
WASS RC 1984 An annotated checklist of the fishes of Samoa. NOAA technical report NMFS SSRF-781, US Dept of Commerce, National Oceanic and Atmospheric Administration, Silver Spring, MD, p43

WHAYLEN L. & D. FENNER 2006 Report of 2005 American Samoa coral reef monitoring program (ASCRMP), expanded edition. Department of Marine and Wildlife Resources Report and Coral Reef Advisory Group, American Samoa. 64 pp.

ZANN L. 1989 A preliminary check list of the major marine species of fishes and other marine organisms in WS (Samoan/Scientific/English). Working copy. FAO and UNDP SAM/89/002 Field Rpt 1. 14 pp. Available at : http://www.botany.hawaii.edu/basch/uhnpscesu/pdfs/sam/Zann1989WS.pdf

SOLOMON ISLANDS

The Solomon islands consist of several island groups. The largest islands are found in the north western part and are organized into two lines. A first line starts from Bougainville (which is politically part of PNG) and groups the Shortland, Treasury, Mbava, Kolonbangara, New Georgia, Russell, Guadalcanal and Makira. A second line a little further north groups Choiseul, Santa Isabel, Florida and Malaita. These northern islands make over 80% of the land area. In the south-east part, north of Vanuatu, the Santa Cruz group is made small islands (the largest, Ndeno, is approx. 500 km²) and a few atoll like reefs. The other major islands are Rennell and Indispensable reefs in the south and Ontong Java atoll and Roncador islands. There are numerous smaller islands, the total number being near 900. The total land area is 28 400 km² and reef area is estimated at 5700 km². There is a wide range of reef types, but fringing reefs are the most widespread. There are several atolls and atoll like structures, the largest being Ontong Java atoll (approx. 900 km²).Barrier reefs exist but are not widespread, short sequences being found around Choiseul, Santa Isabel and New Georgia. Coral diversity is not well known (101/398 species)[6] but should be high.



Map of the Solomon Islands: extracted and adapted from Google Earth (http : //earth.google.com/)

Previous reef fish inventories

There has been considerable reef fish collecting in the Solomon islands since the mid nineteenth century. Work before the 1960's is described by Munro (1967) and a short account can also be found in Allen (2006) and in Reefbase (at http://www.reefbase.org/global_database/dbr5,22,SLB,33.aspx). More recently one may cite the collections in 1975 by G.Allen, J.Randall and W.Stark with the RV El

[6] Coral diversity : the first number is an estimation from UNEP-WCMC data base ; second number estimated from Veron (2000) data base. These numbers are extracted from the "World Atlas of Coral Reefs " by Spalding et al. 2001.

Torito. R.Winterbottom (Royal Ontario Museum) collected fish in the Solomon islands in 1985 and 1996, resulting in approximately 250 species. S. Blaber et al. (1991) worked on the bait fish used by the pole and line tuna fishery. They listed 770 species with numerous reef associated species. In 1998 important collections were made by the Smithsonian, Australian Museum, Field Museum of Natural History, Milwaukee Public Museum and Solomon Fisheries which sampled the Santa Cruz group. Over 720 species were recorded during this expedition. In 2004 an expedition by The Nature Conservancy sampled 786 reef fish species over 65 sites. Based on this work and previous available material G.Allen provided a first comprehensive list of reef fish species for the Solomon islands (Allen, 2006) with 1019 species. In 2006 the PROCFISH program of SPC (Pinca et al. 2009) conducted a number of visual censuses of commercially and ecologically important species. They recorded 289 taxa of which a few were confirmations of previously uncertain records.

Johnson Seeto of the University of the South Pacific (Suva- Fiji) has been working for many years on a comprehensive checklist of the fishes from the Solomon Islands (including Bougainville Island) and preliminary drafts list over 2000 species of marine and freshwater species.

Major characteristics of the reef fish fauna

A total of 1595 taxa of reef fish are recorded from the Solomon islands (Tables CR1 and CR3). This diversity is less than PNG (1929 taxa) and similar to New Caledonia (1569) but a little higher than the nearby Vanuatu (1237 taxa + 120 “likely”) or Fiji (1337 taxa + 73 “likely”). All these reef fish fauna belong to the SW Pacific bio-geographical province (Figures 6-7), the Solomon islands being closest to PNG, whereas New Caledonia, Vanuatu and Fiji form a distinct sub-group. All these reef fish faunas are found on archipelagoes with large to very large islands and are close to the Coral Triangle (PNG is even part of the Coral Triangle according to Green and Mous, 2008).

The reef fish fauna of the Solomon islands is characterized by an above average proportion (Table CR2) of seven major families (Apogonidae, Blenniidae, Gobiidae, Pomacentridae, Pseudochromidae, Sygnathidae and Nemipteridae). All these families have small species except for the Nemipteridae which are average size fish. This pattern is also observed in most reef fish faunas of the SW Pacific. On the contrary, the Solomon islands reef fish fauna has a deficit in a several major families of medium to large size species, in particular Acanthuridae, Scaridae, Balistidae, Mullidae, Holocentridae, Chaetodontidae and Muraenidae. Consequently this reef fish fauna has an above average proportion of small species (< 10cm) and of small invertebrate and plankton feeders (Table CR2; Figure 13). Endemism is average but this reef fish fauna is characterized by low to medium geographical ranges (5 to 50 sites).

Some references

ALLEN G.R. 2006 Coral Reef Fish Diversity. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

BLABER S. J. M. , MILTON D. A., RAWLINSON N. J. F. 1991 A checklist of Fishes recorded by the Baitfish research project in Solomon Islands from 1986 to 1990. CSIRO Marine Laboratories report 212. CSIRO Australia. 21 pp.

HALSTEAD B. 2000 Coral Sea Reef Guide. Sea Challengers, Danville, California. 321 pp.

MOLEA T. 1996 A checklist of fish names in the Lau language of Lau lagoon, North Malaita, Solomon Islands. Honiara: USP Institute of Marine Resources. IMR 96/1. 15 p.

MUNRO I. S. R. 1967 The Fishes of New Guinea. Department of Agriculture, Stock & Fisheries. Port Moresby, New Guinea. 651 pp. + 78 pls.

PINCA S., VUNISEA A., LASI F., FRIEDMAN K.J., KRONEN M., AWIRA R., BOBLIN P., TARDY E., CHAPMAN L.B., MAGRON F. 2009. Solomon Islands country report : profiles and results from survey work at Nggela, Marau, Rarumana and Chubikopi (June to September 2006 and December 2006). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). 409 p.

RANDALL J. E. 1982 The Coral Reef Fishes of the Solomon Islands. National Geographic Society Research Reports. Vol. 14. pp. 553 -540.

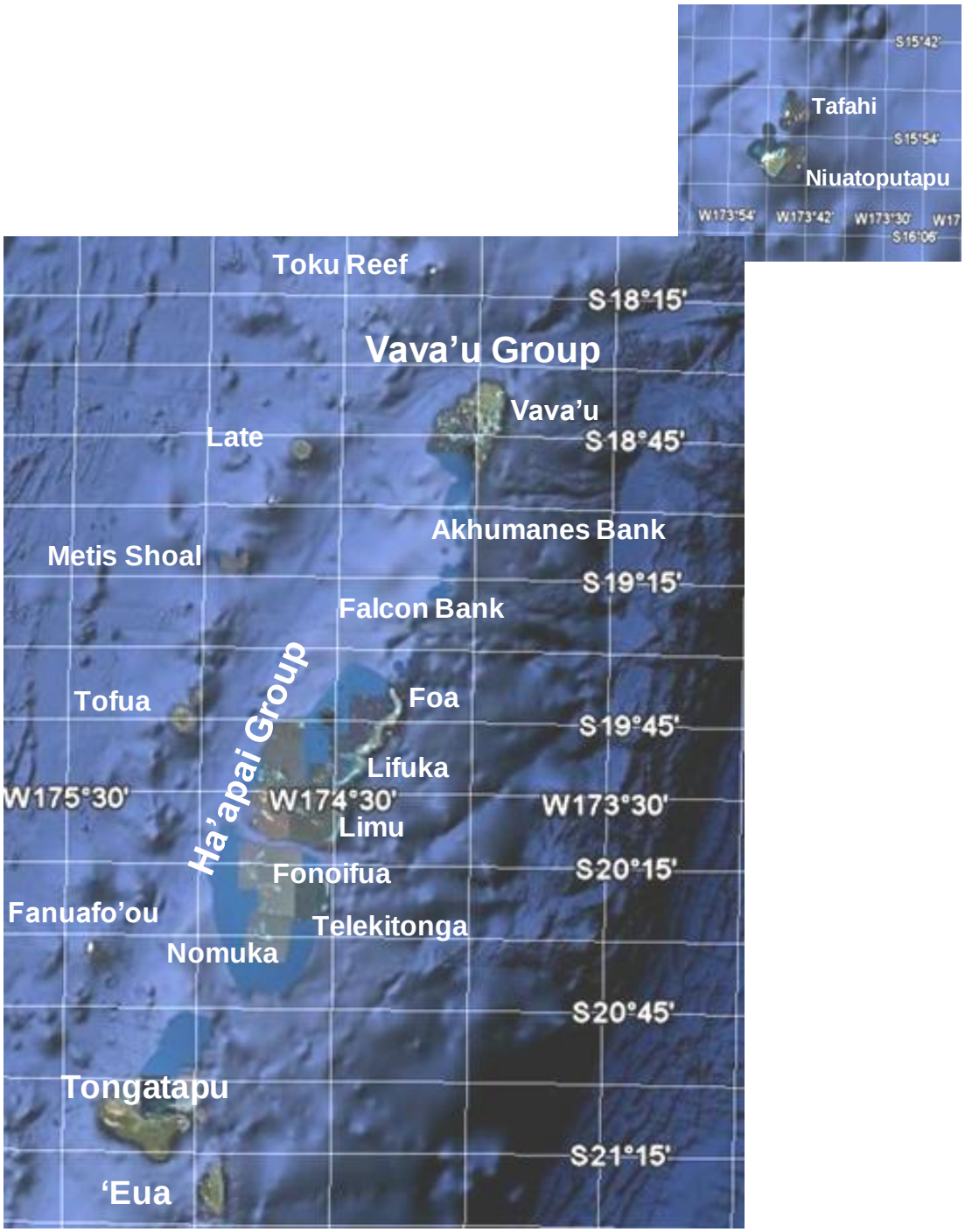
TONGA

Tonga is located east of Fiji between 15°S and 21°S, stretching over 800 km. It is at 7900 km from the Coral Triangle. There are four major groups of islands. In the South, Tongatapu and Eua are the two largest islands and make the Tongatapu group. 100 km north starts the Ha'apai group which comprises 24 islands and numerous islets and reefs. Both the H'apai and Tongatapu groups are low islands. In continuation north of Ha'apai the Vava'u group has mainly one large high island (Vava'u) and a number of islets and reefs. The Tongatapu, Ha'apai and Vava'u groups are on the same submarine ridge. A second line of much smaller islands and reefs (Tofua, Metis schoal, Late, Toku reef) is found to the west. These islands lie along a submerged chain. The last group of Niuatoputapu is 290 km north of Vava'u and is composed of two low islands and several atoll like reefs. In the extreme south (22°50S and 23°40S) lie Pelorus and Minerva reefs. Total land area is 697 km² for a total of 1500 km² of coral reefs. The latter are characterized by a relatively large diversity of reef types. In the Tongatapu group there are both extensive oceanic fringing reefs and sheltered reefs in the lagoon of Tongatapu. Reefs are the most developed and diversified In the Ha'apai group with reefs in the western part sheltered by a kind of barrier reef to the east. The Vava'u group is characterized by steep drop-offs and some very sheltered bays. The Niuatoputapu group has mainly fringing reefs around the two main islands with a small lagoon north of Niuatoputapu island and atoll like reefs further north. The coral diversity is intermediate between Fiji and Polynesia with over na/218[7] species of hard corals recorded.

Previous reef fish inventories.

Tonga has received moderate attention with a number of small collections of reef fishes starting in the early 1800's. All these records were pooled in a single publication (Randall et al. 2003). The major collections were made by Baldwin et al. in 1993 (789 taxa), by Randall in 1983 (310 species) and by the Procfish program (2001-2002) which recorded 466 taxa. Some information is also available from the aquarium reef fish trade. To our knowledge the southern most reefs (Pelorus and Minerva) as well as the northern most reefs (Niuatoputapu group) have not been sampled for reef fishes.

[7] Coral diversity : the first number is an estimation from UNEP-WCMC data base ; second number estimated from Veron (2000) data base. These numbers are extracted from the "World Atlas of Coral Reefs " by Spalding et al. 2001.



Map of Tonga: extracted and adapted from Google Earth (http : //earth.google.com/)

Major characteristics of the reef fish fauna

At present 1031 (+ 33 "likely") taxa of reef fish are reported from Tonga (Tables CR1, CR3). This is a sharp drop from nearby Fiji (1337) but is higher than Samoa to the North (940) or Cook islands (603) to the east. The decline from Fiji is easy to explain by the smaller land and reef area, the increase in latitude and the isolation of this archipelago (330 km east of Fiji and 550 km south of Samoa). The drop in diversity between Tonga and the Cook islands is mainly explained by the distance (Cook islands are 1500 km to the east with only Niue as a stepping stone 400 km east of Tonga) and also by the fact that the Cook islands are on the other side of the tectonic plate margin.

The major difference in structure with the average in the South Pacific comes from 3 families of small benthic fishes: Gobiidae, Trypterygiidae and Blenniidae (Table CR2). Consequently Tonga has a larger proportion of small species and species feeding on small invertebrates than the average for the South Pacific (Table CR2; Figure 13). On the opposite the reef fish fauna of Tonga has a low proportion of large carnivores or piscivores (Table CR2; Figure 13). Endemism is slightly above average (Table CR2; figure 13) with species found in 1-20 sites in higher proportion than average (Table CR2; figure 13). On the opposite the proportion of species with a wide geographical range (> 80 sites) is lower than average (Table CR2; figure 13).

Some references

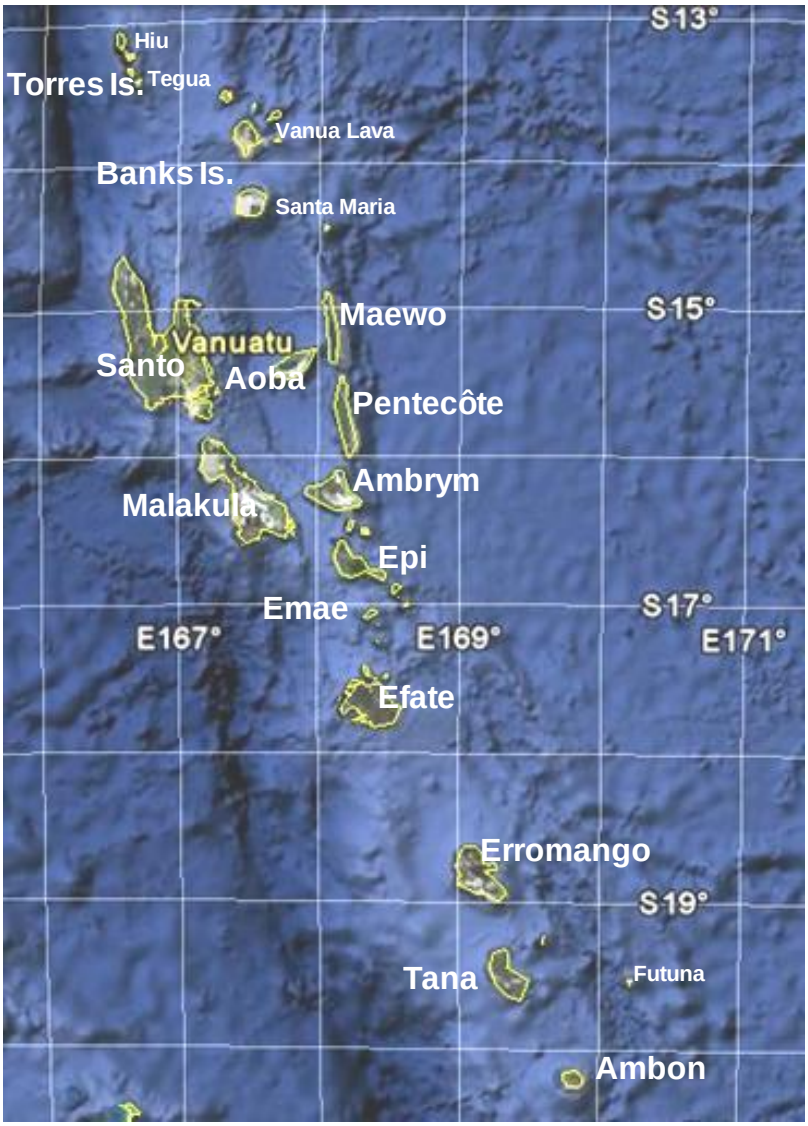
FRIEDMAN K.J., PINCA S., BOBLIN P., MAGRON F., VUNISEA A., LABROSSE P., CHAPMAN L.B., KRONEN M. 2009 Tonga country report: profiles and results from survey work at Ha'atafu, Manuka, Koulo and Lofanga (November and December 2001; March to June 2002; April to June, September and October 2008). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). xxxii, 369 p.

KULBICKI M. 2004 Ecology in Kronen (ed.) DemEcoFish-MacArthur Foundation Grant Number 00-65436 -SPC Technical Report 44-115 +AnnexI-IX (79 p.)

RANDALL J, SMITH D., WILLIAMS D., KULBICKI M., CLUA E., LABROSSE P., KRONEN M., MOU THAM G. 2003 Checklist of shore fishes from Tonga. Atoll Research Bulletin. 502 : 1-35

VANUATU

Vanuatu stretches over 1300 km from the Torres islands (13°S) down to Anatom (20°S). There are over 80 islands of which 65 are inhabited. Total land mass is 12 220 km². Most islands are of volcanic origin, with only a limited number of islands with uplifted carbonate structures (Torres is.). Coral reefs in Vanuatu are mainly fringing reefs with the exception of Reef island in the north. These fringing reefs are mainly well developed on the eastern side of islands, except south of Epi where fringing reefs are found all around each island. The total surface of coral reefs is not well known but David and Cillauren (1989) indicate 448 km² of reefs in less than 10m and 3630 km² between 10 and 100m.



Map of Vanuatu: extracted and adapted from Google Earth (http : //earth.google.com/)

Previous reef fish inventories

At present there is no published general checklist of reef or shore fish species for Vanuatu. R.Fricke (Stuttgart museum- Germany), J.Earle and R.Pyle (Bishop Museum, Hawaii) and B.Séret (IRD) just published (2011) a preliminary list of species for Santo (of which 730 are reef associated species).

This is mainly based on material from the expedition organized in 2006 by the Museum National d'Histoire Naturelle (MNHN) in Paris.There has however been several expeditions which have provided reef fish species. In recent time the first major work was the book by Fourmanoir and Laboute (1976) which illustrated a number of species from Vanuatu (then called "New Hebrides"). The Australian Institute of Marine Science (AIMS) conducted surveys in 1983 during which over 425 species were recorded (Williams, 1984). In 1996 and 1997 two joint expeditions by the Australian Museum, the Smithsonian Institute (Washington DC, USA) and the Field Museum of Natural History (Chicago, USA) collected reef fishes in the south (1996) and north (1997) of Vanuatu. At the same time underwater visual surveys were performed on commercial species (Polunin, 1997). The number of species collected during these expeditions is not yet known, but the lists of the specimen kept at the Smithsonian Institute and the Australian Museum are available on internet. Other collections also exist in museums across the world such as for instance in the Milwaukee Public Museum. There has been also a number of isolated recordings (e.g. G.Allen for Pomacentridae; underwater visual records by M.Francis from NIWA – New Zealand; Tettlebach et al. 2003). There is also some reef fish collecting for the aquarium trade from which it is possible to get information on the presence of some reef fish species. At last the Procfish program by SPC (South Pacific commission) recorded 252 taxa of reef fish in 2003 (Friedman et al. 2008).

Major characteristics of the reef fish fauna

At present 1237 taxa of reef fish are available for Vanuatu from Table CR3 and another 120 taxa are listed as "Likely" based on the known geographical distribution of reef fish species in the nearby countries (species recorded at present from New Caledonia, Solomon Islands and Fiji). This list should be considered with much caution as this is merely a compilation of records from various origins without any formal check on the validity of these records. However, based on this information it is possible to retrieve some basic characteristic of the Vanuatu reef fish fauna. The diversity (around 1350 taxa) is of the same order of magnitude than Fiji (1340 + 74 "Likely") but lower than New Caledonia (1540) and the Solomon Islands (1595). It is at present difficult to say if these differences are real or due to a low level of sampling.

The reef fish fauna of Vanuatu is characterized by a proportion larger than average for 5 diverse families: Blennidae, Gobiidae, Pomacentridae, Tripterygiidae and Lutjanidae (Table CR2). The first four of these families are small to very small species, mostly sedentary, living single and feeding on small invertebrates (except Blenniidae which have a high proportion of herbivorous species). The proportion of large species is lower than the average for the South Pacific with in particular low proportions of Acanthuridae, Scaridae, Mullidae, Holocentridae and Chaetodontidae. The level of endemism is lower than average and similarly the number of species with wide geographical ranges is below average (Table CR-2; figure 13).

Some references

ALLEN G.R. 1991 Damselfishes of the World. Aquarium Systems Ed. 271 pp.

FOURMANOIR, P. & LABOUTE, P. 1976 Poissons des mers tropicales. Nouvelle Calédonie. Nouvelles Hébrides, 376 pp.; Papeete (Éditions du Pacifique).

FRICKE R., EARLE J.L., PYLE R., SERET B. 2011 Checklist of fishes in "The natural history of Santo" Bouchet P., Le Guyader H., Pascal O. (Eds), MNHN Paris, IRD Marseille, Pro-Natura International. Paris: 383-409

FRIEDMAN K.J., PAKOA K., KRONEN M., CHAPMAN L.B., SAUNI S., VIGLIOLA L., BOBLIN P., MAGRON F. 2008 Vanuatu country report : profiles and results from survey work at Paunangisu village, Moso Island, Uri and Uripiv Islands and the Maskelyne archipelago (July to December 2003). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community. 391 p.

POLUNIN N. 1997 Technical report on the UVC component of the project [The performance of customary marine tenure in the management of community fishery resources in Melanesia], based on field work in Fiji and Vanuatu in 1996, and analysis in Newcastle. Report by NVC Polunin to MRAG Ltd, London, 20pp.

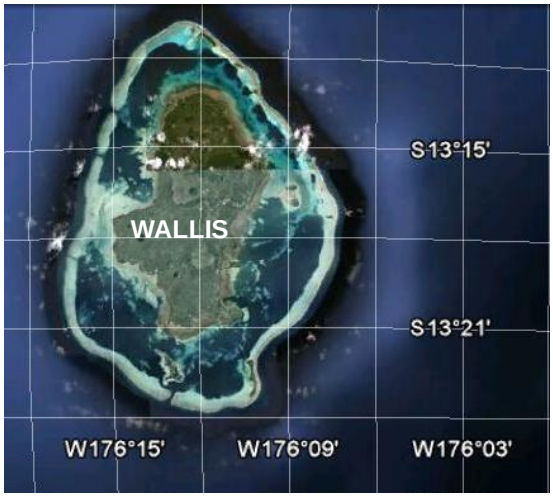
RANDALL J.E. 2005 Reef and Shore Fishes of the South Pacific : New Caledonia to Tahiti and the Pitcairn Islands. ISBN 0-8248-2698-1, 720 pp.

TETTELBACH S., J. CARROLL, H. REISMAN 2003 Fishes of Vanuatu. *Report of the Tropical Marine Biology group, Southampton College of Long Island University, Southampton, New York.*

WILLIAMS D. McB. 1990. Shallow-water reef fishes. In T.J. Done and K. F Navin (eds.). Vanuatu Marine Resources: Report of a biological survey. A project of the Australian International Development Assistance Bureau. Australian Institute of Marine Science, Townsville, Australia. pp. 66-76

WALLIS ET FUTUNA

Les Territoires de Wallis et Futuna comprennent trois îles, Wallis (ou Uvéa), Futuna et Alofi. La surface des terres émergées est de 145 km². Les récifs occupent 140 km² à Wallis et moins de 20 km² sur Futuna et Alofi. A Wallis un récif barrière ceinture un lagon profond dans sa partie sud avec de nombreux pinacles et qutre passes toutes à l'ouest ou au sud. A Futuna il n'y a que du récif frangeant ainsi que sur Alofi avec cependant une zone récifale un peu plus développée au nord d'Alofi. La diversité des coraux est assez élevée (na/363[8] espèces). Ces îles sont relativement isolées (Wallis est à 500 km au NE de Vanua Levu à Fidji et à 360 à l'ouest de Savai'i aux Samoa). Elles sont distantes de 7600 km du « Coral Triangle ». Elles se situent toutes deux à l'est de la limite entre les plaques tectoniques australienne et Pacifique.



Carte de Wallis et Futuna : extrait et adapté de Google Earth (http : //earth.google.com/)

Inventaires faunistiques précédents

Wallis et Futuna n'ont été étudiés que très récemment. Un premier inventaire des poissons récifaux de Wallis, Futuna et Alofi avait été réalisé par l'EPHE en 1982 et avait révélé 330 espèces, sans en préciser cependant la localisation. Un inventaire beaucoup plus complet a été réalisé en 1999-2000, complétée par l'échantillonnage de juvéniles en 2002-2003, aboutissant à une liste pour Wallis de 648 taxons, dont 44 non identifiés à l'espèce. Aucun inventaire faunistique n'a été effectué à Futuna et Alofi. Il faut cependant noter les travaux de Wantiez (2000) au cours desquels 152 espèces y ont été dénombrées par comptages visuels. Depuis ces travaux quelques taxons indéterminés lors des études de 1999-2003 ont été identifiés.

Principales caractéristiques de la faune des poissons de récif

[8] Diversité corallienne : le premier nombre est une estimation de la base de données de l'UNEP-WCMC ; le second nombre est estimé d'après la base de données de Veron (2000). Ces informations sont extraites de "World Atlas of Coral Reefs " par Spalding et al. 2001.

A l'heure actuelle 624 espèces sont identifiées à l'espèce pour ce groupe d'îles. Ce nombre est inférieur à ce qui est observé aux Samoa (940) ou Fidji (1337) qui sont non loin (340 et 530 km respectivement) mais ont des surfaces terrestres importantes comparées à Wallis et Futuna. A l'opposé ce nombre est équivalent à ce qui est observé plus au nord aux Tuvalu (604) un archipel composé de petites îles 600 km plus au nord ou Rotuma (414) une petite île isolée 700 km plus à l'ouest. La faune des poissons. de récif de Wallis et Futuna se caractérise par une diversité plus forte que la moyenne pour les Gobiidae, Apogonidae, Chaetodontidae, Muraenidae, Ophichtidae, Pomacentridae, Scaridae (Tableau CR2). Pour les deux premières de ces familles cette tendance est commune à la plupart des pays à l'ouest de la limite de la plaque tectonique Indo-Pacifique (Figures 1 et 13). A l'opposé la tendance observée pour les Chaetodontidae, Muraenidae et Ophichtidae se retrouve en Micronésie et Polynésie. Ceci suggère que la faune de Wallis est intermédiaire entre les faunes de petites îles et celles de régions plus continentales (Figure 6). Il faut noter aussi que plusieurs familles d'espèces commerciales sont sous-représentées, en particulier les Carangidae, Lethrinidae et Serranidae. La faune de Wallis et Futuna se caractérise en conséquence par une proportion plus importante que la normale de petites espèces, solitaires et mangeant de petits invertébrés (Tableau CR2 ; figure 13) et à l'opposé par un déficit d'espèces carnivores ou piscivores de grande taille (Tableau CR2 ; figure 13). L'endémisme y est très faible, ce qui est commun avec la Micronésie et l'ouest de la Polynésie. A l'opposé les espèces à vaste distribution géographique y sont mieux représentées que la moyenne.

Principales références

JUNCKER M. 2005 Approvisionnement en larves de poissons du lagon de Wallis (Pacifique Sud). Thèse de doctorat- Université de Nouvelle-Calédonie 330 pp.

JUNCKER M. 2007 Jeunes poissons coralliens de Wallis et du Pacifique central – Guide d'identification Service Territorial de l'Environnement de Wallis et Futuna. 170.

KRONEN M., TARDY E., BOBLIN P., CHAPMAN L.B., LASI F., PAKOA K., VIGLIOLA L., FRIEDMAN K.J., MAGRON F., PINCA S. 2008 Wallis and Futuna country report : profiles and results from survey work at Vailala, Halalo, Leava and Vele (August-December 2005 and March 2006). Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C/CoFish). Noumea, New Caledonia: Secretariat of the Pacific Community (SPC). 333 p.

LERVEM 2001 Etude de la structure et du fonctionnement du lagon d'Uvea (Wallis et Futuna). Les poissons du complexe récifo-lagonaire. Service de l'Environnement de Wallis et Futuna, LERVEM-Université de la Nouvelle-Calédonie, Nouméa

RICHARD G., BAGNIS R., BENNETT J., DENIZOT M., GALZIN R., RICARD M. & B. SALVAT, 1982 Étude de l'environnement lagunaire et récifal des îles Wallis et Futuna (Polynésie occidentale). 101 p. France : Rapp. École Pratique des Hautes Études.

WANTIEZ L. 2002 Expertise biologique de Futuna et Alofi (Wallis et Futuna). Rapport final. Le substrat et les poissons coralliens. Université de la Nouvelle-Calédonie, Service de l'Environnement de Wallis et Futuna. 42 p.

WANTIEZ L. & C. CHAUVET 2005 First data on community structure and trophic networks of Uvea coral reef fish assemblages (Wallis and Futuna, South Pacific Ocean). *Cybium* 27 : 83-100.

WILLIAMS J.T., L. WANTIEZ, C. CHAUVET, R. GALZIN, M. HARMELIN-VIVIEN, E. JOBET, M. JUNCKER, G. MOU THAM, S. PLANES, P. SASAL 2006 Checklist of the shorefishes of Wallis Island (Wallis and Futuna French Territories, South-Central Pacific). Cybium 30. 247-260

SOME USEFUL REFERENCES

ALLEN G. R. & EMERY A. R. 1985 A Review of the Pomacentrid Fishes of the Genus Stegastes from the Indo-Pacific, with Descriptions of Two New Species. 31 pp., 24 col. figs.

ALLEN G. R. & RANDALL, J. E. 1977 Review of the sharpnose pufferfishes (subfamily Canthigasterinae) of the Indo-Pacific. – Records of the Australian Museum 30: 475–517.

ALLEN G. R. & TALBOT F. H.. 1985 Review of the Snappers of the Genus Lutjanus (Pisces: Lutjanidae) from the Indo-Pacific, with the Description of a New Species. 87 pp., 80 col. figs

ALLEN G. R. 1972 The Anemonefishes, their classification and biology, 288 pp.; Neptune City (T. F. H. Publications) [Revised 2nd edition 1975, 352 pp.].

ALLEN G. R. 1975 Damselfishes of the South Seas; 240 pp.; Neptune City (T. F. H. Publications).

ALLEN G. R. 1991 Damselfishes of the World, 271 pp.; Melle (Mergus).

ALLEN G. R. 2001 Reef and Shore Fishes of the Calamianes Islands, Palawan Province, Philippines. In: Werner, T.B., G.R. Allen , and S. McKenna (eds.). A Rapid Marine Biodiversity Assessment of the Calamianes Islands, Palawan Province, Philippines. Bulletin of the Rapid Assessment Program 17, Conservation International, Washington, DC.

ALLEN G., R. STEENE, P. HUMANN, & N. DELOACH. 2003. Reef Fish Identification Tropical Pacific. Jacksonville: New World Publications. 480 p.

ALLEN G.R. & ADRIM M. 2003 Coral Reef fishes of Indonesia Zoological Studies 42(1): 1-72

ALLEN G.R. & D.R. ROBERTSON. 1994. Fishes of the Tropical Eastern Pacifi c. University of Hawai‘i Press, Honolulu. xix + 332 pp.

ALLEN G.R. 1985. Snappers of the world. FAO Species Cat., vol. 6: vi + 208 pp.

ALLEN G.R. 1997. Marine Fishes of Tropical Australia and South-east Asia. Western Australian Museum. Pp. 220.

ALLEN G.R., 1997. Marine fishes of the Great Barrier Reef and South-East Asia. Periplus Editions. Western Australian Museum. 292 p.

ALLEN G.R., HOESE, D.F., PAXTON, J.R., RANDALL, J.E., RUSSELL, B.C., STARCK, W.A., II, TALBOT, F.H. & WHITLEY, G.P. 1976. Annotated checklist of the fishes of Lord Howe Island. Records of the Australian Museum Supplement 30(15): 365–454

ALLEN GR. 2001. Reef fishes of the Togean and Banggai Islands, Sulawesi, Indonesia. In GR Allen, SA McKenna, eds. A Marine Rapid Assessment of the Togean and Banggai Islands, Sulawesi, Indonesia. RAP Bull. Biol. Assess. 20. Washington, DC: Conservation International.

ALLEN GR. 2002. Reef fishes of the Raja Ampat Islands, Papua Province, Indonesia. In GR Allen, SA McKenna, S. Suryadi, eds. A Marine Rapid Assessment of the Raja Ampat Islands, Papua Province, Indonesia. RAP Bull. Biol. Assess. 22. Washington, DC: Conservation International.

BATH H. 2004 Revision of the genus Rhabdoblennius Whitley (Pisces: Blenniidae: Salariinae), with descriptions of two new species. – Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie) 669: 26 pp.

BATH H. 2008 Review of the genus Parablennius Miranda-Ribeiro from Australia and New Caledonia (Pisces: Blenniidae: Salariinae). – Stuttgarter Beiträge zur Naturkunde A, Neue Serie 1: 77–94.

BELLWOOD D.R., HUGHES T.P. 2001 Regional-scale assembly rules and biodiversity in reef-building coral reefs. *Science* 292 :1532-1534

BÖHLKE E.B. & J.E. MCCOSKER. 2001. The moray eels of Australia and New Zealand, with descriptions of two new species (Anguilliformes: Muraenidae). Rec. Austral. Mus. 53: 71–102.

BÖHLKE E.B. & RANDALL J.E. 2000. A review of the moray eels (Angulliformes: Muraenidae) of the Hawaiian Islands, with descriptions of two new species. Proceedings of the Academy of Natural Sciences of Philadelphia 150: 203–278, pls. I–IX.

BÖHLKE EB & JE MCCOSKER. 1997. Review of the moray eel genus Scuticaria and included species (Pisces: Anguilliformes: Muraenidae: Uroterygiinae). Proc. Acad. Nat. Sci. Phila. 148: 171-176.

BÖHLKE EB. 2000. Notes on the identity of small, brown, unpatterned Indo-Pacific moray eels, with descriptions of three new species (Anguilliformes: Muraenidae). Pacif. Sci. 54: 395-416.

BRUCE R.W. & RANDALL J.E. 1985. Revision of the Indo-Pacific parrotfish genera Calotomus and Leptoscarus. Indo- Pacific Fishes 5: 1–32, pls. 1–3.

CARPENTER K. E. & NIEM V. H. (eds.) 1999 FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 4. Bony fishes part 2 (Mugilidae to Carangidae), pp. 2602–2610; Rome (FAO).

CARPENTER K. E. & NIEM V. H. (eds.) 1999 FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 5. Bony fishes part 3 (Menidae to Pomacentridae), pp. 2840–2918, pls. 5–10; Rome (FAO).

CARPENTER K. E. & NIEM V. H. (eds.) 1999 FAO Species Identification Guide for Fishery Purposes. The living marine resources of the Western Central Pacific. Vol. 6. Bony fishes part 4 (Labridae to Latimeriidae), estuarine crocodiles, sea turtles, sea snakes and marine mammals, pp. 3468–3492, pls. 6–13; Rome (FAO).

CARPENTER K. E. & NIEM V. H. (eds.) 1999 FAO species identification guide for fishery purposes. The living marine resources of the western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae), pp. 1462–1466; Rome (FAO).

CARPENTER K. E. & V. G. SPRINGER 2005. The center of the center of marine shore fish biodiversity: the Philippine Islands. Environmental Biology of Fishes, 72: 467-480.

CARPENTER K. E. 1990. A phylogenetic analysis of the Caesionidae (Perciformes: Lutjanoidea). Copeia, 1990(3): 692-717.

CARPENTER K. E. 1987 Revision of the Indo-Pacific Fish Family Caesionidae (Lutjanoidea), with Descriptions of Five New Species. 56 pp., 38 col. figs.

CARPENTER K.E. & G.R. ALLEN 1989. FAO Species Catalogue. Vol. 9. Emperor fishes and large-eye breams of the world (family Lethrinidae). An annotated and illustrated catalogue of lethrinid species known to date.. FAO Species Synopsis. No. 125(9): Pp. 118.

CASTLE P.H.J. & RANDALL J.E. 1999. Revision of Indo-Pacific garden eels (Congridae: Heterocongrinae), with descriptions of five new species. Indo-Pacific Fishes 30: 1–52, pls. I–III.

COLLETTE B.B. 1977. Mangrove fishes of New Guinea. In: H.J. Teas (ed.) Tasks for vegetation science. W. Junk Publishers, The Hague: 91-102.

COMPAGNO L. J. V. 1984 a. FAO species catalogue. vol. 4. Sharks ofthe world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. FAO Fish. Synopsis., 125 (4): Pt. 1; 249 pp.

COMPAGNO L. J. V. 1984 b. FAO species catalogue. vol. 4. Sharks ofthe world. An annotated and illustrated catalogue of shark species known to date. Part 2. Carcharhiniformes. FAO Fish. Synopsis., 125 (4): Pt. 2: 251-655.

COMPAGNO L. J. V. 2001 Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Vol. 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes), VIII + 269 pp.; Rome [FAO Species Catalogue for Fishery Purposes 1 (2)].

CONNOLLY S. R., D. R. BELLWOOD, & T. P. HUGHES 2003. Indo-Pacific biodiversity of coral reefs: deviations from a mid-domain model. Ecology, 84(8): 2178-2190.

CRAIG M. T. & P. A. HASTINGS 2007. A molecular phylogeny of the groupers of the subfamily Epinephelinae (Serranidae) with a revised classification of the Epinephelini. Ichthyol. Res., 54: 1-17.

CRESSEY R.F. 1981. Revision of Indo–west Pacific lizardfishes of the genus Synodus (Pisces: Synodontidae). Smithson. Contr. Zool., no. 342: iii + 53 pp.

CVITANOVIC C., FOX R. J. & BELLWOOD D. R. 2007 Herbivory by fishes on the Great Barrier Reef: A review of knowledge and understanding. Unpublished Report to the Marine and Tropical Sciences Research Facility. Reef and Rainforest Research Centre Limited, Cairns (33 pp.).

DAWSON C. E. 1985 Indo-Pacific pipefishes (Red Sea to the Americas), 230 pp., 1 pl.; Ocean Springs, Mississippi (Gulf Coast Research Laboratory).

DISALVO L.H. & RANDALL J.E. 1993. The marine fauna of Rapanui, past and present. In: Easter Island Studies: Contributions to the History of Rapanui in Memory of William T. Mulloy. Oxbow Monogr. Arch. 32: 16–23.

DOOLEY J. K. 1978 Systematics and biology of the tilefishes (Perciformes: Branchiostegidae and Malacanthidae), with descriptions of two new species. – NOAA Technical Report NMFS Circular, U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service 411: V + 79 pp.

ESCHMEYER W. N. & FRICKE R. (eds.) 2010 Catalog of fishes, electronic version (15 January 2010). – Internet publication, San Francisco (California Academy of Sciences). http://research.calacademy.org/research/Ichthyology/Catalog/fishcatmain.asp.

FAUTIN D.G. & ALLEN G.R. 1997. Anemonefishes and their host sea anemones. Rev. ed. Western Australian Museum. 160 p.

FRANCIS M. 2001. Coastal fishes of New Zealand, an identification guide. Reed Publishing (NZ), Ltd. Birkenhead, Auckland, NZ. 103 pp.

FRANCIS M.P. & RANDALL J.E. 1993. Further additions to the fish faunas of Lord Howe and Norfolk Islands, southwest Pacific Ocean. Pacific Science 47(2): 118–135.

FRASER T. H. & E. A. LACHNER 1985. A revision of the cardinalfish subgenera Pristiapogon and Zoramia (genus Apogon) of the Indo-Pacific region (Teleostei: Apogonidae). Smithsonian Contributions to Zoology No. 412, 47 p.

FRASER T. H. 2008. Cardinalfishes of the genus Nectamia (Apogonidae, Perciformes) from the Indo- Pacific region with descriptions of four new species. Zootaxa 1691: 1-52.

FRICKE R. & KULBICKI M. 2007 Checklist of the shore fishes of New Caledonia (2nd edition). – In: PAYRI C. E. & RICHER DE FORGES B. (eds.): Compendium of marine species from New Caledonia. 2nd edition. – Documents scientifiques et techniques, Institut de Recherche pour le Développement Nouméa II 7 (2), pp. 357–401, pls. 15/1 and 15/2

FRICKE R. 1994 Tripterygiid fishes of Australia, New Zealand and the Southwest Pacific Ocean (Teleostei), IX + 585 pp.; Koenigstein (Koeltz Scientific Books).

FRICKE R. 1997 Tripterygiid fishes of the western and central Pacific, with descriptions of 15 new species, including an annotated checklist of world Tripterygiidae (Teleostei), IX + 607 pp.; Koenigstein (Koeltz Scientific Books).

FRICKE R. 2002 Annotated checklist of the dragonet families Callionymidae and Draconettidae (Teleostei: Callionymoidei), with comments on callionymid fish classification. – Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie) 645: 103 pp.

FRICKE R. 2004 Review of the pipefishes and seahorses (Teleostei: Syngnathidae) of New Caledonia, with descriptions of five new species. – Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie) 668: 66 pp.

GABRIE C., ALLEN G.R., BOUILLERET F., DOWNER A., GARRIGUE C., GERAUX H., HANNECART M., HERRENSCHMIDT J.B., ODY D., PETIT M., PICHON M., SEGUIN F., VURLY S., YOU H. 2007 Evaluation rapide du contexte biologique, écologique et humain de la zone marine du Diahot – Balabio (Province nord de Nouvelle-Calédonie).CRSIP-WWF report 151 pp.

GILL A. C. 2004 Revision of the Indo-Pacific dottyback fish subfamily Pseudochrominae (Perciformes: Pseudochromidae). – Smithiana, Publications in aquatic Biodiversity, Bulletin 1: 1–213, pls. 1–12.

GILL A.C. & A.J. Edwards 2004. Revision of the Indian Ocean Dottyback Fish Genera Chlidichthys and Pectinochromis (Perciformes: Pseudochromidae: Pseudoplesiopinae) Smithiana Bulletin 3. Pp. 46

GOMON M. F. 2006. A revision of the labrid fish genus Bodianus with descriptions of eight new species. Records of the Australian Museum Supplement 30: 1-133.

GOMON M.F., C.J.M. GLOVER & R.H. KUITER. 1994. The Fishes of Australia's South Coast. Handbook of the Flora and Fauna of South Australia. State Print, Adelaide. 997 pp.

GON O. & RANDALL J. E. 2003 A review of the cardinalfishes (Perciformes: Apogonidae) of the Red Sea. – Smithiana, Publications in aquatic Biodiversity, Bulletin 1: 1–48, pls. 1–6.

GON O. 1993 Revision of the Cardinalfish Genus Cheilodipterus (Perciformes: Apogonidae), with Description of Five New Species. 59 pp., 28 col. figs.

GREEN AL, MOUS PJ. 2008. Delineating the coral triangle, its ecoregions and functional seascapes. Version 5.0. TNC Coral Triangle Program Report 1/08.
http://conserveonline.org/workspaces/tnccoraltriangle/

GREENFIELD D. W. 2001. Revision of the Apogon erythrinus complex (Teleostei: Apogonidae). Copeia, 2001(2): 459-472.

GREENFIELD D.W. & J.E. RANDALL. 2004. The marine gobies of the Hawaiian Islands. Proceedings of the California Academy of Sciences. 55(27): 498-549.

GUSHIKEN S. 1983. A revision of the carangid fishes of Japan. Galaxea, 2(2): 135- 264.

HANSEN P.E.H. 1986. Revision of the tripterygiid fish genus Helcogramma, including descriptions of four new species. Bulletin of Marine Science, 38(2): 313 - 354.

HOESE D. F. & LARSON H. K. 1994 Revision of the Indo-Pacific Gobiid Fish Genus Valenciennea, with Descriptions of Seven New Species. 71 pp., 35 col. figs.

HOESE D.F. & RANDALL J.E. 1982. Revision of the gobiid fish genus Stonogobiops. Indo-Pacific Fishes 1: 1–18.

HUGHES T.P., BELLWOOD D.R., CONNOLLY S.R. 2002. Biodiversity hotspots, centers of endemicity, and the conservation of coral reefs. Ecology Letters 5: 775-784.

HUTCHINS J.B. 2004 Fishes of the Dampier Archipelago, Western Australia Records of the Western Australian Museum Supplement No. 66: 343–398

HUTCHINS JB. 1986. Review of the monacanthid fish genus Pervagor, with descriptions of two new species. Indo- Pacif. Fishes 12: 1-35.

HUTCHINS JB. 1997. Review of the monacanthid fish genus Paramonacanthus, with descriptions of three new species. Rec. West. Aust. Mus. Suppl. 54: 1-57.

I-HSUN NI & KAI-YIN KWOK 1999 Marine Fish Fauna in Hong Kong Waters Zoological Studies 38(2): 130-152

INEICH, I. BONNET X., BRISCHOUX F., KULBICKI M., SÉRET B., SHINE R. 2007 Anguilliform fishes and sea-kraits: neglected predators in coral-reef ecosystems.Marine Biology 151(2): 793-802

IRVING R.A., JAMIESON J. & RANDALL J.E. 1995. Initial checklist of fishes from Henderson Island, Pitcairn Group, p. 329–338. In: The Pitcairn Islands: Biogeography, Ecology and Prehistory. Academic Press, Inc., London.

JEWETT S. L. & E. A. LACHNER 1983. Seven new species of the Indo-Pacific genus Eviota (Pisces: Gobiidae). Proceedings of the Biological Society of Washington, 96(4): 780-806.

JOHNSON J. W. 1999 Annotated checklist of the fishes of Moreton Bay, Queensland, Australia. – Memoirs of the Queensland Museum 43: 709–762.

JONES G. 1985. Revision of the Australian species of the fish Leiognathidae. Australian Journal of Marine & Freshwater Research, 36: 559-613.

KOSAKI R.K., PYLE R.L., RANDALL J.E. & IRONS D.K. 1991. New records of fishes from Johnston Atoll, with notes on biogeography. Pacific Science 45(2): 186–203.

KUITER R. H. & T. TONOZUKA. 2001. Photo guide to Indonesian Reef fishes. Parts 1-3. Seaford, Australia: Zoonetics. 893 p.

KUITER R. H. 2000: Seahorses, pipefishes and their relatives. A comprehensive guide to Syngnathiformes, 240 pp.; Chordleywood (TMC Publishing).

KUITER R.H. & H. DEBELIUS. 1994. Southeast Asia Tropical Fish Guide. IKAN-Unterwasserarchiv, Germany. 321 pp.

KUITER R.H. 1992. Tropical Reef-Fishes of the Western Pacific Indonesia and Adjacent Waters. Penerbit PT Gramedia Pustaka Utama, Jakarta. xi + 314 pp.

KUITER R.H. 1996. Guide to Sea Fishes of Australia. New Holland Publishers, Australia. 433 pp.

KUITER R.H. 1997. A Photographic Guide to Sea Fishes of Australia.

KUITER RH 2002 Fairy and rainbow wrasses and their relatives. A comprehensive guide to selected labroids. Chorleywood, England: TMC Publishing. 208 pp.

KUITER RH & H DEBELIUS. 2001. Surgeonfishes, Rabbitfishes and their relatives. Chorleywood, England: TMC Publishing. 208 pp.

KUITER RH & T KOZAWA. 1999. Fishes of the Indo-West Pacific. Apogonidae. Seaford, Australia: Zoonetics.

KUITER R. H. & H. DEBELIUS. 2006. World atlas of marine fishes. IKAN-Unterwasserarchiv,Frankfurt.: 1-720.

KULBICKI M. & WILLIAMS J. T. 1997 Checklist of the shorefishes of Ouvéa Atoll, New Caledonia. – Atoll Research Bulletin 444: 1–26.

KULBICKI M., RANDALL J.E. & RIVATON J. 1994. Checklist of the fishes of the Chesterfield Islands (Coral Sea). Micronesica 27(1/2): 1–43.

KUNZMANN A., RANDALL J.E. & SUPRIHANTO I. 1999. Checklist of the shore fishes of the Mentawai Islands, Nias Island and the Padang region of West-Sumatra. Naga, ICLARM Quart. 22(1): 4–10.

LABOUTE P. & GRANDPERRIN R. 2000 Poissons de Nouvelle-Calédonie, 520 pp.; Nouméa (Editions Catherine Ledru).

LACHNER E. A., & S. J. KARNELLA 1980. Fishes of the Indo-Pacific genus Eviota with descriptions of eight new species. Smithsonian Contributions to Zoology No. 315. 127 p.

LARSON H. K. 1985 A revision of the gobiid genus Bryaninops (Pisces), with a description of six new species. –The Beagle, occasional Papers of the Northern Territory Museum of Arts and Sciences 2: 57–93.

LARSON H. K. 1990 A revision of the commensal gobiid fish genera Pleurosicya and Luposicya (Gobiidae), with descriptions of eight new species of Pleurosicya and discussion of related genera. – The Beagle, occasional Papers of the Northern Territory Museum of Arts and Sciences 7: 1–53.

LARSON H. K. 2001 A revision of the gobiid fish genus Mugilogobius (Teleostei: Gobioidei), and its systematic placement. – Records of the Western Australian Museum, Supplement 62: VI + 233 pp

LARSON HK & DF HOESE. 1980. The species of the Indo-Pacific genus Calumia (Pisces: Eleotridae). Proc. Linn. Soc. New S.Wales 104: 17-22.

LARSON HK. 1990. A revision of the commensal gobiid fish genera Pleurosicya and Luposicya (Gobiidae) with descriptions of eight new species of Pleurosicya and discussion of related genera. Beagle Occas. Pap. N. Terr. Mus. 7: 1-53.

LAST P. R. & STEVENS J. D. 1994 Sharks and rays of Australia, 513 pp., 1084 pls.; Deakin West, ACT (Fisheries Research & Development Corporation).

LEIS J.M. & B.M. CARSON-EWART. (editors). 2004. The larvae of Indo-Pacific coastal fishes. An identification guide to marine fish larvae. (Fauna Malesiana Handbooks 2). Soft cover edition. E.J. Brill, Leiden. Pp. 870.

LIESKE E. & MYERS R. 2001. Collins Pocket Guide to Coral Reef Fishes: revised edition. Publishers: Princeton University Press. 400pp.

LOBEL P. S. & L. K. LOBEL 2004. Annotated checklist of the fishes of Wake Atoll. Pacific Science, 58(1): 65-90.

LOURIE S. A. & R. H. KUITER. 2008. Three new pygmy seahorse species from Indonesia (Teleostei: Syngnathidae: Hippocampus). Zootaxa 1963: 54-68.

LOURIE S. A., VINCENT A. C. & HALL H. J. 1999 Seahorses. An identification guide to the world's species and their conservation, X + 214 pp.; London (Project Seahorse).

MARKLE DG & JE OLNEY. 1990. Systematics of the pearlfishes (Pisces, Carapidae). Bull. Mar. Sci. 47: 269-410.

MASUDA H., K. AMAOKA, C. ARAGA, T. UYENO, & T. YOSHINO, EDS. 1984. The fishes of the Japanese Archipelago, vols. I and II. Tokai University Press, Tokyo, Japan.

MATSUURA K. 1980. A revision of Japanese balistoid fi shes. I. Family Balistidae. Bull. Natl. Sci. Mus., ser. A (Zool.), 6(1): 27–69

MCCOSKER J. E. 1998. A revision of the snake-eel genus Callechelys, (Anguilliformes: Ophichthidae) with the description of two new Indo-Pacific species and a new callechelyin genus. Proceedings of the California Academy of Sciences, 50(7): 185-215.

MCCOSKER J. E. & R. H. ROSENBLATT. 1993. A revision of the snake eel genus Myrichthys (Anguilliformes: Ophichthidae) with the description of a new eastern Pacific species. Proc. Calif. Acad. Sci. 48 (8): 153169.

MCCOSKER J.E. & J.E. RANDALL. 2005. Notes on the snake eels of the genera Apterichtus and Ichthyapus (Anguilliformes: Ophichthidae) of the Central and South Pacifi c, with the description of a new species. Zootaxa 800: 1–11.

MCCOSKER JE, K HATOOKA, K SASAKI, JT MOYER. 1984. Japanese moray eels of the genus Uropterygius. Jpn. J. Ichthyol. 31: 261-267.

MCKENNA S.A., BAILLON, N. BLAFF ART, H. ABRUSCI G. 2006 Une évaluation rapide de la biodiversité marine des récifs coralliens du Mont Panié, Province Nord, Nouvelle Calédonie. Conservation International. RAP 42: 134 pp

MØLLER P.R. & SCHWARZHANS W. 2008. Review of the Dinematichthyini (Teleostei: Bythitidae) of the Indo-west Pacific. Part IV. Dinematichthys and two new genera with descriptions of nine new species. The Beagle, Records of the Museums and Art Galleries of the Northern Territory, 24: 87–146.

MOOI R. D. 1995. Revision, phylogeny, and discussion of biology and biogeography of the fish genus Plesiops (Perciformes: Plesiopidae). Royal Ontario Museum Life Sciences Contribution No. 159, 107 p.

MOTOMURA H. 2004. Threadfins of the world (family Polynemidae). An annotated and illustrated catalogue of polynemid species known to date. FAO Species Catalogue for Fishery Purposes, no. 3, FAO, Rome, 117 p.

MUNDY B. C. 2005. Checklist of the fishes of the Hawaiian Islands. Bishop Museum Bulletin in Zoology No. 6, 703 p.

MUNDY B., WASS R., DEMARTINI E., GREENE B., ZGLIZYNSKI B., SCHROEDER R.E., MUSBERGER 2010 Inshore fishes of Howland island, Baker island, Jarvis Island, Palmyra atoll and Kingman Reef. Atoll Research Bulletin . 585: 133 pp.

MURDY E. O. & HOESE. D. F. 1985 Revision of the Gobiid Fish Genus Istigobius. 41 pp., 14 col. figs.

MURDY E. O. 1985 A Review of the Gobiid Fish Genera Exyrias and Macrodontogobius, with Description of a New Species of Exyrias. 14 pp., 6 col. figs. Oct 1985

MYERS R. F. 1999 Micronesian reef fishes. A comprehensive guide to the coral reef fishes of Micronesia. 3rd revised and expanded edition, VI + 330 pp., 192 pls.; Barrigada, Guam (Coral Graphics).

MYERS R. G. & T. J. DONALDSON 2003. The fishes of the Mariana Islands. Micronesica, 35-36: 598-652.

NAKABO T. (Ed.) 2002 Fishes of Japan with pictorial keys to the species, English edition. Toaki univ. press.Tokyo 1749 p.

NELSON J. S.2006. Fishes of the world. 4th edition. John Wiley and Sons, Inc., N. Y. 601 p.

NIELSEN J. G., COHEN D. M., MARKLE D. F. & ROBINS C. R. 1999 FAO species catalogue. Vol. 18. Ophidiiform fishes of the world (order Ophidiiformes), XI + 178 pp.; Rome (FAO)

ORR JW, RA FRITZSCHE 1993. Revision of the ghost pipefishes, family Solenostomidae (Teleostei: Syngnathoidei). Copeia 1993: 168-182.

PALSSON W. A. & PIETSCH T. W. 1989 Revision of the Acanthopterygian Fish Family Pegasidae (Order Gasterosteiformes). 38 pp., 8 col. figs.

PARENTI P. & RANDALL J.E. 2000 An annotated checklist of the species of the labroid fish families Labridae and Scaridae. Ichthyological Bulletin of the J. L. B. Smith Institute of Ichthyology 68: 1–97.

PARIN N.V. 1991 Fish fauna of the Nazca and Sala y Gomez submarine ridges, the easternmost outpost of the Indo-west Pacifi c zoogeographic region. Bull. Mar. Sci. 49(3): 671–683.

PIETSCH T. W. & GROBECKER D. B. 1987 Frogfishes of the world. Systematics, zoogeography, and behavioral ecology, XXII + 420 pp., pls. 1–56; Stanford (Stanford University Press).

POSS S.G. & ESCHMEYER W.N., 1978 Two new Australian velvetfishes genus Paraploactis (Scorpaeniformes: Aploacticidae), with a revision of the genus and comments on the genera and species of the Aploactinidae. Proceedings of the California Academy of Sciences, 41(18): 401-426.

PRESTON G. 1989 The marine resources of Palmerston Island, Cook Islands: report of a survey carried out in September 1988 / G. Preston... [et al.].- (South Pacific Commission Inshore Fisheries Project technical document; no. 10.) (Forum Fisheries Agency Research Coordination Unit report; no. 89/16).

RANDALL J E. & HEEMSTRA P C. 2006 Review of the Indo-Pacific Fishes of the Genus Odontanthias (Serranidae: Anthiinae), with Descriptions of Two New Species and a Related New Genus. 32 pp. 20 col. figs.

RANDALL J E. & JOHNSON J W. 2007 Revision of the Soleid Fish Genus Pardachirus. 22 pp. 12 col. figs. . Indo-Pacific Fishes

RANDALL J. E. 2007 *Reef and shore fishes of the Hawaiian Islands*. Sea Grant College Program,

RANDALL J. E. 2005a A review of the soles of the genus Aseraggodes from the South Pacific, with descriptions of seven new species and a diagnosis of Synclidopus. – Memoirs of the Museum of Victoria 62: 191–212.

RANDALL J. E. 2005b Reef and shore fishes of the South Pacific. New Caledonia to Tahiti and the Pitcairn Islands, XII + 707 pp.; Honolulu (University of Hawai'i Press).

RANDALL J. E. 2008 Six new sandperches of the genus Parapercis from the western Pacific, with description of a neotype for P. maculata (Bloch & Schneider). – Raffles Bulletin of Zoology, Supplement 19: 159–178.

RANDALL J.E. & BALDWIN C.C. 1997 Revision of the serranid fishes of the subtribe Pseudogrammina, with descriptions of five new species. Indo-Pacific Fishes 26: 1–56, pl. 1.

RANDALL J.E. & DOOLEY J.K. 1974 Revision of the Indo-Pacific branchiostegid fish genus Hoplolatilus, with descriptions of two new species. Copeia 1974(2): 457–471.

RANDALL J.E. & EARLE J.L. 2000. Annotated checklist of the shore fishes of the Marquesas Islands. Occasional Papers of the Bernice Pauahi Bishop Museum 66: 1–39.

RANDALL J.E. & FERRARIS C.J. Jr. 1981 A revision of the Indo-Pacific labrid fish genus Leptojulis with descriptions of two new species. Revue Français d'Aquariologie 8(3): 89–96.

RANDALL J.E. & GOLANI D. 1995 Review of the moray eels (Anguilliformes: Muraenidae) of the Red Sea. Bulletin of Marine Science 56(3): 849–880.

RANDALL J.E. & GREENFIELD D.W. 1996 Revision of the Indo-Pacific holocentrid fishes of the genus Myripristis, with Randall J.E. 1996. Second revision of the labrid fish genus Leptojulis, with descriptions of two new species. Indo- Pacific Fishes 24: 1–20.

RANDALL J.E. & HEEMSTRA P.C. 1991 Revision of Indo-Pacific groupers (Perciformes: Serranidae: Epinephelinae), with descriptions of five new species. Indo-Pacific Fishes 20: 1–332, pls. 1–41.

RANDALL J.E. & HOESE D.F. 1985 Revision of the Indo-Pacific dartfishes, genus Ptereleotris (Perciformes: Gobioidei). Indo-Pacific Fishes 7: 1–36, pls. 1–4.

RANDALL J.E. & HOESE D.F. 1986 Revision of the groupers of the Indo-Pacific genus Plectropomus (Perciformes: Serranidae). Indo-Pacific Fishes 13: 1–31.

RANDALL J.E. & KUNZMANN A. 1998 Seven new records of fishes from Indonesia, with discussion of western Indian Ocean fishes in southwestern Indonesia. Raffles Bulletin of Zoology 46(2): 477–485.

RANDALL J.E. & LIM K.K.P. 2000 A checklist of the fishes of the South China Sea. Raffles Bulletin of Zoology Supplement 8: 569–667

RANDALL J.E. & LUBBOCK R. 1981 A revision of the serranid fishes of the subgenus Mirolabrichthys (Anthiinae: Anthias), with description of five new species. Contributions in Science of the Natural History Museum of Los Angeles County 333: 1–27.

RANDALL J.E. & LUBBOCK R. 1981 Labrid fishes of the genus Paracheilinus, with descriptions of three new species from the Philippines. Japanese Journal of Ichthyology 28(1): 19–30.

RANDALL J.E. & MCCOSKER J.E. 1992 Revision of the fish genus Luzonichthys (Perciformes: Serranidae: Anthiinae), with descriptions of two new species. Indo-Pacific Fishes 21: 1–21

RANDALL J.E. & P.C. HEEMSTRA. 1991 Revision of Indo-Pacific groupers (Perciformes: Serranidae: Epinephelinae), with descriptions of five new species. Indo-Pacific Fishes 20: 1-332, 168 figs., 41 color pls.

RANDALL J.E. & RANDALL H.A. 1981 A revision of the labrid fish genus Pseudojuloides, with descriptions of five new species. Pacific Science 35(1): 51–74, pls. 1–3.

RANDALL J.E. & RANDALL H.A. 1987 Annotated checklist of the fishes of Enewetak Atoll and other Marshall Islands. Chapter 28, p. 289–324. In: The natural history of Enewetak Atoll, Vol. II, Biogeography and systematics. DOE/EV/00703. T1-Vol. 2 (DEB7006111). U.S. Department of Energy, Office of Scientific and Technical Information, Oak Ridge, Tennessee.

RANDALL J.E. 1955 Fishes of the Gilbert Islands. Atoll Res. Bull., no. 47: xi + 243 pp.

RANDALL J.E. 1973 Tahitian fish names and a preliminary checklist of the fishes of the Society Islands. Occasional Papers of the Bernice Pauahi Bishop Museum 24(11): 167–214.

RANDALL J.E. 1975 A revision of the Indo-Pacific angelfish genus Genicanthus, with descriptions of three new species. Bulletin of Marine Science 25(3): 393–421, pl. 1.

RANDALL J.E. 1978 A revision of the Indo-Pacific labrid fish genus Macropharyngodon, with descriptions of five new species. Bulletin of Marine Science 28(4): 742–770.

RANDALL J.E. 1980 Revision of the fish genus Plectranthias (Serranidae: Anthiinae) with descriptions of 13 new species. Micronesica 16(1): 101–187.

RANDALL J.E. 1981 Revision of the labrid fish genus Labropsis with descriptions of five new species. Micronesica 17(1–2): 125–155.

RANDALL J.E. 1983 Revision of the Indo-Pacific labrid fish genus Wetmorella. Copeia 1983(4): 875–883.

RANDALL J.E. 1986 Sharks of Arabia. Immel Publishing Co., London. 148 p., 98 figs.

RANDALL J.E. 1992 A review of the labrid fishes of the genus Cirrhilabrus from Japan, Taiwan and the Mariana Islands, with descriptions of two new species. Micronesica 25(1): 99–121.

RANDALL J.E. 1992 Endemism of fishes in Oceania. In: UNEP: Coastal resources and systems of the Pacific basin; investigation and steps toward protective management. UNEP Regional Seas Reports and Studies 147: 55–67.

RANDALL J.E. 1995 A review of the wrasses of the genus Cirrhilabrus (Perciformes: Labridae) from the western Indian Ocean. Revue Français d'Aquariologie 22(1–2): 19–26.

RANDALL J.E. 1996 Shore Fishes of Hawai'i. Natural World Press, Vida, Oregon. 216 p.descriptions of three new species. Indo-Pacific Fishes 25: 1–61.

RANDALL J.E. 1996 Shore Fishes of Hawaii. University of Hawaii Press, Honolulu, 216 p.

RANDALL J.E. 1998a Review of the cardinalfishes (Apogonidae) of the Hawaiian Islands, with descriptions of two new species. Aqua, Journal of Ichthyology and Aquatic Biology 3(1): 25–38.

RANDALL J.E. 1998b Revision of the Indo-Pacific squirrelfishes (Beryciformes: Holocentridae: Holocentrinae) of the genus Sargocentron, with descriptions of four new species. Indo-Pacific Fishes 27: 1–105, pls. 1–11.

RANDALL J.E. 1998c Zoogeography of shore fishes of the Indo-Pacific region. Zoological Studies 37(4): 227–268.

RANDALL J.E. 1999a Report on fish collections from the Pitcairn Islands. Atoll Research Bulletin 461: 1–36.

RANDALL J.E. 1999b Review of the dragonets (Pisces: Callionymidae) of the Hawaiian Islands, with descriptions of two new species. Pacific Science 53(2): 185–207.

RANDALL J.E. 1999c Revision of the Indo-Pacific labrid fishes of the genus Coris, with descriptions of five new species. Indo-Pacific Fishes 29: 1–74, pls. I–XXII.

RANDALL J.E. 1999d Revision of the Indo-Pacific labrid fishes of the genus Pseudocheilinus, with descriptions of three new species. Indo-Pacific Fishes 28: 1–34, pls. I–II.

RANDALL J.E. 2002 Surgeonfishes of the world. Bishop Museum Bulletin in Zoology 4: i–ix, 1–123.

RANDALL J.E. 2004 Revision of the goatfish genus Parupeneus (Perciformes: Mullidae), with descriptions of two new species. Indo-Pacific Fishes 36: 1–62.

RANDALL J.E. 2005a Reef and Shore Fishes of the South Pacific: New Caledonia to Tahiti and the Pitcairn Islands. University of Hawaii Press, Honolulu, xii + 707 p.

RANDALL J.E. 2005b Reef and Shore Fishes of the South Pacific: New Caledonia to Tahiti and the Pitcairn Islands. University of Hawaii Press, Honolulu. xii + 707 p.

RANDALL J.E. 2006 Reef and shore fishes of the Hawaiian Islands. University of Hawai'i Press, Honolulu.

RANDALL J.E., ALLEN G.R. & STEENE R.C. 1997 Fishes of the Great Barrier Reef and Coral Sea. Second edition, revised and expanded. University of Hawai'i Press, Honolulu & Crawford House Press, Bathurst, New South Wales. xx + 557 p.

RANDALL J.E., BACCHET P., WINTERBOTTOM R. & WROBEL L. 2002 Fifty new records of shore fishes from the Society Islands and Tuamotu Archipelago. Aqua, Journal of Ichthyology and Aquatic Biology 5(4): 153–166.

RANDALL J.E., CEA A. 2010 Shore fishes of Eater Island 2010 University of Hawai 'i Press

RANDALL J.E., EARLE J.L., HAYES T., PITTMAN C., SEVERNS M. & SMITH, R.J.F. 1993a Eleven new records and validations of shore fishes from the Hawaiian Islands. Pacific Science 47(3): 222–239

RANDALL J.E., EARLE J.L., PYLE R.L., PARRISH J.D. & HAYES T. 1993b Annotated checklist of the fishes of Midway Atoll, Northwestern Hawaiian Islands. Pacific Science 47(4): 356–400.

RANDALL J.E., G.R. ALLEN & R.C. STEENE 1990. Fishes of the Great Barrier Reef and Coral Sea. Crawford House Press, Bathurst, NSW. 507 p., 1243 col. figs.

RANDALL J.E., IDA H., KATO K., PYLE R.L. & EARLE J.L. 1997 Annotated checklist of the inshore fishes of the Ogasawara Islands. National Science Museum Tokyo, National Science Museum Monographs 11: 1–74, pls. 1–19.

RANDALL J.E., LACHNER E.A. & FRASER T.H. 1985a A revision of the Indo-Pacific apogonid fish genus Pseudamia, with descriptions of three new species. Indo-Pacific Fishes 6: 1–23, pl. 1.

RANDALL J.E., LOBEL P.S. & CHAVE E.H. 1985b Annotated checklist of the fishes of Johnston Island. Pacific Science 39(1): 24–80

RANDALL J.E., MATSUURA K. & ZAMA A. 1978 A revision of the triggerfish genus Xanthichthys, with description of a new species. Bulletin of Marine Science 28(4): 688–706.

RANDALL J.E., MYERS R.F., TREVOR M.N., JOHNSON J.L., JOHNSON S.R., YOSHII S. & GREENE B.D. 2005 Ninetyone new records of fishes from the Marshall Islands. Aqua, Journal of Ichthyology and Aquatic Biology 9(3): 115–132.

RANDALL J.E., SMITH C.L. & FEINBERG M.N. 1990 Report on fish collections from Rapa, French Polynesia. American Museum Novitates 2966: 1–42.

RANDALL J.E., WILLIAMS J.T., SMITH D.G., KULBICKI M., MOU THAM G., LABROSSE P. & KRONEN M. 2004 Checklist of the shore and epipelagic fishes of Tonga. Atoll Research Bulletin 502: i–ii, 1–35.

RANDALL J.E.2007 Reef and shore fishes of the Hawaiian Islands. Sea Grant College Program, University of Hawai`i, Honolulu. 546 p.

RANDALL JE, ALLEN GR, STEENE RC 1997 Fishes of the Great Barrier Reef and Coral Sea. Crawford House Publishing Pty. Ltd., Australia. Pp 557.

REAKA M. L., P. J. RODGERS & A. U. KUDLA 2008 Patterns of biodiversity and endemism on Indo-west Pacific coral reefs. Proc. Nat. Acad. Sci., 105(Suppl. 1): 11474-11481.

RENNIS DS, DF HOESE. 1987 Aioliops, a new genus of ptereleotrine fish (Pisces: Gobioidei) from the tropical Indo-Pacific with descriptions of four new species. Rec. Aust. Mus. 39: 67-84.

ROBERTS C.M., MCCLEAN C.J., VERON J.E.N., HAWKINS J.P, ALLEN G.R., MCALLISTER D.E., MITTERMEIER C.G., SCHUELER F.W., SPALDING M., WELLS F., VYNNE C., WERNER T.B. 2002 Marine biodiversity hotspots and conservation priorities for tropical coral reefs. Science Vol 292: 1280-1284.

RUSSELL B. C.. 1985 Revision of the Indo-Pacific Labrid Fish Genus Suezichthys, with Descriptions of Four New Species. 21 pp., 11 col. figs.

RUSSELL B.C., 1990b Nemipterid fishes of the world. (Threadfin breams, whiptail breams, monocle breams, dwarf monocle breams, and coral breams). Family Nemipteridae: an annotated and illustrated catalogue of nemipterid species known to date. FAO Fisheries Synopsis, 12(125): 149 p.

RUSSELL BC. 1990a FAO species catalogue. Nemipterid fishes of the world (Threadfin breams, Whiptail breams, Monocle breams, Dwarf monocle breams and Coral breams). An annotated and illustrated catalogue of nemipterid species known to date. Vol. 12. FAO Fisheries Synopsis 125, pp. 1-149.

RUSSELL. B.C. 1988 Revision of the labrid fish genus Pseudolabrus and allied genera. Rec. Austral. Mus., Suppl. 9: 1–72.

SAKAI K. & T. NAKABO. 2004 Two new species of Kyphosus (Kyphosidae) and a taxonomic review of Kyphosus bigibbus Lacepede from the Indo-Pacific. Ichthyological Research, 51(1):20-32.

SALE P. (ed.) 2002 Coral reef fishes. Dynamics and diversity in a complex ecosystem. Academic Press, Elsevier Science (U.S. A.), San Diego, Ca., 549 p

SANTINI F. & R. WINTERBOTTOM 2002 Historical biogeography of Indo-western Pacific coral reef biota: is the Indonesian region a centre of origin? Journal of Biogeography, 29: 189-205.

SCHWARZHANS W. & MØLLER P. R. 2007 Review of the Dinematichtyini (Teleostei, Bythitidae) of the Indo-West Pacific. Part III. Beaglichthys, Brosmolus, Monothrix and eight new genera with description of 20 new species. – The Beagle, Records of the Museums and Art Galleries of the Northern Territory 23: 29–110.

SCHWARZHANS W., P. R. MØLLER & J. G. NIELSEN. 2005 Review of the Dinematichthyini (Teleostei: Bythitidae) of the Indo-West Pacific. Part I. Diancistrus and two new genera with 26 species. The Beagle, Records of the Museums and Art Galleries of the Northern Territory [Australia] 21: 73-163.

SENOU H., KODATO H., NOMURA H., YUNOKAWA K. 2006 Coastal fishes of Ie-Jima island, the Rykyus,Okinama Japan.Bull. Kanagawa Pref Mus. (Nat.sci.) 35: 67-92

SENOU H., T. SUZUKI K. SHIBUKAWA & K. YANO. 2004 A photographic guide to the gobioid fishes of Japan. Tokyo: Heibonsha. 534 p.

SMITH DG, EB BÖHLKE. 1997 A review of the Indo-Pacific banded morays of the Gymnothorax reticularis group, with descriptions of three new species (Pisces, Anguilliformes, Muraenidae). Proc. Acad. Nat. Sci. Phila. 148: 177-188.

SMITH M.M. & P.C. HEEMSTRA (eds.). 1986 Smiths' Sea Fishes. Macmillan South Africa, Johannesburg. Xx + 1047 pp.

SMITH-VANIZ W. F. 1989 Revision of the jawfish genus Stalix (Pisces: Opistognathidae) with descriptions of four new species. Proceedings of the Academy of Natural Sciences of Philadelphia 141: 375-407.

SMITH-VANIZ WF, VG SPRINGER. 1971 Synopsis of the tribe Salariini, with description of five new genera and three new species (Pisces, Blenniidae). Smithsonian Contrib. Zool. 73: 1-72.

SMITH-VANIZ WF. 1987 The saber-toothed blennies, tribe Neomophini (Pisces: Blenniidae): an update. Proc. Acad. Nat. Sci. Phila. 139: 1-52.

SPRINGER V. G. 1972 Additions to revisions of the blenniid fish genera Ecsenius and Entomacrodus, with descriptions of three new species of Ecsenius. – Smithsonian Contributions to Zoology 134: 13 pp.

SPRINGER V. G. 1967 Revision of the circumtropical shorefish genus Entomacrodus (Blenniidae: Salariinae). Proceedings of the U.S. National Museum, 122(3582), 150 p.

SPRINGER V.G. 1988 The Indo-Pacific blenniid fish genus Ecsenius. Smithson. Contrib. Zool. (465):134 p.

SPRINGER VG, JT WILLIAMS. 1994 The Indo-Pacific blenniid fish genus Istiblennius reappraised: a revision of Istiblennius, Blenniella, and Paralticus, new genus. Smithsonian Contrib. Zool. 565: 1-193.

SPRINGER VG, MF GOMON. 1975 Revision of the blenniid fish genus Omobranchus with descriptions fo three new species and notes on other species of the tribe Omobranchini. Smithsonian Contrib. Zool. 117: 1-135.

STARNES WC. 1988 Revision, phylogeny, and biogeographic comments on the circumglobal marine percoid fish family Priacanthidae. Bull. Mar. Sci. 43: 117-203.

THACKER C. E. 2000 Phylogeny of the Wormfishes (Teleostei: Gobioidei: Microdesmidae). Copeia, 2000 (4): 940-957

VERON J.E.N. 2000 Corals of the World. Australian Institute of Marine Science (3 volumes) 1,410pp.

WANTIEZ L, FANINOZ S, BOUILLERET F & O GIL 2010 Etat zéro des communautés biocénotiques avant la mise en place de zones de type I.B au sein de l'aire marine protégée de l'aire de Yambé-Diahoué. WWF-France, Université de la Nouvelle-Calédonie. 65 pp.

WAPLES R.S. & RANDALL J.E. 1989 A revision of the Hawaiian lizardfishes of the genus Synodus, with descriptions of four new species. Pacific Science 42(3–4)[1988]: 178–213, pls. 1–3.

WHITEHEAD P.J.P. 1985 FAO species catalogue. Vol. 7. Clupeoid fishes of the world (Suborder Clupeoidei). An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. Part I. Chirocentridae, Clupeidae, and Pristigasteridae.FAO Fish. Synop., (125)Vol. 7, Pt. 1:303 p.

WHITEHEAD P.J.P., G.J. NELSON & T. WONGRATANA. 1988 FAO species catalogue. Vol. 7. Clupeoid fishes of the world. An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. Part 2. Engraulididae. FAO Fish. Synop., (125)Vol.7,Pt.2:305-579.

WILKINSON CR ed. 2004 Status of the Coral Reefs of the World: 2004. Global Coral Reef Monitoring Network and Australian Institute of Marine Science, Townsville, Queensland, Australia.

WILLIAMS. J. T. 1988 Revision and Phylogenetic Relationships of the Blenniid Fish Genus Cirripectes. 78 pp., 56 col. figs

WINTERBOTTOM R, AR EMERY. 1986 Review of the gobioid fishes of the Chagos Archipelago, central Indian Ocean. R. Ontario Mus. Life Sci. Contrib. 142: 1-82.

WINTERBOTTOM R. 1990 The Trimmatom nanus species complex (Actinopterygii, Gobiidae): phylogeny and progenetic heterochrony. Systematic Zoology, 39(3): 253-265.

WINTERBOTTOM. R. 1986 Revision and Vicariance Biogeography of the Subfamily Congrogadinae (Pisces: Perciformes: Pseudochromidae). 34 pp., 6 col. figs.

WOODLAND DJ 1990 Revision of the family Siganidae with descriptions of two new species and comments on the distribution and biology. Indo-Pac. Fish. 19: 1-136

YAGASHITA N. & T. NAKABO 2000 Revision of the genus Girella (Girellidae) from East Asia. Ichth. Res. 47(2): 119–135

YOSHINO T, T KON & S. OKABE 1999 Review of the genus Limnichthys (Perciformes: Creedidae) from Japan, with description of a new species. Ichthyol. Res. 46 (1): 73-83.

USEFUL REFERENCES ON SOUTH PACIFIC REEF FISH DIET

The following list of references does not include literature beyond 2005

Abel, E.F 1972. Problem der ökoligischen Definition des "Korallenfisches". *In* Mukundan, C., and C.S. Gopinadah Pillai (eds.), *Proc. Symp. Coral & Coral Reefs. Mar. Biol. Assoc. India (Publ.)* : 449-456.

Abu Khair, M.M., M.A. Ambak, M.Zaki Bin Mohamed Said, M.Sakiam and S. Hayase 1990. A study on the feeding habits of fishes in the South-Western portion of the South China Sea. *In* Abu Khair, M.M, R. Abdul Rahman and M.A. Ambak (eds.) *Ekspedisi Matahari '86 Faculty of Fisheries and Marine Science. Pertanian University Malaysia Occasional Publication* 4: 159-172.

Aldonov, V.K., and A.D. Druzhinin. 1979. Some data on scavengers (family Lethrinidae) from the Gulf of Aden region. *J. Ichthyol*. 18(4): 527-535.

Ali, Mohamed, Hussain 1993 Trophic interrelationships of the demersal fish assemblage in the northwest Arabian Gulf, Iraq *Asian-Fish.-Sci.*, 1993, vol. 6, n° 3, pp. 255-264

Alino, P.M., P.W. Sammarco and J.C. Coll. 1988. Studies on the feeding preferences of *Chaetodon melannotus* for soft corals. *Proc. 6th Int. Coral Reef Symp.* Townsville Aust. Aug. 1988 3:31-36.

Allen, G.R 1975. *Damselfishes of the South Seas.* TFH publications : Neptune City (USA), 238 p.

Allen, G.R 1993. Cardinalfishes (Apogonidae) of Madang province, Papua New Guinea, with descriptions of three new species *Revue fr. aquariol.*, 20 (1) : 9-20.

Allen, G.R 1999 Three new species of damselfishes (Pomacentridae) from Indonesia and Eastern Papua New Guinea *Revue fr. aquariol.* 25 (3-4): 99-105.

Allen, G.R and P.Munday. 1995 Description of four new gobies (gobiidae) from the western Pacific ocean *Revue fr. aquariol.* 22 (3-4): 99-104

Allen, G.R., and H. Kuiter. 1976. A review of the Plesiopid fish genus *Assessor* with description of two new species. *Rec. West. Aust. Mus.* 4(3): 210-215.

Allen, G.R., and J.E. Randall. 1977. Review of the sharpnose pufferfishes (subfamily Canthigasterinae) of the Indo-Pacific. *Rec. austr. Mus.* 30(17): 475-517.

Almeida, Lessa. 1998. Feeding habits of the bonnethead shark, sphyrna tiburo, from northern Brazil *Cybium* 22(4): 383-394.

Ambak, M.A., K.Yunus, M.M. Abu Khair, M. Zaki Mohamed Said and S. Hayase. 1990. Sex ratio, fecundity and the feeding behavior of big eyes (*Priacanthidae*). *In:* Abu Khair, M.M., R. Abdul Rahman and M.A. Ambak (eds.) *Ekspedisi Matahari '86 Faculty of Fisheries and Marine Sciences. University Pertanian Malaysia Occasional Publication* 4:147-157.

Amesbury, S.S., and R.F. Myers. 1982. Guide to the coastal resources of Guam : vol 1 The fishes. *University of Guam Press*, 142 p.

Bakus, G.J. 1964. The effects of fish-grazing on invertebrate evolution in shallow tropical waters. *Allan Hancock Foundation Publications - Occasional Paper* 27, 29 p.

Bal, D.V., and K.V. Rao. 1987. *Marine Fisheries.* Tata McGraw Hill Publ. Company New Dehli, 470 p.

Balan, V. 1963. Biology of the silver belly *Leiognathus bindus* of the Calicut coast. *Ind. J. Fish.* 10A(1):118-134

Bell, J.D., D.A. Pollard, J.J. Burchmore, B.C. Pease and M.J. Middleton. 1984. Structure of a fish community in a temperate mangrove creek in Botany Bay (New South Whales). *Aust. J. Mar. Freshw. Res.* 35: 33-46.

Bellwood, D. 1988. Ontogenic changes in the diet of early post-settlement Scarus species (Pisces : Scaridae) *J.-Fish-Biol.* 33(2) : 213-219.

Ben Yami, M., and T. Glaser. 1974. The invasion of *Saurida undosquamis* into the Levant Basin - an example of biological effect of interoceanic canals. *Fish. Bull*. 72(2):359-373.

Beumer, J.P. 1978. Feeding ecology of four fishes from a mangrove creek in North Queensland Australia. *J. Fish. Biol*. 12: 475-490.

Blaber, S.J.M. 1980. Fish of the Trinity inlet system of north Queensland with notes on the ecology of the fish faunas of tropical Indo-Pacific estuaries. *Aust. J. Mar. Freshw. Res.* 31:137-146

Blaber, S.J.M. 1986. Feeding selectivity of a guild of piscivorous fish in mangrove areas of NW Australia. *Austr. J. Mar. Freshw. Res.* 37: 329-336.

Blaber, S.J.M., and Bulman. 1987 Diets of fishes of the upper continental slope of eastern Tasmania : content, caloric values, dietary overlap and trophic relationships. *Mar.-biol.* 95 (3): 345-356.

Blaber, S.J.M., and P.D. Cyrus. 1981. A revised checklist and further notes on the fishes of the Kosi system. *Lammergeyer* 31:5-14.

Blaber, S.J.M., and P.D. Cyrus. 1983. The biology of Carangidae (Teleostei) in Natal estuaries. *J. Fish. Biol.* 22: 173-188.

Blaber, S.J.M., and T.G. Blaber. 1980. Factors affecting the distribution of juvenile estuarine and inshore fishes. *J. Fish. Biol*. 17:143-162.

Blaber, S.J.M., D.A. Milton and N.J.F. Rawlinson. 1990. Diets of lagoon fishes in the Solomon Islands : predators of tuna baitfish and trophic effects of baitfishing on the subsistence fishery. *Fish. Res.* 8:263-286.

Bograd-Zisman, L. 1965. The food of *Saurida undosquamis* in the eastern Mediteranean in comparison with that in Japanese waters. *Rapp. P. V. Reun. Comm. Int. Explor. Sci. Mer*. 18:251-252.

Bohlke E., Randall J.E. 2000. A review of the moray eels (Anguilliformes : Muraenidae) of the Hawaiian islands, with descriptions of two species. *Proceed. Academ. Natur. Sci. Philad.* 150 : 203-278.

Bouchon-Navaro, Y. 1986. Partitioning of food and space resources by chaetodontid fishes on coral reefs. *J. Exp. Mar. Biol. Ecol.* 103:21-40.

Brewer, D.T., Blaber, S.J.M. Milton, and J.P. Salini. 1989. Feeding biology of Caranx bucculentus Alleyne and Macleay (Teleostei : carangidae) in Albaros Bay, Gulf of Carpentaria, with special reference to predation on penaeid prawns. *Aust.J.Mar.Freshwat.Res.* 40(6): 657-668.

Brewer, D.T., Blaber, S.J.M. Milton, and J.P. Salini. 1994. Aspects of the biology of *Caranx bucculentus* (teleostei : carangidae) from the Gulf of Carpentaria, *Aust.J.Mar.Freshwat.Res* 45(3): 413-427.

Brian, P. 1975. Food habits, functional digestive morphology, and assimilation efficiency of the rabbitfish *Siganus spinus* on Guam. *Pacific Sci.* 29(3):269-277.

Bruce, R.W., and J.E Randall.1985. Revision of the Indo-Pacific parrot fish genera *Calotomus* and *Leptoscarus. Indo-Pac. Fishes* 5, 32 p.

Burchmore, J.J., D.A. Pollard, M.J. Middelton, J.D. Bell and B.C. Pease. 1988. Biology of four species of whiting (Pisces : Sillaginidae) in Botany Bay, New South Wales. *Austr. J. Mar. Freshw. Res.* 39:709-727.

Burgess, W.E. 1978. *Butterflyfishes of the world.* TFH publication, 830 p.

Caillart, B. 1988. Etude d'une pêcherie artisale des Tuamotus (Polynésie Française). Biologie, étologie et dynamique des populations d'une espèce caractéristique

Naso brevirostris. ORSTOM Papeete Notes et Documents Océanographie 38, 85 p.

Caliente, A.C. 1987. Aspects of the biology and fishery of redtail round scad (*Decapterus russeli*) in the coastal waters of wertern Leyte *M. Sc. Thesis University Quezon Philippines* 181 p.

Cardona 1999. Seasonal changes in the food quality, diel feeding rhythm and growth rate of juvenile leaping grey mullet Liza saliensAquat-living-resour. 12(4) : 263-270.

Chapau, M.R. 1983. Food and feeding behavior of Ysabel passage bait-fish. *Fish. Res. Surv. Branch Rep. Dept. Prim. Indus. Papua New Guinea*, 83-08 : 24 p.

Chave E.H. 1979. General ecology of six species of Hawaian cardinalfishes. *Pac. Sci.* 48(4) : 245-270.

Cliff 1995 Sharks caught in the protective gill nets off Kwazulu-Natal, South Africa. 8. The great hammerhead shark *Sphyrna mokarran* (Ruppell) *S.Afr.J.Mar.Sci.S.Afr.*15: 105-114.

Clifton, Motta 1998 Feeding morphology, diet, and ecomorphological relationships among five caribbean labrids (teleostei, labridae) *Copeia* (4) : 953-966.

Coates, D. 1990. Aspects of the biology of the perchlet *Ambassis interrupta* Bleeker (Pisces : Ambassidae) in the Sepik river, Papua New Guinea. *Aust. J. Mar. Fresh. Res.* 41:267-274.

Coates, D. 1987. Observations on the biology of Tarpon, *Megalops cyprinoides* (Broussonet) (Pisces : Megalopidae), in the Sepik river, northern Papua New Guinea *Aust.J.Mar.Freshwater.Res.* 38(4) : 529-535.

Coleman, N. 1981. *Australian sea fishes north of 30°S.* Doubleday Australia Pty - Lane Cove Australia, 297 p.

Collette, B.B. 1974. The garfishes (Hemiramphidae) of Australia and New Zealand. *Rec. Austr. Mus.* 29(2):11-105.

Collette, B.B., and C.E. Nauen. 1983. *FAO species catalogue - Scombrids of the world.* FAO Fish Synopsis 125 vol.2, 137 p.

Compagnon, L.J.V. 1984a. *Sharks of the world. An annotated and illustrated catalogue of sharks known to date. Part 1. Hexanchiformes and Lamniformes.* FAO species Synop., 125 (4/1), 249 p.

Compagnon, L.J.V. 1984b. *Sharks of the world. Part 2. Carcharhiniformes. An annotated and illustrated catalogue of sharks known to date.* FAO species Synop. 125 (4/2), 415 p.

Conde, B., and D. Terver. 1979a. Fiche technique *Amphiprion perideraion. Revue Franc. Aquariol.* 1(79) supplement

Conde, B., and D. Terver. 1979b. Fiche technique *Paracanthurus hepatus. Revue Franc. Aquariol.* 2(79) supplement

Conde, B., and D. Terver. 1980a. Fiche technique *Centropyge flavissimus. Revue Franc. Aquariol.* 1(80) supplement

Conde, B., and D. Terver. 1980b. Fiche technique *Forcipiger longirostris. Revue Franc. Aquariol.* 2(80) supplement

Conde, B., and D. Terver. 1981a. Fiche technique n°210 *Chaetodon rainfordi. Revue Franc. Aquariol.* 1(81) supplement

Conde, B., and D. Terver. 1981b. Fiche technique *Malacanthus brevirostris. Revue Franc. Aquariol.* 4(80) supplement

Conde, B., and D. Terver. 1983a. Fiche technique n°262 *Malacanthus latovittatus. Revue Franc. Aquariol.* 2(83) supplement

Conde, B., and D. Terver. 1983b. Fiche technique n°248 *Lutjanus kasmira. Revue Franc. Aquariol.* 3(83) supplement

Conde, B., and D. Terver. 1983c. Fiche technique n°270 *Balistoides conspicullum. Revue Franc. Aquariol.* 4(83) supplement
Conde, B., and D. Terver. 1985. Fiche technique n°294 *Naso lituaratus. Revue Franc. Aquariol.* 3(85) supplement
Conde, B., and D. Terver. 1988a. Fiche technique n°326-327 *Chaetodontoplus conspiculatus. Revue Franc. Aquariol.* 1(88) supplement
Conde, B., and D. Terver. 1988b. Fiche technique n°330 *Zanclus cornutus. Revue Franc. Aquariol.* 1(88) supplement
Conde, B., and D. Terver. 1989a. Fiche technique n° 341 *Pygoplites diacanthus. Revue Franc. Aquariol.* 3(88) supplement
Conde, B., and D.Terver. 1989b. Fiches aquariologiques n°352 et 358 sur *Coradion altivelis. Revue Franc. Aquariol. Herpet.* 1989 1 & 2
Connell 1998. Patterns of piscivory by resident predatory reef fish at One Tree Reef, Great Barrier Reef. *Aust. J. Mar. Fresh. Res.* 49: 25-30.
Coutinho, Ferreira, Gonçalves, Peret 1998 Herbivory by the dusky damselfish Stegastes fuscus (Cuvier, 830) in a tropical rocky shore : effects on the benthic community *J.Exp.Mar.Biol.Ecol.* 229(2) : 241-264.
Cox 1994 Resource use by corallivorous butterflyfishes (family chaetodontidae) in Hawaii *Bull.Mar.Sci.* 54(2) : 535-545.
Dalzell, P.J. 1990. *Small pelagic fisheries resources of the south Pacific.* FFA/ICOD : Inshore marine resources of the South Pacific : information for fishery development and management, 40 p.
Dalzell, P.J 1988 The biology of surgeon fishes (family Acanthuridae) with particular emphasis on *Acanthurus nigricauda* and *A. xanthopterus* from northern Papua New Guinea. *M. Sc. Thesis Department of Biology University of Newcastle upon Tyne (U.K.)*, 285 p.
Day, J.H., S.J.M. Blaber and J.H. Wallace. 1981. *Estuarine fishes.* Chapitre 12 *in* Day, J.H. (ed.), Estuarine ecology with particular reference to Southern Africa, Balkema : Rotterdam (Hollande) :197-221.
De Crosta, M. 1984. Age determination, growth, and energetics of three species of carcharinid sharks in Hawaii. *M. Sc. Thesis University Hawaii*, 66 p.
De Crosta, M.A., L.R. Taylor and J.D. Parrish. 1984. Age determination, growth, and energetics of three species of carcharinid sharks in Hawaii. *Proc. Res. Inv. NWHI Hawaii* :75-95.
Dee, A.J. 1986. Age, growth, reproduction and diet of *Myripristis amaena* at Johnston Atoll. *M. Sc. Thesis University of Hawaii*, 73 p.
Deshmukh, V.M. 1973. Fishery and biology of *Pomadasys hasta* (Bloch). *Ind. J. Fish.* 22(2) : 497-522.
Dotu, Y. 1956. The life history of the eleotrid goby *Parioglossus taeniotus. Science Bull. Fac. Kyushu Univ.* 15(4) : 489-496.
Druzhinin, A.D., and N.A.Ilatova. 1979. Some data on *Plectorhinchus pictus* of the family Pomadasydae. *J. Ichtyol.* 19(1):154-155.
Du Preez, H.H., A. McLachlan, J.F.K. Marais and A.C. Cockroft. 1990. Bioenergetics of fishes in a high energy surf zone. *Mar. Biol.* 106:1-12.
Dudley, Cliff. 1993. Sharks caught in the protective gill nets off natal, South Africa 7. The blacktip shark *Carcharhinus limbatus* (Valenciennes) *S. Afr.J.Mar.Sci.* 13 : 237-254.
Edgar, Shaw. 1995. The production and tophic ecology of shallow-water fish assemblages in southern Australia - II Diets of fishes and trophic relationships between fishes and benthos at Western Port, Victoria *J.Exp.Mar.Biol.Ecol.* 194(1) : 83-106.

Eggleston, Grover, Lipcius. 1998. Ontogenetic diet shifts in nassau grouper : trophic linkages and predatory impact *Bull.Mar.Sci.* 63(1): 111-126.

Eggleston, Grover, Shenker.1998. Transition fom pelagic to demersal phase in early-juvenile nassau grouper, epinephelus striatus : pigmentation, squamation, and ontogeny of diet. *Bull.Mar.Sci.* 62(1) : 97-113.

Egretaud C.1992. Etude de la biologie générale, et plus particulièrement du régime alimentaire de Lethrinus nebulosus du lagon d'Ouvéa (Nouvelle-Calédonie) *Rapp. Sci.Mer Biol. Nouméa ORSTOM* 45p.

Euzen, O. 1987. Food habits and diet composition of some fish of Kuwait. *Kuwait Bull. Mar. Sci.* 9 : 65-85.

Jeyaseelan, M.J.P., and K. Krishnamurthy. 1980. Role of mangrove forests of pichavaran as fish nurseries. *Proc. Ind. Nat. Sci. Acad.* B46(1): 48-53.

Fishelson, L., L.W. Montgomery and A.H. Myberg. 1987. Biology of the surgeon fish *Acanthurus nigrofuscus* with emphasis on changeover in diet and annual gonadial cycles. *Mar. Ecol. Progr. Ser.* 39: 37-47.

Fishelson, L., L.W. Montgomery and A.H. Myberg. 1987. Biology of the surgeon fish Acanthurus nigrofuscus with emphasis on changeover in diet and annual gonadial cycles. *Mar. Ecol. Progr. Ser.* 39 : 37-47.

Fisher, W., and G. Bianchi. 1984. *FAO species identification sheets for fisheries purpose. Western Indian Ocean (Fishing area 51)* FAO Rome vol 1-6

Forrester. 1991. Social rank, individual size and group composition as determinants of food consumption by humbug damselfish, *Dascyllus aruanus*. *Anim. Behav.* 42(5) : 701-711.

Fouda, El-Sayed. 1994. Feeding ecology of two surgeonfish, *Zebrasoma xanthura* and *Ctenochaetus striatus* in the Red Sea. *J. Fish Biology*, 45 : XXX

Fourmanoir, P., and P. Laboute. 1976. *Poissons de Nouvelle-calédonie et des Nouvelles Hébrides.* Les Editions du Pacifique Tahiti, 376 p.

Francis, M. 1988. *Coastal fishes of New Zealand. A diver's identification guide.* Heinemann Reed Auckland New Zealand, 63 p.

Galzin, R. 1985. Ecologie des poissons récifaux de Polynésie Française. *Ph. D. Thesis University of Montpellier France*, 195 p.

Gelsleichter, Musick, Nichols.1999. Food habits of the smooth dogfish, *Mustelus canis*, dusky shark, *Carcharhinus obscurus*, atlantic sharpnose shark, *Rhizoprionodon terraenovae*, and the sand tiger, *Carcharias taurus*, from the northwest Atlantic Ocean.XXXX

George, K.C., M.G. Dayanandan and P. Karunakaran Nair. 1968. Food of some demersal fishes from the trawl grounds off Cochin. *Ind. J. Fish.* 15(1-2): 81-87.

Gerber, R.P., and N. Marshall. 1974. Ingestion of detritus by the lagoon pelagic community at Enewetak Atoll. *Limnol. Oceanog.* 19(5):815-823

Goeden, G.B. 1978. A monograph of the coral trout. *Queensland Fish. Serv. Res. Bull.* 1, 42 p.

Golani 1994. Niche separation between colonizing an indigenous goatfish (Mullidae) along the Mediteranean coast of Israel. *J.Fish Biol*.45 : 503-513.

Gowda, H.H., P.S. Joseph and M.M. Joseph. 1988. Feeding ecology of the indian sandwhiting *Sillago sihama* (Forskal) inhabiting the Nethravati - Gurpur estuary. *In* Joseph, M.M. (ed.), *Proc. 1st Ind. Fish. Forum As. Fish. Soc., Indian Branch, Mangalore* : 263-266.

Grant, E.M. 1978. *Guide to fishes.* The department of Harbours and Marine: Brisbane (Australia), 767 p.

Grutter1997. Size-selective predation by the cleaner fish *Labroides dimidiatus J.Fish Biol.* 50 : 1303-1308.

Grutter1997. Spatiotemporal variation and feeding selectivity in the diet of the cleaner fish *Labroides dimidiatus. Copeia* (2): 346-354.

Grutter1999. Fish cleaning behaviour in Noumea, New Caledonia. *Mar. Freshw. Res.* (3) : 209-212.

Guiasu, R. Winterbottom.1998. Yellow juvenile color pattern, diet switching and the phylogeny of the surgeonfish genus *Zebrasoma* (percomorpha, Acanthuridae). *Bull.Mar.Sci.* 63(2) : 277-294.

Gunn, J.S. 1990. A revision of selected genera of the family Carangidae (Pisces) from Australian waters. *Rec. Austr. Mus. Suppl.* 12, 57 p. + 20 pl.h.t

Gunn, J.S., and N.E. Milward. 1985. The food and feeding habits and feeding structures of the whiting species *Sillago sihama* (Forsskal) and *Sillago analis* Whitley from Townsville, north Queensland, Australia. *J. Fish. Biol.* 26:411-427.

Gushima, Hashimoto, Ikeda, Noda 1996. Foraging ecology of the pomacentrid fish *Chromis margaritifer* and *Pomacentrus coelestis* at Kuchierabu island. *Appl.-biol.-sci.-seibutsu.-seisangaku-kenkyu* 35(2): 113-123.

Gushima, Hashimoto, Shibuno1997. Feeding ecology of labrid fishes at Kuchierabu jima *J.Fac.Appl.Biol.Sci.* 36(1): 51-56 .

Gushima, Hazumi, Kakuta1991. Growth-related vhanges in diet and foraging behavior of the yellow wrasse Thalassoma lutescens at kuchierabu island. *Jap.J.Ichthyol.* 38(3): 307-314.

Gushima, Kakuda, Noda1990. Growth-related changes in feeding patterns of the pomacentrid fish *Abudefduf vaigiensis* at Kuchinoerabu island. *Jap.J.Ecol.* 40(1): 7-17.

Guzman, H.M., and D.R. Robertson. 1989. Population and feeding responses of the corallivorous pufferfish *Arothron meleagris* to coral mortality in the Eastern Pacific. *Mar. Ecol. Progr. Ser.* 55:121-131.

Guzman, H.M. and Lopez.1991. Diet of the corallivorous putterfish *Arothron meleagris* (Pisces : Tetraodontidae) at Gorgona Island, Colombia. *Rev.Biol.Trop* .39(2): 203-206.

Haight, W.R. 1989. Trophic relationships, density and habitat associations of deepwater snappers (Lutjanidae) from Penguin Bank (Hawaii). *M. Sc. Thesis University of Hawaii*, 86 p.

Hara, S., H. Kohno, M. Duray, T. Bagarinao, A. Gallego and Y. Taki. 1986. Feeding habits of larval rabbitfish *Siganus guttatus* in the laboraory. *In* Maclean, J.L., L.B. Dizon and L.V. Hosillos (eds.) *The First Asian Fisheries Forum Asian Fisheries Society Manila Philippines* :573-576

Harmelin-Vivien, M.L., and C. Bouchon. 1976. Feeding behavior of some carnivorous fishes (Serranidae and Scorpaenidae) from Tuléar (Madagascar). *Mar. Biol.* 37(4):329-340.

Harmelin-Vivien, M.L. 1979. Ichtyofaune des récifs coralliens de Tuléar (Madagascar) : écologie et relations trophiques. *Thèse Docteur es Sciences Université Aix Marseille II* XXXp.

Hayes, T.A., T.F. Hourrigan, S.C. Jazwinski, S.R. Johnson, J.D. Parrish and D.J. Walsh. 1982. The coastal resources, fisheries and fishery ecology of Puako, West Hawaii. *Hawaiian cooperative fishery research unit Technical Report* 82 (1), 159 p. + 13 appendices

Helfrich P., Piyakernchana, P.S. and Miles. 1968. The ecology of ciguateric reef fishes in the Line Islands. *Occas.Pap. Bernice P.Bishop Museum. Hawaii* 23: 305-369.

Hiatt, R.W. 1944. Food-chains and the food cycle in hawaiian fish ponds.-Part I. The food and feeding habits of mullet (*Mugil cephalus*), milkfish (*Chanos chanos*) and the ten-pounder (*Elops machnata*). *Trans. Am. Fish. Soc.* 74:250-261.

Hiatt, R.W., and D.W. Strasburg. 1960. Ecological relationships of the fish fauna on coral reefs of the Marshall islands. *Ecol. Monographs* 30(1):65-127.

Hida, T.S., and J.H. Uchiyama. 1977. Biology of the baitfishes *Herklotsichthys punctatus* and *Pranesus pinguis* in Majuro, Marshall Islands. *NOAA tech. Rep. NMFS, circ.* 408:63-68.

Hobson, E.S. 1974. Feeding relationships of teleostean fishes on coral reefs in Kona, Hawaii. *Fish. Bull.* 72(4):915-1031.

Hobson, E.S., and J.R. Chess. 1973. Feeding oriented movements of the Atherinid fish *Pranesus pinguis* at Majuro Atoll, Marshall Islands. *Fish. Bull.* 71(3):777-786.

Hobson, E.S., and J.R. Chess. 1978. Trophic relationships among fishes and plankton in the lagoon at Enewetak atoll, Marshall Islands. *Fish. Bull.* 76(1):133-153.

Hourigan, T.F., T.C. Tricas and E. Reese. 1988. Coral reef fishes as indicators of environmental stress in coral reefs. *In* Soule, D.F., and G.S. Kleppel (eds.) *Marine organisms as indicators.* Springer Verlag New York Inc. :107-135.

Humphreys, R.L., and S.H. Kramer. 1984. Ciguatera and the feeding habits of the greater amberjack *Seriola dumerili* in the Hawaian archipelago. *Proc. Res. Inv. NWHI University Hawaii* 84-01:237-264.

Jayabalan, Ramamoorthi1985. Food and feeding habits of the silverbelly, *Gazza minuta* (Bloch) in Porto Novo Waters. *Indian-J.-Mar.-Sci.,* 14(2) : 110-112.

St John, J. 1999. Ontogenic changes in the diet of the coral reef grouper Plectropomus leopardus (Serranidae) : patterns in taxa, size and habitat of prey. *Mar.Ecol.Prog.Ser.* 180: 233-246.

Jones, R.S. 1968. Ecological relationships in Hawaiian and Johnston Island Acanthuridae (surgeonfishes). *Micronesica* 4(2):309-361.

Kingsford1992. Spatial and temporal variation in predation on reef fishes by coral trout (*Plectropomus leopardus*, Serranidae). *Coral Reefs.* 11(4): 193-198.

Konchina, Y.V. 1978. Some data on the biology of grunts (family Pomadasydae). *J. Ichthyol.* 17(4):548-558.

Kume, Yamaguchi, Taniuchi.1999. Feeding habits of the cardinalfish *Apogon lineatus* in Tokyo Bay, Jap. Fish. Sci. 65(3): 420-423.

Kuthalingham, M.D.K., G. Luther and J.J. Joel. 1973. On some growth stages and food of *Arothron stellatus. Ind. J. Fish.* 20(1):240-243.

Le Mao, P. 1986. Feeding relationships between the benthic infauna and the dominant benthic fish of the Rance estuary (France) *J. Mar. Biol. Ass. U.K.* 66:391-401.

Letourneur, Y., Galzin, R. and M.L. Harmelin-Vivien.1997. Temporal variations in the diet of the damselfish *Stegastes nigricans* (Lacepède) on a Reunion fringing reef. *J.Exp.Mar.Biol.Ecol.* 217(1): 1-18.

Lowe, Wetherbee, Crow, Tester.1996.Ontogenetic dietary shifts and feeding behavior of the tiger shark, *Galeocerdo cuvier*, in Hawaiian waters. Environ.Biol.Fish 47(2): 203-211.

Lundberg, B., and Y. Lipkin. 1979. Natural food of the herbivorous rabbitfish (*Siganus* spp.) in the northern Red Sea. *Bot. Mar.* 22(3):173-181.

Luther, G. 1962. The food habits of *Liza macrolepis* (Smith) and *Mugil cephalus* Linnaeus (Mugilidae). *Ind. J. Fish.* 9(2):605-626.

Maciolek, J.A. 1981. Consumer trophic relations in a tropical insular estuary. *Bull. Mar. Sci.* 31(3):702-711

Marais, J.F.K. 1984. Feeding ecology of major carnivorous fish from four eastern Cape estuaries. *S. Afr. J. Zool.* 19(3):210-223.

Marchal, E., B. Stequert, A. Intes, J.L. Cremoux and B. Piton. 1981. Ressources pélagiques et démersales des îles Seychelles. *Résultats de la 2ème campagne du N.O. Coriolis (août-septembre 1980). ORSTOM : Paris*, 53 p.

McAfee, Morgan.1996. Resource use by five sympatric parrotfishes in the San Blas Archipelago, Panama. *Mar.Biol.* 125(3): 427-437.

Milton, D.A., S.J.M. Blaber and J.F. Rawlinson. 1990. Diet and prey selection of six species of tuna bait fish in three coral reef lagoons in the Salomon Islands. *J. Fish. Biol.* 37:205-224.

Milton, D.A., S.J.M. Blaber and J.F. Rawlinson. 1990. Diet and prey selection of six species of tuna baitfish in three coral reef lagoons in the Solomon Islands. *J.Fish.Biol.* 37(2) : 205-224.

Milton, D.A., S.J.M. Blaber and J.F. Rawlinson. 1994. Diet, prey selection and their energetic relationship to reproduction in the tropical herring *Herklotsichthys quadrimaculatus* in Kiribati, Central Pacific *Mar.Ecol.Prog.Ser.*103(3): 239-250.

Monkolprasit, S., and K. Lewmanomont. 1987. The determination of food in digestive tracts of some coral reef fishes from Phuket island, Thailand. *16th Pac. Sci. Cong., Seoul, Korea, August 20-30 1987*, 16 p. + 5 pl.h.t. (available from author only)

Montgomery, W.L., A.A. Myrberg and L. Fisherson. 1989. Feeding ecology of surgeon fishes (*Acanthuridae*) in the Northern Red Sea with particular reference to *Acanthurus nigrofuscus. J. Exp. Mar. Biol. Ecol.* 132:179-207.

Morton, R.M., B.R. Pollock and J.P. Beumer. 1987. The occurence and diet of fishes in a tidal inlet to a saltmarsh in southern Moreton Bay, Queensland. *Austr. J. Ecol*. 12:217-237.

Motta1985. Functional morphology of the head of Hawaiian and Mid-Pacific butterfly-fishes (Perciformes, chaetodontidae). *Envir.Biol.Fish* 13(4): 253-276.

Motta1988Functional morphology of the feeding apparatus of ten species of Pacific butterflyfishes (perciformes, Chaetodontidae) : an ecomorpological approach *Envir.Biol.Fish* 22(1): 39-67.

Myers, R.F. 1989. *Micronesian reef fishes*. Coral Graphics :Guam (USA), 298 p.

Noble, A. 1962. The food and feeding habits of the Indian mackerel (*Rastrelliger kanagurta*) at Karwar. *Ind. J. Fish.* 9A(2):701-713.

Norris, J.E. 1985. Trophic relationships of piscivorous coral reef fishes from the northwestern Hawaiian Islands. *M. Sc. Thesis University of Hawaii (USA)*, 71 p.

Norris, J.E., and J.D. Parrish. 1988. Predator-prey relationships among fishes in pristine coral reef communities. *Proc. 6th Int. Coral Reef Symp. Townsville Aust. Aug. 1988* 2:107-113.

Oda, D.K., and J.D. Parrish. 1982. Ecology of commercial snappers and groupers introduced to Hawaiian reefs. *Proc. 4th Int. Coral Reef Symp. Manila 1981* 1:59-67.

Odum, W.E 1968. The ecological significance of fine particle selection by the stripped mullet *Mugil cephalus*. *Limnol. Oceanogr.* 13 :92-97.

Odum, W.E 1970. Utilization of the direct grazing and plant detritus food chains by the stripped mullet *Mugil cephalus*. *In* Steele, J.H. (ed.) *Marine food chains*, Oliver and Boyd : Edimburgh (Scottland) :222-240.

Odum, W.E., and E.J. Heald. 1972. Trophic analysis of an estuarine mangrove community. *Bull. Mar. Sci.* 22 (3):671-738.

Ogden, J.C., and P.S. Lobel. 1978. The roles of herbivorous fishes and urchins in coral reef communities. *Env. Biol. Fish.* 3(1):49-63.

Ong, T.L., and A. Sasekumar. 1984. The trophic relationship of fishes in the shallow waters adjoining a mangrove shore. *Proc. As. Symp. Mangrove Env. Res. & Manag.* : 453-456.

Palomares, Garces, Q.P. SIA III, Vega. 1997. Diet composition and daily ration estimates of selected trawl-caught fishes in San Miguel Bay, Philippines. *Naga* 20(2) : 35-40.

Parmentier E., Chardon M., Poulicek M., Busser JC, and P. Vandewalle. 1999. Morphological particularities of the head in four carapidae (ophidiiformes). *Proc. 5th Indo Pacific Fish Conf., Nouméa, New Caledonia, 3-8 november 1997*, Seret,-B.-(ed.); Sire, -J.Y.(ed.) Paris France société française d'ichtyologie pp. 135-146.

Parrish, J.D personal communication Hawaii Cooperative Fishery Research Unit data base

Parrish, J.D. 1987b. The trophic biology of snappers and groupers. Chapitre 9 *in* Polovina, J.J., and S. Ralston (eds.) : *Tropical snappers and groupers : biology and fishery management.* Westview Press: Boulder (USA) : 405-464.

Parrish, J.D., M.W. Callahan and J.E. Norris. 1985. The trophic relationships that structure reef communities. *Proc. 5th Int. Coral Reef Congr. Tahiti* 85 4:73-78.

Parrish, J.D., J.E. Norris, M.W. Callahan, J.K. Callahan, E.J. Magarifuji and R.E. Schroeder. 1986. Piscivory in a coral fish reef community. *In* Simenstad, C.A., and G.M. Cailliet (eds.) *Contemporary studies on fish feeding.* Dr. Junk Publisher Dordrecht Nederland :285-297.

Parrish, J.D., R.,Radtke, S.,Ralston and A.E. Sudekum.1991. Life history and ecology of large jacks in undisturbed, Shallow, Oceanic communities. *Fish.Bull.* 89(3) : 493-513 .

Pawlik, Kernan, Molinski, Harper, Faulkner.1988. Defensive chemicals of the spanish dancer nudibranch *Hexabranchus sanguineus* and its egg ribbons : macrolides derived from a sponge diet. *J.Exp.Mar.Biol.Ecol.* 119(12): 99-109.

Pietsh, T.W., and D.B. Grobecker. 1987. *Frogfish of the world Systematics, zoogeography and behavioral ecology.* Standford University Press - Standford USA, 420 p.

Pinto, L. 1987. Environmental factors influencing the occurence of juvenile fish in the mangrove of Pagbilao, Philippines. *Hydrobiologia* 150:283-301.

Pitts1991. Comparative use of food and space by three Bahamian butterflyfishes. Bull.Mar.Sci. 48(3): 749-756.

Polunin, N.V.C. 1988. Efficient uptake of algal production by a single resident herbivorous fish on the reef. *J. Exp. Mar. Biol. Ecol.* 123:61-76.

Polunin, N.V.C, M.L. Harmelin-Vivien and R. Galzin. 1995. Contrasts in algal food processing among five herbivorous coral-reef fishes. *J.Fish Biol.* 47(3) : 455-465.

Prabhu, M.S. 1955. Some aspects of the biology of the ribbonfish *Trichiurus haumela* (Forskall). *Ind. J. Fish.* 2(1):132-163.

Radhakrishnan, N. 1957. A contribution to the biology of the Indian sand whiting *Sillago sihama* (Forskal). *Ind. J. Fish.* 4(2):254-283.

Randall, H.E., and G.R. Allen. 1977. A revision of the damselfish genus *Dascyllus* with description of a new species. *Rec. Aust. Mus.* 31(9):349-385.

Randall, J.E. 1955a. Fishes of the Gilbert Islands. *Atoll Res. Bull.* 47, 243 p.

Randall, J.E. 1955b. A revision of the surgeon fish genus *Ctenochaetus* family *Acanthuridae* with description of five new species. *Zoologica* 40(4):149-165.

Randall, J.E. 1958. A review of the labrid fishes of the genus *Labroides* with description of two new species and notes on ecology. *Pacific Sci.* 12(4):327-347.

Randall, J.E. 1961. A contribution of the biology of the convict surgeonfish of the Hawaian islands *Acanthurus triostegus sandvicensis. Pacific Sci.* 15(2):215-272.

Randall, J.E. 1963. Review of the hawkfishes (family *Cirrhitidae*). *Proc. U.S. Nat. Mus. Smithson. Instit.* 114(3472): 389-451.

Randall, J.E. 1967. Food habits of reef fishes of the West Indies. *Stud. Trop. Oceanogr.* 5:665-847.

Randall, J.E. 1972a. A revision of the labrid genus *Anampses* . *Microsenica* 8(1-2):151-195.
Randall, J.E. 1972b. Hawaiian trunkfishes of the genus *Ostracion*. *Copeia* 4:756-768.
Randall, J.E. 1974. The effects of fishes on coral reefs. *Proc. 2nd Int. Coral Reef Symp. Brisbane 1974* 1:159-166.
Randall, J.E. 1976. A review of the Hawaiian labrid fishes of the genus *Coris*. *U. O.* 26:1-10
Randall, J.E. 1980. A survey of ciguatera at Enewetak and Bikini, Marshall Islands, with notes on the systematics and food habits of ciguatoxic fishes. *Fish. Bull.* 78(2):201-249.
Randall, J.E. 1981. Revision of the labrid genus *Labropsis* with description of five new species. *Micronesica* 17(1-2):125-155.
Randall, J.E. 1982. A review of the labrid fish genus *Hologymnosus. Rev. Franc. Aquar. Herpet.* 1:13-19.
Randall, J.E. 1983a. *Red Sea reef fishes*. Immel : London (Angleterre), 192 p.
Randall, J.E. 1983b. A review of the fishes of the subgenus *Goniistius*, genus *Cheilodactylus* with description of a new species from Eastern Island and Rapa. *Occ. Papers Bernice Bishop Museum Hawaii* 25(7): 24 p.
Randall, J.E. 1985. *Guide to Hawaiian reef fishes.* Harrowood Books : Newton Square (USA), 79 p.
Randall, J.E. 1984. A new labrid fish of the genus *Thalassoma* from the Pitcairn group with a review of related Indo Pacific species *J. Aquariculture & Aquatic Sci.* 4 (2):13-32.
Randall, J.E. 1992. Review of the biology of the tiger shark (*Galeocerdo cuvier*). *Aust.J.Mar.Freshw.Res*. 43 : 21-31.
Randall, J.E. 1995. A review of the triplefin fishes (perciformes : blennioidei : tripterygiidae) of Oman, with descriptions of two new species of *Enneapterygius*. *Rev. Fr. Aquariol.* 22 (1-2): 27-34.
Randall, J.E. 1995. A review of the wrasses of the genus *Cirrhilabrus* (perciformes : Labridae) from the western Indian Ocean. *Rev. Fr. Aquariol.* 22 (1-2): 19-26.
Randall, J.E. 1996. Two new soles of the genus *Aseraggodes* (Pleuronectiformes : Soleidae) from the Hawaiian Islands. Pac.Sci. 50(4): 427-440.
Randall, J.E., and A. Ben Tuvia. 1983. A review of the groupers (Pisces : Serranidae : *Epinephelinae*) of the Red sea with description of a new species of *Cephalopholis. Bull. Mar. Sci.* 33(2):373-426.
Randall, J.E., and A. Kunzmann. 1998. *Cirrhilabrus adornatus,* a new species of labrid fish from Sumatra. *Rev. Fr. Aquariol.* 25 (1-2): 41-44.
Randall, J.E., and A. Nahacky. 1988. The keyhole angelfish. *Aquarium* 4:6-7.
Randall, J.E., and D.F. Hoese. 1985. Revision of the Indo-Pacific dartfishes, genus *Ptereleotris* (Perciformes : Gobioidei). *Indo-Pac. Fish.* 7, 36 p.
Randall, J.E., and Golani. 1995. Review of the moray eels (Anguilliformes : Muraenidae) of the Red Sea. *Bull.Mar.Sci.* 56(3): 849-880.
Randall, J.E., and J.C. Kay. 1974. *Stethojulis axillaris* a junior synonym of the Hawaian labrid fish *Stethojulis balteata* with a key to the species of the genus. *Pac. Sci*. 28(2):101-107.
Randall, J.E., and J.K. Dooley. 1974. Revision of the Indo-Pacific Branchiostegid fish genus *Hoplolatilus* with descriptions of two new species. *Copeia* 2:457-471.
Randall, J.E., and R. Lubbock. 1981. A revision of the Serranid fishes of the subgenus *Mirolabrichthys* (*Anthiinae: Anthias*) with description of five new species. *Nat. Hist. Mus. Los Angeles Contrib. Sci.* 333:1-27.

Randall, J.E., and R. Lubbock. 1982. Three new labrid fishes of the genus *Cirrhilabrus* from the southwestern Pacific. *Occ.Pap. Bishop Mus.Honolulu Hawaii* 25(2):1-12.

Randall, J.E., and R.H. Kuiter. 1989. *Cirrilabrus punctatus* a new species of labrid fish from the southwestern Pacific. *Rev. Fr. Aquariol.* 16(2):43-50.

Randall, J.E., and R.M. Pyle. 1989. *Cirrhilabrus scottorum* a new labrid fish from the south Pacific Ocean. *Rev. Fr. Aquariol.* 15(4):113-118.

Randall, J.E., and S.N. Swerdoff. 1973. A review of the damselfish *Chromis* from the Hawaiian islands with description of 3 new species. *Pac. Sci.* 27(4):327-349.

Randall, J.E., and W.D. Hartman. 1968. Sponge-feeding fishes of the West Indies. *Mar. Biol.* 1(3):216-225.

Randall, J.E., Bradley Tarr. 1994. *Trichonotus arabicus* (Perciformes : trichonotidae), a new species of sand diver from the Arabian Gulf and Oman. *Fauna Saudi Arabia* 14: 309-316.

Rangarajan, K. 1970. Food and feeding habits of the snapper *Lutjanus kasmira* from the Andaman Sea. *Ind. J. Fish.* 17(1&2): 43-52.

Rao, K.S. 1964. Food and feeding habits of fishes from trawl catches in the Bay of Bengal with observations on diurnal variation in the nature of the feed. *Ind. J. Fish.* 11(1):277-314.

Reese, E.S. 1977. Coevolution of corals and coral feeding fishes of the family *Chaetodontidae. Proc. 3rd Int. Coral Reef Symp. Miami* :267-274.

Reese, E.S. 1978; A comparative field study of the social behavior and related ecology of reef fishes of the family Chaetodontidae. *Z. Tierpsychol.* 37(1):37-61.

Reese, E.S. 1981. Predation on corals by fishes of the family *Chaetodontidae*: implications for conservation and management of coral reef ecosystems. *Bull. Mar. Sci.* 31(3):594-604.

Rennis, D.S., and D.F. Hoese. 1985. A review of the genus *Parioglossus*, with descriptions of six new species (Pisces : Gobioidei). *Rec Austr. Mus.* 36:169-201.

Robertson, D.R., N.V.C Polinin and K. Leighton. 1979. The behavioral ecology of three Indian ocean surgeonfishes (*Acanthurus lineatus, A. leucosternon* and *Zebrazoma scopas*) : their feeding strategies, and social mating systems. *Env. Biol. Fish.* 4(2):125-170.

Ronquillo, I.A 1960 Synopsis of the biological data on Philippines sardines (*Sardinella perforata, S. fimbriata, S. sirm, S. longiceps*). *FAO Fish. Biol. Synopsis* 18(13), 28 p.

Russell, B.C. 1983. The food and feeding habits of rocky reef fish of north-eastern New Zealand. *New Zealand J. Mar. Freshw. Res.* 17:121-145.

Russell, B.C. 1985. Revision of the Indo-Pacific genus *Suezichthys*, with descriptions of four new species. *Indo-Pac. Fish.* 2, 21 p.

Sainsbury, K.J., and A.W. Whitelaw. 1984. Biology of Peron's threadfin bream *Nemipterus peronii* from the north west shelf of Australia. *Aust. J. Mar. Freshw. Res.* 35:167-185.

Salini, J.P., S.J.M. Blaber and D.T. Brewer. 1990. Diets of piscivorous fishes in a tropical australian estuary, with special reference to predation on penaeid prawns. *Mar. Biol.* 105:363-374.

Salini, J.P., S.J.M. Blaber and D.T. Brewer. 1992. Diets of sharks from estuaries and adjacent waters of the North-eastern Gulf of Carpentaria, Australia. Aust.J.Mar.Freshw.Res. 43 (1) : 87-96.

Salini, J.P., S.J.M. Blaber and D.T. Brewer. 1994. Diets of trawled predatory fish of the gulf of Carpentaria, Australia, with particular reference to predation on prawns Aust.J.Mar.Freshw.Res. 43(3):397-411.

Sammarco, P.W., J.H. Carlston and M.J. Risk. 1986. Effects of grazing and damselfish territoriality on bioerosion of dead corals : direct effects. *J. Exp. Mar. Biol. Ecol.* 98:1-19.

Sano, M. 1989. Feeding habits of japanese butterfly fishes (*Chaetodontidae*). *Env. Biol. Fish.* 25(1-3):195-203.

Sano, M., M. Shimizu and Y. Nose. 1984. Food habits of the teleostean reef fishes in Okinawa Island, southern Japan. *Univ. Mus. Univ. Tokyo Bull.* 25, 128 p.

Sano, M.1993. Foraging activities and diets of males and females in a haremic sandprech (Pisces : *Pinguipedidae*). *Mar.Ecol.Prog.Ser.* 98: 55-59.

Santa, T., and C.C. Peng. 1973. Studies on the feeding habits of red snappers *Lutjanus sanguineus* and *L.sebae*. *SEAFDEC/SCS* 73:S11:63-66.

Sasekumar, A., T.L. Ong and K.L. Thong. 1984. Predation of mangrove fauna by marine fishes. *Proc. As. Symp. Mangrove Env. Manag.*: 378-384.

Schmidt, T.W. 1989. Food habits, length-weight relationship and condition factor of young great barracuda, *Sphyraena barracuda* (Walbaum), from Florida Bay, Everglades national park, Florida. *Bull. Mar. Sci.* 44(1):163-170.

Seki, M.P., and McCallahan.1988. The feeding habits of two deep slope snappers, pristipomoides zonatus and p. auricilla, at pathfinder reef, Mariana archipelago. *Fish.-Bull.* 86(4), pp. 807-811.

Seki, M.P. 1984. The food and feeding habits of the white trevally, *Pseudocaranx dentex* in the northwestern Hawaiian islands. *Proc. Res. Inv. NWHI University Hawaii* 84-01:192-208.

Shao, K.T., and S.R. Kuo. 1989. Feeding ecology of the damselfishes from the southern part of Taiwan. *3rd Indo-Pac. Fish. Conf. Wellington New Zealand 27nov.- 2 dec. 1989*

Shibuno, Hashimoto, Gushima.1994. Changes with growth in feeding habits and gravel turning behavior of the wrasse, *Coris gaimard*. *Jap.J.Ichthyol.* 41(3):301-306.

Shirai, S. 1986. *Ecological encyclopedie of the marine animals of the Indo-Pacific.* Vol. 1 *Vertebrata* (Mammals. Reptiles. Fishes). Shin Nippon Kyoiku Tosho : Tokyo (Japon), 352 p.

Shpigel, Fishelson.1989. Food habits and prey selection of three species of groupers from the genus *Cephalopholis* (serranidae : Teleostei). *Envir.Biol.Fish* 24(1): 67-73.

Shubnikov, D.A. 1977. A coastal-estuarine community of fishes of the north Indian Ocean and the ecological relationships of its components. *J. Ichthyol*. 17(5):693-709.

Simpfendorfer.1992. Biology of tiger shark (*Galeocerdo cuvier*) caught by the Queensland shark meshing program off Townsville, Australia. *Aust.J.Mar.Freshw.Res*. 43(1): 33-43.

Smith M.M., Salini, J.P., and S.J.M. Blaber. 1991. Food intake and growth in the Moses perch, *Lutjanus russelli* (Bleeker), with reference to predation on penaeid prawns. *J.Fish Biol.* 38: 897-903.

Smith, M.M., and P.C. Heemstra. 1986. *Smith's sea fishes.* Springer Verlag Berlin New York Paris London, 1047 p.

Sorden, C.T. 1982. Trophic relationships of goatfishes (family Mullidae) in the Northwestern Hawaiian Islands. *M. Sc. Thesis University of Hawaii (USA)*, 86 p.

Springer, V.G., and J.E. Randall. 1974. Two new species of the labrid genus *Cirrhilabrus* from the Red sea. *Israel J. Zool.* 23:45-54.

Springer, V.G., and W.F. Smith-Vaniz. 1972. Mimetic relationships involving fishes of the family *Blenniidae. Smithson. Contrib. Zool.* 112, 36 p.

Starnes, W.C. 1988. Revision, phylogeny and biogeographic comments on the circumtropical marine percoid fish family Priacanthidae. *Bull. Mar. Sci.* 43(2):117-203.

Steen, R.C. 1977. *Butterflyfishes and angelfishes*. Mergus Verlag : Melle (RFA), 143 p.

Stevens, J.D., and J.M. Lyle. 1989. Biology of three hamerhead sharks (*Eusphyra blochii, Sphyrna mokarran* and *S. lewini*) from northern Australia. *Austr. J. Mar. Freshw. Res.* 40:129-146.

Stevens, J.D., and McLoughlin.1991. Distribution, size and sex composition, reproductive biology nad diet of sharks from Northern Australia. *Aust.J.Mar.Freshw.Res.* 42(2): 151-199.

Stiwell, and Kohler. 1993. Food habits of the sanbar shark *Carcharhinus plumbeus* off the U.S northeast coast, with estimates of daily ration *Fish.Bull. U.S*. 138-150.

Sturn, and Horn.1998. Food habits, gut morphology and pH, and assimilation efficiency of the zebraperch *Hermosilla azurea*, an herbivorous kyphosid fish on temperate marine waters *Mar.Biol.* 132(3): 512-522.

Sudekum, A.E. 1984. Growth, feeding and reproduction of *Caranx ignobilis* and *Caranx melampygus* from the Northwestern Hawaiian Islands. *M Sc. Thesis University of Hawaii (USA)*, 53 p.

Sumpton, and Greenwood.1990. Pre- and post-food feeding ecology of four species of juvenile fish from the Logan-Albert estuarine system, Moreton Bay, Queensland. *Aust.J.Mar.Freshw.Res.* 41(6): 795-806.

Swerdloff, S.N. 1970. Behavior observations on Eniwetak damselfishes (*Pomacentridae : Chromis*) with special reference to the spawning of *Chromis caeruleus. Copeia* 2:371-374.

Talwar, P.K. 1962. Studies on the food and feeding relationships of the halfbeak fishes (*Hemirhamphidae*) from the Gulf of Mannar and Palk Bay. *Ind. J. Fish.* 9(1):1-9.

Ter Kuile, C. 1989. The forage base of some reef fishes in the Flores sea with notes on sampling and fishery. *Netherland J. Sea Res.* 23(2):171-179.

Tham, A.K. 1950. The food and feeding relationships of the fishes of Singapore Straits. *Colonial Office Fish. Publ. London* 1(1), 35 p.

Thomson, J.M. 1959. Some aspects of the ecology of Lake Macquarie, N.S.W., with regard to an alledged depletion of fish. IX. The fishes and their food. *Aust. J. Mar. Freshw. Res.* 10(3):365-374.

Thong, K.L., and A. Sasekumar. 1984. The trophic relationships of the fish community of the Angsa bank, Selangor, Malaysia. *Proc. As. Symp. Mangrove Env. Res. & Manag.* : 385-399.

Tiews, K, I.A. Ronquillo and P. Caces Borja. 1970. On the biology of the roundscads (*Decapterus*) in the Philippine waters. *Proc. Indo-Pac. Fish. Counc.* 13(2):82-106.

Tiews, K., P. Divino, I.A. Ronquillo and J. Marquez. 1973. On the food and feeding habits of eight species of *Leiognathus* found in Manila Bay and San Miguel Bay. *Philipp. J. Fish.* 11(1-2):62-72.

Toor, H.S. 1964. Biology and fishery of the pig-face bream, *Lethrinus lentjan* Lacépède. I. Food and feeding habits. *Ind. J. Fish.* 11(2):559-580.

Toriyama, M. 1958. On diurnal rythm in the feeding activity of *Saurida undosquamis* and *Upeneus bensasi. Report of Nankai Region Fish Research Lab.* 9:84-90.

Tsuda, R.T. and G. Bryan. 1973. Food preference of juvenile *Siganus rostratus* and *Siganus spinus* in Guam. *Copeia* 3:604-606.

Tsuda, R.T., W.J. Tobias, P.G. Bryan, W.J. Fitzgerald, H.T. Kami Jr. and I.I. Ikehara. 1976. Studies on the genus *Siganus* (rabbitfishes) in Guam waters. *Univ. Guam mar. Lab. tech. Rep.*, 29, 93 p.

Uchida, R.N., and J.H. Uchiyama. 1986. Fishery atlas of the northwestern Hawaiian islands. *NOAA tech. Rep. NMFS*, 38, 142 p.

Van der Spiegel, D., and T. Jangoux. 1989. La symbiose entre poissons *Carapidae* et Holothuries autour de l'île de Laing (Mer de Bismarck- PNG) *Indo-Malayan Zool.* 6:223-228.

Venkataram, G. 1960. Studies of the food and feeding relationships of the inshore fishes off Calicut on the Malabar coast. *Ind. J. Fish.* 7(2):275-306.

Vigliola,L., R., Galzin, M.L., Harmelin-Vivien, Mazeas and B. Salvat.1996. Les heterocongrinae (Teleostei : *Congridae*) de la pente externe de Moorea (île de la Société, Polynésie Française) : distribution et biologie. *Cybium* 20(4): 379-393.

Vivien, M.L. 1973. Contribution à la connaissance de l'éthologie alimentaire de l'ichthyofaune du platier interne des récifs coralliens de Tuléar (Madagascar). *Tethys* suppl. 5:221-308.

Vivien, M.L. 1975. Place of Apogonid fish in the food webs of a Malagasy coral reef. *Microsenica* 11(2):185-198.

Wahbeh,1992. The food and feeding habits of the goatfishes, *Mulloides flavolineatus* and *Mulloides vanicolensis* in the Gulf of Aqaba, Jordan. *Senckenbergiana Maritima* 22(3/6): 245-254.

Walker, M.H. 1975. Aspects of the biology of emperor fishes, family *Lethrinidae*, in north Queensland Barrier Reef waters. *Ph. D. Thesis James Cook University of North Queensland (Australia)*, 242 p.

Walker, M.H. 1978. Food and feeding habits of *Lethrinus chrysostomus* Richardson (pisces : perciformes) and other lethrinids on the great barrier reef. Aust.J.Mar.Freshw.Res 29(5): 623-630.

Wells.1984. The food of the grey mullet (*Mugil cephalus L.*) in lake Waahi and the Waikato river at Huntly. *N.Z.J.Mar.Freshw.Res.* 18(1):13-19.

Westneat, M.W., and J.M. Resing. 1988. Predation on coral spawn by planktivorous fishes. *Coral reefs* 7:89-92.

Wetherbee, Crow, Lowe.1997. Distribution, reproduction and diet of the gray reef shark *Carcharhinus amblyrhynchos* in Hawaii. *Mar.EcoL.Prog.Ser.* 151(1-3): 181-189.

Wetherbee, Lowe, Crow.1994. A review of shark control in Hawaii with recommendations for future research. Pac.Sci. 48(2): 95-115.

Whitfield, A.K. 1980. A quantitative study of the trophic relationships within the fish community of the Mhlanga estuary, South Africa. *Estuar. Coast. Mar. Sci.* 10: 417-435.

Wijeyaratne, M.J.S., and H.H. Costa.1990. Food and feeding of two species of grey mullets *Valamugil buchanani* (Bleeker) and *Liza vaigiensis* (Quoy and Gaimard) inhabiting brackishwater environments in SriLanka. *Indian J.Fish.* 37(3): 211-219.

Wijeyaratne, M.J.S., and H.H. Costa. 1986. On the biology of an estuarine population of grey mullet, *Mugil cephalus* L., in Negombo lagoon, Sri Lanka. *Cybium* 10(4):351-363.

Williams, D.McB., and A.I. Hatcher. 1983. Structure of fish communities on outer slopes of inshore, mid-shelf and outer shelf reefs of the Great Barrier Reef. *Mar. Ecol. Progr. Ser.* 10:239-250.

Wilson, and D.Bellwood. 1997. Cryptic dietary components of territorial damselfishes (*Pomacentridae, Labroidei*) *Mar. Ecol. Progr. Ser.* 153: 299-310.

Wright, A., P.J. Dalzell and H. Richards. 1986. Some aspects of the biology of the red bass *Lutjanus bohar* (Forsskal) from the Tigak Islands, Papua New Guinea. *J. Fish. Biol.* 28:533-544.

Wright, J.M. 1988. Recruitement patterns and trophic relationships of fish in Sulaibikhat Bay, Kuwait. *J. Fish. Biol.* 33:671-687.

Table CR1: Number of species per family, size class, diet, home range, activity, schooling, geographical range for each country or region. See coding at the end of the Table.

Family	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapingamangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
ACANTHURIDAE	33	13	37	29	36	27	39	34	36	38	23	31	18	21	19	20	35	24	38	24	32	26	35	39	40	34	22	28	23	16	31	31	21
APOGONIDAE	72	23	85	47	80	27	57	54	70	50	18	30	32	18	28	18	38	14	21	45	40	39	79	108	102	10	12	20	19	23	28	25	15
BALISTIDAE	17	6	18	9	18	10	18	16	17	18	11	18	10	9	5	12	16	7	14	11	15	11	14	19	17	16	6	10	11	8	15	14	9
BLENNIIDAE	66	27	68	21	57	26	59	58	48	41	13	26	22	9	25	17	38	10	30	25	51	26	40	83	81	19	4	23	20	17	29	27	19
CAESIONIDAE	12	3	13	9	11	11	13	6	10	9	6	6	2	4	6	2	6	0	6	6	7	11	12	14	15	1	1	1	2	1	2	2	1
CARANGIDAE	37	7	34	12	34	14	35	30	29	23	12	19	5	11	9	10	21	12	25	7	23	18	22	49	49	21	15	18	14	14	18	18	10
CARCHARHINIDAE	15	4	13	7	13	6	9	5	7	9	5	3	4	4	6	4	9	4	9	1	9	10	11	16	16	8	7	8	8	2	9	10	5
CHAETODONTIDAE	35	14	33	24	33	32	35	34	39	33	21	21	19	28	24	30	32	17	28	30	30	34	43	50	43	27	22	24	15	22	28	28	20
CIRRHITIDAE	11	5	10	5	10	6	13	13	11	11	4	5	8	6	5	0	9	8	6	4	8	7	8	11	12	10	6	8	7	6	9	14	11
DASYATIDAE	5	2	7	2	7	1	5	1	5	6	3	2	0	3	6	1	5	0	2	3	2	6	6	8	7	4	1	1	2	0	3	2	0
GOBIIDAE	154	43	187	44	170	56	120	120	181	116	38	26	36	15	38	14	105	22	42	70	95	73	126	203	193	24	10	41	33	40	56	35	15
GRAMMISTIDAE	5	2	6	2	6	3	9	5	7	7	1	2	2	2	5	1	7	1	3	5	6	3	6	6	7	5	1	3	3	1	5	5	3
HAEMULIDAE	8	0	10	3	10	5	10	2	10	9	4	7	2	4	1	3	2	1	0	1	4	7	11	15	15	0	1	1	0	1	2	1	0
HOLOCENTRIDAE	28	18	29	21	29	19	26	27	27	25	11	23	21	16	21	11	24	17	16	20	30	23	29	31	31	25	15	19	20	16	22	21	15
KYPHOSIDAE	3	1	4	4	4	1	3	3	2	2	2	1	0	2	0	2	2	4	2	1	3	2	2	2	3	3	5	3	5	3	3	3	2
LABRIDAE	102	30	126	77	117	78	112	85	107	88	50	43	27	42	36	33	83	47	50	57	74	77	113	134	112	64	45	53	38	36	61	62	41
LETHRINIDAE	24	10	23	16	22	17	20	15	18	20	5	18	6	12	3	8	13	4	13	7	13	19	21	27	20	11	3	6	6	4	10	9	4
LUTJANIDAE	33	8	27	11	27	14	34	23	21	16	13	11	9	12	6	11	15	5	18	13	17	28	31	39	35	16	9	8	8	5	11	9	5
MALACANTHIDAE	4	1	8	4	7	2	4	3	6	4	0	2	1	1	0	0	4	1	2	2	2	4	7	11	9	3	1	3	1	0	3	3	1
MICRODESMIDAE	16	3	18	4	17	5	12	10	21	12	4	2	4	2	6	2	11	3	4	8	10	12	18	26	20	6	3	5	5	2	10	9	2
MONACANTHIDAE	12	4	18	12	16	6	10	11	13	14	7	8	3	2	5	5	12	3	6	5	8	10	16	24	12	7	3	8	4	4	7	9	4
MULLIDAE	18	7	17	12	17	13	13	15	12	16	10	14	8	9	8	10	14	10	9	7	13	10	13	20	16	11	9	9	11	8	11	12	7
MURAENIDAE	50	8	65	20	58	20	45	42	38	46	6	30	32	6	27	2	40	16	32	30	50	7	17	52	41	22	14	26	39	15	50	29	20
NEMIPTERIDAE	6	0	10	5	9	2	11	4	11	5	2	2	1	1	2	5	4	0	2	2	4	10	14	20	17	0	0	0	0	0	0	0	0
OPHICHTIDAE	31	5	23	8	17	4	14	15	22	20	2	7	10	3	9	2	20	3	5	12	21	0	6	23	18	5	2	5	19	7	25	5	6
ORECTOLOBIDAE	2	1	2	2	2	1	1	2	2	2	2	2	1	1	2	2	2	1	1	0	2	0	3	5	5	1	1	1	1	0	1	1	0
OSTRACIIDAE	6	1	7	7	7	3	3	5	7	5	1	5	2	1	0	2	5	2	2	2	3	3	4	8	7	4	4	2	4	4	4	4	1
PINGUIPEDIDAE	6	2	13	7	11	7	3	6	6	3	2	2	0	0	1	2	2	1	2	5	3	5	9	16	7	5	1	1	1	0	2	2	3
PLATACIDAE	3	1	3	2	3	0	3	1	4	3	2	3	1	1	1	2	1	0	2	0	1	4	5	6	5	1	1	1	0	0	1	1	0
PLATYCEPHALIDAE	4	2	8	3	7	0	6	3	4	4	0	0	0	0	3	1	4	1	1	2	4	1	3	12	13	3	1	2	2	0	2	2	1
PLESIOPIDAE	7	1	8	2	8	3	10	8	5	3	1	2	2	1	2	1	3	2	2	2	4	0	4	8	10	2	0	0	0	0	0	1	0
POMACANTHIDAE	21	3	21	12	19	13	23	11	26	19	6	8	7	11	14	10	16	4	13	8	14	15	21	26	26	14	6	7	3	7	13	11	7
POMACENTRIDAE	82	32	104	53	99	73	106	76	94	70	39	49	27	40	37	40	52	22	34	58	53	89	106	125	127	39	24	34	28	22	37	40	20
PSEUDOCHROMIDA	12	4	17	7	14	9	15	9	15	9	0	4	3	4	8	1	8	4	3	8	6	8	17	28	23	1	0	2	1	0	2	2	1
SCARIDAE	26	4	28	21	28	23	30	28	34	30	21	26	10	18	13	17	26	12	22	22	25	24	28	31	28	22	12	21	6	19	19	22	10
SCOMBRIDAE	5	3	5	2	4	4	5	4	4	3	3	3	2	2	2	2	3	0	4	2	1	4	5	6	6	1	1	2	1	1	1	1	1
SCORPAENIDAE	38	11	57	25	48	20	27	17	18	24	3	13	8	3	18	3	21	6	16	16	23	8	24	51	34	20	8	18	18	13	23	15	14
SERRANIDAE	67	19	78	30	72	41	67	49	73	57	29	35	23	21	30	22	55	24	37	20	48	61	65	95	78	38	21	18	18	16	37	32	19
SIGANIDAE	12	1	11	5	11	4	14	7	12	13	8	9	3	6	7	8	5	2	5	4	3	11	12	18	13	2	2	2	1	1	2	2	1
SPHYRAENIDAE	10	1	8	2	8	3	4	5	6	5	3	1	4	0	0	3	4	1	4	1	5	5	5	8	9	5	2	4	4	2	4	4	1
SYNGNATHIDAE	34	10	36	13	33	10	22	19	28	16	4	4	4	2	12	8	16	3	6	8	18	17	23	50	37	4	4	5	2	3	13	6	1
SYNODONTIDAE	9	3	12	11	11	5	6	6	6	5	4	4	4	3	5	1	4	1	2	4	3	3	7	14	9	6	3	7	4	8	8	4	4
TETRAODONTIDAE	17	5	24	10	22	8	17	16	18	17	6	13	6	6	6	5	15	10	9	8	14	9	13	23	19	13	5	9	6	5	11	10	3
TRIPTERYGIIDAE	20	20	31	9	30	19	34	23	11	11	2	1	2	1	6	0	9	2	7	9	19	6	9	34	23	1	1	3	3	5	12	6	3

Size Class	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapingamangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
< 5 cm	188	73	228	68	188	104	157	162	157	130	28	31	43	16	60	16	116	30	49	87	114	63	129	249	199	24	17	59	32	52	80	51	35
5 – 10 cm	320	92	391	147	361	152	283	222	335	228	72	99	81	75	127	59	199	73	92	138	206	186	281	447	417	102	47	90	87	69	132	112	70
10-20 cm	279	84	362	175	333	166	286	227	298	243	113	124	101	98	127	101	195	71	127	145	200	196	288	413	349	139	81	116	85	83	164	136	80
20-40 cm	289	94	315	181	298	172	290	233	276	260	121	201	128	127	133	127	226	105	173	156	235	209	279	386	330	184	108	140	131	112	192	168	112
40-80 cm	145	38	151	78	149	78	133	115	130	121	64	89	47	49	41	54	110	47	101	56	113	100	127	197	166	92	54	68	75	59	93	81	42
> 80 cm	109	31	108	43	107	36	83	68	86	75	41	54	34	31	43	31	64	32	61	38	67	57	64	121	120	59	40	47	52	24	63	55	29
ALL	1337	414	1569	697	1446	714	1237	1031	1284	1061	439	601	435	396	531	388	913	359	604	624	940	811	1176	1824	1595	603	349	521	466	403	728	604	370

Home Range	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapingamangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
S	812	265	983	393	881	421	740	624	794	620	200	287	260	187	327	177	549	190	306	404	559	428	677	1092	965	288	161	292	267	218	447	335	211
M	309	105	362	216	347	208	316	265	307	279	159	200	123	139	138	142	238	118	182	166	231	251	333	444	368	204	121	154	120	128	177	176	111
W	213	42	214	87	208	84	179	141	180	159	80	111	51	70	66	69	125	50	115	52	147	131	163	281	258	110	66	74	78	56	103	92	48
ALL	1337	414	1569	697	1446	714	1237	1031	1284	1061	439	601	435	396	531	388	913	359	604	624	940	811	1176	1824	1595	603	349	521	466	403	728	604	370

Activity	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapingamangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
B	176	56	195	90	190	77	154	129	154	135	75	94	51	61	76	61	119	46	100	50	120	119	137	254	229	101	56	70	71	58	97	87	48
D	810	250	961	429	884	489	811	671	858	668	301	352	248	264	315	266	576	4	366	406	565	552	789	1130	997	362	210	316	241	240	411	372	217
N	344	105	400	177	359	147	268	228	268	254	63	153	135	71	139	61	215	77	138	165	249	136	245	425	361	139	83	134	154	101	219	144	104
ALL	1337	414	1569	697	1446	714	1237	1031	1284	1061	439	601	435	396	531	388	913	359	604	624	940	811	1176	1824	1595	603	349	521	466	403	728	604	370

Schooling	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapingamangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
S	735	247	922	389	826	377	672	577	686	585	190	307	236	168	308	163	523	190	322	336	533	360	558	978	840	310	171	298	273	226	443	332	226
P	81	30	79	46	79	47	68	70	88	66	39	34	31	40	41	43	59	40	44	55	60	67	86	99	93	42	28	36	26	31	45	41	23
F	248	73	258	122	245	136	237	184	248	196	97	128	86	90	88	89	163	83	114	118	152	190	261	368	320	116	71	99	81	77	118	115	61
M	174	45	188	92	180	91	171	132	173	135	71	94	55	58	47	63	109	118	89	78	121	131	180	227	215	99	55	65	57	48	84	84	43
L	86	15	102	42	97	61	84	64	81	74	42	34	26	40	47	30	57	17	33	34	65	61	83	127	111	34	22	21	24	18	37	27	14

ALL	1337	414	1569	697	1446	714	1237	1031	1284	1061	439	601	435	396	531	388	913	359	604	624	940	811	1176	1824	1595	603	349	521	466	403	728	604	370
Diet Group	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapingamangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
C	4	3	7	3	6	3	4	3	2	3	0	1	1	1	3	1	2	1	0	3	4	1	2	5	3	0	3	3	0	2	2	2	3
C1	140	41	167	80	153	75	126	102	118	122	39	**78**	59	46	52	40	108	48	75	72	101	72	111	186	148	62	41	54	57	47	85	66	51
C1C2	75	21	89	52	81	54	76	63	76	69	32	47	21	30	23	30	53	26	28	36	52	61	88	116	94	42	30	37	26	27	41	42	30
C1Co	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
C1P	85	20	108	46	97	45	68	59	60	57	11	31	18	12	28	9	51	20	35	32	60	30	51	111	85	45	17	34	36	31	50	42	25
C1Z	2	1	3	1	3	1	1	1	1	1	0	1	0	0	0	1	1	0	0	1	2	0	2	3	3	1	0	0	1	1	1	1	1
C2	149	49	199	75	174	70	128	108	154	110	29	35	35	26	67	30	102	30	41	65	103	77	126	212	186	37	17	39	36	26	61	44	28
C2C1	26	8	26	13	26	13	23	18	21	20	15	12	7	10	10	9	17	11	10	13	19	15	20	24	22	11	10	11	13	5	15	12	8
C2Co	26	11	26	17	26	24	28	24	29	25	15	16	13	19	17	23	23	9	21	21	24	28	31	35	33	18	12	16	9	10	19	19	10
C2D	67	17	89	25	82	22	51	48	91	55	19	19	17	7	22	5	50	13	26	32	40	29	53	103	83	12	6	25	22	14	39	21	8
C2H2	30	24	43	14	41	23	44	32	20	20	5	9	6	5	10	2	16	8	10	13	25	9	16	47	33	10	5	10	6	9	19	13	6
C2Z	6	1	6	5	6	3	5	4	6	5	4	2	2	2	3	3	5	1	5	3	5	4	6	7	6	4	1	1	1	3	3	3	0
Co	9	3	9	5	9	8	10	10	13	9	5	6	6	7	6	7	8	4	6	7	7	11	13	13	14	6	5	6	4	6	6	6	5
CoC2	8	4	9	5	8	3	8	4	6	5	1	4	3	0	0	1	4	1	2	1	3	4	6	6	11	1	0	1	0	7	3	2	1
CoH2	2	1	2	1	2	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	3	3	2	1	1	1	0	1	2	1	0
CZ	0	0	1	0	1	0	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	4	5	2	0	0	0	0	0	0	0	0
D	8	4	8	1	8	3	7	6	7	7	4	6	2	0	1	3	6	4	4	2	8	4	7	9	8	6	3	5	6	4	6	5	1
DC2	30	13	36	7	31	17	23	36	30	24	7	4	8	4	8	7	18	5	10	20	21	10	18	29	26	5	3	10	2	11	9	8	6
H1	5	2	9	7	9	4	6	6	5	5	2	4	1	3	1	4	5	5	5	3	5	4	5	5	6	6	8	4	7	4	5	4	3
H1H2	16	3	15	8	15	6	18	11	16	17	10	12	5	8	10	11	8	3	7	6	6	15	15	22	17	5	4	6	3	4	5	6	4
H1Z	2	1	2	1	2	1	3	3	4	3	1	1	0	1	0	1	1	1	2	1	4	2	3	4	2	4	1	1	1	0	1	2	1
H2	65	29	73	32	64	41	71	57	61	57	20	41	29	25	32	34	48	27	47	34	56	33	47	74	80	44	19	37	30	23	45	42	28
H2C2	29	11	30	18	27	19	35	27	34	26	13	20	8	10	13	12	16	9	14	18	14	30	41	50	43	10	8	13	8	7	11	12	6
H2Co	1	0	2	1	1	2	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0
H2D	48	14	48	28	45	30	51	46	50	44	25	33	17	22	24	16	40	16	31	30	42	35	44	61	60	27	15	29	13	26	27	31	17
H2Z	3	1	3	1	3	1	5	3	5	4	2	4	3	1	1	3	3	2	3	3	3	5	5	6	6	3	1	2	1	1	2	2	1
P	153	51	166	78	160	62	129	111	132	114	56	80	60	45	64	43	102	40	95	56	106	95	108	198	181	92	60	77	78	48	102	86	54
PC1	73	19	79	36	74	31	63	48	60	50	24	36	29	21	30	21	47	16	34	26	48	46	59	100	79	36	18	25	31	18	44	27	16
Z	176	34	210	91	194	105	169	130	185	142	65	59	48	66	71	44	118	36	56	81	117	133	185	247	221	79	40	43	44	35	85	68	36
ZC	56	19	66	37	64	30	49	43	53	36	21	26	24	17	25	17	34	17	26	30	40	34	64	85	85	27	17	20	22	24	26	28	16
ZC2	35	7	28	8	25	13	22	19	33	21	9	7	6	2	5	3	19	2	5	10	15	18	36	40	41	3	0	6	6	6	8	4	1
ZH1	2	1	1	0	1	0	2	3	3	4	0	2	4	1	1	2	3	1	1	1	4	0	2	3	3	4	2	3	1	1	2	3	1
ZP	1	0	1	0	1	0	1	0	1	1	1	0	0	1	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
ALL	1337	414	1569	697	1446	714	1237	1031	1284	1061	439	601	435	396	531	388	913	359	604	624	940	811	1176	1824	1595	603	349	521	466	403	728	604	370

Geographical Range	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapingamangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
1-2 sites	35	1	35	6	31	3	5	15	6	3	1	1	0	1	3	1	3	1	2	3	7	1	6	30	12	10	3	4	38	7	4	4	3
3-5 sites	33	4	58	13	53	11	26	20	21	18	3	2	3	2	4	1	15	2	2	4	11	7	17	57	36	14	10	10	8	19	16	18	19
5-10 sites	41	8	75	17	63	20	35	27	25	21	2	2	2	3	8	3	19	3	4	11	23	5	13	70	53	22	16	13	7	19	27	11	21
10-20 sites	103	16	134	49	114	42	91	60	85	42	4	8	14	6	20	6	39	15	17	23	52	28	69	177	144	25	16	25	18	30	47	31	30
20-30 sites	131	22	157	43	132	43	114	81	154	99	13	37	32	12	41	16	82	25	29	44	70	69	113	242	202	30	15	31	25	15	49	31	23
30-40 sites	142	28	179	49	163	62	152	94	164	112	32	44	34	14	58	27	92	25	38	50	75	115	171	251	215	34	13	35	31	23	52	37	23
40-50 sites	164	20	181	55	178	60	166	111	168	127	42	56	33	40	46	35	95	29	56	51	98	109	168	231	219	50	17	37	26	16	63	43	24
50-60 sites	161	34	169	77	166	81	149	130	145	147	48	76	48	41	64	39	116	36	64	61	111	96	131	176	170	48	25	48	37	28	67	58	29
60-70 sites	134	44	136	75	135	74	126	110	118	113	51	71	48	48	61	47	100	27	76	66	103	81	105	140	139	52	25	51	36	27	74	63	19
70-80 sites	106	42	105	67	104	78	103	98	97	95	52	65	43	48	50	41	82	28	73	65	90	71	93	106	106	65	29	42	33	28	62	54	23
80-90 sites	104	61	106	77	105	84	103	100	104	102	62	88	62	53	67	52	96	52	87	78	100	75	92	104	104	83	47	67	60	45	84	83	47
90-100 sites	70	39	71	58	71	58	71	69	69	69	53	63	46	49	42	47	68	40	67	55	67	56	65	71	70	64	49	64	47	51	67	67	33
100-110 sites	69	45	69	61	69	60	69	69	68	69	56	62	50	61	48	55	66	49	68	64	69	66	68	69	69	68	56	62	52	49	68	68	45
110-120 sites	21	18	21	19	21	19	21	21	21	21	17	21	18	17	14	18	21	19	21	19	21	20	21	21	21	21	21	21	21	20	21	21	21
ALL	1337	414	1569	697	1446	714	1237	1031	1284	1061	439	601	435	396	531	388	913	359	604	624	940	811	1176	1824	1595	603	349	521	466	403	728	604	370

Home Range: S: sedentary; M: mobile; W: very mobile

Activity: D: diurnal; N: nocturnal; B: both D and N

Schooling: S: single; P: paired; F: small school (3-20 fish); M: medium size school (20-50 fish); L: large school (> 50 fish)

Diet Group: C: carnivore; C1: macro-invertebrate feeder; C2: micro-invertebrate feeder; D: detritus feeder; H: herbivore; H1: macro-algae feeder; H2: micro-algae feeder; P: piscivore; Z: plankton feeder. The first letter indicates the major diet item and the second letter (if present) indicates a secondary but important diet item.

Geographical Range: a site represents a checklist where a species is present. For instance if for a country there is a value of 12 for the class 5-10 sites, this means that there are 12 species in that country which have been recorded in 5 to 10 checklists in the Indo-Pacific (on a total of 140 checklists).

Table CR2: proportion of species per family, size class, diet, home range, activity, schooling, geographical range for each country or region. See coding at the end of the Table. There is 100% per column for a given classification (e.g.family).

Family	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapinga-mangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
ACANTHURIDAE	2.5	3.1	2.4	4.2	2.5	3.8	3.2	3.3	2.8	3.6	5.2	5.2	4.1	5.3	3.6	5.2	3.8	6.7	6.3	3.8	3.4	3.2	3.0	2.1	2.5	5.6	6.3	5.4	4.9	4.0	4.3	5.1	5.7
APOGONIDAE	5.4	5.6	5.4	6.7	5.5	3.8	4.6	5.2	5.5	4.7	4.1	5.0	7.4	4.5	5.3	4.6	4.2	3.9	3.5	7.2	4.3	4.8	6.7	5.9	6.4	1.7	3.4	3.8	4.1	5.7	3.8	4.1	4.1
BALISTIDAE	1.3	1.4	1.1	1.3	1.2	1.4	1.5	1.6	1.3	1.7	2.5	3.0	2.3	2.3	0.9	3.1	1.8	2.0	2.3	1.8	1.6	1.4	1.2	1.0	1.1	2.7	1.7	1.9	2.4	2.0	2.1	2.3	2.4
BLENNIIDAE	4.9	6.5	4.3	3.0	3.9	3.6	4.8	5.6	3.7	3.9	3.0	4.3	5.1	2.3	4.7	4.4	4.2	2.8	5.0	4.0	5.4	3.2	3.4	4.6	5.1	3.2	1.1	4.4	4.3	4.2	4.0	4.5	5.1
CAESIONIDAE	0.9	0.7	0.8	1.3	0.8	1.5	1.1	0.6	0.8	0.8	1.4	1.0	0.5	1.0	1.1	0.5	0.7	0.0	1.0	1.0	0.7	1.4	1.0	0.8	0.9	0.2	0.3	0.2	0.4	0.2	0.3	0.3	0.3
CARANGIDAE	2.8	1.7	2.2	1.7	2.4	2.0	2.8	2.9	2.3	2.2	2.7	3.2	1.1	2.8	1.7	2.6	2.3	3.4	4.1	1.1	2.4	2.2	1.9	2.7	3.1	3.5	4.3	3.5	3.0	3.5	2.5	3.0	2.7
CARCHARHINIDAE	1.1	1.0	0.8	1.0	0.9	0.8	0.7	0.5	0.5	0.8	1.1	0.5	0.9	1.0	1.1	1.0	1.0	1.1	1.5	0.2	1.0	1.2	0.9	0.9	1.0	1.3	2.0	1.5	1.7	0.5	1.2	1.7	1.4
CHAETODONTIDAE	2.6	3.4	2.1	3.4	2.3	4.5	2.8	3.3	3.0	3.1	4.8	3.5	4.4	7.1	4.5	7.7	3.5	4.7	4.6	4.8	3.2	4.2	3.7	2.7	2.7	4.5	6.3	4.6	3.2	5.5	3.8	4.6	5.4
CIRRHITIDAE	0.8	1.2	0.6	0.7	0.7	0.8	1.1	1.3	0.9	1.0	0.9	0.8	1.8	1.5	0.9	0.0	1.0	2.2	1.0	0.6	0.9	0.9	0.7	0.6	0.8	1.7	1.7	1.5	1.5	1.5	1.2	2.3	3.0
DASYATIDAE	0.4	0.5	0.4	0.3	0.5	0.1	0.4	0.1	0.4	0.6	0.7	0.3	0.0	0.8	1.1	0.3	0.5	0.0	0.3	0.5	0.2	0.7	0.5	0.4	0.4	0.7	0.3	0.2	0.4	0.0	0.4	0.3	0.0
GOBIIDAE	11.5	10.4	11.9	6.3	11.8	7.8	9.7	11.6	14.1	10.9	8.7	4.3	8.3	3.8	7.2	3.6	11.5	6.1	7.0	11.2	10.1	9.0	10.7	11.1	12.1	4.0	2.9	7.9	7.1	9.9	7.7	5.8	4.1
GRAMMISTIDAE	0.4	0.5	0.4	0.3	0.4	0.4	0.7	0.5	0.5	0.7	0.2	0.3	0.5	0.5	0.9	0.3	0.8	0.3	0.5	0.8	0.6	0.4	0.5	0.3	0.4	0.8	0.3	0.6	0.6	0.2	0.7	0.8	0.8
HAEMULIDAE	0.6	0.0	0.6	0.4	0.7	0.7	0.8	0.2	0.8	0.8	0.9	1.2	0.5	1.0	0.2	0.8	0.2	0.3	0.0	0.2	0.4	0.9	0.9	0.8	0.9	0.0	0.3	0.2	0.0	0.2	0.3	0.2	0.0
HOLOCENTRIDAE	2.1	4.3	1.8	3.0	2.0	2.7	2.1	2.6	2.1	2.4	2.5	3.8	4.8	4.0	4.0	2.8	2.6	4.7	2.6	3.2	3.2	2.8	2.5	1.7	1.9	4.1	4.3	3.6	4.3	4.0	3.0	3.5	4.1
KYPHOSIDAE	0.2	0.2	0.3	0.6	0.3	0.1	0.2	0.3	0.2	0.2	0.5	0.2	0.0	0.5	0.0	0.5	0.2	1.1	0.3	0.2	0.3	0.2	0.2	0.1	0.2	0.5	1.4	0.6	1.1	0.7	0.4	0.5	0.5
LABRIDAE	7.6	7.2	8.0	11.0	8.1	10.9	9.1	8.2	8.3	8.3	11.4	7.2	6.2	10.6	6.8	8.5	9.1	13.1	8.3	9.1	7.9	9.5	9.6	7.3	7.0	10.6	12.9	10.2	8.2	8.9	8.4	10.3	11.1
LETHRINIDAE	1.8	2.4	1.5	2.3	1.5	2.4	1.6	1.5	1.4	1.9	1.1	3.0	1.4	3.0	0.6	2.1	1.4	1.1	2.2	1.1	1.4	2.3	1.8	1.5	1.3	1.8	0.9	1.2	1.3	1.0	1.4	1.5	1.1
LUTJANIDAE	2.5	1.9	1.7	1.6	1.9	2.0	2.7	2.2	1.6	1.5	3.0	1.8	2.1	3.0	1.1	2.8	1.6	1.4	3.0	2.1	1.8	3.5	2.6	2.1	2.2	2.7	2.6	1.5	1.7	1.2	1.5	1.5	1.4
MALACANTHIDAE	0.3	0.2	0.5	0.6	0.5	0.3	0.3	0.3	0.5	0.4	0.0	0.3	0.2	0.3	0.0	0.0	0.4	0.3	0.3	0.3	0.2	0.5	0.6	0.6	0.6	0.5	0.3	0.6	0.2	0.0	0.4	0.5	0.3
MICRODESMIDAE	1.2	0.7	1.1	0.6	1.2	0.7	1.0	1.0	1.6	1.1	0.9	0.3	0.9	0.5	1.1	0.5	1.2	0.8	0.7	1.3	1.1	1.5	1.5	1.4	1.3	1.0	0.9	1.0	1.1	0.5	1.4	1.5	0.5
MONACANTHIDAE	0.9	1.0	1.1	1.7	1.1	0.8	0.8	1.1	1.0	1.3	1.6	1.3	0.7	0.5	0.9	1.3	1.3	0.8	1.0	0.8	0.9	1.2	1.4	1.3	0.8	1.2	0.9	1.5	0.9	1.0	1.0	1.5	1.1
MULLIDAE	1.3	1.7	1.1	1.7	1.2	1.8	1.1	1.5	0.9	1.5	2.3	2.3	1.8	2.3	1.5	2.6	1.5	2.8	1.5	1.1	1.4	1.2	1.1	1.1	1.0	1.8	2.6	1.7	2.4	2.0	1.5	2.0	1.9
MURAENIDAE	3.7	1.9	4.1	2.9	4.0	2.8	3.6	4.1	3.0	4.3	1.4	5.0	7.4	1.5	5.1	0.5	4.4	4.5	5.3	4.8	5.3	0.9	1.4	2.9	2.6	3.6	4.0	5.0	8.4	3.7	6.9	4.8	5.4
NEMIPTERIDAE	0.4	0.0	0.6	0.7	0.6	0.3	0.9	0.4	0.9	0.5	0.5	0.3	0.2	0.3	0.4	1.3	0.4	0.0	0.3	0.3	0.4	1.2	1.2	1.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OPHICHTIDAE	2.3	1.2	1.5	1.1	1.2	0.6	1.1	1.5	1.7	1.9	0.5	1.2	2.3	0.8	1.7	0.5	2.2	0.8	0.8	1.9	2.2	0.0	0.5	1.3	1.1	0.8	0.6	1.0	4.1	1.7	3.4	0.8	1.6
ORECTOLOBIDAE	0.1	0.2	0.1	0.3	0.1	0.1	0.1	0.2	0.2	0.2	0.5	0.3	0.2	0.3	0.4	0.5	0.2	0.3	0.2	0.0	0.2	0.0	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.0	0.1	0.2	0.0
OSTRACIIDAE	0.4	0.2	0.4	1.0	0.5	0.4	0.2	0.5	0.5	0.5	0.2	0.8	0.5	0.3	0.0	0.5	0.5	0.6	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.7	1.1	0.4	0.9	1.0	0.5	0.7	0.3
PINGUIPEDIDAE	0.4	0.5	0.8	1.0	0.8	1.0	0.2	0.6	0.5	0.3	0.5	0.3	0.0	0.0	0.2	0.5	0.2	0.3	0.3	0.8	0.3	0.6	0.8	0.9	0.4	0.8	0.3	0.2	0.2	0.0	0.3	0.3	0.8

PLATACIDAE	0.2	0.2	0.2	0.3	0.2	0.0	0.2	0.1	0.3	0.3	0.5	0.5	0.2	0.3	0.2	0.5	0.1	0.0	0.3	0.0	0.1	0.5	0.4	0.3	0.3	0.2	0.3	0.2	0.0	0.0	0.1	0.2	0.0
PLATYCEPHALIDAE	0.3	0.5	0.5	0.4	0.5	0.0	0.5	0.3	0.3	0.4	0.0	0.0	0.0	0.0	0.6	0.3	0.4	0.3	0.2	0.3	0.4	0.1	0.3	0.7	0.8	0.5	0.3	0.4	0.4	0.0	0.3	0.3	0.3
PLESIOPIDAE	0.5	0.2	0.5	0.3	0.6	0.4	0.8	0.8	0.4	0.3	0.2	0.3	0.5	0.3	0.4	0.3	0.3	0.6	0.3	0.3	0.4	0.0	0.3	0.4	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.0
POMACANTHIDAE	1.6	0.7	1.3	1.7	1.3	1.8	1.9	1.1	2.0	1.8	1.4	1.3	1.6	2.8	2.6	2.6	1.8	1.1	2.2	1.3	1.5	1.8	1.8	1.4	1.6	2.3	1.7	1.3	0.6	1.7	1.8	1.8	1.9
POMACENTRIDAE	6.1	7.7	6.6	7.6	6.8	10.2	8.6	7.4	7.3	6.6	8.9	8.2	6.2	10.1	7.0	10.3	5.7	6.1	5.6	9.3	5.6	11.0	9.0	6.9	8.0	6.5	6.9	6.5	6.0	5.5	5.1	6.6	5.4
PSEUDOCHROMIDA	0.9	1.0	1.1	1.0	1.0	1.3	1.2	0.9	1.2	0.8	0.0	0.7	0.7	1.0	1.5	0.3	0.9	1.1	0.5	1.3	0.6	1.0	1.4	1.5	1.4	0.2	0.0	0.4	0.2	0.0	0.3	0.3	0.3
SCARIDAE	1.9	1.0	1.8	3.0	1.9	3.2	2.4	2.7	2.6	2.8	4.8	4.3	2.3	4.5	2.4	4.4	2.8	3.4	3.6	3.5	2.7	3.0	2.4	1.7	1.8	3.6	3.4	4.0	1.3	4.7	2.6	3.6	2.7
SCOMBRIDAE	0.4	0.7	0.3	0.3	0.3	0.6	0.4	0.4	0.3	0.3	0.7	0.5	0.5	0.5	0.4	0.5	0.3	0.0	0.7	0.3	0.1	0.5	0.4	0.3	0.4	0.2	0.3	0.4	0.2	0.2	0.1	0.2	0.3
SCORPAENIDAE	2.8	2.7	3.6	3.6	3.3	2.8	2.2	1.6	1.4	2.3	0.7	2.2	1.8	0.8	3.4	0.8	2.3	1.7	2.6	2.6	2.4	1.0	2.0	2.8	2.1	3.3	2.3	3.5	3.9	3.2	3.2	2.5	3.8
SERRANIDAE	5.0	4.6	5.0	4.3	5.0	5.7	5.4	4.8	5.7	5.4	6.6	5.8	5.3	5.3	5.6	5.7	6.0	6.7	6.1	3.2	5.1	7.5	5.5	5.2	4.9	6.3	6.0	3.5	3.9	4.0	5.1	5.3	5.1
SIGANIDAE	0.9	0.2	0.7	0.7	0.8	0.6	1.1	0.7	0.9	1.2	1.8	1.5	0.7	1.5	1.3	2.1	0.5	0.6	0.8	0.6	0.3	1.4	1.0	1.0	0.8	0.3	0.6	0.4	0.2	0.2	0.3	0.3	0.3
SPHYRAENIDAE	0.7	0.2	0.5	0.3	0.6	0.4	0.3	0.5	0.5	0.5	0.7	0.2	0.9	0.0	0.0	0.8	0.4	0.3	0.7	0.2	0.5	0.6	0.4	0.4	0.6	0.8	0.6	0.8	0.9	0.5	0.5	0.7	0.3
SYNGNATHIDAE	2.5	2.4	2.3	1.9	2.3	1.4	1.8	1.8	2.2	1.5	0.9	0.7	0.9	0.5	2.3	2.1	1.8	0.8	1.0	1.3	1.9	2.1	2.0	2.7	2.3	0.7	1.1	1.0	0.4	0.7	1.8	1.0	0.3
SYNODONTIDAE	0.7	0.7	0.8	1.6	0.8	0.7	0.5	0.6	0.5	0.5	0.9	0.7	0.9	0.8	0.9	0.3	0.4	0.3	0.3	0.6	0.3	0.4	0.6	0.8	0.6	1.0	0.9	1.3	0.9	2.0	1.1	0.7	1.1
TETRAODONTIDAE	1.3	1.2	1.5	1.4	1.5	1.1	1.4	1.6	1.4	1.6	1.4	2.2	1.4	1.5	1.1	1.3	1.6	2.8	1.5	1.3	1.5	1.1	1.1	1.3	1.2	2.2	1.4	1.7	1.3	1.2	1.5	1.7	0.8
TRIPTERYGIIDAE	1.5	4.8	2.0	1.3	2.1	2.7	2.7	2.2	0.9	1.0	0.5	0.2	0.5	0.3	1.1	0.0	1.0	0.6	1.2	1.4	2.0	0.7	0.8	1.9	1.4	0.2	0.3	0.6	0.6	1.2	1.6	1.0	0.8

Size classes	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapinga mangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
< 5 cm	14.1	17.6	14.5	9.8	13.0	14.6	12.7	15.7	12.2	12.3	6.4	5.2	9.9	4.0	11.3	4.1	12.7	8.4	8.1	13.9	12.1	7.8	11.0	13.7	12.5	4.0	4.9	11.3	6.9	12.9	11.0	8.4	9.5
5 – 10 cm	23.9	22.2	24.9	21.1	25.0	21.3	22.9	21.5	26.1	21.5	16.4	16.5	18.6	18.9	23.9	15.2	21.8	20.4	15.2	22.1	21.9	22.9	23.9	24.5	26.1	16.9	13.5	17.3	18.7	17.1	18.1	18.5	18.9
10-20 cm	20.9	20.3	23.1	25.1	23.0	23.2	23.1	22.0	23.2	22.9	25.7	20.6	23.2	24.7	23.9	26.0	21.4	19.8	21.0	23.2	21.3	24.2	24.5	22.6	21.9	23.1	23.2	22.3	18.2	20.6	22.5	22.5	21.6
20-40 cm	21.6	22.7	20.1	26.0	20.6	24.1	23.4	22.6	21.5	24.5	27.6	33.4	29.4	32.1	25.0	32.7	24.8	29.3	28.6	25.0	25.0	25.8	23.7	21.2	20.7	30.5	30.9	26.9	28.1	27.8	26.4	27.8	30.3
40-80 cm	10.8	9.2	9.6	11.2	10.3	10.9	10.8	11.2	10.1	11.4	14.6	14.8	10.8	12.4	7.7	13.9	12.0	13.1	16.7	9.0	12.0	12.3	10.8	10.8	10.4	15.3	15.5	13.1	16.1	14.6	12.8	13.4	11.4
> 80 cm	8.2	7.5	6.9	6.2	7.4	5.0	6.7	6.6	6.7	7.1	9.3	9.0	7.8	7.8	8.1	8.0	7.0	8.9	10.1	6.1	7.1	7.0	5.4	6.6	7.5	9.8	11.5	9.0	11.2	6.0	8.7	9.1	7.8

Diet Groups	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapinga mangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
C	0.3	0.7	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.3	0.0	0.2	0.2	0.3	0.6	0.3	0.2	0.3	0.0	0.5	0.4	0.1	0.2	0.3	0.2	0.0	0.9	0.6	0.0	0.5	0.3	0.3	0.8
C1	10.5	9.9	10.6	11.5	10.6	10.5	10.2	9.9	9.2	11.5	8.9	13.0	13.6	11.6	9.8	10.3	11.8	13.4	12.4	11.5	10.7	8.9	9.4	10.2	9.3	10.3	11.7	10.4	12.2	11.7	11.7	10.9	13.8
C1C2	5.6	5.1	5.7	7.5	5.6	7.6	6.1	6.1	5.9	6.5	7.3	7.8	4.8	7.6	4.3	7.7	5.8	7.3	4.6	5.8	5.5	7.5	7.5	6.4	5.9	7.0	8.6	7.1	5.6	6.7	5.6	7.0	8.1
C1Co	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.3	0.1	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.2	0.2	0.2	0.1	0.2	0.3
C1P	6.4	4.8	6.9	6.6	6.7	6.3	5.5	5.7	4.7	5.4	2.5	5.2	4.1	3.0	5.3	2.3	5.6	5.6	5.8	5.1	6.4	3.7	4.3	6.1	5.3	7.5	4.9	6.5	7.7	7.7	6.9	7.0	6.8
C1Z	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.2	0.2	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.2	0.2	0.1	0.2	0.3

C2	11.1	11.8	12.7	10.8	12.0	9.8	10.3	10.5	12.0	10.4	6.6	5.8	8.0	6.6	12.6	7.7	11.2	8.4	6.8	10.4	11.0	9.5	10.7	11.6	11.7	6.1	4.9	7.5	7.7	6.5	8.4	7.3	7.6
C2C1	1.9	1.9	1.7	1.9	1.8	1.8	1.9	1.7	1.6	1.9	3.4	2.0	1.6	2.5	1.9	2.3	1.9	3.1	1.7	2.1	2.0	1.8	1.7	1.3	1.4	1.8	2.9	2.1	2.8	1.2	2.1	2.0	2.2
C2Co	1.9	2.7	1.7	2.4	1.8	3.4	2.3	2.3	2.3	2.4	3.4	2.7	3.0	4.8	3.2	5.9	2.5	2.5	3.5	3.4	2.6	3.5	2.6	1.9	2.1	3.0	3.4	3.1	1.9	2.5	2.6	3.1	2.7
C2D	5.0	4.1	5.7	3.6	5.7	3.1	4.1	4.7	7.1	5.2	4.3	3.2	3.9	1.8	4.1	1.3	5.5	3.6	4.3	5.1	4.3	3.6	4.5	5.6	5.2	2.0	1.7	4.8	4.7	3.5	5.4	3.5	2.2
C2H2	2.2	5.8	2.7	2.0	2.8	3.2	3.6	3.1	1.6	1.9	1.1	1.5	1.4	1.3	1.9	0.5	1.8	2.2	1.7	2.1	2.7	1.1	1.4	2.6	2.1	1.7	1.4	1.9	1.3	2.2	2.6	2.2	1.6
C2Z	0.4	0.2	0.4	0.7	0.4	0.4	0.4	0.4	0.5	0.5	0.9	0.3	0.5	0.5	0.6	0.8	0.5	0.3	0.8	0.5	0.5	0.5	0.5	0.4	0.4	0.7	0.3	0.2	0.2	0.7	0.4	0.5	0.0
Co	0.7	0.7	0.6	0.7	0.6	1.1	0.8	1.0	1.0	0.8	1.1	1.0	1.4	1.8	1.1	1.8	0.9	1.1	1.0	1.1	0.7	1.4	1.1	0.7	0.9	1.0	1.4	1.2	0.9	1.5	0.8	1.0	1.4
CoC2	0.6	1.0	0.6	0.7	0.6	0.4	0.6	0.4	0.5	0.5	0.2	0.7	0.7	0.0	0.0	0.3	0.4	0.3	0.3	0.2	0.3	0.5	0.5	0.3	0.7	0.2	0.0	0.2	0.0	1.7	0.4	0.3	0.3
CoH2	0.1	0.2	0.1	0.1	0.1	0.3	0.2	0.2	0.2	0.2	0.5	0.3	0.2	0.5	0.2	0.5	0.2	0.6	0.3	0.3	0.2	0.2	0.3	0.2	0.1	0.2	0.3	0.2	0.0	0.2	0.3	0.2	0.0
CZ	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.6	1.0	0.5	0.1	0.6	0.4	0.6	0.6	0.5	0.7	0.9	1.0	0.5	0.0	0.2	0.8	0.7	1.1	0.7	0.3	0.9	0.5	0.6	0.5	0.5	1.0	0.9	1.0	1.3	1.0	0.8	0.8	0.3
DC2	2.2	3.1	2.3	1.0	2.1	2.4	1.9	3.5	2.3	2.3	1.6	0.7	1.8	1.0	1.5	1.8	2.0	1.4	1.7	3.2	2.2	1.2	1.5	1.6	1.6	0.8	0.9	1.9	0.4	2.7	1.2	1.3	1.6
H1	0.4	0.5	0.6	1.0	0.6	0.6	0.5	0.6	0.4	0.5	0.5	0.7	0.2	0.8	0.2	1.0	0.5	1.4	0.8	0.5	0.5	0.5	0.4	0.3	0.4	1.0	2.3	0.8	1.5	1.0	0.7	0.7	0.8
H1H2	1.2	0.7	1.0	1.1	1.0	0.8	1.5	1.1	1.2	1.6	2.3	2.0	1.1	2.0	1.9	2.8	0.9	0.8	1.2	1.0	0.6	1.8	1.3	1.2	1.1	0.8	1.1	1.2	0.6	1.0	0.7	1.0	1.1
H1Z	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.2	0.0	0.3	0.0	0.3	0.1	0.3	0.3	0.2	0.4	0.2	0.3	0.2	0.1	0.7	0.3	0.2	0.2	0.0	0.1	0.3	0.3
H2	4.9	7.0	4.7	4.6	4.4	5.7	5.7	5.5	4.8	5.4	4.6	6.8	6.7	6.3	6.0	8.8	5.3	7.5	7.8	5.4	6.0	4.1	4.0	4.1	5.0	7.3	5.4	7.1	6.4	5.7	6.2	7.0	7.6
H2C2	2.2	2.7	1.9	2.6	1.9	2.7	2.8	2.6	2.6	2.5	3.0	3.3	1.8	2.5	2.4	3.1	1.8	2.5	2.3	2.9	1.5	3.7	3.5	2.7	2.7	1.7	2.3	2.5	1.7	1.7	1.5	2.0	1.6
H2Co	0.1	0.0	0.1	0.1	0.1	0.3	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.3	0.1	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
H2D	3.6	3.4	3.1	4.0	3.1	4.2	4.1	4.5	3.9	4.1	5.7	5.5	3.9	5.6	4.5	4.1	4.4	4.5	5.1	4.8	4.5	4.3	3.7	3.3	3.8	4.5	4.3	5.6	2.8	6.5	3.7	5.1	4.6
H2Z	0.2	0.2	0.2	0.1	0.2	0.1	0.4	0.3	0.4	0.4	0.5	0.7	0.7	0.3	0.2	0.8	0.3	0.6	0.5	0.5	0.3	0.6	0.4	0.3	0.4	0.5	0.3	0.4	0.2	0.2	0.3	0.3	0.3
P	11.4	12.3	10.6	11.2	11.1	8.7	10.4	10.8	10.3	10.7	12.8	13.3	13.8	11.4	12.1	11.1	11.2	11.2	15.7	9.0	11.3	11.7	9.2	10.9	11.3	15.3	17.2	14.8	16.7	11.9	14.0	14.2	14.6
PC1	5.5	4.6	5.0	5.2	5.1	4.3	5.1	4.7	4.7	4.7	5.5	6.0	6.7	5.3	5.6	5.4	5.1	4.5	5.6	4.2	5.1	5.7	5.0	5.5	5.0	6.0	5.2	4.8	6.7	4.5	6.0	4.5	4.3
Z	13.2	8.2	13.4	13.1	13.4	14.7	13.7	12.6	14.4	13.4	14.8	9.8	11.0	16.7	13.4	11.3	12.9	10.1	9.3	13.0	12.4	16.4	15.7	13.5	13.9	13.1	11.5	8.3	9.4	8.7	11.7	11.3	9.7
ZC	4.2	4.6	4.2	5.3	4.4	4.2	4.0	4.2	4.1	3.4	4.8	4.3	5.5	4.3	4.7	4.4	3.7	4.7	4.3	4.8	4.3	4.2	5.4	4.7	5.3	4.5	4.9	3.8	4.7	6.0	3.6	4.6	4.3
ZC2	2.6	1.7	1.8	1.1	1.7	1.8	1.8	1.8	2.6	2.0	2.1	1.2	1.4	0.5	0.9	0.8	2.1	0.6	0.8	1.6	1.6	2.2	3.1	2.2	2.6	0.5	0.0	1.2	1.3	1.5	1.1	0.7	0.3
ZH1	0.1	0.2	0.1	0.0	0.1	0.0	0.2	0.3	0.2	0.4	0.0	0.3	0.9	0.3	0.2	0.5	0.3	0.3	0.2	0.2	0.4	0.0	0.2	0.2	0.2	0.7	0.6	0.6	0.2	0.2	0.3	0.5	0.3
ZP	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.0	0.0	0.3	0.2	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Home Range	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapinga mangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
S	60.7	64.0	62.7	56.4	60.9	59.0	59.8	60.5	61.8	58.4	45.6	47.8	59.8	47.2	61.6	45.6	60.1	53.1	50.7	64.7	59.5	52.8	57.6	59.9	60.5	47.8	46.1	56.0	57.3	54.1	61.4	55.5	57.0
M	23.1	25.4	23.1	31.0	24.0	29.1	25.5	25.7	23.9	26.3	36.2	33.3	28.3	35.1	26.0	36.6	26.1	33.0	30.1	26.6	24.6	30.9	28.3	24.3	23.1	33.8	34.7	29.6	25.8	31.8	24.3	29.1	30.0
W	15.9	10.1	13.6	12.5	14.4	11.8	14.5	13.7	14.0	15.0	18.2	18.5	11.7	17.7	12.4	17.8	13.7	14.0	19.0	8.3	15.6	16.2	13.9	15.4	16.2	18.2	18.9	14.2	16.7	13.9	14.1	15.2	13.0

Activity	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapinga mangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
B	13.2	13.5	12.4	12.9	13.1	10.8	12.4	12.5	12.0	12.7	17.1	15.6	11.7	15.4	14.3	15.7	13.0	12.8	16.6	8.0	12.8	14.7	11.6	13.9	14.4	16.7	16.0	13.4	15.2	14.4	13.3	14.4	13.0
D	60.6	60.4	61.2	61.5	61.1	68.5	65.6	65.1	66.8	63.0	68.6	58.6	57.0	66.7	59.3	68.6	63.1	65.6	60.6	65.1	60.1	68.1	67.1	62.0	62.5	60.0	60.2	60.7	51.7	59.6	56.5	61.6	58.6
N	25.7	25.4	25.5	25.4	24.8	20.6	21.7	22.1	20.9	23.9	14.4	25.5	31.0	17.9	26.2	15.7	23.5	21.5	22.8	26.4	26.5	16.8	20.8	23.3	22.6	23.1	23.8	25.7	33.0	25.1	30.1	23.8	28.1

Schooling	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapinga mangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
S	55.0	59.7	58.8	55.8	57.1	52.8	54.3	56.0	53.4	55.1	43.3	51.1	54.3	42.4	58.0	42.0	57.3	51.3	53.3	53.8	56.7	44.4	47.4	53.6	52.7	51.4	49.0	57.2	58.6	56.1	60.9	55.0	61.1
P	6.1	7.2	5.0	6.6	5.5	6.6	5.5	6.8	6.9	6.2	8.9	5.7	7.1	10.1	7.7	11.1	6.5	7.3	7.3	8.8	6.4	8.3	7.3	5.4	5.8	7.0	8.0	6.9	5.6	7.7	6.2	6.8	6.2
F	18.5	17.6	16.4	17.5	16.9	19.0	19.2	17.8	19.3	18.5	22.1	21.3	19.8	22.7	16.6	22.9	17.9	23.2	18.9	18.9	16.2	23.4	22.2	20.2	20.1	19.2	20.3	19.0	17.4	19.1	16.2	19.0	16.5
M	13.0	10.9	12.0	13.2	12.4	12.7	13.8	12.8	13.5	12.7	16.2	15.6	12.6	14.6	8.9	16.2	11.9	13.4	14.7	12.5	12.9	16.2	15.3	12.4	13.5	16.4	15.8	12.5	12.2	11.9	11.5	13.9	11.6
L	6.4	3.6	6.5	6.0	6.7	8.5	6.8	6.2	6.3	7.0	9.6	5.7	6.0	10.1	8.9	7.7	6.2	4.8	5.5	5.4	6.9	7.5	7.1	7.0	7.0	5.6	6.3	4.0	5.2	4.5	5.1	4.5	3.8

Geographical Range	Fiji	Rotuma	New Caledonia	Chesterfield	Grande-Terre	Loyautés	Vanuatu	Tonga	Palau	Carolines total	Chuuk	Ifaluk	Kapinga mangari	Kosrae	Pohnpei	Yap	Marshall	Wake	Tuvalu-Gilbert	Wallis	Samoa	Kimbe(PNG)	MilneBay (PNG)	PNG-Tot	Solomon Is.	Cook Is.	Australes	Gambier	Marquises	Rapa	Societes	Tuamotu	Pitcairn &Dulcie
1-2 sites	2.6	0.2	2.2	0.9	2.1	0.4	0.4	1.5	0.5	0.3	0.2	0.2	0.0	0.3	0.6	0.3	0.3	0.3	0.3	0.5	0.7	0.1	0.5	1.6	0.8	1.7	0.9	0.8	8.2	1.7	0.5	0.7	0.8
3-5 sites	2.5	1.0	3.7	1.9	3.7	1.5	2.1	1.9	1.6	1.7	0.7	0.3	0.7	0.5	0.8	0.3	1.6	0.6	0.3	0.6	1.2	0.9	1.4	3.1	2.3	2.3	2.9	1.9	1.7	4.7	2.2	3.0	5.1
5-10 sites	3.1	1.9	4.8	2.4	4.4	2.8	2.8	2.6	1.9	2.0	0.5	0.3	0.5	0.8	1.5	0.8	2.1	0.8	0.7	1.8	2.4	0.6	1.1	3.8	3.3	3.6	4.6	2.5	1.5	4.7	3.7	1.8	5.7
10-20 sites	7.7	3.9	8.5	7.0	7.9	5.9	7.4	5.8	6.6	4.0	0.9	1.3	3.2	1.5	3.8	1.5	4.3	4.2	2.8	3.7	5.5	3.5	5.9	9.7	9.0	4.1	4.6	4.8	3.9	7.4	6.5	5.1	8.1
20-30 sites	9.8	5.3	10.0	6.2	9.1	6.0	9.2	7.9	12.0	9.3	3.0	6.2	7.4	3.0	7.7	4.1	9.0	7.0	4.8	7.1	7.4	8.5	9.6	13.3	12.7	5.0	4.3	6.0	5.4	3.7	6.7	5.1	6.2
30-40 sites	10.6	6.8	11.4	7.0	11.3	8.7	12.3	9.1	12.8	10.6	7.3	7.3	7.8	3.5	10.9	7.0	10.1	7.0	6.3	8.0	8.0	14.2	14.5	13.8	13.5	5.6	3.7	6.7	6.7	5.7	7.1	6.1	6.2
40-50 sites	12.3	4.8	11.5	7.9	12.3	8.4	13.4	10.8	13.1	12.0	9.6	9.3	7.6	10.1	8.7	9.0	10.4	8.1	9.3	8.2	10.4	13.4	14.3	12.7	13.7	8.3	4.9	7.1	5.6	4.0	8.7	7.1	6.5
50-60 sites	12.0	8.2	10.8	11.0	11.5	11.3	12.0	12.6	11.3	13.9	10.9	12.6	11.0	10.4	12.1	10.1	12.7	10.1	10.6	9.8	11.8	11.8	11.1	9.6	10.7	8.0	7.2	9.2	7.9	6.9	9.2	9.6	7.8
60-70 sites	10.0	10.6	8.7	10.8	9.3	10.4	10.2	10.7	9.2	10.7	11.6	11.8	11.0	12.1	11.5	12.1	11.0	7.5	12.6	10.6	11.0	10.0	8.9	7.7	8.7	8.6	7.2	9.8	7.7	6.7	10.2	10.4	5.1
70-80 sites	7.9	10.1	6.7	9.6	7.2	10.9	8.3	9.5	7.6	9.0	11.8	10.8	9.9	12.1	9.4	10.6	9.0	7.8	12.1	10.4	9.6	8.8	7.9	5.8	6.6	10.8	8.3	8.1	7.1	6.9	8.5	8.9	6.2
80-90 sites	7.8	14.7	6.8	11.0	7.3	11.8	8.3	9.7	8.1	9.6	14.1	14.6	14.3	13.4	12.6	13.4	10.5	14.5	14.4	12.5	10.6	9.2	7.8	5.7	6.5	13.8	13.5	12.9	12.9	11.2	11.5	13.7	12.7
90-100 sites	5.2	9.4	4.5	8.3	4.9	8.1	5.7	6.7	5.4	6.5	12.1	10.5	10.6	12.4	7.9	12.1	7.4	11.2	11.1	8.8	7.1	6.9	5.5	3.9	4.4	10.6	14.0	12.3	10.1	12.7	9.2	11.1	8.9
100-110 sites	5.2	10.9	4.4	8.8	4.8	8.4	5.6	6.7	5.3	6.5	12.8	10.3	11.5	15.4	9.0	14.2	7.2	13.7	11.3	10.3	7.3	8.1	5.8	3.8	4.3	11.3	16.0	11.9	11.2	12.2	9.3	11.3	12.2
110-120 sites	1.6	4.3	1.3	2.7	1.5	2.7	1.7	2.0	1.6	2.0	3.9	3.5	4.1	4.3	2.6	4.6	2.3	5.3	3.5	3.0	2.2	2.5	1.8	1.2	1.3	3.5	6.0	4.0	4.5	5.0	2.9	3.5	5.7

Home Range: S: sedentary; M: mobile; W: very mobile

Activity: D: diurnal; N: nocturnal; B: both D and N

Schooling: S: single; P: paired; F: small school (3-20 fish); M: medium size school (20-50 fish); L: large school (> 50 fish)

Diet Group: C: carnivore; C1: macro-invertebrate feeder; C2: micro-invertebrate feeder; D: detritus feeder; H: herbivore; H1: macro-algae feeder; H2: micro-algae feeder; P: piscivore; Z: plankton feeder. The first letter indicates the major diet item and the second letter (if present) indicates a secondary but important diet item.

Geographical Range: a site represents a checklist where a species is present. For instance if for a country there is a value of 12 for the class 5-10 sites, this means that there are 12 % of the species in that country which have been recorded in 5 to 10 checklists in the Indo-Pacific (on a total of 140 checklists).

Table CR3 List of species per country and region – see CDrom

ACKNOWLEDGEMENT

The authors wish to thank the many persons who assisted in constructing this data base. In particular we are very grateful to J.Randall, G.Allen, R.Myers, R.Winterbottom, R.Fricke, M.Francis, B.Mundy, R.Pyle, J.Seeto, P.Laboute, J.Rivaton, J.Williams, P.Bacchet for providing information on species distribution and identification. We also wish to thank the crew of the IRD research vessels who were of great assistance during the collection of reef fishes in French Territories. We are also grateful to the many colleagues who helped during reef fish censuses across the South Pacific, in particular R.Galzin, P.Chabanet, T.Lison de Loma, S.Planes and M.Harmelin-Vivien. Thank you to Adrian Stier for proof reading the English. This report was financed by IRD, CRISP and FRB.