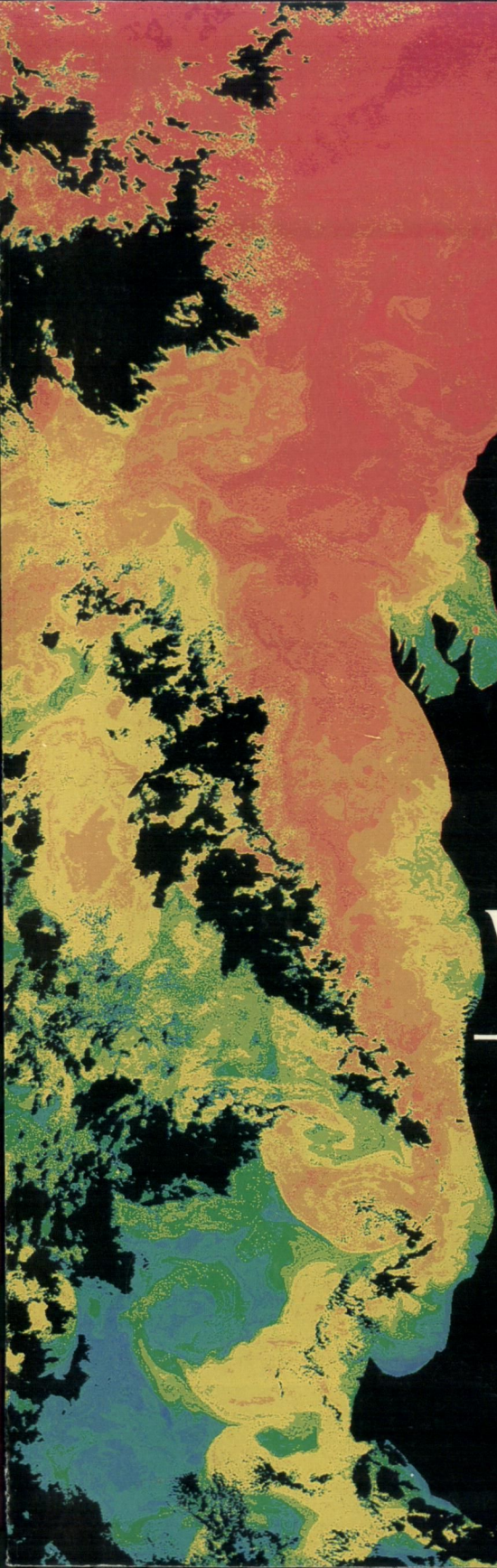
Records of the Western Australian Museum
Supplement No. 46, 1994



A Survey of the Nearshore Reef Fish Fauna of Western Australia's West and South Coasts – *The Leeuwin Province*

Barry Hutchins

A SURVEY OF THE NEARSHORE REEF FISH FAUNA OF WESTERN AUSTRALIA'S WEST AND SOUTH COASTS – THE LEEUWIN PROVINCE

Records of the Western Australian Museum
Supplement No. 46, 1994

A Survey of the Nearshore Reef Fish Fauna of Western Australia's West and South Coasts – *The Leeuwin Province*

Cover NOAA Satellite image of the western half of Western Australia on 27 July 1991. The area shown is from the north-west coast to the south coast (latter partly obscured). The Leeuwin Current is evident as an orange body of water narrowing as it heads south. Image courtesy of the Western Australian Satellite Technology and Applications Consortium (WASTAC), Wembley.

World List Abbreviation:
Rec. West. Aust. Mus. Suppl. No. 46

ISBN 0 7309 5583 4
ISSN 0 313 122X

Printed and published by the Western Australian Museum, Francis Street, Perth, Western Australia 6000.

Cover printed by Frank Daniels Pty Ltd, Wellington Street, Perth, Western Australia 6000.

CONTENTS

A SURVEY OF THE NEARSHORE REEF FISH FAUNA OF WESTERN AUSTRALIA'S WEST AND SOUTH COASTS – THE LEEUWIN PROVINCE

Barry Hutchins*

ABSTRACT

Twenty-three locations were surveyed along Western Australia's west and south coasts during the period 1976-1993. This produced a total of 728 species of reef fishes, of which 491 species were tropical (67% of the total), 174 species warm-temperate (24%), and 36 species subtropical (5%) – the remaining 27 species (4%) have uncertain distributions. Tropical fish numbers were highest in the Ningaloo Reef area at the northern end of the study area, the fauna reducing southwards to Rottnest Island, where it was nevertheless still prominent. The warm-temperate component was most numerous along the south and lower west coasts, its numbers reducing northwards to Shark Bay. Within the overlap zone of these two faunas, the subtropical fauna was at its strongest.

To examine the patterns of distribution, survey locations were divided into 12 regions and the fish fauna arranged into 13 range categories. Analysis of the data under these groupings produced numerous discrepancies in the diversity of the fauna. The most prominent one involved an "offshore" versus "inshore" effect to the tropical species. Evidence is presented showing that the Leeuwin Current is most likely responsible for this difference.

A "faunal signature" was identified for each survey region. This indicated that the endemic species provide many of the most commonly sighted fishes in the area between Shark Bay and Albany. These are gradually replaced to the north by wide-ranging tropical species and to the east by warm-temperate species which range into other southern Australian states. On the basis of this uniquely Western Australian flavour, the name Leeuwin Province is suggested for the region encompassing Coral Bay and the Recherche Archipelago.

INTRODUCTION

This study investigates the distribution pattern of fishes inhabiting shallow water reefs along the coastline of Western Australia's southern half. The region is termed the Leeuwin Province after Hatcher (1991), who introduced the name for that portion of the continental shelf and slope of Western Australia which is clearly under the influence of the warm south-flowing Leeuwin Current. Hatcher included the North West Shelf and Great Australian Bight in this province; however, I prefer to restrict it to the region stretching from Coral Bay in the north to the Recherche Archipelago in the south-east (Figure 1). This approximates the coastline of what Iredale (1937) described as the "Leeuwinian Area" for terrestrial molluscs. My reasons for doing so will be discussed later on.

* Western Australian Museum, Francis St, Perth, Western Australia 6000

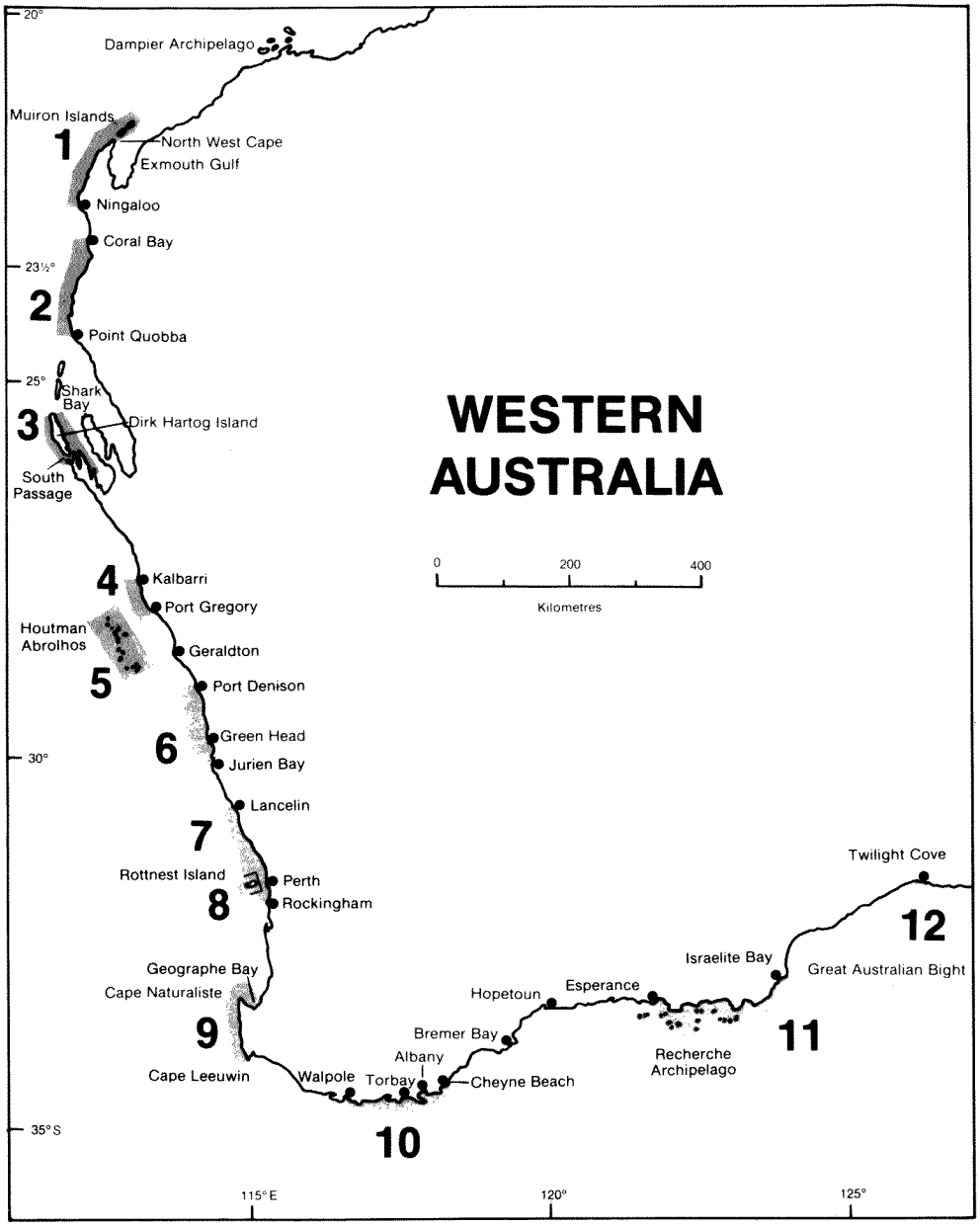


Figure 1 Location of survey sites along the west and south coasts of Western Australia. Numbers 1-12 refer to survey regions indicated by stippling (see Methods section for additional information).

The survey commenced in 1976 as part of an effort by the Western Australian Museum to document the state's reef fish fauna. The tropical fauna was reasonably well represented in the Museum's collections because of numerous surveys made along the north-western coastline in the period 1971-1976. In contrast, the fauna inhabiting the west and south coasts was relatively poorly known. Collecting had been haphazard, with the waters near the major population centres receiving the most attention. Furthermore, the larger, more often caught species tended to dominate these collections. The present study was instigated to remedy this imbalance.

During the years 1976-1993, surveys were conducted at numerous locations along the western and southern coasts (Figure 1). This investigation specifically excluded reefs located north of the Tropic of Capricorn (23.5°S), with the exception of Ningaloo Reef. Situated just inside the tropics, Ningaloo Reef is defined here as extending north from Ningaloo homestead to North West Cape, and including the offshore Muiron Islands. It was added, firstly, because of its location on the west coast, and secondly, because many of its tropical species range into the state's more southern waters. Thus the fishes inhabiting this area would provide a good basis for examining the anticipated southwards attenuation of the tropical fauna.

All surveys were conducted by me, with assistance from staff of various departments in the Western Australian Museum. Investigations at Ningaloo Reef and the Houtman Abrolhos also involved my colleague, Dr G.R. Allen, who separately visited these areas on several occasions. He has generously made his data available for this study.

It became clear in the early part of the investigation that there was a shortage of published distributional information on reef fishes of Australia's southern half. Therefore, to facilitate comparison with the western fauna, the study was expanded. During 1980-1981, I conducted week long surveys at 33 locations between southern Queensland and western South Australia, including Tasmania. Although the full results of these surveys are outside the scope of the present paper, some distributional data have been incorporated.

Whereas the main aim of this paper is to provide both a checklist of the species recorded during the investigation and a synthesis of their distributions, factors influencing the latter are also discussed. This leads to a reinterpretation of the faunal provinces of the state, as well as a suggested amendment to the provincial names that have been used for southern Australia.

METHODS

Sampling

The method of survey was based on the visual survey technique described in Wilson and Marsh (1979). During the course of a dive, all observed fishes were identified to species (if possible), classed into several categories (juvenile, female, and male), habitat preferences noted, and subjective graded estimates of their abundance tabulated (i.e. abundant, frequent, occasional, and rare). Any peculiarities of particular species were also noted. A brief description of each survey site was also made, including data on air and water temperatures, nature of the substrate, water movements, wind direction and approximate strength, water

clarity, and depth range. This method enabled reasonably accurate correlations to be made between the many sites surveyed. Only those fishes positively identified to species were recorded (many visual records were verified by the use of underwater photographs). In addition, collections were frequently made with spears and rotenone. Dives were mainly confined to a depth range of 0-20 m, but were extended to 35 m where conditions allowed it. (A more detailed account of one of the surveys is presented in Hutchins [1990]).

At any one location, as many as possible of the available reefs habitats were visited. This sometimes necessitated long searches to find suitable reefs. Manta-board tows were often utilised to allow a SCUBA-equipped diver to search a greater area.

The surveys were concentrated in areas of coral and/or rocky reef. All reef-associated species were recorded, including those that often wandered into the reefs from nearby seagrass beds and sandy areas. Midwater species were particularly difficult to categorise, but were included if often encountered in the water column above the reefs. For this reason, tunas and most sharks of the genus *Carcharhinus* are not included as they were rarely sighted.

Sites

Underwater surveys were conducted at 23 locations. These sites are divided into survey regions based on the similarities of their fish faunas and are numbered 1 to 12 (Figure 1) (in the following text, each region is referred to by the name of only one survey site for simplicity). The areas surveyed were selected to give as broad a coverage as possible of the accessible portions of the western and southern coastlines. Surveys planned for Bremer Bay and Hopetoun on the south coast were cancelled several times due to poor weather conditions.

Some regions were subjected to far more intensive surveys than others (see survey section below). This was generally due to the greater habitat diversity at these areas (the exception is Rottnest Island which was revisited many times because of other studies occurring there, as well as its proximity to Perth). Whereas I believe that the surveys at most sites provided an accurate record of the more highly visible species, I won't attempt to lay a similar claim for the cryptic species. Further work with rotenone in all of these areas should result in additional species being recorded. Its worth noting that in those areas where repeat surveys were conducted, e.g., Rottnest Island, new records were few, and often consisted of species classed as extralimital (i.e., species occurring outside their normal range).

Particular emphasis was directed at identifying the most abundant fishes at each survey location. In my opinion, these species indicated the distinctive character or "signature" of the area, i.e., they were the most likely to be encountered on each dive. Thus for each region, the ten most abundant species were selected as representing its faunal signature. Where possible, data from surveys conducted over several years were utilised to eliminate species whose numbers may fluctuate significantly from year to year.

Species list

A complete fish list is presented in the Appendix, which is arranged phylogenetically following Paxton *et al.* (1989). Additional information includes details of species records

(column labelled "Regions") and their Western Australian distribution (column labelled "Dn"). A dash between two numbers in the former column indicates that the relevant species was recorded for all regions within that range of numbers. The estimate of the distribution in the other column utilises the letters A to K as indicated in Figure 2, and is discussed more fully below. An asterisk after this estimate indicates that an additional note is included at the end of the Appendix. Illustrations of most species can be found in Hutchins and Swainston (1986) and Allen and Swainston (1988).

Distribution estimates

An estimate of the distribution for each species was determined after comparison between the survey results and data provided by the collections at the Western Australian Museum. This estimate is based on the premise that the species is likely to be continuously represented in the regions enclosed by the range. For many species, this represents the breeding range, but for others, it includes part of the non-breeding range where transient individuals are regularly found. For example, many tropical species at Rottnest Island rely on yearly recruitment via the Leeuwin Current from areas further to the north to maintain their presence at the island (see Hutchins 1991). However, range extensions based on rare occurrences, even though they are recorded in the Appendix, are not included in these estimates.

The estimates are arranged into 13 range categories as outlined below (see Figure 2):

Category A – Tropical species which reach the southern limit of their range in the Ningaloo area (region 1).

Category B – Tropical species which occur as far south as South Passage in Shark Bay (region 3).

Category C – Tropical species which are found as far south as the Houtman Abrolhos (region 5).

Category D – Tropical species which occur as far south as Rottnest Island (region 8) are placed here.

Category E – Subtropical species which range between Coral Bay (region 2) and Cape Leeuwin (region 9).

Category F – Subtropical species which range from Shark Bay southwards to the Recherche Archipelago (region 11).

Category G – Warm-temperate species which range between either the offshore Houtman Abrolhos (region 5) or Port Denison (region 6) on the mainland and the Recherche Archipelago (region 11).

Category H – Warm-temperate species which are distributed southwards and eastwards from Shark Bay (region 3) to other southern Australian states.

Category I – Similar to category H, but its northernmost limit is either the offshore Houtman Abrolhos (region 5) or Port Denison (region 6) on the mainland.

Category J – Similar to category H, but its northernmost limit is either the offshore Rottnest

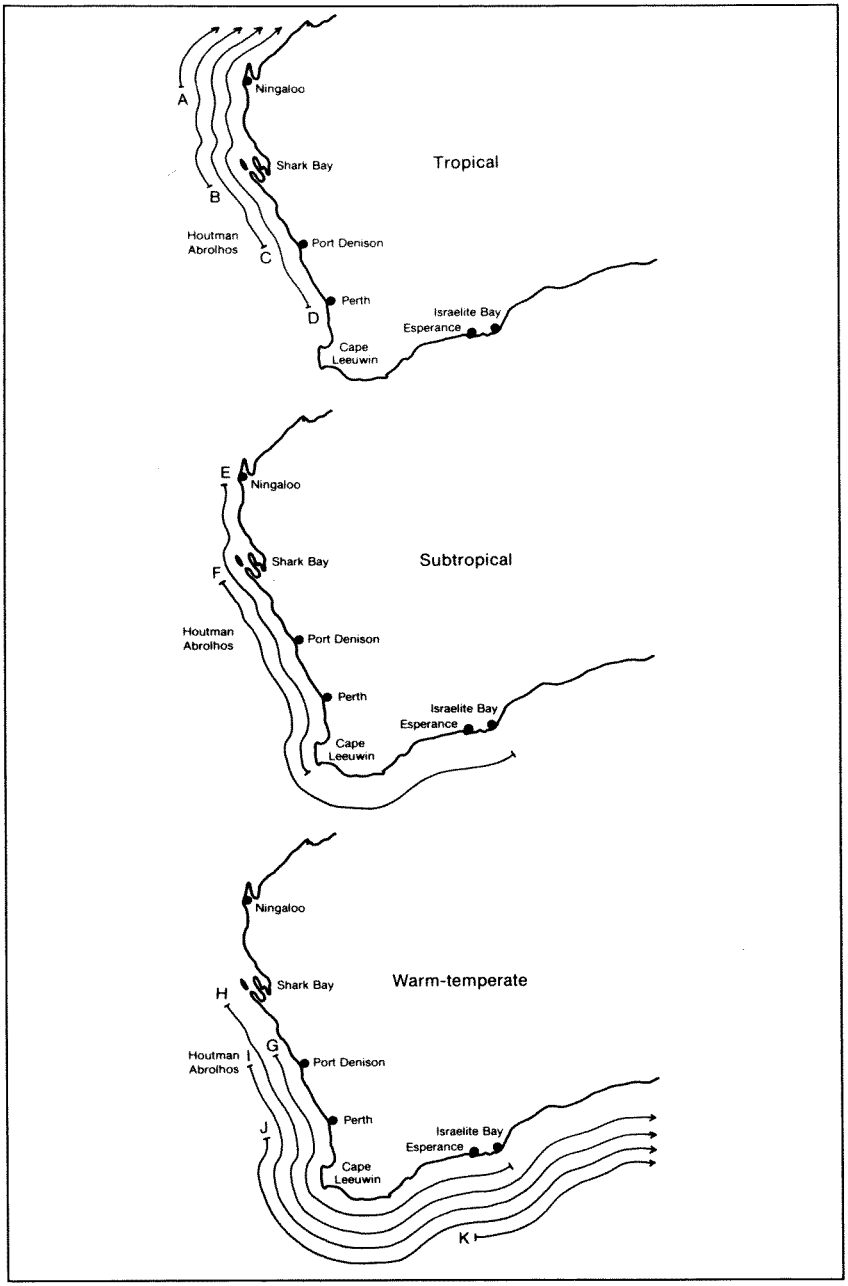


Figure 2 Distributions of the tropical, subtropical, and warm-temperate components of the reef fish fauna along the west and south coasts of Western Australia. Letters A-K indicate the distributional estimates of 11 range categories as referred to in the text.

Island (region 8) or Lancelin (region 7) on the mainland. Category K – Similar to category H, but its westernmost limit is the Recherche Archipelago (region 11). Categories O and ? – These categories include species which either have unusual distributions (O) or are known from insufficient material to describe a range accurately (?).

Definitions

Biogeographic papers dealing with the Australian fauna have not always been consistent with the terminology used to describe the preferred range of latitude for a species. Therefore, for the purposes of this paper, the following definitions are presented (latitudinal ranges are based on Lincoln *et al.*, 1982):

Tropical species

These are distributed in Western Australian seas mostly to the north of 23.5°S (Tropic of Capricorn), although numerous species also occur well to the south. Much of this tropical fauna is widespread throughout the Indo-West Pacific region. Only a few species are endemic to Western Australia.

Subtropical species

These occur mostly between 23.5 and 34°S, i.e., confined to the west coast. However, species which are also found along the south coast, but in progressively smaller numbers eastwards to as far as the Recherche Archipelago, are also included. Many belong to tropical genera, although some are placed in genera which are predominantly temperate. These subtropical species constitute the majority of the state's endemic reef fish fauna. Subtropical species are sometimes not recognised by biogeographers as a separate entity, instead being included with the warm-temperate species.

Warm-temperate species

These inhabit the south-western corner of the state, including those species which also range eastwards to other parts of southern Australia. They are generally equally numerous on the lower west and south coasts, but some are more abundant along the latter. Although the range of latitude for warm-temperate species, according to Lincoln *et al.* (1982), is 34 to 45°S, many range well into the subtropical zone of Western Australia. The lower end of this range, from 38°S and below, is often referred to as cool-temperate (e.g., Bennett and Pope 1953), or even cold-temperate (e.g., Briggs 1974). However, this temperate category does not exist in Western Australia.

Transient species

Also referred to as stragglers and strays, transient species are those which are considered to be only temporary residents. Ocean currents often disperse larvae well away from the parent population, and some of these may settle in areas outside the normal range of the species. The numbers of these extralimital individuals are generally low, and many don't survive to adulthood.

Abbreviations

The following abbreviations are used throughout the text:

NSW – New South Wales
Qld – Queensland
NT – Northern Territory
NZ – New Zealand
SA – South Australia
Tas – Tasmania
Vic – Victoria
WA – Western Australia
WAM – Western Australian Museum

THE SURVEYS

The following summary provides details of the surveys conducted at each of the 12 regions. It includes information on the sites surveyed, brief résumés of the results, and relevant data on habitat diversity. For this purpose, Table 1 presents information on the times and dates worked, Table 2 provides details of the numbers of species recorded per region, and Table 3 lists the ten most abundant species recorded at each survey region. The reader is referred to Veron and Marsh (1988) for additional information on the geography and environment of Western Australia's coastal waters.

Region 1

Much of the survey work at the Muiron Islands was conducted in the north-eastern lagoon at the southern island. Dives were also made on the exposed western and southern coasts of this island. In mainland waters, surveys were mainly concentrated in the Tantabiddi, Yardie Creek, and Norwegian Bay areas. These produced a total of 482 species of reef fishes (Table 2), most of which were tropical (97%), with only a small number of subtropical species (3%). No warm-temperate species were found.

All tropical range categories were well represented (Table 2), although category A was by far the most numerous. Eleven species of subtropical category E were recorded, but only three are considered to permanently inhabit the region. These are *Pentapodus vitta* (271), *Chaetodon assarius* (333), and *Cirripectes hutchinsi* (536); the remainder were all found in low numbers of individuals only, as was the single species of category F (*Coris auricularis* [453]), and are treated here as representing extralimital records.

The ten most abundant species were all tropical (Table 3), and consisted of six category D, three category B, and one category C species.

Even though the Muiron Islands are located well offshore in comparison to the mainland reefs, the fish faunas of the two areas were found to be very similar. However, numbers of individuals of many species were higher at the islands. Another obvious difference were the

Table 1 Survey sites (Depth [in metres] refers to the maximum depth reached).

Region	Location	No. of days	Date	Depth
1	Muiron Islands	12	June, 1977	15
	Ningaloo Reef	10	June, 1975	15
	"	12	May, 1976	
	"	10	May, 1979	
	"	5	April, 1987	
	"	6	June, 1993	
2	Coral Bay	6	July, 1981	15
	"	5	June, 1993	
	Point Quobba	8	April, 1983	25
3	Shark Bay	17	April, 1979	28
	"	3	March, 1990	
	"	2	Nov., 1990	
	"	2	June, 1991	
4	Kalbarri	2	Nov., 1979	20
	"	3	April, 1983	
	Port Gregory	3	Jan., 1985	10
5	Houtman Abrolhos	10	May, 1975	35
	"	13	Aug., 1977	
	"	3	Dec., 1981	
	"	7	April, 1982	
	"	6	March, 1988	
6	Port Denison	5	April, 1983	15
	Green Head	7	June, 1979	20
	Jurien Bay	4	April, 1983	20
	"	2	Feb., 1992	
7	Lancelin	2	Nov., 1980	10
	Perth	20	1975–1989	25
8	Rottnest Island	220	1975–1992	35
9	Geographe Bay	1	Jan., 1979	25
	"	2	June, 1982	
	"	1	March, 1983	
	"	6	April, 1985	
	Cape Leeuwin	2	April, 1976	20
	"	4	Feb., 1979	
	"	1	May, 1983	
	"	4	Feb., 1984	
	"	2	April, 1985	
10	Walpole	2	Feb., 1979	15
	Torbay	3	Feb., 1979	30
	"	3	April, 1980	
	Albany	3	April, 1980	25
	"	2	March, 1986	
	Cheyne Beach	4	April, 1980	20
11	Recherche Archipelago	10	April, 1977	35
	"	11	March, 1978	
	"	7	April, 1984	
	Israelite Bay	7	April, 1984	10
12	Twilight Cove	2	April, 1984	10

Table 2 Numbers of species of each range category recorded for each survey region.
Total a = Total number of species recorded for each survey region
Total b = Total number of species recorded for each range category

	A	B	C	D	E	F	G	H	I	J	K	O and ?	Total a
1	216	131	75	46	11	1	–	–	–	–	–	2	482
2	62	104	70	43	17	3	–	3	–	–	–	5	307
3	5	131	68	47	15	11	–	18	2	1	–	11	309
4	–	6	30	30	14	12	2	20	9	–	–	2	125
5	10	29	80	41	18	14	8	19	21	2	–	7	249
6	1	5	17	29	18	14	14	19	42	9	–	3	171
7	–	2	8	17	13	9	9	17	35	17	–	1	128
8	3	6	19	46	20	15	16	23	51	39	–	7	245
9	–	–	–	7	17	11	13	19	48	34	–	1	150
10	–	–	–	4	3	10	12	15	42	29	4	1	120
11	–	–	–	–	1	11	16	21	51	51	17	4	172
12	–	–	–	–	–	1	1	8	14	7	5	–	36
Total b	219	139	84	49	21	15	18	25	57	57	17	27	

absence at the Muiron Islands of two of the three subtropical species mentioned above (only *Pentapodus vitta* was present). Both areas are reasonably shallow (less than 20 m), although in each case, the edge of the continental shelf is located only a short distance to the west.

The coral fauna in the lagoons is rich (Veron and Marsh 1988), particularly in the passages where the lagoons open to the sea. This is reflected in the high diversity of fishes. The coral fauna of the exposed seaward reefs, on the other hand, is relatively poor, being confined usually to the tops and sides of the heavily dissected reef slope (spur and groove structures). Also, macroalgal communities in the region are relatively insignificant.

Region 2

Surveys at Coral Bay covered the area from Point Maud south to Point Anderson. Sites inside and outside the lagoon were visited. At Point Quobba, most work was done in the vicinity of the Point Quobba Marine Reserve, but the Blowholes and various offshore areas including the Fitzroy Reefs were also surveyed. A total of 307 species were recorded (Table 2), most of which were tropical species (91%), with a small number of subtropical species (7%). However, a few warm-temperate species (1%) were also found.

All tropical range categories were present, but in lower numbers of species than at region 1 (Table 2), particularly category A which suffered a massive fall from 216 to 62 species. The subtropical range categories E and F increased from 12 for region 1 to a total of 20 species, whereas three warm-temperate category H species were found.

The ten most abundant species (Table 3) consisted of nine tropical species (five category D, two category C, and two category B species) and one subtropical category E species.

In terms of the numbers of individuals, tropical species were generally more abundant at Coral Bay than at Point Quobba. On the other hand, subtropical species were generally more

Table 3 Ten most abundant species at each survey region (Range category follows specific name)

1	2	3
380 *Chromis atripectoralis* B	380 *Chromis atripectoralis* B	386 *Chromis westaustralis* E
404 *Pomacentrus coelestis* C	404 *Pomacentrus coelestis* C	321 *Kyphosus cornelii* E
496 *Thalassoma lunare* D	412 *Stegastes obreptus* D	496 *Thalassoma lunare* D
497 *Thalassoma lutescens* D	496 *Thalassoma lunare* D	464 *Halichoeres brownfieldi* F
523 *Scarus sordidus* D	497 *Thalassoma lutescens* D	489 *Stethojulis bandanensis* D
406 *Pomacentrus moluccensis* B	468 *Halichoeres nebulosus* C	513 *Scarus ghobban D*
371 *Abudefduf sexfasciatus* D	371 *Abudefduf sexfasciatus* D	566 *Helcogramma decurrens* H
402 *Plectroglyphidodon lacrymatus* B	489 *Stethojulis bandanensis* D	492 *Suezichthys cyanolaemus* E
489 *Stethojulis bandanensis* D	536 *Cirripectes hutchinsi* E	497 *Thalassoma lutescens* D
666 *Acanthurus triostegus* D	402 *Plectroglyphidodon lacrymatus* B	371 *Abudefduf sexfasciatus* D

4	5	6
398 *Parma occidentalis* E	405 *Pomacentrus milleri* D	453 *Coris auricularis* F
321 *Kyphosus cornelii* E	491 *Stethojulis strigiventer* D	464 *Halichoeres brownfieldi* F
405 *Pomacentus milleri* D	321 *Kyphosus cornelii* E	397 *Parma mccullochi* G
304 *Parupeneus spilurus* D	386 *Chromis westaustralis* E	405 *Pomacentrus milleri* D
370 *Abudefduf bengalensis* C	450 *Choerodon rubescens* E	436 *Austrolabrus maculatus* H
480 *Notolabrus parilus* H	371 *Abudefduf sexfasciatus* D	321 *Kyphosus cornelii* E
324 *Microcanthus strigatus* E	464 *Halichoeres brownfieldi* F	480 *Notolabrus parilus* H
453 *Coris auricularis* F	496 *Thalassoma lunare* D	398 *Parma occidentalis* E
566 *Helcogramma decurrens* H	433 *Anampses geographicus* D	450 *Choerodon rubescens* E
464 *Halichoeres brownfieldi* F	513 *Scarus ghobban* D	212 *Apogon victoriae* E

7	8	9
464 *Halichoeres brownfieldi* F	453 *Coris auricularis* F	382 *Chromis klunzingeri* G
480 *Notolabrus parilus* H	464 *Halichoeres brownfieldi* F	487 *Pseudolabrus biserialis* G
313 *Pempheris klunzingeri* H	480 *Notolabrus parilus* H	313 *Pempheris klunzingeri* H
566 *Helcogramma decurrens* H	321 *Kyphosus cornelii* E	464 *Halichoeres brownfieldi* F
323 *Kyphosus sydneyanus* H	323 *Kyphosus sydneyanus* H	189 *Trachinops noarlungae* I
327 *Scorpis georgianus* I	397 *Parma mccullochi* G	453 *Coris auricularis* F
397 *Parma mccullochi* G	566 *Helcogramma decurrens* H	436 *Austrolabrus maculatus* H
324 *Microcanthus strigatus* E	313 *Pempheris klunzingeri* H	481 *Ophthalmolepis lineolatus* I
207 *Apogon rueppellii* D	382 *Chromis klunzingeri* G	397 *Parma mccullochi* G
724 *Torquigener pleurogramma* H	325 *Neatypus obliquus* F	458 *Dotalabrus alleni* H

10	11	12
382 *Chromis klunzingeri* G	382 *Chromis klunzingeri* G	480 *Notolabrus parilus* H
487 *Pseudolabrus biserialis* G	189 *Trachinops noarlungae* I	326 *Scorpis aequipinnis* J
481 *Ophthalmolepis lineolatus* I	313 *Pempheris klunzingeri* H	323 *Kyphosus sydneyanus* H
313 *Pempheris klunzingeri* H	436 *Austrolabrus maculatus* H	313 *Pempheris klunzingeri* H
323 *Kyphosus sydneyanus* H	326 *Scorpis aequipinnis* J	327 *Scorpis georgianus* I
189 *Trachinops noarlungae* I	481 *Ophthalmolepis lineolatus* I	
397 *Parma mccullochi* G	505 *Siphonognathus beddomei* J	
480 *Notolabrus parilus* H	480 *Notolabrus parilus* H	
326 *Scorpis aequipinnis* J	487 *Pseudolabrus biserialis* G	
458 *Dotalabrus alleni* G	399 *Parma victoriae* I	

numerous at Point Quobba. Some subtropical species were found in prominent numbers throughout the region, especially *Chaetodon assarius* (333), *Choerodon rubescens* (450), and *Cirripectes hutchinsi* (536), whereas others, such as *Kyphosus cornelii* (321) and *Parma occidentalis* (398), were mostly restricted to areas of low limestone reef. One warm-temperate species, *Helcogramma decurrens* (566), was reasonably numerous at Point Quobba, but was not sighted at Coral Bay. Many of the tropical category A species, which are considered to be transients from region 1, were found only at Coral Bay.

Like the fish fauna, coral diversity is also poorer here in comparison with Ningaloo Reef (region 1). There are some areas of luxuriant coral growth, especially near the Coral Bay townsite, but many large expanses of limestone reef support only a sparse coral fauna. Seawards, the prominent coral-covered spurs of region 1 are either much reduced or absent. For much of the region, the spurs are replaced by an algal-covered rocky bottom which gently slopes seawards. It is often pock-marked with small depressions that are occupied by sea urchins; coral growth here is sparse.

Region 3

The majority of the survey work was conducted in the South Passage area of Shark Bay, but other locations briefly visited include Turtle Bay, Notch Point, Egg Island, Meade Island, Sunday Island (all at Dirk Hartog Island), Boat Haven Loop, Wilds Islands, Denham, and Monkey Mia. A total of 309 species were recorded, consisting mostly of tropical species (81%), with small subtropical (8%) and warm-temperate components (7%).

All tropical range categories were represented (Table 2), but category A was almost nonexistent, comprising five rarely sighted species. Range category B and D fishes were slightly greater in numbers than at region 2. Subtropical range category E was slightly less numerous than at region 2, but category F was better represented here. Eighteen species of the warm-temperate range category H were found, and a few category I and J species.

Five of the ten most abundant species (Table 3) were tropical, all belonging to range category D. The remainder consisted of four subtropical (three category E and one category F species) and one warm-temperate category H species.

The subtropical species here were an important part of the fauna, providing four of the ten most abundant species (Table 3). Some of the warm temperate species were also found in prominent numbers, particularly *Helcogramma decurrens* (566) and *Neatypus obliquus* (325). Nevertheless, the tropical fishes were by far the most numerous overall, and gave the region a distinctly tropical appearance.

Surveys in Shark Bay were concentrated in the western portion of the bay because of the lack of suitable reefs to the east. The richest area for fishes was South Passage, a well protected location saddled between the southern end of Dirk Hartog Island and the mainland, but still exposed to oceanic conditions (see Hutchins 1990). Unlike most other parts of the bay, this passage has a rich coral fauna (Veron and Marsh 1988). The exposed coasts of both the mainland to the south and the western side of Dirk Hartog Island to the north have relatively poor coral and fish faunas. The eastern side of Dirk Hartog Island, however, is more

protected but its shallow sandy bottoms are not conducive to coral growth. The southernmost reef area surveyed in the bay, Wilds Island (near Depuch Loop), had no coral, and only 14 species (11 tropical and three subtropical) of reef fish were observed. Macroalgae, particularly of the genus *Sargassum*, was reasonably rich in some areas of South Passage, but no evidence of the southern kelp *Ecklonia radiata* was found (see following account).

Region 4

Sites surveyed at Kalbarri included coastal reefs between the mouth of the Murchison River and Red Bluff, in addition to reefs inside the river mouth. At Port Gregory, reefs inside and outside the lagoon were worked. These surveys produced a total of 125 species, which is made up of a moderate number of tropical species (53%), and smaller subtropical (21%) and warm-temperate (25%) components.

The change in percentage composition, when compared with Shark Bay (region 3), was caused by the dramatic fall in number of tropical species, whereas the number of warm-temperate species increased slightly (Table 2).

From the ten most abundant species listed in Table 3, three are tropical (two in category D, and one in C), five are subtropical (three in category E, and two in F), and two are warm-temperate species (both category H). As in region 3, the two most often sighted species were both subtropicals in category E.

The tropical reef fish faunas at Kalbarri and Port Gregory differed considerably from each other due to differences in the available reef habitat. All offshore reefs surveyed at Kalbarri supported poor tropical fish and coral faunas. Those in the mouth of the river lacked corals, but numerous species of tropical fishes were present. Obviously the last area would be denuded of marine species during periods of heavy freshwater run-off. At Port Gregory, a shallow lagoon of moderate size provides a sheltered area where coral growth is rich. Many tropical reef fishes inhabit this area, but few were recorded outside the lagoon.

Macroalgae are prominent in both areas, with heavy growths of *Ecklonia* and *Sargassum* on the shallow exposed reefs. However, the tops of the deeper reefs tend to be bare, with invertebrates covering the lower sides.

Region 5

Most of the survey work at the Houtman Abrolhos was done in the Wallabi and Easter Groups. From a total of 249 species recorded for the region, 64% were tropical, 13% were subtropical, and 20% were warm-temperate.

All tropical range categories were present (Table 2), although species numbers in both categories A and B were low. Category C and D species were prominent, but members of category D were the most abundant in terms of the number of individuals (Table 3). Both subtropical categories E and F were well represented. Warm-temperate categories G, H, I, and J were all recorded, but category J was represented by only two species (both are considered to be extralimital).

The ten most abundant species are listed in Table 3, six being tropical (all from range category D) and four subtropical (three category E and one category F species).

Many of the tropical species were found in very high numbers of individuals (Table 3), as were some of the subtropical species, but even though the warm-temperate component was well represented, only a couple of its members were in prominent numbers. These include *Helcogramma decurrens* (566), *Kyphosus sydneyanus* (323), and *Parapercis haackei* (527).

The Houtman Abrolhos is a large offshore area of islands and reefs, with a diverse array of reef habitats. In comparison to the Shark Bay area, the coral fauna here is very much richer (184 species versus 82 at Shark Bay – Veron and Marsh 1988). However, this is not the case for tropical reef fishes. A total of 160 species were found at the Houtman Abrolhos in contrast to 251 from Shark Bay. This discrepancy was apparent during the surveys; some rich coralliferous areas had inexplicably low numbers of fishes. These tended to be in places where current flow and wave action were low, i.e., either in the deep, protected lagoonal holes or on the more protected eastern sides of the island groups. In addition, the exposed western reefs which bear the full brunt of the prevailing south-westerly swell also had poor faunas. On the other hand, reefs near the sides of the passages which separate the island groups generally had much more diverse fish faunas. These areas are generally more protected than the exposed western reefs, but are still influenced by the currents flowing between the island groups.

Large areas of the Houtman Abrolhos are covered with macroalgae, especially the exposed western reefs and nearby back reefs. Coral growth is usually poor here, although on some reefs, coral and algae grow side-by-side.

Region 6

Surveys in the Port Denison area were carried out at Irwin Reef, White Tops, and several nearshore reefs, including the boat harbour sea wall. At Green Head, work was mostly concentrated in the shallow lagoon at the offshore Fisherman Islands. The Jurien Bay investigation involved surveys at Seaward Ledge, and Escape, Boullanger, and Favourite Islands. From a total of 171 species recorded for these areas, the largest component was warm-temperate (49%), followed by tropical (30%) and subtropical (19%).

All tropical range categories were present (Table 2), but were in much lower numbers than at region 5 (both categories A and B were represented by transient individuals). Subtropical categories E and F, as well as the warm-temperate category H, were just as abundant here as they were in region 5, but warm-temperate categories G and I were far more numerous.

The ten most abundant species are listed in Table 3, six being subtropical (four category E and two category F species), three warm-temperate (two category H and one category G species), and one tropical category D species.

The three areas surveyed in this region all had similar fish faunas, although some tropical species which prefer more protected reefs (e.g., *Thalassoma lunare* [496] and *Stethojulis bandanensis* [489]) were in much smaller numbers at Port Denison. Green Head and Jurien Bay both have shallow lagoon-like areas which support not only more diverse fish faunas than

the exposed reefs, but also richer coral faunas. The exposed reefs at all three areas support rich macroalgal communities, and are inhabited by relatively few tropical fishes.

Region 7

At Lancelin, most survey work was conducted near Lancelin Island. Surveys in the Perth area occurred at reefs off Whitford Beach, Trigg Island, and Fremantle, as well as at Woodman Point in Cockburn Sound, Mewstones, Carnac Island, Garden Island, and Point Peron near Rockingham. The reef fish fauna in this region, which totalled 128 species, consisted mostly of warm-temperate species (61%), with smaller numbers of tropical (21%) and subtropical species (17%).

Tropical species from range categories B, C, and D were recorded (Table 2), but only a few category D species were considered to have permanent populations in the area (see below). Although subtropical range categories E and F with nine species each were not well represented, the total number of warm-temperate species was similar to that at region 6.

The ten most abundant species (Table 3) consisted of seven warm-temperate (five category H species, and one each of categories G and I), two subtropical (one category E and one category F) and one tropical category D species.

Although closer to Jurien Bay than to Perth, Lancelin was included with the latter because its fish fauna was more similar to that inhabiting the reefs off Perth's northern beaches. However, neither of these locations possessed the distinctive fish community that was found in the protected waters of Cockburn Sound, an embayment located just to the south of Perth. In particular, the tropicals *Apogon rueppellii* (207), *Pentapodus vitta* (271), and *Monacanthus chinensis* (707) occur here in very large numbers. Even though they are more often associated with seagrass meadows, these fishes also occupy adjacent rocky reefs.

Except for the species just mentioned, the tropical fish fauna of this region is poor. Most of the 27 species in Table 2 are considered to be extralimital records. For example, *Pterois volitans* (120), *Platax teira* (331), and *Ostracion cubicus* (714) were each recorded only once (all from Woodman Point in Cockburn Sound).

The coral fauna of this region is also relatively poor, even though 16 species have been found (Veron and Marsh 1988). They occur mostly as patches of small, scattered coral heads, usually in protected areas around nearshore islands and reefs. Like region 6, the macroalgal communities are the dominant reef cover here.

Region 8

Surveys were conducted at Rottnest Island's inshore and offshore reefs which produced a total of 245 species. This was made up mostly of warm-temperate species (53%), with a considerable number of tropical species (30%), and a smaller number of subtropical species (14%).

All tropical range categories were present in slightly higher numbers than found at region six, except for category D which was far more numerous at 46 species (Table 2). Category A,

B, and C species were represented by low numbers of individuals which were all considered to be extralimital. All subtropical and warm-temperate categories, with the exception of category K, were found; most were represented by prominent numbers of species.

The ten most abundant species listed in Table 3 comprise six warm-temperate (four category H species and two category G species) and four subtropical species (three category F and one category E species).

Rottnest Island has the best developed coral fauna south of the Houtman Abrolhos (Veron and Marsh 1988). The shallow reefs around the island support many coral communities, most consisting of aggregations of many small to moderately sized coral heads. However in some areas, large expanses of coral predominate. The most noteworthy is the peninsula separating Salmon Bay from Porpoise Bay on the island's southern coastline. Lagoons formed by offshore reefs harbour large stands of the coral *Pocillopora damicornis*. These in turn have attracted a reasonably diverse tropical fish fauna. The most common species include *Thalassoma lutescens* (497), *Thalassoma lunare* (496), *Parupeneus spilurus* (304), *Pomacentrus milleri* (405), *Scarus ghobban* (513), and *Scarus schlegeli* (522). Few of these species occur outside the lagoons, although others such as *Anampses geographicus* (433) and *Plectorhinchus flavomaculatus* (278) are more often sighted on deeper (10-20 m) reefs.

All exposed reefs around the island support rich macroalgal communities. These algae are also found in many shallow areas, often adjacent to coral heads. However, most corals flourish in areas where macroalgal growth is reduced. The deeper reefs (25 m and over) have sparse macroalgal communities, the dominant cover consisting of invertebrates. Some corals occur at these depths, but attract very few tropical fishes.

Region 9

Surveys were carried out at various inshore and offshore reefs in Geographe Bay, including Naturaliste Reef and Busselton Jetty. Additional work was conducted southwards along the coast between Cape Naturaliste and Yallingup. Most surveys in the Cape Leeuwin area were done at the offshore islands of Alouarn, Flinders, and Seal, but dives were also made on the inshore reefs at Quarry and Ringbolt Bays. Extra surveys were conducted to the north of Cape Leeuwin in the vicinity of Cumberland Rock and Hamelin Bay. This produced a total of 150 species of reef fishes, which consisted largely of warm-temperate species (76%), although the subtropical component (19%) was reasonably numerous. Very few tropical species (5%) were found.

Range category D was the only tropical category present (Table 2). Most of its seven species were represented by one-off records, although *Apogon rueppellii* (207) was in reasonable numbers in certain areas. The subtropical and warm-temperate categories were all somewhat less numerous than at region 8.

Of the ten most abundant species listed in Table 3, eight are warm-temperate (four category G, two category H, and two category I species) and two are subtropical category F species.

The faunas recorded for the Geographe Bay and Cape Leeuwin areas were very similar.

Both areas were dominated by the warm-temperate species, with only a few subtropicals being well represented. Tropical species were generally found in very low numbers, even though coral growth was particularly rich in some areas of Geographe Bay. Prominent tierlike coral structures of the genus *Turbinaria* were observed to depths of 20 m, but most fish inhabitants of these were warm-temperate species. Corals of this genus were also sighted in the Cape Leeuwin area, but were not as large. As for region 8, the dominant cover here was macroalgae, which became sparser with increased depth.

Region 10

Survey work at Walpole was undertaken near Rocky Head and Saddle Island, whereas in the Torbay area, it was conducted at Torbay Head, West Cape Howe, Cosy Corner, and Seagull Island. Sites surveyed in the Albany area included Salmon Holes, Michaelmas Island, Frenchman Bay, Oyster Harbour, and Two People Bay. At Cheyne Beach, most work was done around Bald Island, but dives were also made at Lookout Point and Channel Point. From a total of 120 species recorded for the region, most were warm-temperate species (85%), with much smaller numbers of subtropical (11%) and tropical species (3%).

The tropical fauna was represented by transient individuals of a few range category D species (Table 2). Several subtropical category E fish were recorded, but category F was better represented with 10 species. All warm-temperate range categories were present, although the four category K species were found in low numbers only, and are considered to be extralimital.

The ten most abundant species, all of which were warm-temperate (four category G, three category H, two category I, and one category J species), are listed in Table 3.

The faunas at the four study areas were similar to each other with several exceptions. Range category K species were not recorded to the west of Albany, and some subtropical category F species (e.g., *Coris auricularis* [453]) were in much lower numbers to the east of Albany. Records of tropical species were haphazard, with *Plagiotremus rhinorhynchos* (556) being found at Walpole, *Apogon rueppellii* (207) at Albany and *Anampses geographicus* (433) at Cheyne Beach. However, records at the WAM suggest that more extralimital tropical species may occasionally turn up in the Albany area. For example, *Platax teira* (331) and *Tetrasomus concatenatus* (716) have been found there on several occasions.

Invertebrate growth in this region was rich, including corals of the genus *Turbinaria* which were present in most areas surveyed. At Wapole, the single record of *Plagiotremus rhinorhynchos* for this region was sighted hovering over a large head of *Turbinaria frondens*. Nevertheless, the dominant cover on exposed reefs was macroalgae, which became sparser as depth increased.

Region 11

Surveys were conducted at numerous offshore areas in the Recherche Archipelago, including Sandy Hook, Long, Frederick, Gull, Rob, and Mondrain Islands. Dives were also made on mainland reefs at Lucky Bay. At Israelite Bay, most work was carried out at Six Mile Island, Dempster Point, Point Malcolm, as well as on reefs in the bay itself. From a total of

172 species, most were warm-temperate (91%), but a small number of subtropical species were also found (7%). A single species thought to be tropical, *Barbuligobius boehlkei* (610), was recorded at Israelite Bay. However, its distribution in WA could not be categorised (see Notes to Appendix).

Both subtropical range categories were represented, but only one category E species (*Parablennius postoculomaculatus* [553]) was found. In terms of individuals, most of the 11 category F species were in low numbers. The exceptions are *Epinephelides armatus* (153) and *Halichoeres brownfieldi* (464) which were reasonably abundant in some areas. All warm-temperate categories were represented by prominent numbers of species.

Like region 10, all of the ten most abundant species listed in Table 3 are warm-temperate (three category H, three category I, two category G, and two category J species). The most abundant species, *Chromis klunzingeri* (382), was also the most commonly observed species at the previous two regions.

In the Recherche Archipelago area, there were no obvious differences between the fauna found in mainland waters at Lucky Bay and that recorded around the offshore islands. Both had heavy growths of macroalgae on the shallow exposed reefs, which became sparser as depth increased. The deeper reefs were covered with luxuriant invertebrate growths, although a similar cover also occurred in many shallow protected areas. Corals of the genus *Turbinaria* were especially rich, forming extensive communities. However, they were not found to the east of the archipelago.

Israelite Bay shared many of the species found at the Recherche Archipelago; however, it differed significantly in lacking most of the deeper water fishes. All reefs surveyed were shallow (less than 10 m), and lacked the habitat diversity of the latter area. In particular, no corals of the genus *Turbinaria* were found. Of the 172 species of reef fishes recorded for the region, only 111 were found at Israelite Bay. Here, the most diverse fauna occurred at the offshore Six Mile Island. The Eastern Group, another offshore area situated further to the east, is expected to have a fish fauna more like that of western parts of the archipelago. However, it was not possible to visit these islands to substantiate this.

Region 12

Surveys were carried out at various locations to the west and east of Twilight Cove, including inshore and offshore areas. Despite much searching, only 36 species of reef fishes were found, all except one being warm-temperate species. The exception was the subtropical *Halichoeres brownfieldi* (464) which was recorded on the basis of several small juveniles. Unfortunately all categories were found in very low numbers, both in terms of species (Table 2) and individuals. Because of this, it was difficult to decide which species could be classed as abundant. Therefore, only five are listed in Table 3 (three category H species, and one each of categories I and J).

The reef fish fauna at Twilight Cove was poor, most likely due to the lack of habitat diversity and the shallowness of the area. At the base of the limestone cliffs to the west of the cove, the bottom is sandy, with scattered areas of low reef and some large boulders which

have fallen from the cliffs above. The few species of fish recorded here were mostly juveniles. Off the beach at Twilight Cove, areas of submerged, dissected reef platforms were found in depths to 5 m. These had a slightly higher fish diversity. Although most species were represented by adults, none appeared to be in sufficient numbers to suggest that breeding populations were present. Because of the surge and poor visibility, additional searches for reefs were unsuccessful.

The reefs here were mostly covered with sparse macroalgal communities. Some invertebrate growth was observed in crevices and under ledges, but no corals were found.

DISTRIBUTION PATTERNS

A total of 728 species of reef-associated fishes were recorded from the west and south coasts. Of this number, 78 were new to science, of which 45 have since been described. A faunal list is presented in the Appendix together with the regions where the species were recorded and estimates of their distributions. Broadly speaking, the most dominant group of fishes are the tropical species, represented by 491 species or 67% of the total, followed by the warm-temperate component (174 species, 24% of the total) and a small number of subtropical species (36 species, 5% of the total). A comparison between the totals from Table 2 (Total b) with the distributions shown in Figure 2, indicates that the tropical fauna is richest along the upper portion of the west coast, its numbers decreasing southwards to Rottnest Island, whereas the warm-temperate component is most numerous along the south coast, its numbers decreasing northwards to Shark Bay. The subtropical fauna is concentrated along the west coast between Shark Bay and Cape Leeuwin, its numbers diminishing both northwards to Ningaloo and eastwards to Israelite Bay. Other workers have reported a similar relationship (e.g. Wilson and Allen 1987), but none has presented a close analysis of these distributions.

Figure 3a depicts the attenuation of the tropical fauna southwards, the reduction of the warm temperate fauna northwards, and the more widespread nature of the subtropical fauna. To the north of region 3 (Shark Bay) and to the east of region 9 (Cape Leeuwin), the trend for each component is reasonably linear, but in the intervening area, it is much more haphazard. The offshore regions 5 (Houtman Abrolhos) and 8 (Rottnest Island) have considerably higher percentages of tropical species than the adjacent mainland regions; however, for the warm temperate species, the reverse occurs (lower percentages offshore, higher in mainland areas). The subtropical component is more evenly represented with only slightly lower percentages at the offshore islands versus the mainland areas. This infers that the offshore locations of regions 5 and 8 are more conducive for the tropical fauna than the warm temperate fauna, but have only a slight effect on the subtropical component. This offshore versus inshore (mainland) effect on the tropical and warm temperate faunas can be illustrated by joining the respective values as in Figure 3b. This suggests that any imaginary offshore areas located between Shark Bay and Cape Leeuwin would possess faunal percentages lying close to the "offshore" lines. Similarly, other areas along the mainland coast should have faunal percentages that are close to the lines marked "inshore". (As the differences between the

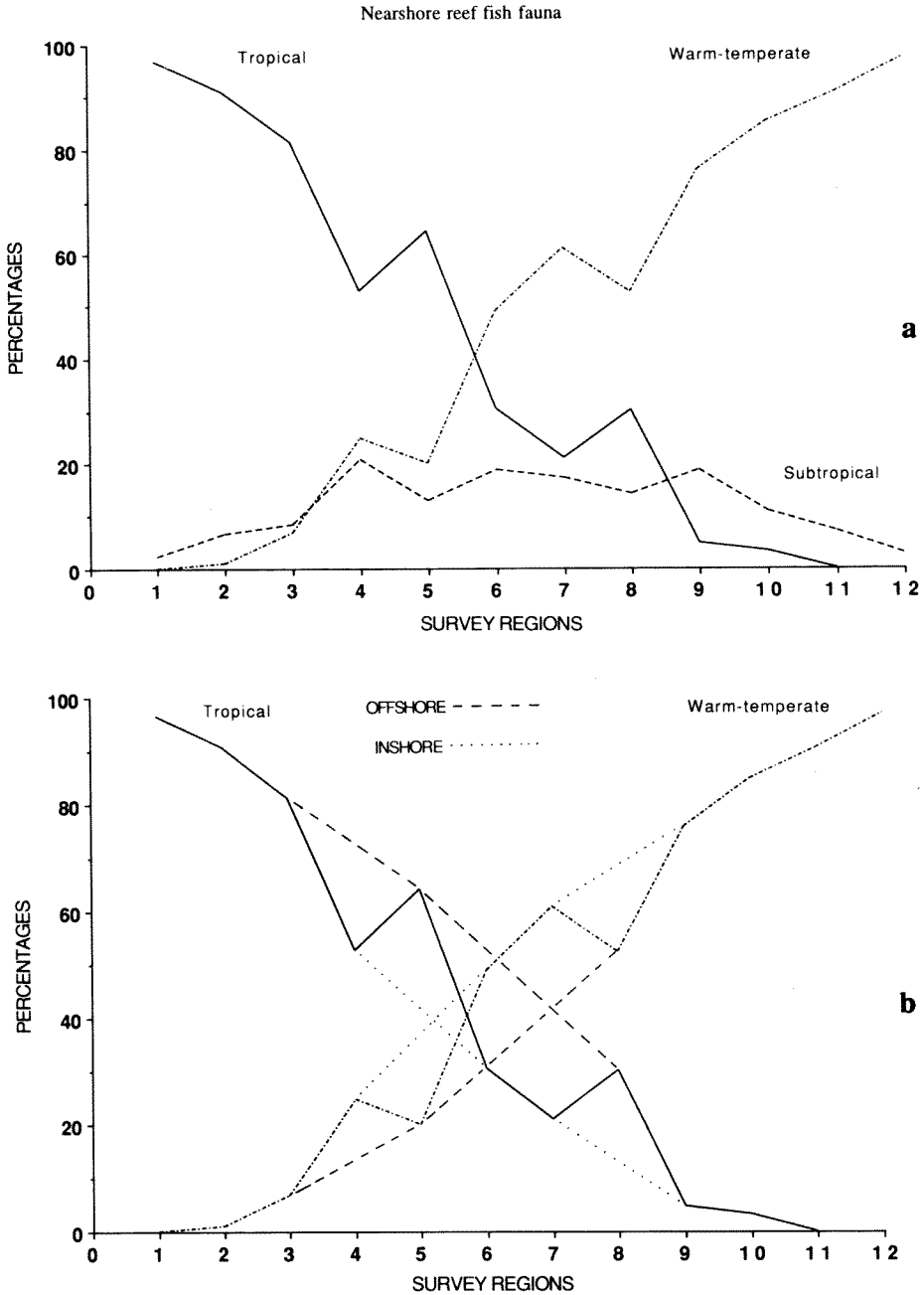


Figure 3 (a) Frequency of tropical, subtropical, and warm-temperate species recorded for each survey region (number of species of each category expressed as a percentage of the total number of species recorded for the respective region); (b) Frequency of tropical and warm-temperate species recorded for each survey region showing differential between inshore and offshore locations.

offshore and inshore areas for the subtropical component are only minor, they have not been shown). But are these differences real, or are they just artifacts of the method of collecting the data and/or its presentation?

Although differences in sampling effort exist between the various survey sites (see Table 1), I believe that the species lists are reasonably accurate representations of the fish diversity in each region. Survey sites with low species diversity were usually worked less because habitat diversity was low. Conversely, those areas with high species diversity required more time to survey the greater variety of reef habitats. Therefore, the discrepancies between inshore and offshore sites are probably not due to differences in the survey effort.

To test the possibility that the method of data presentation is at fault, the following analysis looks more closely at the distributions of the individual range categories A to K. Each is examined in respect to the number of species recorded for each survey region (Table 2), and expressed as a percentage of the total number of species in that range category. This method of presentation (Figure 4) shows the actual changes that occurred to each range category throughout the study area.

The tropical range categories A, B, C, and D (Figure 4a) are all prominent in region 1 (Ningaloo Reef), decreasing in species numbers through a series of steps southwards. The most obvious changes to their diversities are the marked falls that occur to the south of, respectively, regions 1, 3, 5, and 8. These are considered, therefore, to be the hypothetical southern boundaries of the respective range categories (species recorded to the south of their respective boundaries are considered to be extralimital at those sites because, in most cases, they were present in very low numbers only). Furthermore, these range categories are all close to their maximum value (i.e., 100%) at their southern limits.

Both subtropical range categories E and F (Figure 4b) are similar in that they reach peaks at firstly regions 5 (Houtman Abrolhos) and 6 (Port Denison) and secondly at region 8 (Rottnest Island) (these peaks are separated by a marked decrease in species numbers at region 7 [Lancelin] for both categories). The most obvious differences between the two is that the species diversity for category E is much higher in both regions 1 (Ningaloo) and 2 (Coral Bay) and much lower in regions 10 (Albany) and 11 (Recherche Archipelago) than for category F. Based on these diversities, the hypothetical limits for category E are considered to be region 2 (Coral Bay) in the north and region 9 (Cape Leeuwin) in the south, whereas the limits for category F are placed at region 3 (Shark Bay) and region 11 (Recherche Archipelago). Although category E appears to be well represented in region 1, the majority of the species recorded there are considered to be extralimital (but also see region 1 summary above).

The relationships for the warm-temperate range categories H, G, I, J, and K are illustrated in Figure 4c. The most obvious changes to their diversities occur to the north of, respectively, regions 3 (Shark Bay), 6 (Port Denison), 6, 8 (Rottnest Island), and 11 (Recherche Archipelago). Therefore, these regions are considered to be the hypothetical northern or western limits of the respective range categories (most species recorded to the north or west of their respective limits were based on low numbers of transient individuals). All categories

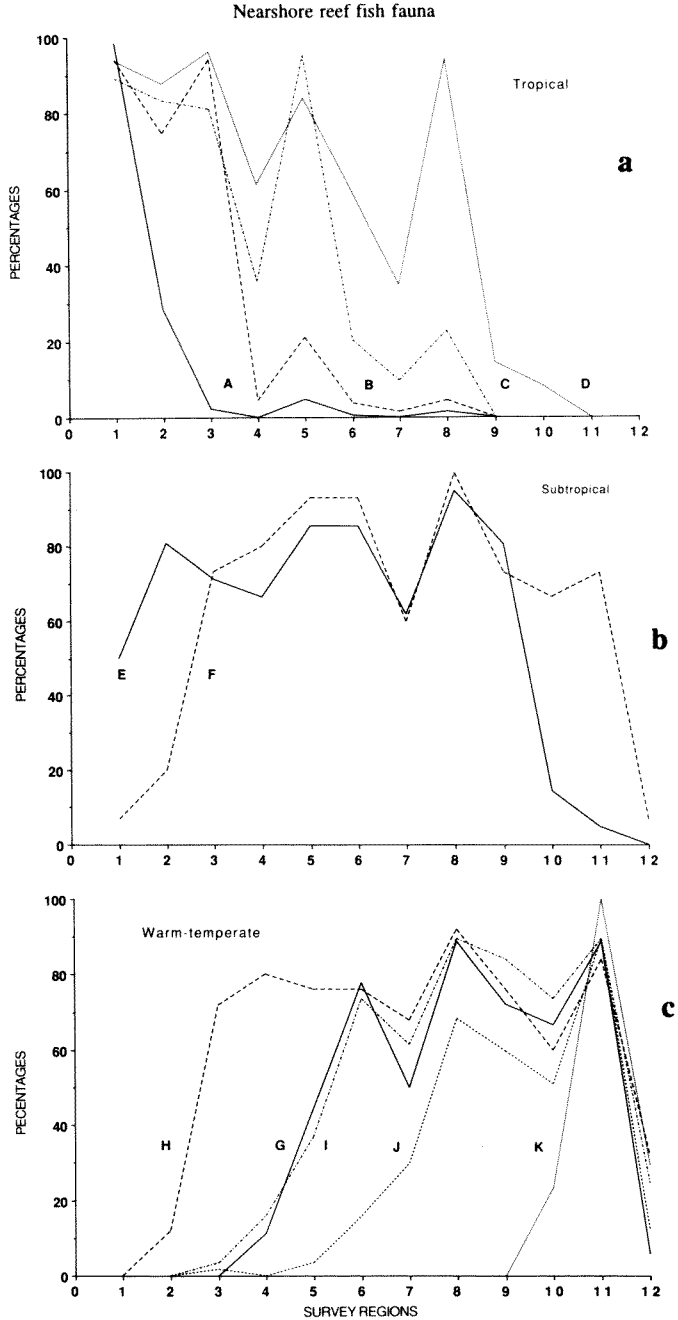


Figure 4 Frequency of species of each range category recorded for each survey region (number of species of each category expressed as a percentage of the total number of species in the respective range category): (a) tropical range categories; (b) subtropical range categories; and (c) warm-temperate range categories.

suffer prominent decreases in diversity between region 11 (Recherche Archipelago) and region 12 (Twilight Cove), but this is probably due to the shortage of reefs in the latter area (see region 12 summary above). Except for category G, all have distributions which continue across the Great Australian Bight to South Australia, and many to the eastern Australian coastline (see section on affinities below).

In Figure 5, the data from Table 2 for range categories A, B, C, and D have been combined and expressed as a percentage of the total tropical fauna, whereas the combination of data for categories E and F is expressed as a percentage of the total subtropical fauna, and the combined data for categories G, H, I, J, and K is expressed as a percentage of the total warm-temperate fauna. In this form, the changes to the three faunal components across the area of study are more evident, and are comparable with Figure 3.

Almost 50% of the tropical species are lost (Figure 5) in the area between region 1 (Ningaloo Reef) and region 3 (Shark Bay). This is due to the absence from regions 2 and 3 of most category A species (Figure 4a), the largest category of tropical fishes. The prominent numbers of tropical species at region 5 (Houtman Abrolhos) and region 8 (Rottnest Island), in comparison to the adjacent mainland areas (regions 4, 6, 7, and 9), are also evident. Therefore, The "offshore" and "inshore" effects, as shown in Figure 3b, are still present, but now the former may be extrapolated northwards from region 3 (Shark Bay) to region 1 (Ningaloo Reef) and the latter from region 4 (Kalbarri) to region 2 (Coral Bay).

There are few differences for the subtropical species between Figures 4 and 5. The warm-temperate fauna, however, is shown in Figure 5 to have its largest numbers at region 11 (Recherche Archipelago), these falling significantly at region 10 (Albany), before rising again at region 9 (Cape Leeuwin) and region 8 (Rottnest Island). The numbers fall away steadily northwards, becoming insignificant to the north of region 3 (Shark Bay). The most marked change to this fauna is the rather rapid reduction in species to the north of region 8 (Rottnest Island). This is not as obvious in Figure 4 because of the strengths of categories G, H, and I at region 6 (Port Denison), and category H at region 3 (Shark Bay). The much greater number of warm-temperate species at region 6 (Port Denison) in comparison to the more offshore region 5 (Houtman Abrolhos) is also evident in Figure 5. Importantly, there is no visible "offshore" or "inshore" effect as depicted in Figure 3 for the warm-temperate component.

Therefore, the method of data presentation utilised in Figure 4 and reproduced more succinctly in Figure 5, has shown some of the inadequacies of Figure 3. For tropical species, the big drop in numbers between regions 1 (Ningaloo Reef) and 2 (Coral Bay) is not shown in Figure 3 but is readily apparent in Figure 5. The great variation in the numbers of warm-temperate species along the south coast similarly is not depicted in Figure 3 as it is in Figure 5. Furthermore, the offshore and inshore effects on the tropical and warm-temperate species indicated in Figure 3 are corroborated by Figure 5 for the tropical component, but not for the warm-temperate one. Discrepancies between the subtropical component in Figures 3 and 5 are rather minor, except for the one occurring at region 7. In Figure 3, little change is visible between regions 6 to 8, but in Figure 5, a prominent reduction in the number of species is indicated for region 7. Thus, it is apparent that the relationships depicted in Figure 3 are not

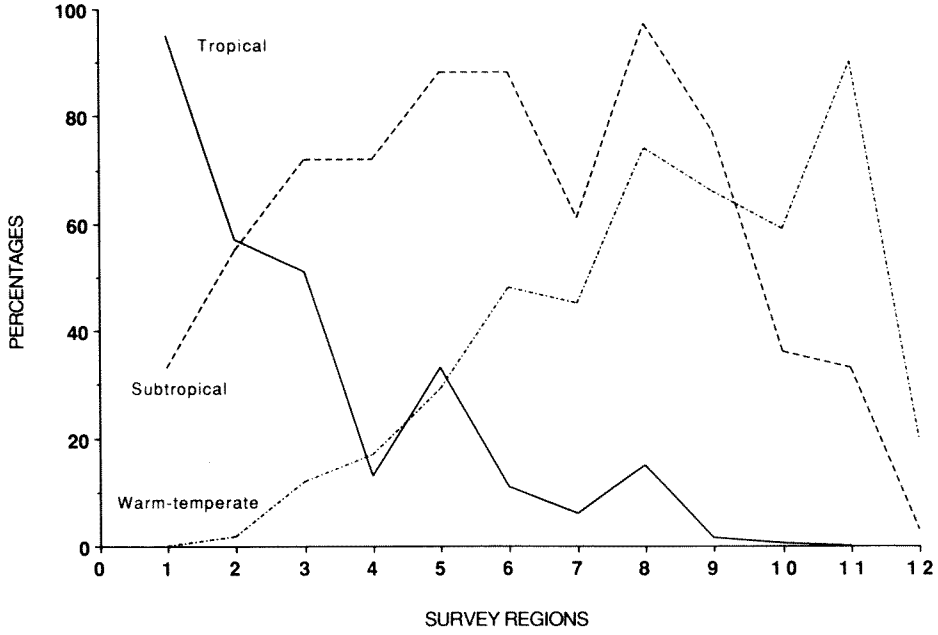


Figure 5 Frequency of tropical, subtropical, and warm-temperate species recorded for each survey region (number of species of each category expressed as a percentage of the total number of species in that category).

entirely relevant. On the other hand, Figure 5 – and Figure 4 – are much more representative of the distribution patterns.

Affinities with other Australian States

Except for the endemic species, which are listed in Table 4 and referred to below, and those species with uncertain distributions, most fishes recorded during this study also occur in other Australian states. The following is a summary of these affinities:

Tropical species

Most range across the northern half of Australia to either Queensland or NSW. Many are also widespread throughout the Indo-West Pacific. Some species, however, range only to the NT, but may also reach New Guinea.

Subtropical species

Only a few species of this component occur outside the state. These are *Gymnothorax prasinus* (40), *Cleidopus gloriamaris* (82), *Rhabdosargus sarba* (294), and *Microcanthus strigatus* (324). All are common along the west coast, and occur at similar latitudes on the east coast. Likewise, many of the subtropical endemics have a closely related species

Table 4 Endemic species of Western Australia.

No.	Species	Range	No.	Species	Range
10	*Aulohalaelurus labiosus*	G	306	*Upeneichthys stotti*	F
21	*Orectolobus* species	E	309	*Schuettea woodwardi*	F
26	*Cirrhimuraena calamus*	E	316	*Pempheris* species 1	B
42	*Gymnothorax woodwardi*	E	319	*Girella tephraeops*	G
54	*Paraplotosus* species	A	321	*Kyphosus cornelii*	E
60	*Batrachomoeus rubricephalus*	G	325	*Neatypus obliquus*	F
74	*Dinematichthys dasyrhynchus*	?	333	*Chaetodon assarius*	E
75	*Dipulus caecus*	E	382	*Chromis klunzingeri*	G
77	*Ogilbia* species 1	E	386	*Chromis westaustralis*	E
84	*Optivus* species	?	396	*Parma bicolor*	G
100	*Choeroichthys latispinosus*	?	397	*Parma mccullochi*	G
109	*Nannocampus subosseus*	F	398	*Parma occidentalis*	E
121	*Scorpaena sumptuosa*	F	422	*Cheilodactylus gibbosus*	F
124	*Scorpaenodes steenei*	E	424	*Cheilodactylus rubrolabiatus*	F
140	*Acanthistius pardalotus*	E	434	*Anampses lennardi*	A
141	*Acanthistius serratus*	G	447	*Choerodon cauteroma*	B
144	*Caesioperca* species	?	450	*Choerodon rubescens*	E
145	*Caesioscorpis theagenes*	E	453	*Coris auricularis*	F
153	*Epinephelides armatus*	F	458	*Dotalabrus alleni*	G
154	*Epinephelus bilobatus*	B	464	*Halichoeres brownfieldi*	F
165	*Hypoplectrodes cardinalis*	F	483	*Pictilabrus viridis*	G
167	*Hypoplectrodes wilsoni*	G	487	*Pseudolabrus biserialis*	G
186	*Paraplesiops sinclairi*	G	492	*Suezichthys cyanolaemus*	E
188	*Trachinops brauni*	G	500	*Thalassoma septemfasciata*	E
190	*Beliops xanthokrossos*	G	525	*Opistognathus* species	?
192	*Glaucosoma hebraicum*	F	536	*Cirripectes hutchinsi*	E
206	*Apogon pallidofasciatus*	A	553	*Parablennius postoculomaculatus*	E
212	*Apogon victoriae*	E	583	*Heteroclinus* species 4	?
221	*Pterapogon mirifica*	A	594	*Alabes* species 2	?
227	*Vincentia punctata*	G	596	*Aspasmogaster occidentalis*	G
271	*Pentapodus vitta*	E	621	*Eviota bimaculata*	F
			680	*Siganus trispilos*	A

occupying a similar range of latitude on the east coast. Most of these apparently allopatric sister species are listed in Table 5 (in the absence of phylogenetic analyses of most of these taxa, these relationships, and those referred to below, must be treated as unproven).

Warm-temperate species

Many of these species range across the southern half of Australia, a breakdown of their distributions being presented in Table 6. The wide-ranging species which inhabit all southern states are the most numerous (58 species, or 37% of the total), followed by those which range into SA only (38 species, or 25% of the total). Species ranging across to Tas are also well represented (26 species, or 17% of the total); however, those that are distributed across to NSW, with the exception of Tas, are poorly represented (5 species, or 3% of the total).

Some warm-temperate species which do not range into NSW have a closely related species

Table 5 Allopatric species pairs – west and east coasts of Australia.

No.	West Coast	East Coast
121	*Scorpaena sumptuosa*	*Scorpaena cardinalis*
165	*Hypoplectrodes cardinalis*	*Hypoplectrodes mccullochi*
167	*Hypoplectrodes wilsoni*	*Hypoplectrodes annulatus*
186	*Paraplesiops sinclairi*	*Paraplesiops poweri*
188	*Trachinops brauni*	*Trachinops taeniatus*
212	*Apogon victoriae*	*Apogon limenus*
309	*Schuettea woodwardi*	*Schuettea scalaripinnis*
319	*Girella tephraeops*	*Girella elevata*
333	*Chaetodon assarius*	*Chaetodon guentheri*
422	*Cheilodactylus gibbosus*	*Cheilodactylus vestitus*
453	*Coris auricularis*	*Coris sandageri*
487	*Pseudolabrus biserialis*	*Pseudolabrus guentheri*
492	*Suezichthys cyanolaemus*	*Suezichthys arquatus*
553	*Parablennius postoculomaculatus*	*Parablennius intermedius*

in that state. These apparently allopatric sister species are listed in Table 7. There is also some evidence to suggest that further studies on what are currently regarded as wide-ranging species might see an increase in the size of this list.

Several species inhabiting WA waters have an apparently sympatric sister species (Table 8), although the distributional overlap for some of these occurs in SA.

Endemic species

A total of 63 species of fishes endemic to Western Australia were recorded from the west and south coasts (Table 4). This is approximately 9% of the total reef fish fauna, and is made up of 8 tropical, 32 subtropical, 16 warm-temperate, and 7 species of uncertain distribution. In addition, four of the genera, namely *Dipulus, Caesioscorpis, Beliops*, and *Neatypus*, are considered to be endemic to Western Australia. They are all monotypic.

Family distributions

Table 9 lists all of the fish families with ten or more species inhabiting the study area. The families with the largest numbers of species also tend to be the most widespread (e.g., Labridae with 72 species is represented by all range categories except K). These families are

Table 6 Distribution of non-endemic warm-temperate species.

	H	I	J	K	Total
WA and SA	7	13	13	5	38
WA, SA, and Vic	0	6	6	2	14
WA, SA, Vic, and Tas	2	7	14	4	26
Southern Australia	11	22	19	6	58
WA, SA, and NSW	5	7	3	0	15
WA, SA, Vic, and NSW	0	2	3	0	5
Total	25	57	57	17	156

Table 7 Allopatric species pairs – west/south and east coasts of Australia.

No.	West/South Coasts	East Coast
136	*Platycephalus speculator*	*Platycephalus caeruleopunctatus*
185	*Paraplesiops meleagris*	*Paraplesiops bleekeri*
251	*Arripis truttaceus*	*Arripis trutta*
351	*Chelmonops curiosus*	*Chelmonops truncatus*
419	*Chironemus georgianus*	*Chironemus marmoratus*
431	*Achoerodus gouldii*	*Achoerodus viridis*
480	*Notolabrus parilus*	*Notolabrus gymnogenis*
568	*Lepidoblennius marmoratus*	*Lepidoblennius haplodactylus*
597	*Aspasmogaster tasmaniensis*	*Aspasmogaster costatus*
598	*Cochleoceps bicolor*	*Cochleoceps orientalis*
712	*Anoplocapros robustus*	*Anoplocapros inermis*

composed mostly of tropical species, but also possess reasonable numbers of subtropical and warm-temperate taxa. A few contain more temperate than tropical species (e.g., Syngnathidae, Clinidae, and Monacanthidae). Of these, only one, Clinidae, is made up totally of temperate species. Furthermore, the speciose tropical families contribute most of the endemic species. The Labridae, for example, contains 10 species found only in Western Australia (two tropical, five subtropical, and three warm-temperate species [Table 4]). Some families are made up completely of tropical species, such as the Acanthuridae, while other tropical families also have 1-2 subtropical or warm-temperate species (e.g. Chaetodontidae).

DISCUSSION

This investigation has shown the extraordinary diversity of the reef fish fauna that inhabits the west and south coasts of Western Australia. This diversity, however, is not constant from region to region. Some areas have extremely rich fish faunas, while adjacent areas are relatively poor. In effect, the indications are that each survey region is inhabited by a reasonably discrete fauna.

Several factors govern what type of fish community develops in a particular area. These are: 1. The regular source of larvae; 2. The type of substrate, initially for settlement of the larvae,

Table 8 Sympatric species pairs.

No.	West to south-west coasts	No.	Mostly south coast
21	*Orectolobus* species	19	*Orectolobus tentaculatus*
189	*Trachinops noarlungae*		*Trachinops caudimaculatus*
225	*Vincentia badia*		*Vincentia conspersa*
421	*Aplodactylus westralis*		*Aplodactylus arctidens*
458	*Dotalabrus alleni*	459	*Dotalabrus aurantiacus*
483	*Pictilabrus viridis*	482	*Pictilabrus laticlavius*
589	*Ophiclinus pectoralis*	587	*Ophiclinus gracilis*
700	*Eubalichthys cyanoura*		*Eubalichthys gunnii*
723	*Omegophora cyanopunctata*	722	*Omegophora armilla*

Table 9 Numbers of species from largest families by distribution.

	A	B	C	D	E	F	G	H	I	J	K	0,?	Total No.
Labridae	21	11	13	9	3	2	3	2	4	2	–	2	72
Gobiidae	13	14	7	1	–	1	–	1	–	2	–	10	49
Pomacentridae	13	13	6	5	2	–	3	–	1	–	–	–	43
Serranidae	9	6	6	2	2	2	2	–	2	1	1	1	34
Apogonidae	13	5	9	1	1	–	1	–	2	–	1	–	33
Blenniidae	8	9	6	4	1	–	–	–	–	–	–	–	28
Chaetodontidae	10	7	5	2	1	–	–	1	–	–	–	–	26
Scaridae	9	2	3	3	–	–	–	–	–	–	–	–	17
Syngnathidae	4	–	2	–	–	1	1	–	1	6	1	1	17
Carangidae	5	6	–	2	–	–	–	3	1	–	–	–	17
Clinidae	–	–	–	–	–	–	–	–	4	7	5	1	17
Monacanthidae	–	3	1	1	–	–	–	2	7	3	–	–	17
Acanthuridae	7	6	2	1	–	–	–	–	–	–	–	–	16
Scorpaenidae	2	3	2	1	1	1	–	–	2	1	–	1	14
Mullidae	7	3	–	2	–	1	–	–	1	–	–	–	14
Muraenidae	8	2	1	–	1	1	–	–	–	–	–	–	13
Gobiesocidae	1	–	1	–	–	–	1	–	–	6	2	2	13
Lutjanidae	9	3	1	–	–	–	–	–	–	–	–	–	13
Tripterygiidae	2	1	–	1	–	–	–	1	–	2	3	1	11
Orectolobidae	4	1	1	–	1	–	–	–	3	1	–	–	11
Lethrinidae	5	2	2	1	–	–	–	–	–	–	–	–	10

and subsequently for their survival; and 3. Quality of environmental conditions, such as water temperature, salinity, water clarity, water movement, and food supply. The interaction of the all these factors produce the distinctive fauna for the area. However, one of the most important determinants of this interaction are ocean currents (Hatcher 1991). In Western Australia, the dominant pattern is provided by the Leeuwin Current. This south-flowing eastern boundary current has the potential to affect all the factors mentioned above, thereby weaving a considerable influence on the marine fauna and flora of the state (see Pearce and Walker 1991).

Leeuwin Current

The flow of the Leeuwin Current has become increasingly better known due to ongoing work by the CSIRO (Cresswell 1991; Pearce 1991). Its source is in the tropical Indian Ocean off north-western Australia. To the north of North West Cape, the current is a broad body of warm, low-salinity water. During summer it is mostly quiescent, but in autumn, the flow to the south intensifies, narrowing as it approaches North West Cape. The current flows along the edge of the continental shelf, passing close to Ningaloo Reef. At about 27°S (just south of Shark Bay), it moves away from the coast, passing just to the west of the Houtman Abrolhos and Rottnest Island. It then rounds Cape Leeuwin and flows eastwards into the Great Australian Bight. Parts of the current are narrow and jetlike, but large meanders can occur along its path, developing into cyclonic and anticyclonic eddies which may flow onto the shelf. This strong southwards flow wanes in late spring.

During summer, wind driven northward-flowing water of high salinity occupies most of the shelf along the west coast. It is not clear if this is a feature of the West Australian Current, a northwards flow located well offshore which forms the eastern limb of the south Indian Ocean gyre. However, Pearce (1991) refers to a branch of this current that meanders eastwards between latitudes 29 and 31°S as the "West Australian Summer Current". He indicates that this current is deflected southwards offshore of the Leeuwin Current. Thus the inshore northwards movement of water is probably a separate phenomenon.

In a recent paper, I reported on the recruitment of tropical reef fishes at Rottnest Island via the Leeuwin Current (Hutchins 1991). I suggested that the sudden influx of juveniles in March or April was related to the arrival of the current off the island. Furthermore I stated that the nearest source of breeding stocks of tropical fishes was probably the Houtman Abrolhos, which is also in the path of the Leeuwin Current. As there was little evidence of tropical fish recruitment at Rottnest Island during the summer, when the current is weak or not flowing, my surmation was that the populations were being maintained at the island by this autumn to spring recruitment.

The Leeuwin Current also maintains higher minimum water temperatures at Rottnest Island. In contrast to the nearby mainland reefs, mean minimum water temperatures of 18°C along the western portion of the island are about 3°C higher. This enables the hardier tropical species to survive at Rottnest Island. In turn, these temperatures allow many coral species to flourish there (Veron and Marsh 1988), providing the necessary habitat for tropical reef fishes. Furthermore, the clear oceanic conditions that occur at the island during winter, in contrast to the silt-laden waters found along the nearby mainland coast, are a feature of the Leeuwin Current.

Thus the peak in numbers of tropical species (range category D, and to a lesser extent category C [Figure 4a]), recorded during this study for Rottnest Island (region 8) is obviously related to the Leeuwin Current. Can the peaks in the tropical categories at the Houtman Abrolhos (region 5), Shark Bay (region 3), and Ningaloo Reef (region 1) also be tied to this current?

The location of the 100 m depth contour along the west and south coasts of Western Australia is indicated in Figure 6. This closely approximates the edge of the continental shelf, traditionally the 200 m depth contour, although in the vicinity of Shark Bay the latter is considerably further offshore. The path described above for the Leeuwin Current appears to closely follow the 100 m contour. Therefore it is reasonable to presume that those regions close to this depth contour (regions 1, 3, 5, and 8) are more likely to be under the influence of the current than those further away from it (regions 2, 4, 6, 7, and 9 to 11). Indeed Figure 5 shows that the tropical fauna at each of the former regions is more diverse than those at the adjacent inshore regions. The Leeuwin Current ensures the survival of the tropical fauna at these locations by maintaining a regular supply of tropical larvae and providing the necessary environmental conditions. At the inshore regions, recruitment is more haphazard and environmental conditions are much harsher.

This dispersal via the Leeuwin Current, therefore results in a continuation of tropical fishes

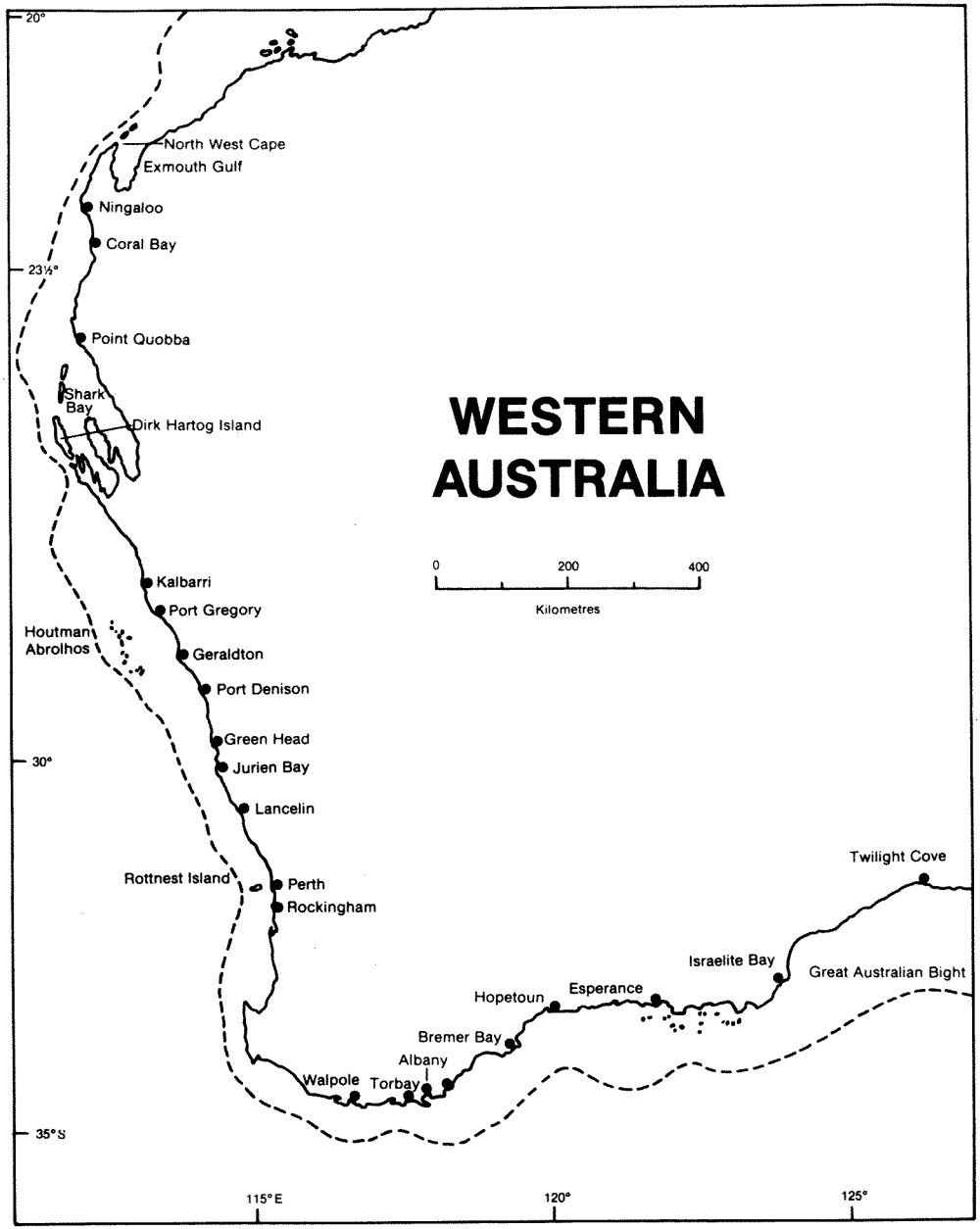


Figure 6 Approximate position of the 100 m depth contour (broken line) off the west and south coasts of Western Australia.

well into the subtropical zone. However, the attenuation of the fauna is more punctuated than gradual. It was shown above that the hypothetical southern boundaries for range categories A, B, C, and D are respectively regions 1, 3, 5, and 8. In addition, each category is close to its maximum numbers at this limit. Thus, the abrupt reduction of tropical species to the south of each region produces this punctuated effect. This is further accentuated by the relatively low tropical diversity at the inshore regions 4, 6, 7, and 9. The spread of the tropical fauna southwards could be likened to a series of large jumps from one "offshore" refuge to another – these essentially by-pass the more unfavourable inshore regions. It is noteworthy, however, that the majority of the most abundant tropical species in both offshore and inshore regions belong to range category D (Table 3). Evidently the success of these species to populate a region is reflected by their ability both to disperse southwards and to occupy areas unfavourable to other tropical fishes.

The punctuated effect is nowhere more evident than at Ningaloo Reef (region 1). The sudden loss of most category A fishes at Coral Bay (region 2) has a significant affect on the diversity of the fauna (Figure 5). Furthermore, those areas to the north of Ningaloo Reef, but located well to the east of the 100 m depth contour, also have considerably less diverse fish faunas. For example, only 335 species of reef fish were found at the Dampier Archipelago (Figure 1) during eight visits between 1971 and 1978 (Hutchins and Allen, unpublished data). On the other hand, the Rowley Shoals, which lie to the west of the shelf break, possess probably the most diverse reef fish fauna in Western Australia (Allen and Russell 1986). These shoals are located almost 700 km to the north of North West Cape and about 300 km off the Western Australian coastline; this is considered to be in the source region for the Leeuwin Current (Pearce 1991). Over 600 reef fish species have been recorded there (Allen and Russell 1986). Many of these are shared with Ningaloo Reef, but have not been found elsewhere in nearshore waters of the state. This faunal connection between the Rowley Shoals and Ningaloo Reef suggests that gene flow between the two areas is being maintained by the Leeuwin Current. Furthermore, it indicates that those reefs to the east of the shelf break are apparently less influenced by the current.

The Leeuwin Current also appears to assist in the dispersal of some subtropical species further to the south and east. Some range category F species were recorded at the Recherche Archipelago in relatively low numbers, e.g., *Coris auricularis* (453). This suggests that these populations are being maintained by recruitment from areas further to the west via the Leeuwin Current.

There is little doubt that the Leeuwin Current is responsible for many of the unexpected range extensions of tropical and subtropical fishes that have been recorded during this investigation. Among these were several tropical species found along the south coast of the state, including *Anampses geographicus* (433), *Plagiotremus rhinorhynchos* (556), and *Barbuligobius boehlkei* (610). Others like *Plotosus lineatus* (55), *Pterois volitans* (120), *Platax teira* (331), *Sphyraena barracuda* (427), and *Tetrosomus concatenatus* (716) have been either reported or are represented by specimens at WAM. The most wide-ranging record is that of *Epinephelus lanceolatus* (159) from the Coorong in South Australia (Kailola and

Jones 1981). Some subtropicals, including *Cleidopus gloriamaris* (82), *Halichoeres brownfieldi* (464) and *Parablennius postoculomaculatus* (553), have been found in the Great Australian Bight, while others, such as *Gymnothorax prasinus* (40), *Neatypus obliquus* (325), *Schuettea woodwardi* (309), *Cheilodactylus rubrolabiatus* (424), and *Eviota bimaculata* (621), have reached western parts of South Australia. The warm-temperate *Acanthistius serratus* (141) has also been recorded once in South Australia.

The Leeuwin Current may also indirectly influence the dispersal of subtropical and warm-temperate fishes along northern parts of the west coast. Satellite images in autumn indicate a countercurrent of cool water flowing northwards from Shark Bay inshore of the Leeuwin current (A. Pearce, pers. comm.). This may extend as far north as Point Cloates (Ningaloo homestead), and would help explain the range extensions of some warm-temperate and subtropical species. For example, *Kyphosus cornelii* (321) was abundant in Shark Bay (region 3), but occurred in much reduced numbers at Point Quobba (southern end of region 2), and was not recorded at Coral Bay (northern end of region 2). However, some recently settled juveniles were found at Norwegian Bay (just north of Ningaloo Homestead) in June, 1993, suggesting that they were carried north by the cooler inshore water (water temperatures taken at Norwegian Bay during June 1993 showed differences of up to 4°C between waters inside and outside the lagoons).

This northwards movement of inshore water may also contribute to the disparity in the faunas between Ningaloo Reef and Coral Bay. The presence of the Leeuwin Current adjacent to Ningaloo Reef, as well as the extreme narrowness of the shelf there, may inhibit any flow of inshore water to the north of the Norwegian Bay area. However, the rare occurrences of some warm-temperate species (e.g., *Aulopus purpurissatus* [56], *Bodianus frenchii* [439], and *Omegophora armilla* [722]), well to the north of North West Cape, indicate that a northern movement of larvae must exist, even if only sporadically.

Faunal discontinuities

In addition to the relatively regular faunal breaks described above, several unexpected faunal shifts occurred at regions 7 (Lancelin) and 10 (Albany). All subtropical and warm-temperate categories experienced prominent reductions in species numbers at region 7; species diversity at each of the adjacent regions 6 and 8 was considerably higher. Although habitat diversity is relatively low in the former area, pollution also probably plays a part. The southern portion of the region includes the industrial area of Cockburn Sound. Effluent released into the sound has been responsible for degrading its biota (Moore 1979). Because of its proximity to a large population centre, this region also suffers from heavy fishing pressures. The combination of all three factors may be responsible for the lower number of species here. At region 10 (Albany), the reduction in species numbers of warm-temperate categories may be due to similar circumstances. Pollution has been a problem near the port of Albany, particularly in Princess Royal Harbour, and fishing pressures are considerable as well. However, habitat differences between this area and adjacent regions 9 and 11, although not great, may also contribute to the lower species diversity.

Faunal Provinces

Recent papers on biogeography (e.g., Wilson and Allen 1987; Morgan and Wells 1991) have tended to reject the idea of dividing the Australian coastline into a series of relatively small provinces (see Knox 1980). These works have instead promoted a northern Australian tropical region and a southern Australian temperate region with extensive areas of overlap on the east and west coasts. Each overlap zone is inhabited also by a small distinctive fauna composed of endemic species. While my findings certainly add weight to this, I nevertheless feel that the characteristically Western Australian flavour provided by the endemic species deserves further consideration.

Between Shark Bay (region 3) and Albany (region 10), the 52 species of endemic fishes with subtropical and warm-temperate distributions – just over 10% of the fauna in this area – make up generally the larger portion of the most commonly sighted species. As stated in the methods section above, the ten most abundant species (Table 3) can be considered to represent the faunal signature for each of the 12 survey regions. For regions 1 and 2, the faunal signature consists mostly of wide-ranging tropical species. From region 3 southwards, the tropical species are gradually replaced by subtropical and warm-temperate species. The endemic component of these faunal signatures consists of one species in region 2, four species in each of regions 3, 4, and 5, seven species in region 6, two species in region 7, six species in region 8, six species in region 9, four species in region 10, and two species in region 11. Furthermore, in the majority of regions 3 to 11, the first and second most abundant species are the endemics. This uniquely Western Australian flavour, therefore, is most obvious on the mid to lower west coast, being gradually replaced to the north by the wide-ranging tropical Indo-West Pacific species and to the east by the warm-temperate species which range across Australia's southern coastline.

Early studies on the zoogeography of Western Australia (e.g. Whitley 1932) showed a northern Dampierian Province meeting a southern Flindersian Province in the area of the Houtman Abrolhos. Other workers have varied the northern and southern limits of these provinces, and some have even added additional provinces. Knox (1963) included the West Australian Province for the region extending from the Houtman Abrolhos to between Cape Riche (just east of Albany) and Esperance, whereas the south-western corner from Perth to Albany was placed in the Baudinian Province by Kott (1952). Probably the most unusual is the Leeuwin Province of Hatcher (1991), which includes that area of Western Australian under the direct influence of the Leeuwin Current. This province is inferred by Hatcher to extend from the Rowley Shoals off the north-western coastline to the Great Australian Bight. The first two are clearly described as warm-temperate provinces, whereas the third is a mixture of tropical, subtropical and warm-temperate regions. Expanding the range of the West Australian Province north to Shark Bay and south-east to the Recherche Archipelago would seem to be the most appropriate move to accommodate the endemic fauna. However, the name of this province is unsuitable, as Knox (1963) himself suggested (it only covers a relatively small portion of the state). Of the remaining two, Baudinian is also not appropriate because of its very restricted range. However, Leeuwin Province appears more befitting, firstly, because of the influence of the Leeuwin Current on this region, and secondly, because

Table 10 Distribution details of the most abundant non-tropical species recorded for each southern state. A = Abundant; F = Frequent; O = Occasional; R = Rare; a dash indicates that the species was not recorded.

No.	Species	WA	SA	Tas	Vic	NSW
	Caesioperca lepidoptera	–	–	A	A	O
143	*Caesioperca rasor*	O	O	A	A	–
	Ellerkeldia mccullochi	–	–	–	F+	A
	Trachinops caudimaculatus	–	–	A	A	–
189	*Trachinops noarlungae*	A	A	–	–	–
	Trachinops taeniatus	–	–	–	O+	A
228	*Dinolestes lewini*	F	O	A	O	F
294	*Rhabdosargus sarba*	O	–	–	–	A
	Schuettea scalaripinnis	–	–	–	–	A
	Pempheris affinis	–	–	–	–	A
	Pempheris compressus	–	–	–	–	A
313	*Pempheris klunzingeri*	A	F	–	–	–
314	*Pempheris multiradiata*	F	F	A	F	A
320	*Girella zebra*	F	A	O*	O	R
321	*Kyphosus cornelii*	A	–	–	–	–
323	*Kyphosus sydneyanus*	A	A	–	R+	0
	Atypichthys strigatus	–	–	–	A+	A
325	*Neatypus obliquus*	A	–	–	–	–
326	*Scorpis aequipinnis*	A	A	O	A	–
	Scorpis lineolatus	–	–	–	A+	A
	Chromis hypsilepis	–	–	–	O+	A
382	*Chromis klunzingeri*	A	–	–	–	–
386	*Chromis westaustralis*	A	–	–	–	–
397	*Parma mccullochi*	A	–	–	–	–
	Parma microlepis	–	–	R	F+	A
398	*Parma occidentalis*	A	–	–	–	–
	Parma unifasciata	–	–	–	–	A
399	*Parma victoriae*	F	F	O*	A	–
	Chironemus marmoratus	–	–	–	R+	A
	Crinodus lophodon	–	–	–	O+	A
	Cheilodactylus fuscus	–	–	–	–	A
423	*Cheilodactylus nigripes*	O	A	A	F	–
	Achoerodus viridis	–	–	–	R+	A
436	*Austrolabrus maculatus*	A	A	–	–	O
450	*Choerodon rubescens*	A	–	–	–	–
453	*Coris auricularis*	A	–	–	–	–
458	*Dotalabrus alleni*	A	–	–	–	–
459	*Dotalabrus aurantiacus*	O	O	A	A	R
461	*Eupetrichthys angustipes*	O	R	–	R+	A
464	*Halichoeres brownfieldi*	A	–	–	–	–
	Notolabrus fucicola	–	R+	A	A	–
	Notolabrus gymnogenis	–	–	–	R+	A
480	*Notolabrus parilus*	A	O	–	–	–
	Notolabrus tetricus	–	A	A	A	R
481	*Ophthalmolepis lineolatus*	A	–	–	F+	A
482	*Pictilabrus laticlavius*	F	F	A	A	A

Table 10 (cont.)

No.	Species	WA	SA	Tas	Vic	NSW
487	*Pseudolabrus biserialis*	A	–	–	–	–
	Pseudolabrus guntheri	–	–	–	–	A
	Pseudolabrus psittaculus	–	R	A	A	R
504	*Odax cyanomelas*	F	A	F	A	F
505	*Siphonognathus beddomei*	F	F	A*	O	–
	Neoodax balteatus	R	A	A	R	R
527	*Parapercis haackei*	F	A	–	–	–
566	*Helcogramma decurrens*	A	F	–	–	–
694	*Acanthaluteres brownii*	O	A	–	–	–
695	*Acanthaluteres vittiger*	O	A	A	A	O
705	*Meuschenia hippocrepis*	F	A	F*	O	–

+ Eastern parts only
* North coast only

the name has been used in this context previously for south-western Australia. Based on the distribution of terrestrial molluscs, Iredale (1937) introduced the name "Leeuwinian Area" for the region stretching from near Shark Bay to the South Australian border. Subsequently the northern border was moved to Exmouth Gulf and the south-eastern border to near Twilight Cove (see Smith and Kershaw 1979).

Based on my examination of the reef fish fauna, I believe that the name Leeuwin Province should be employed to provide a formal name for the region stretching from at least Shark Bay to Albany. Between Shark Bay and Coral Bay, however, endemic species are still numerous, although more restricted in numbers (only one, *Cirripectes hutchinsi* [536] is considered part of the faunal signature for region 2, see Table 3). Furthermore, along the south coast, endemic species are prominent as far east as the Recherche Archipelago (two species are included in the faunal signature for region 11). If recognition of the dwindling endemic fauna to the north of Shark Bay and to the east of Albany is also warranted, the province could be extended to the Coral Bay region in the north and to the Recherche Archipelago in the east. Overlap zones with the tropical Dampierian Province and warm-temperate Flindersian Province would commence at these localities, the former ranging southwards to Rottnest Island and the latter extending westwards and northwards to Shark Bay.

Southern Australia

The other southern states of Australia possess distinctive reef fish faunas as well. For comparison with the situation described above for Western Australia, Table 10 presents distributional details of the most abundant non-tropical species recorded for each of the southern states (the tropical fauna is not considered here because the most abundant tropical species in WA and NSW generally possess wide-ranging distributions in the Indo-West Pacific, and thus do not provide a distinctive regional flavour). To qualify for inclusion here, a species had to be abundant in at least two survey regions in the respective state (see

Introduction). Utilising the premise that the characteristic signature of the fish fauna can be approximated by examining the ranges of those species observed in the largest numbers, the following state-by-state summary is presented:

Western Australia

The most commonly sighted species total 19, of which 11 are endemic (seven subtropical and four warm-temperate species). The eight non-endemic species are all warm-temperate, four of which are shared with SA only, three also occur in SA and NSW, and one ranges across to Vic.

South Australia

The most abundant species total 13, none of which is endemic. All are warm-temperate, four of which range across Australia's southern coastline from WA to NSW. Three species are shared with WA only, another three range from WA to Vic, two also occur in WA and NSW, and one ranges from SA to NSW.

Tasmania

Of the 14 most often sighted species, none is endemic. Two are cool-temperate species, occurring also in Vic, and extending into south-eastern SA (one also is found in NZ). The remaining 12 species are warm-temperate, six of which are wide ranging across southern Australia from WA to NSW. Three species range from WA to Vic, whereas three are shared with SA, Vic, and NSW (one of the latter three also occurs in NZ).

Victoria

The most abundant species total 14, none of which is endemic. Two are cool-temperate species, occurring also in Tas, and ranging into south-eastern SA (one occurs also in NZ). From the remaining 12 species, all of which are warm-temperate, four are wide-ranging, extending from WA to NSW, three range from Vic across to WA, three are distributed from SA to NSW (one also occurs in NZ), and two are shared with NSW only.

New South Wales

The most commonly sighted species total 21, 13 of which are endemic to south-eastern Australia (all the latter species range to either far eastern Vic or southern Qld). The endemic fishes consist of five subtropical and 8 warm-temperate species. The remaining eight non-endemic species are all warm-temperate, of which three are shared with NZ, three also occur in SA and WA, one of which ranges across to NZ, and two are distributed from NSW to WA.

Therefore, the fifty-seven most abundant non-tropical species which inhabit Australia's southern half consist of, in decreasing order of magnitude, 13 south-eastern endemics, 11 WA endemics, eight species which range from WA to NSW, six from WA to Vic (usually including Tas), six from WA to SA, and three from SA to NSW (one occurs also in NZ), while three occur in WA, SA, and NSW (one is found also in NZ), three are shared between NSW and NZ, two inhabit WA and NSW only, and two occur in Tas and Vic (one also ranges

across to NZ) (those ranges incorporating the eastern and northern portions only of Vic and Tas respectively, as well as southern Qld, have not been fully described here for simplicity).

My interpretation of the data presented above is that the characteristic faunas of NSW and WA each consist mostly of endemic species, with smaller numbers of species which range into other southern states (in northern waters, the endemics are replaced generally by wide-ranging tropical species). On the other hand, the faunal signatures of Vic, Tas, and SA are made up predominantly of widely distributed south coast species, which usually range into southern portions of the east and/or west coasts.

Therefore the reef fish fauna of Australia's southern half can be considered to have three distinct components, a south-western, a south-eastern, and a southern fauna. If formal recognition of these components is deemed appropriate, they could be termed Leeuwin, Peronian and Flindersian, respectively, with broad zones of overlap on the south-western and south-eastern coasts (a more detailed examination of this situation is currently in progress, and will be reported on in a future publication).

CONCLUSIONS

Nearshore reef fishes are an important part of the state's marine fauna. Their habitat is heavily utilised by humans, especially for recreational purposes, and as such, is susceptible to overexploitation. Fortunately, the coastline of Western Australia is largely underpopulated, and the impact of our activities is still reasonably small. Nevertheless, as the pressure to expand the size and number of our population centres increases, humans will further impact on nearshore reefs. The fish list presented here, therefore, represents a fauna that is still largely pristine, although certainly under pressure in some areas (for example, in the coastal waters of Perth). This list then should provide a basis for monitoring any changes that occur in the future.

Over the period of the study, one change did become apparent at Rottnest Island. Surveys in 1976 showed that many of the island's coralliferous areas had only a sparse tropical fish fauna. During subsequent visits to the island, however, it became obvious that not only was the coral community increasing in size, but also the numbers of associated fishes were growing larger. For example, the area covered by the coral *Pocillopora damicornis* has expanded greatly in the peninsula area near Salmon Bay (see regional summary above). This has been reflected by the growth in numbers of tropical fishes in the same area, particularly the wrasses *Thalassoma lunare* (496) and *T. lutescens* (497) . This increase, however, mostly involved well established species – new or additional records of rare species have increased only marginally. The nature of this fluctuation can only be determined by continued monitoring.

ACKNOWLEDGEMENTS

Many people assisted with various facets of this investigation, most of whom have been acknowledged elsewhere, particularly in the publications of Hutchins and Thompson (1983),

Hutchins and Swainston (1986), and Hutchins (1990). Additional thanks go to Nick Haigh, Kevin Smith, and Garry Morgan (WAM), Greg Finley (Fisheries Department, Shark Bay), Bruce McKay (Underwater World, Perth), Pancho Neira (Murdoch University, Perth), Alan Pearce (CSIRO, Perth), Vic Springer (Smithsonian Institution, Washington, DC) and Stuart Poss (Gulf Coast Research Laboratory Museum, Mississippi), who more recently provided help. An early draft of the manuscript was kindly commented on by Jerry Allen (WAM), and Greg Jackson, Vince McInerney, Kevin Smith, and Mark Cowan (all at WAM) helped with the preparation of the figures. Finally, I am especially grateful for the constructive comments made by two referees, John Paxton (Australian Museum, Sydney) and Martin Gomon (Museum of Victoria, Melbourne).

REFERENCES

Allen, G.R. and Russell, B.C. (1986). Fishes. In Berry, P.F. (ed.), Faunal surveys of the Rowley Shoals, Scott Reef and Seringapatam Reef, north-western Australia. *Rec. West. Aust. Mus.* Suppl. no. 25: 75-103.

Allen, G.R. and Swainston, R. (1988). *The marine fishes of north-western Australia. A field guide for anglers and divers*. Western Australian Museum, Perth.

Bennett, I. and Pope, E.C. (1953). Intertidal zonation of the exposed rocky shores of Victoria together with a rearrangement of the biogeographical provinces of temperate Australian shores. *Aust. J. Mar. Freshwat. Res.* **4**(1): 105-159.

Briggs, J.C. (1974). *Marine zoogeography*. McGraw-Hill Book Company, New York.

Chubb, C.F., Hutchins, J.B., Lenanton, R.C.J. and Potter, I.C. (1979). An annotated checklist of the fishes of the Swan-Avon river system, Western Australia. *Rec. West. Aust. Mus.* **8**(1): 1-55.

Cresswell, G.R. (1991). The Leeuwin Current – observations and recent models. In Pearce, A.F. and Walker, D.I. (eds). The Leeuwin current: an influence on the coastal climate and marine life of Western Australia. *J. Roy. Soc. West. Aust.* **74**: 1-140.

Glover, C.J.M. and Branden, K.L. (1978). New fish records from South Australia. *South Aust. Nat.* **52**(4): 55-60.

Glover, C.J.M. and Branden, K.L. (1983). Additions to the marine fish fauna of South Australia. *Trans. R. Soc. S. Aust.* **107** (2): 134-136.

Hardy, G.S. and Hutchins, J.B. (1981). On the validity of the pufferfish genus *Omegophora* Whitley (Tetraodontiformes: Tetraodontidae) with the description of a new species. *Rec. West. Aust. Mus.* **9**(2): 187-201.

Hatcher, B.G. (1991). Coral reefs in the Leeuwin Current – an ecological perspective. In Pearce, A.F. and Walker, D.I. (eds). The Leeuwin current: an influence on the coastal climate and marine life of Western Australia. *J. Roy. Soc. West. Aust.* **74**: 115-127.

Hutchins, J.B. (1990). Fish survey of South Passage, Shark Bay, Western Australia. In Berry, P.F., Bradshaw, S.D. and Wilson, B.R. (eds). *Research in Shark Bay. Report of the France-Australe Bicentenary Expedition Committee*. Western Australian Museum, Perth (pp. 263-278).

Hutchins, J.B. (1991). Dispersal of tropical fishes to temperate seas in the southern hemisphere. In Pearce, A.F. and Walker, D.I. (eds). The Leeuwin current: an influence on the coastal climate and marine life of Western Australia. *J. Roy. Soc. West. Aust.* **74**: 79-84.

Hutchins, J.B. and Swainston, R. (1986). *Sea fishes of southern Australia. Complete field guide for anglers and divers*. Swainston Publishing, Perth.

Hutchins, J.B. and Thompson, M. (1983). *The marine and estuarine fishes of south-western Australia. A field guide for anglers and divers*. Western Australian Museum, Perth.

Iredale, T. (1937). A basic list of the land mollusca of Australia. *Aust. Zool.* **8**(4): 287-333.

Kailola, P.J. and Jones, G.K. (1981). First record of *Promicrops lanceolatus* (Bloch) (Pisces:Serranidae) in South Australian Waters. *Trans. R. Soc. S. Aust.* **105**: 211-212.

Knox, G.A. (1963). The biogeography and intertidal ecology of the Australasian coasts. *Oceanogr. Mar. Biol. Ann. Rev.* **1**: 341-40.

Knox, G.A. (1980). Plate tectonics and the evolution of intertidal and shallow water benthic biotic distribution patterns of the southwest Pacific. *Palaeogeography, Palaeoclimatology, Palaeoecology* **31**(2-4): 267-297.

Kott, P. (1952). Ascidians of Australia. I. *Aust. J. Mar. Freshwat. Res.* **3**(2): 205-333.

Lachner, E.A. and Karnella, S.J. (1980). Fishes of the Indo-Pacific genus *Eviota* with descriptions of eight new species (Teleostei: Gobiidae). *Smithson. Contrib. Zool.* **315**: 1-127.

Lincoln, R.J., Boxshall, G.A. and Clark, P.F. (1982). *A dictionary of ecology, evolution, and systematics.* Cambridge University Press, Cambridge.

Moore, L. (1979). (ed.). A study for sound management. A survey of the findings of the Cockburn Sound environmental study. *Dept. of Conservation and Environment Bull.* **73**: 1-22.

Morgan, G.J. and Wells, F.E. (1991). Zoogeographic provinces of the Humboldt, Benguela and Leeuwin Current systems. In Pearce, A.F. and Walker, D.I. (eds). The Leeuwin current: an influence on the coastal climate and marine life of Western Australia. *J. Roy. Soc. West. Aust.* **74**: 1-140.

Paxton, J.R., Hoese, D.F., Allen, G.R. and Hanley, J.E. (1989). *Zoological catalogue of Australia. Vol 7. Pisces. Petromyzontidae to Carangidae.* Australian Government Publishing Service, Canberra.

Pearce, A.F. (1991). Eastern boundary currents of the southern hemisphere. In Pearce, A.F. and Walker, D.I. (eds). The Leeuwin current: an influence on the coastal climate and marine life of Western Australia. *J. Roy. Soc. West. Aust.* **74**: 35-45.

Pearce, A.F. and Walker, D.I. (1991). (eds). The Leeuwin current: an influence on the coastal climate and marine life of Western Australia. *J. Roy. Soc. West. Aust.* **74**: 1-140.

Pietsch, T.W. and Grobecker, D.B. (1987). *Frogfishes of the world. Systematics, zoogeography and behavioral ecology.* Stanford University Press, Stanford, California.

Scott, T.D., Glover, C.J.M. and Southcott, R.V. (1974). *The marine and freshwater fishes of South Australia.* Government Printer, Adelaide.

Smith, B.J. and Kershaw, R.C. (1979). *Field guide to the non-marine molluscs of south eastern Australia.* Australian National University Press, Canberra.

Veron, J.E.N. and Marsh, L.M. (1988). Hermatypic corals of Western Australia: records and annotated species list. *Rec. West. Aust. Mus.* Suppl. no. 29: 1-136.

Whitehead, P. (1985). Clupeoid fishes of the world. An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, anchovies and wolf-herrings. Part 1 – Chirocentridae, Clupeidae Pristigasteridae. *FAO Fish. Synop.* (125)7(1): 1-303.

Whitley, G.P. (1932). Marine zoogeographical regions of Australasia. *Aust. Nat.* **8**: 166-167.

Wilson, B.R. and Allen, G.R. (1987). Major components and distribution of marine fauna. In Dyne, G.R. and Walton, D.E. (eds). *Fauna of Australia.* Vol 1A. General articles. Canberra: Australian Govt. Publishing Service.

Wilson, B.R. and Marsh, L.M. (1979). Coral reef communities at the Houtman Abrolhos, Western Australia, in a zone of biogeographic overlap. *Proc. Int. Symp. Mar. Biogeog. South Hemisphere*, NZ DSIR Info. Ser. 137, pp. 259-278.

APPENDIX

Nearshore reef fishes of Western Australia's west and south coasts (for regions see Figure 1, for distributions [Dn] see Figure 2; an asterisk indicates a note at the end of the Appendix)

No.	Family and Species	Regions	Dn
	DASYATIDIDAE		
1	*Amphotistius kuhlii* (Müller and Henle, 1841)	1-4	C
2	*Dasyatis brevicaudata* (Hutton, 1875)	2-4,6-9,11	H
3	*Taeniura lymma* (Forsskål, 1775)	1,2	A
	UROLOPHIDAE		
4	*Trygonoptera ovalis* Last and Gomon, 1987	4-10	I
5	*Trygonoptera personata* Last and Gomon, 1987	8,9	?
6	*Urolophus circularis* McKay, 1966	8,10	J
	MYLIOBATIDAE		
7	*Aetobatus narinari* (Euphrasen, 1790)	1-3,5	B
8	*Myliobatis australis* Macleay, 1881	6-12	I
	SCYLIORHINIDAE		
9	*Asymbolus* species	11	K*
10	*Aulohalaelurus labiosus* (Waite, 1905)	5-8,11	G
	CARCHARHINIDAE		
11	*Carcharhinus melanopterus* (Quoy and Gaimard, 1824)	1,2	A
	HEMIGALEIDAE		
12	*Triaenodon obesus* (Rüppell, 1837)	1,2	A
	ORECTOLOBIDAE		
13	*Chiloscyllium punctatum* Müller and Henle, 1838	1-3	B
14	*Eucrossorhinus dasypogon* (Bleeker, 1867)	1,2	A
15	*Hemiscyllium trispeculare* Richardson, 1843	1	A
16	*Nebrius concolor* Rüppell, 1837	1	A
17	*Orectolobus maculatus* (Bonnaterre, 1788)	8	J
18	*Orectolobus ornatus* (De Vis, 1883)	5,9,11	I
19	*Orectolobus tentaculatus* (Peters, 1864)	8	I
20	*Orectolobus wardi* Whitley, 1939	1,2	A
21	*Orectolobus* species	2,5,8,9	E*
22	*Parascyllium variolatum* (Duméril, 1853)	8-11	I
23	*Stegostoma fasciatum* (Hermann, 1783)	1,4	C
	HETERODONTIDAE		
24	*Heterodontus portusjacksoni* (Meyer, 1793)	5,7-12	I
	OPHICHTHIDAE		
25	*Callechelys marmoratus* (Bleeker, 1853)	1	A
26	*Cirrhimuraena calamus* (Günther, 1870)	1	E
27	*Ichthyapus vulturus* Weber and Beaufort, 1916	1	A
28	*Leiuranus semicinctus* (Lay and Bennett, 1839)	1	A
29	*Muraenichthys australis* Macleay, 1881	4,6,8,9,11	H

No.	Family and Species	Regions	Dn
30	*Muraenichthys breviceps* Günther, 1876	11	J
31	*Myrichthys colubrinus* (Boddaert, 1781)	1,5	C
32	*Ophichthus melanochir* Bleeker, 1865	1	A
33	*Yirrkala lumbricoides* (Bleeker, 1864)	1	A
	MURAENIDAE		
34	*Echidna nebulosa* (Thunberg, 1789)	1	A
35	*Gymnomuraena zebra* (Shaw and Nodder, 1797)	1	A
36	*Gymnothorax eurostus* (Abbott, 1861)	1-3	B
37	*Gymnothorax fimbriatus* (Bennett, 1832)	1	A
38	*Gymnothorax flavimarginatus* (Rüppell, 1830)	1	A
39	*Gymnothorax javanicus* (Bleeker, 1859)	1	A
40	*Gymnothorax prasinus* (Richardson, 1848)	3,5,6,8-11	F*
41	*Gymnothorax undulatus* (Lacépède, 1803)	1-5	C
42	*Gymnothorax woodwardi* McCulloch, 1912	4-9	E*
43	*Gymnothorax zonipectis* Seale, 1906	1	A
44	*Siderea picta* (Ahl, 1789)	1	A
45	*Siderea thrysoideus* (Richardson, 1845)	1-3	B
46	*Uropterygius concolor* Rüppell, 1838	1	A
	CONGRIDAE		
47	*Conger cinereus* Rüppell, 1830	1	A
48	*Conger wilsoni* (Bloch and Schneider, 1801)	6-11	I
	CLUPEIDAE		
49	*Spratelloides gracilis* (Schlegel, 1846)	1,5	C
50	*Spratelloides delicatulus* (Bennett, 1831)	1,2	A
51	*Spratelloides robustus* Ogilby, 1897	3-9,11	H*
	PLOTOSIDAE		
52	*Cnidoglanis macrocephalus* (Valenciennes, 1840)	7-11	I
53	*Paraplotosus albilabris* (Valenciennes, 1840)	1-8	D
54	*Paraplotosus* species	1,2	A*
55	*Plotosus lineatus* (Thunberg, 1791)	1,3,5,7,8	D*
	AULOPIDAE		
56	*Aulopus purpurissatus* Richardson, 1843	5,6,8-11	I*
	SYNODONTIDAE		
57	*Synodus jaculum* Russell and Cressy, 1979	1	A
58	*Synodus variegatus* (Lacépède, 1803)	1-3,5	C
	HARPADONTIDAE		
59	*Saurida gracilis* (Quoy and Gaimard, 1824)	1,2	A
	BATRACHOIDIDAE		
60	*Batrachomoeus rubricephalus* Hutchins, 1976	5-9	G
61	*Halophryne diemensis* (Lesueur, 1824)	1-3	B

No.	Family and Species	Regions	Dn
	ANTENNARIIDAE		
62	*Antennarius nummifer* (Cuvier, 1817)	1,3,5,8	D
63	*Antennarius striatus* (Shaw, 1794)	2,5	C
64	*Echinophryne crassispina* McCulloch and Waite, 1918	11	K
65	*Histiophryne cryptacanthus* (Weber, 1913)	9,11	I*
66	*Lophiocharon trisignatus* (Richardson, 1844)	3	B
67	*Phyllophryne scortea* (McCulloch and Waite, 1918)	8,9,11	J
	MORIDAE		
68	*Eeyorius hutchinsi* Paulin, 1986	8,11	J
69	*Lotella fuliginosa* Günther, 1862	4-6,8,9,11	H
70	*Lotella rhacinus* (Forster, 1801)	6,8-11	I
71	*Pseudophycis breviuscula* (Richardson, 1846)	8-11	J
	BYTHITIDAE		
72	*Brosmophyciops* species	1	A*
73	*Dermatopsis multiradiatus* McCulloch and Waite, 1918	6-12	I
74	*Dinematichthys dasyrhynchus* Cohen and Hutchins, 1982	6,8	?
75	*Dipulus caecus* Waite, 1905	2-9	E
76	*Microbrotula* species	11	?*
77	*Ogilbia* species 1	2,4-6,8,9	E*
78	*Ogilbia* species 2	10-12	K*
79	*Ogilbia* species 3	1	A*
	ATHERINIDAE		
80	*Atherinomorus ogilbyi* (Whitley, 1930)	1-8	D
81	*Leptatherina presbyteroides* (Richardson, 1843)	5-8,10,11	I
	MONOCENTRIDIDAE		
82	*Cleidopus gloriamaris* De Vis, 1882	4-6,8	F*
	TRACHICHTHYIDAE		
83	*Trachichthys australis* Shaw, 1799	4,6-12	I
84	*Optivus* species	10	?*
	BERYCIDAE		
85	*Centroberyx gerrardi* (Günther, 1887)	11	J
86	*Centroberyx lineatus* (Cuvier, 1829)	8,11	J
	HOLOCENTRIDAE		
87	*Myripristis kuntee* Cuvier, 1831	1	A
88	*Myripristis murdjan* (Forsskål, 1775)	1-3	B
89	*Neoniphon sammara* (Forsskål, 1775)	1	A
90	*Sargocentron rubrum* (Forsskål, 1775)	1-3,4	B
91	*Sargocentron spiniferum* (Forsskål, 1775)	1	A
92	*Sargocentron tiere* (Cuvier, 1829)	1	A
93	*Sargocentron violaceum* (Bleeker, 1853)	1	A

No.	Family and Species	Regions	Dn
	AULOSTOMIDAE		
94	*Aulostomus chinensis* (Linnaeus, 1766)	1,2	A*
	FISTULARIIDAE		
95	*Fistularia commersonii* Rüppell, 1838	1-3,8	D
	SOLENOSTOMIDAE		
96	*Solenostomus cyanopterus* Bleeker, 1854	2	A
	SYNGNATHIDAE		
97	*Bulbonaricus brauni* (Dawson and Allen, 1978)	1	A
98	*Campichthys galei* (Duncker, 1909)	8,11	J
99	*Choeroichthys brachysoma* (Bleeker, 1855)	1	A
100	*Choeroichthys latispinosus* Dawson, 1978	1	?
101	*Choeroichthys suillus* Whitley, 1951	4,6	C
102	*Halicampus brocki* (Herald, 1953)	3-6	C
103	*Halicampus spinirostris* (Dawson and Allen, 1981)	1	A
104	*Heraldia nocturna* Paxton, 1975	9-11	J
105	*Lissocampus caudalis* Waite and Hale, 1921	8,11	J
106	*Lissocampus runa* (Whitley, 1931)	8,9,11	J
107	*Maroubra perserrata* Whitley, 1948	8,9,11	J
108	*Micrognathus micronotopterus* (Fowler, 1938)	1	A
109	*Nannocampus subosseus* Günther, 1870	5,6,8,11	F
110	*Notiocampus ruber* (Ramsay and Ogilby, 1886)	11	K
111	*Phycodurus eques* (Günther, 1865)	11	J*
112	*Phyllopteryx taeniolatus* (Lacépède, 1804)	7,9-11	I
113	*Vanacampus margaritifer* (Peters, 1869)	6,11	G
	SCORPAENIDAE		
114	*Ablabys taenianotus* (Cuvier, 1829)	1,5	A
115	*Dendrochirus zebra* (Cuvier, 1829)	1-3	B
116	*Glyptauchen panduratus* (Richardson, 1850)	11	J*
117	*Neosebastes bougainvilli* (Cuvier, 1829)	5,8,9	I
118	*Neosebastes pandus* (Richardson, 1842)	5-11	I
119	*Parascorpaena picta* (Kuhl and Van Hasselt, 1829)	1-3	B
120	*Pterois volitans* (Linnaeus, 1758)	1-3,5-8	D*
121	*Scorpaena sumptuosa* Castelnau, 1875	3-10	F
122	*Scorpaenodes guamensis* (Quoy and Gaimard, 1824)	1,2,5	B
123	*Scorpaenodes scaber* (Ramsay and Ogilby, 1886)	1,3,5	C
124	*Scorpaenodes steenei* Allen, 1977	2,4-6,8-10	E
125	*Scorpaenopsis diabolus* (Cuvier, 1829)	1	A
126	*Scorpaenopsis venosa* (Cuvier, 1829)	1-3,5	C
127	*Sebastapistes* species	3	?*
	SYNANCEIIDAE		
128	*Inimicus sinensis* (Valenciennes, 1833)	5	C
129	*Synanceia horrida* (Linnaeus, 1766)	2	B

No.	Family and Species	Regions	Dn
	APLOACTINIDAE		
130	*Cocotropus* species	1	A*
131	*Neoaploactis tridorsalis* Eschmeyer and Allen, 1978	3,8	?*
	PATAECIDAE		
132	*Aetapcus maculatus* (Günther, 1861)	7,11	J
	PLATYCEPHALIDAE		
133	*Leviprora inops* (Jenyns, 1840)	3,5	H
134	*Papilloculiceps nematophthalamus* (Günther, 1860)	1	B
135	*Platycephalus malayanus* Bleeker, 1853	1	A
136	*Platycephalus speculator* Klunzinger, 1872	4,6-8,10,11	H
137	*Thysanophrys cirronasus* (Richardson, 1848)	6-11	I
	CONGIOPODIDAE		
138	*Perryena leucometopon* (Waite, 1922)	6,8,11	I
	CENTROPOMIDAE		
139	*Psammoperca waigiensis* (Cuvier, 1828)	1-4,6-8	D
	SERRANIDAE		
140	*Acanthistius pardalotus* Hutchins, 1981	2-6,8	E
141	*Acanthistius serratus* (Cuvier, 1828)	5,7-11	G*
142	*Anyperodon leucogrammicus* (Valenciennes, 1828)	1,2	A
143	*Caesioperca rasor* (Richardson, 1839)	10,11	K
144	*Caesioperca* species	8	?*
145	*Caesioscorpis theagenes* Whitley, 1945	3,4,6-10	E*
146	*Callanthias australis* Ogilby, 1899	8,10	J
147	*Cephalopholis argus* Bloch and Schneider, 1801	1,2,5	A
148	*Cephalopholis boenak* (Bloch, 1790)	1,2	A
149	*Cephalopholis miniata* (Forsskål, 1775)	1-3,5	C
150	*Cephalopholis sonnerati* (Valenciennes, 1828)	1,3	B
151	*Cephalopholis urodeta* (Forster, 1801)	1	A
152	*Cromileptes altivelis* (Valenciennes, 1828)	1-3	B
153	*Epinephelides armatus* (Castelnau, 1875)	3-11	F
154	*Epinephelus bilobatus* Randall and Allen, 1987	1-3	B
155	*Epinephelus coioides* (Hamilton, 1822)	1-6	D*
156	*Epinephelus corallicola* (Valenciennes, 1828)	2	A
157	*Epinephelus fasciatus* (Forsskål, 1775)	1-5	C
158	*Epinephelus fuscoguttatus* (Forsskål, 1775)	1	A
159	*Epinephelus lanceolatus* (Bloch, 1790)	1-3,5,7,8	D*
160	*Epinephelus malabaricus* (Bloch and Schneider, 1801)	1	A
161	*Epinephelus multinotatus* (Peters, 1876)	1-3,5	C
162	*Epinephelus quoyanus* (Valenciennes, 1830)	1-3	B
163	*Epinephelus rivulatus* (Valenciennes, 1830)	1-8	C
164	*Epinephelus tukula* Morgans, 1959	1,2	A
165	*Hypoplectrodes cardinalis* Allen and Randall, 1990	3-6,8,11	F
166	*Hypoplectrodes nigrorubrum* (Cuvier, 1828)	4,6-11	I

No.	Family and Species	Regions	Dn
167	*Hypoplectrodes wilsoni* (Allen and Moyer, 1980)	6,8-10	G*
168	*Othos dentex* (Cuvier, 1828)	6,8-11	I
169	*Plectropomus leopardus* (Lacépède, 1802)	1,5,6	C
170	*Plectropomus maculatus* (Bloch, 1790)	1-5	C
171	*Pseudanthias cooperi* (Regan, 1902)	1-3,5	B
172	*Rainfordia opercularis* McCulloch, 1923	1	A
173	*Variola louti* (Forsskål, 1775)	1,3,5	B
	GRAMMISTIDAE		
174	*Diploprion bifasciatum* Cuvier, 1828	1	A
175	*Grammistes sexlineatus* (Thunberg, 1792)	1-3	B
	PSEUDOCHROMIDAE		
176	*Assiculus punctatus* (Richardson, 1846)	1,3	B
177	*Labracinus lineatus* (Castelnau, 1875)	1-6	C
178	*Pseudochromis fuscus* Müller and Troschel, 1849	1,2	A
179	*Pseudochromis marshallensis* Shultz, 1953	1	A
180	*Pseudochromis tapeinosoma* Bleeker, 1853	1,2	A
181	*Pseudochromis wilsoni* (Whitley, 1929)	2-6	C
182	*Pseudoplesiops rosae* Schultz, 1943	1	A
	PSEUDOGRAMMATIDAE		
183	*Pseudogramma polyacanthus* (Bleeker, 1856)	1	A
	PLESIOPIDAE		
184	*Calloplesiops altivelis* (Steindachner, 1903)	1	A
185	*Paraplesiops meleagris* (Peters, 1869)	5-11	I
186	*Paraplesiops sinclairi* Hutchins, 1987	11	G*
187	*Plesiops coeruleolineatus* Rüppell, 1835	1	A
188	*Trachinops brauni* Allen, 1977	5,6,8-11	G
189	*Trachinops noarlungae* Glover, 1974	5-11	I
	ACANTHOCLINIDAE		
190	*Beliops xanthokrossos* Hardy, 1985	6,8,11	G
191	*Belonepterygion fasciolatum* (Ogilby, 1889)	1,2,5,6,8	D
	GLAUCOSOMATIDAE		
192	*Glaucosoma hebraicum* Richardson, 1845	4-6,8,9	F
	PRIACANTHIDAE		
193	*Heteropriacanthus cruentatus* (Lacépède, 1801)	1-3,5	C
	APOGONIDAE		
194	*Apogon angustatus* (Smith and Radcliffe, 1911)	1	A
195	*Apogon aureus* (Lacépède, 1802)	1-3,5	C
196	*Apogon bandanensis* Bleeker, 1854	1	A
197	*Apogon chrysotaenia* Bleeker, 1851	1	A
198	*Apogon coccineus* Rüppell, 1838	1-6	C
199	*Apogon cookii* Macleay, 1881	1-4,6	C

No.	Family and Species	Regions	Dn
200	*Apogon doederleini* Jordan and Snyder, 1901	1-5	C
201	*Apogon fraenatus* Valenciennes, 1832	1,3	B
202	*Apogon fuscus* Quoy and Gaimard, 1824	1	A
203	*Apogon kallopterus* Bleeker, 1856	1	A
204	*Apogon moluccensis* Valenciennes, 1832	1	A
205	*Apogon pallidofasciatus* Allen, 1987	1	A
206	*Apogon properupta* (Whitley, 1964)	1-3	B
207	*Apogon rueppellii* Günther, 1859	1-10	D*
208	*Apogon semiornatus* Peters, 1876	1-3,5	C
209	*Apogon taeniophorus* Regan, 1908	1,3	B
210	*Apogon timorensis* Bleeker, 1854	1	A
211	*Apogon trimaculatus* Cuvier, 1828	1	A
212	*Apogon victoriae* Günther, 1859	3-9	E*
213	*Apogon virgulatus* Allen and Randall, 1993	3,5	B
214	*Apogonichthys perdix* Bleeker, 1854	1	A
215	*Archamia fucata* (Cantor, 1850)	1-3	B
216	*Cercamia eremia* (Allen, 1987)	1,2,5	C
217	*Cheilodipterus macrodon* (Lacépède, 1802)	1-3	B
218	*Cheilodipterus quinquelineatus* Cuvier, 1828	1,2,5	C
219	*Fowleria aurita* (Valenciennes, 1831)	1,2,5	C
220	*Fowleria variegata* (Valenciennes, 1832)	1,5	C
221	*Pterapogon mirifica* (Mees, 1966)	1	A
222	*Rhabdamia cypselurus* Weber, 1909	1	A
223	*Rhabdamia gracilis* (Bleeker, 1856)	1	A
224	*Siphamia cephalotes* (Castelnau, 1875)	3,5-12	I
225	*Vincentia badia* Allen, 1987	6-9,11,12	I
226	*Vincentia macrocauda* Allen, 1987	10,11	K
227	*Vincentia punctata* (Klunzinger, 1880)	6-12	G*
	DINOLESTIDAE		
228	*Dinolestes lewini* (Griffith, 1834)	8-11	J
	SILLAGINIDAE		
229	*Sillaginodes punctata* (Cuvier, 1829)	8,9,11	I
	ECHENEIDIDAE		
230	*Echeneis naucrates* Linnaeus, 1758	1-4,8	D
	CARANGIDAE		
231	*Atule mate* (Cuvier, 1833)	1	A
232	*Carangoides ferdau* (Forsskål, 1775)	1,6	B
233	*Carangoides fulvoguttatus* (Forsskål, 1775)	1-3	B*
234	*Carangoides gymnostethus* (Cuvier, 1833)	1,2	A
235	*Carangoides orthogrammus* (Jordan and Gilbert, 1882)	1	A*
236	*Caranx ignobilis* (Forsskål, 1775)	1,3,8	B
237	*Caranx lugubris* Poey, 1860	8	A*
238	*Caranx melampygus* Cuvier, 1833	1	A

No.	Family and Species	Regions	Dn
239	*Caranx sexfasciatus* Quoy and Gaimard, 1825	1-3	B*
240	*Decapterus muroadsi* (Temminck and Schlegel, 1844)	2,3,8	D
241	*Gnathanodon speciosus* (Forsskål, 1775)	1-3	B*
242	*Pseudocaranx dentex* (Bloch and Schneider, 1801)	3-12	H*
243	*Pseudocaranx wrighti* (Whitley, 1931)	5,7,8	I
244	*Scomberoides commersonnianus* Lacépède, 1801	1,2	A
245	*Selaroides leptolepis* (Cuvier, 1833)	1-3	B
246	*Seriola dumerili* (Risso, 1810)	3,5-8	D*
247	*Seriola hippos* Günther, 1876	3-11	H
248	*Seriola lalandi* Valenciennes, 1833	3-5,8-10	H
249	*Trachurus novaezelandiae* Richardson, 1843	3,5-10	H*
	ARRIPIDAE		
250	*Arripis georgianus* (Valenciennes, 1831)	6,8-12	I
251	*Arripis truttaceus* Johnston, 1883	8,9,11	I
	LUTJANIDAE		
252	*Aprion virescens* Valenciennes, 1830	1	A
253	*Lutjanus argentimaculatus* (Forsskål, 1775)	1	A
254	*Lutjanus bohar* (Forsskål, 1775)	1,3	A
255	*Lutjanus carponotatus* (Richardson, 1842)	1-3	B
256	*Lutjanus fulviflamma* (Forsskål, 1775)	1-5	C
257	*Lutjanus lemniscatus* (Valenciennes, 1828)	1-3	B
258	*Lutjanus lutjanus* Bloch, 1790	1	A
259	*Lutjanus monostigma* (Cuvier, 1828)	1	A
260	*Lutjanus quinquelineatus* (Bloch, 1790)	1-3,5	B
261	*Lutjanus russelli* (Bleeker, 1849)	1,2	A
262	*Lutjanus sebae* (Cuvier, 1828)	1	A*
263	*Lutjanus vitta* (Quoy and Gaimard, 1824)	1,5	A
264	*Symphorus nematophorus* (Bleeker, 1860)	1	A
	CAESIONIDAE		
265	*Caesio caerulaurea* Lacépède, 1801	1-3	B
266	*Caesio cuning* (Bloch, 1790)	1-3	B
267	*Caesio lunaris* Cuvier, 1830	1	A
268	*Pterocaesio digramma* (Bleeker, 1865)	1-3	B
	NEMIPTERIDAE		
269	*Pentapodus emeryii* (Richardson, 1843)	1	A
270	*Pentapodus porosus* (Valenciennes, 1830)	1,3,5	B
271	*Pentapodus vitta* Quoy and Gaimard, 1824	1-9	E*
272	*Scaevius milii* (Bory de Saint-Vincent, 1823)	1-3	B
273	*Scolopsis bilineatus* (Bloch, 1793)	1-3	B
274	*Scolopsis monogramma* (Cuvier, 1830)	1,2	A
275	*Scolopsis xenochrous* Günther, 1872	1	A
	HAEMULIDAE		
276	*Diagramma pictum* (Thunberg, 1792)	1-3,5	C

No.	Family and Species	Regions	Dn
277	*Plectorhinchus chaetodonoides* Lacépède, 1800	1,2	A
278	*Plectorhinchus flavomaculatus* (Ehrenberg, 1830)	1-9	D
279	*Plectorhinchus gibbosus* (Lacépède, 1802)	1	A
280	*Plectorhinchus multivittatus* (Macleay, 1878)	1-4	B
281	*Plectorhinchus schotaf* (Forsskål, 1775)	1-5,7	C
	LETHRINIDAE		
282	*Gymnocranius elongatus* Senta, 1973	1	A
283	*Lethrinus atkinsoni* Seale, 1909	1-3,5	C
284	*Lethrinus genivittatus* Valenciennes, 1830	1,3-5,7,8	D
285	*Lethrinus laticaudis* Alleyne and Macleay, 1877	1-3	B
286	*Lethrinus miniatus* (Schneider, 1801)	1-3	B
287	*Lethrinus nebulosus* (Forsskål, 1775)	1-3,5,6,8	C
288	*Lethrinus olivaceus* Valenciennes, 1830	1	A
289	*Lethrinus rubrioperculatus* Sato, 1978	1	A
290	*Lethrinus variegatus* Valenciennes, 1830	1	A
291	*Monotaxis grandoculis* (Forsskål, 1775)	1	A
	SPARIDAE		
292	*Acanthopagrus latus* (Houttuyn, 1782)	1-3	B
293	*Pagrus auratus* (Bloch and Schneider, 1801)	3-5,8	H
294	*Rhabdosargus sarba* (Forsskål, 1775)	2-9	E
	MULLIDAE		
295	*Mulloides flavolineatus* (Lacépède, 1801)	1	A
296	*Mulloides vanicolensis* (Valenciennes, 1831)	1	A
297	*Parupeneus barberinoides* (Lacépède, 1801)	1,2	A
298	*Parupeneus bifasciatus* (Lacépède, 1801)	1	A
299	*Parupeneus chryserydros* (Lacépède, 1802)	1	A
300	*Parupeneus chrysopleuron* (Schlegel, 1843)	1-6,8,9	D
301	*Parupeneus indicus* (Shaw, 1803)	1-4	B
302	*Parupeneus multifasciatus* (Quoy and Gaimard, 1825)	1	A
303	*Parupeneus pleurostigma* (Bennett, 1830)	1-3	B
304	*Parupeneus spilurus* (Bleeker, 1854)	1-9	D
305	*Upeneichthys lineatus vlamingii* (Cuvier, 1829)	5-12	I
306	*Upeneichthys stotti* Hutchins, 1990	4,8	F*
307	*Upeneus moluccensis* (Bleeker, 1855)	1	A
308	*Upeneus tragula* Richardson, 1846	1,3,6	B
	MONODACTYLIDAE		
309	*Schuettea woodwardi* (Waite, 1905)	3-11	F*
	PEMPHERIDIDAE		
310	*Parapriacanthus elongatus* (McCulloch, 1911)	6-11	I
311	*Parapriacanthus ransonneti* Steindachner, 1870	1-3	B
312	*Pempheris analis* Waite, 1910	1-6	C
313	*Pempheris klunzingeri* McCulloch, 1911	3-12	H
314	*Pempheris multiradiata* Klunzinger, 1879	6-12	I

No.	Family and Species	Regions	Dn
315	*Pempheris schwenkii* Bleeker, 1855	1-3,5,7,8	C
316	*Pempheris* species 1	1,3	B*
317	*Pempheris* species 2	1-5,8	D*
318	*Pempheris* species 3	6,8-11	I*
	GIRELLIDAE		
319	*Girella tephraeops* (Richardson, 1846)	4-6,8-11	G*
320	*Girella zebra* (Richardson, 1846)	6-11	I
	KYPHOSIDAE		
321	*Kyphosus cornelii* (Whitley, 1944)	1-9	E
322	*Kyphosus gibsoni* Ogilby, 1912	1-3	B
323	*Kyphosus sydneyanus* (Günther, 1886)	3-12	H
	SCORPIDIDAE		
324	*Microcanthus strigatus* (Cuvier, 1831)	1-9	E*
325	*Neatypus obliquus* Waite, 1905	3-11	F*
326	*Scorpis aequipinnis* Richardson, 1848	3,7-12	J*
327	*Scorpis georgianus* Valenciennes, 1832	4-12	I
328	*Tilodon sexfasciatum* (Richardson, 1842)	6-12	J
	EPHIPPIDIDAE		
329	*Platax batavianus* Cuvier, 1831	1	A
330	*Platax pinnatus* (Linnaeus, 1758)	1	A
331	*Platax teira* (Forsskål, 1775)	1-3,5,7-9	D*
	CHAETODONTIDAE		
332	*Chaetodon adiergastos* Seale, 1905	1,2	A
333	*Chaetodon assarius* Waite, 1905	1-3,5-9	E*
334	*Chaetodon aureofasciatus* Macleay, 1878	1,2,4	B
335	*Chaetodon auriga* Forsskål, 1775	1-5,8	D
336	*Chaetodon citrinellus* Cuvier, 1831	1,2,6,8	A*
337	*Chaetodon ephippium* Cuvier, 1831	1	A
338	*Chaetodon kleinii* Bloch, 1790	1	A
339	*Chaetodon lineolatus* Cuvier, 1831	1-5,8	C
340	*Chaetodon lunula* (Lacépède, 1803)	1-5,8	C
341	*Chaetodon meyeri* Schneider, 1801	1	A
342	*Chaetodon ornatissimus* Cuvier, 1831	1	A
343	*Chaetodon plebeius* Cuvier, 1831	1-5,8	D
344	*Chaetodon punctatofasciatus* Cuvier, 1831	1,2	A
345	*Chaetodon speculum* Cuvier, 1831	1-5	C
346	*Chaetodon trifascialis* Quoy and Gaimard, 1824	1-3,5	B
347	*Chaetodon trifasciatus* Park, 1797	1,2,5	A*
348	*Chaetodon ulietensis* Cuvier, 1831	1	A
349	*Chaetodon unimaculatus* Bloch, 1787	1,2	A
350	*Chelmon marginalis* Richardson, 1842	1-3,5	B
351	*Chelmonops curiosus* Kuiter, 1986	3-12	H
352	*Coradion chrysozonus* (Cuvier, 1831)	1,3	B

No.	Family and Species	Regions	Dn
353	*Forcipiger flavissimus* Jordan and McGregor, 1898	1-3	B
354	*Heniochus acuminatus* (Linnaeus, 1758)	1-7	C
355	*Heniochus diphreutes* Jordan, 1903	3	B*
356	*Heniochus singularius* Smith and Radcliff, 1911	1-3	B
357	*Parachaetodon ocellatus* (Cuvier, 1831)	5,6	C
	POMACANTHIDAE		
358	*Apolemichthys trimaculatus* (Lacépède, 1831)	1	A
359	*Centropyge eibli* Klausewitz, 1963	1	A
360	*Centropyge tibicen* (Cuvier, 1831)	1-3,5	C
361	*Chaetodontoplus duboulayi* (Günther, 1867)	1,3	B
362	*Chaetodontoplus personifer* (McCulloch, 1914)	1,3,5	B
363	*Pomacanthus imperator* (Bloch, 1787)	1-3	B
364	*Pomacanthus semicirculatus* (Cuvier, 1831)	1-3,5	B
365	*Pomacanthus sexstriatus* (Cuvier, 1831)	1-3	B
	ENOPLOSIDAE		
366	*Enoplosus armatus* (Shaw, 1790)	3-12	I
	PENTACEROTIDAE		
367	*Parazanclistius hutchinsi* Hardy, 1983	8,11	J
368	*Paristiopterus gallipavo* Whitley, 1945	8,9	J*
369	*Pentaceropsis recurvirostris* (Richardson, 1845)	8-11	J
	POMACENTRIDAE		
370	*Abudefduf bengalensis* (Bloch, 1787)	1-6	C
371	*Abudefduf sexfasciatus* (Lacépède, 1802)	1-6,8	D
372	*Abudefduf sordidus* (Forsskål, 1775)	1-3,5,8	B*
373	*Abudefduf vaigiensis* (Quoy and Gaimard, 1825)	1-6,8	D
374	*Amblyglyphidodon curacao* (Bloch, 1787)	1	A
375	*Amphiprion clarkii* (Bennett, 1830)	1-3,5	C
376	*Amphiprion perideraion* Bleeker, 1855	1	A
377	*Amphiprion rubrocinctus* Richardson, 1842	1,2	A
378	*Amphiprion sandaracinos* Allen, 1972	1	A
379	*Cheiloprion labiatus* (Day, 1877)	1	A
380	*Chromis atripectoralis* Welander and Schultz, 1951	1-3,5	B
381	*Chromis fumea* (Tanaka, 1917)	1	A
382	*Chromis klunzingeri* Whitley, 1929	5-11	G
383	*Chromis margaritifer* Fowler, 1946	1-3	B
384	*Chromis viridis* (Cuvier, 1830)	1-3,5	B
385	*Chromis weberi* Fowler and Bean, 1928	1-3	B
386	*Chromis westaustralis* Allen, 1976	1-3,5-8	E
387	*Dascyllus aruanus* (Linnaeus, 1758)	1,2,5	C
388	*Dascyllus reticulatus* (Richardson, 1846)	1-3,5	C
389	*Dascyllus trimaculatus* (Rüppell, 1828)	1-3,5	C
390	*Dischistodus prosopotaenia* (Bleeker, 1852)	1,2	A
391	*Neoglyphidodon melas* (Cuvier, 1830)	1,2	A

No.	Family and Species	Regions	Dn
392	*Neoglyphidodon nigroris* (Cuvier, 1830)	1	A
393	*Neopomacentrus azysron* (Bleeker, 1877)	1-3	B
394	*Neopomacentrus cyanomos* (Bleeker, 1856)	1-3	B
395	*Neopomacentrus filamentosus* (Macleay, 1883)	1,3	B
396	*Parma bicolor* Allen and Larson, 1979	8,9,10,11	G*
397	*Parma mccullochi* Whitley, 1929	4-11	G
398	*Parma occidentalis* Allen and Hoese, 1975	1-9	E
399	*Parma victoriae* (Günther, 1863)	6-11	I
400	*Plectroglyphidodon dickii* (Liénard, 1839)	1-3,5	B
401	*Plectroglyphidodon johnstonianus* Fowler and Ball, 1924	1-3,5	B
402	*Plectroglyphidodon lacrymatus* (Quoy and Gaimard, 1824)	1-3,5	B
403	*Plectroglyphidodon leucozonus* (Bleeker, 1859)	1-3,5,6,8	D
404	*Pomacentrus coelestis* Jordan and Starks, 1901	1-6,8	C
405	*Pomacentrus milleri* Taylor, 1964	1-6,8	D
406	*Pomacentrus moluccensis* Bleeker, 1853	1-3	B
407	*Pomacentrus nagasakiensis* Tanaka, 1917	1,2	A
408	*Pomacentrus vaiuli* Jordan and Seale, 1906	1-3	B
409	*Stegastes fasciolatus* (Ogilby, 1889)	1,2	A
410	*Stegastes lividus* (Bloch and Schneider, 1801)	1,2	A
411	*Stegastes nigricans* (Lacépède, 1802)	1,2	A
412	*Stegastes obreptus* (Whitley, 1948)	1-8	D
	CIRRHITIDAE		
413	*Cirrhitichthys aprinus* (Cuvier, 1829)	1-3,5	B
414	*Cirrhitichthys oxycephalus* (Bleeker, 1855)	1-3	B
415	*Cirrhitus pinnulatus* (Schneider, 1801)	1	A
416	*Cyprinocirrhites polyactis* (Bleeker, 1875)	3	B
417	*Paracirrhites arcatus* (Cuvier, 1829)	1	A
418	*Paracirrhites forsteri* (Schneider, 1801)	1-3,5	B
	CHIRONEMIDAE		
419	*Chironemus georgianus* Cuvier, 1829	9,11	J
420	*Threpterius maculosus* Richardson, 1850	6,8,11	I
	APLODACTYLIDAE		
421	*Aplodactylus westralis* Russell, 1987	8-12	J*
	CHEILODACTYLIDAE		
422	*Cheilodactylus gibbosus* Richardson, 1841	3-11	F
423	*Cheilodactylus nigripes* Richardson, 1850	10-12	K
424	*Cheilodactylus rubrolabiatus* Allen and Heemstra, 1976	2-11	F*
425	*Dactylophora nigricans* (Richardson, 1850)	7-11	J
426	*Nemadactylus valenciennesi* (Whitley, 1937)	8-11	J*
	SPHYRAENIDAE		
427	*Sphyraena barracuda* (Walbaum, 1792)	1,2	A*
428	*Sphyraena jello* Cuvier, 1829	1	A

No.	Family and Species	Regions	Dn
429	*Sphyraena novaehollandiae* Günther, 1860	7-11	J
430	*Sphyraena obtusata* Cuvier, 1829	1-10	D*
	LABRIDAE		
431	*Achoerodus gouldii* (Richardson, 1843)	5-12	I
432	*Anampses caeruleopunctatus* Rüppell, 1829	1-3,8	B
433	*Anampses geographicus* Valenciennes, 1840	1-6,8,10	D
434	*Anampses lennardi* Scott, 1959	1,3	A
435	*Anampses meleagrides* Valenciennes, 1840	1-3,6	B
436	*Austrolabrus maculatus* (Macleay, 1881)	3-11	H
437	*Bodianus axillaris* (Bennett, 1831)	1-3,5	C
438	*Bodianus bilunulatus* (Lacépède, 1801)	1-3,5	C
439	*Bodianus frenchii* (Klunzinger, 1879)	4-11	I*
440	*Bodianus perditio* (Quoy and Gaimard, 1834)	5	C
441	*Cheilinus bimaculatus* Valenciennes, 1840	1,3	B
442	*Cheilinus chlorurus* (Bloch, 1791)	1-3	B
443	*Cheilinus fasciatus* (Bloch, 1791)	5	?*
444	*Cheilinus trilobatus* Lacépède, 1801	1,2	A
445	*Cheilinus unifasciatus* Streets, 1877	1,2	A
446	*Cheilio inermis* (Forsskål, 1775)	1-3,5,8	C
447	*Choerodon cauteroma* Gomon and Allen, 1987	1,3,5	B
448	*Choerodon cyanodus* (Richardson, 1843)	1-3,5	B
449	*Choerodon jordani* (Snyder, 1908)	3,5	C*
450	*Choerodon rubescens* (Günther, 1862)	1-9	E
451	*Choerodon schoenleinii* (Valenciennes, 1839)	1-3	B
452	*Cirrhilabrus temmincki* Bleeker, 1853	1-3,5	B
453	*Coris auricularis* (Valenciennes, 1839)	1-11	F*
454	*Coris aygula* Lacépède, 1801	1-3,5,8	C
455	*Coris caudimacula* (Quoy and Gaimard, 1834)	1-3,5	C
456	*Coris gaimard* (Quoy and Gaimard, 1824)	1	A
457	*Cymolutes praetextatus* (Quoy and Gaimard, 1834)	1	A
458	*Dotalabrus alleni* Russell, 1988	6-11	G
459	*Dotalabrus aurantiacus* (Castelnau, 1872)	8,9,11,12	J
460	*Epibulus insidiator* (Pallas, 1770)	1,2	A*
461	*Eupetrichthys angustipes* Ramsay and Ogilby, 1888	5-11	J
462	*Gomphosus varius* Lacépède, 1801	1-3,5,8	D
463	*Halichoeres biocellatus* Schultz,1960	1	A
464	*Halichoeres brownfieldi* (Whitley, 1945)	2-12	F
465	*Halichoeres hortulanus* (Lacépède, 1801)	1	A
466	*Halichoeres marginatus* Rüppell, 1835	1-3	B
467	*Halichoeres melanochir* Fowler and Bean, 1928	1	A
468	*Halichoeres nebulosus* (Valenciennes, 1839)	1-5	C
469	*Halichoeres trimaculatus* (Quoy and Gaimard, 1834)	1,2,5	A
470	*Hemigymnus fasciatus* (Bloch, 1792)	1-3,5,8	C
471	*Hemigymnus melapterus* (Bloch, 1791)	1-3	B
472	*Hologymnosus annulatus* (Lacépède, 1801)	1-3	A

No.	Family and Species	Regions	Dn
473	*Hologymnosus doliatus* (Lacépède, 1801)	1	A
474	*Labrichthys unilineatus* (Guichenot, 1847)	1,2,5	A
475	*Labroides bicolor* Fowler and Bean, 1928	1,2,5	A
476	*Labroides dimidiatus* (Valenciennes, 1839)	1-5,8	D
477	*Leptojulis cyanopleura* (Bleeker, 1853)	1	A
478	*Macropharyngodon negrosensis* Herre, 1932	1	A
479	*Macropharyngodon ornatus* Randall, 1978	1-3	B
480	*Notolabrus parilus* (Richardson, 1850)	3-12	H
481	*Ophthalmolepis lineolatus* (Valenciennes, 1839)	5-11	I
482	*Pictilabrus laticlavius* (Richardson, 1839)	5-11	I
483	*Pictilabrus viridis* Russell, 1988	6-11	G
484	*Pseudocheilinus evanidus* Jordan and Evermann, 1903	1	A
485	*Pseudocheilinus hexataenia* (Bleeker, 1857)	1	A
486	*Pseudojuloides elongatus* Ayling and Russell, 1977	1-3,5	C
487	*Pseudolabrus biserialis* (Klunzinger, 1879)	5-11	G
488	*Pteragogus flagellifera* (Valenciennes, 1839)	1-5	C
489	*Stethojulis bandanensis* (Bleeker, 1851)	1-8	D
490	*Stethojulis interrupta* (Bleeker, 1851)	1-3,5	C
491	*Stethojulis strigiventer* (Bennett, 1832)	1-3,5,6,8	D
492	*Suezichthys cyanolaemus* Russell, 1985	1-3,5,6,8-10	E*
493	*Thalassoma amblycephalum* (Bleeker, 1856)	1-3,8	D
494	*Thalassoma hardwicke* (Bennett, 1828)	1-3,5,8	C
495	*Thalassoma jansenii* (Bleeker, 1856)	3	?*
496	*Thalassoma lunare* (Linnaeus, 1758)	1-6,8	D
497	*Thalassoma lutescens* (Lay and Bennett, 1839)	1-8	D
498	*Thalassoma purpureum* (Forsskål, 1775)	1-3,5,6,8	D
499	*Thalassoma quinquevittatum* (Lay and Bennett, 1839)	1	A
500	*Thalassoma septemfasciata* Scott, 1959	2-6,8	E*
501	*Thalassoma trilobatum* (Lacépède, 1801)	1	A
502	*Xenojulis margaritaceous* (Macleay, 1884)	1	A
	ODACIDAE		
503	*Odax acroptilus* (Richardson, 1846)	4-11	I
504	*Odax cyanomelas* (Richardson, 1850)	4,6-12	I
505	*Siphonognathus beddomei* (Johnston, 1885)	6-11	J
506	*Siphonognathus caninis* (Scott, 1976)	6-11	J
	SCARIDAE		
507	*Bolbometopon muricatum* (Valenciennes, 1840)	1	A
508	*Cetoscarus bicolor* (Rüppell, 1829)	1	A
509	*Hipposcarus longiceps* (Valenciennes, 1840)	1,2	A
510	*Scarus chameleon* Choat and Randall, 1986	1-5,8	C
511	*Scarus dimidiatus* Bleeker, 1859	1	A
512	*Scarus frenatus* Lacépède, 1802	1-3,5	B
513	*Scarus ghobban* Forsskål, 1775	1-6,8	D
514	*Scarus gibbus* Rüppell, 1828	1-3,5,8	C

No.	Family and Species	Regions	Dn
515	*Scarus globiceps* Valenciennes, 1840	1	A
516	*Scarus oedema* Snyder, 1909	1,5	A
517	*Scarus oviceps* Valenciennes, 1840	1,2	A
518	*Scarus prasiognathus* Valenciennes, 1839	1,2	A
519	*Scarus psittacus* Forsskål, 1775	1	A
520	*Scarus rivulatus* Valenciennes, 1840	1-5,8	C
521	*Scarus rubroviolaceus* Bleeker, 1847	1-3	B
522	*Scarus schlegeli* (Bleeker, 1861)	1-3,5,6,8	D
523	*Scarus sordidus* Forsskål, 1775	1-5,8	D
	OPISTOGNATHIDAE		
524	*Opistognathus darwiniensis* Macleay, 1878	1	A
525	*Opistognathus* species	5	?*
	PINGUIPEDIDAE		
526	*Parapercis clathrata* Ogilby, 1911	1-3	B
527	*Parapercis haackei* (Steindachner, 1884)	2-11	H
528	*Parapercis multiplicata* Randall, 1984	1	A
529	*Parapercis ramsayi* Steindachner, 1884	8	J*
	PERCOPHIDIDAE		
530	*Enigmapercis reducta* Whitley, 1936	4,8,9,11	H
	CREEDIIDAE		
531	*Limnichthys fasciatus* Waite, 1904	1,2,8,11	O*
	BLENNIIDAE		
532	*Aspidontus dussumieri* (Valenciennes, 1836)	1	A*
533	*Aspidontus taeniatus* Quoy and Gaimard, 1834	1,3	B
534	*Atrosalarius fuscus holomelas* (Günther, 1872)	1,2,5	C
535	*Cirripectes filamentosus* (Alleyne and Macleay, 1877)	1-3	B
536	*Cirripectes hutchinsi* Williams, 1988	1-3,8,9	E*
537	*Ecsenius bicolor* (Day, 1888)	1-3	B
538	*Ecsenius lineatus* Klausewitz, 1962	1	A
539	*Ecsenius oculus* Springer, 1971	1-3	B
540	*Ecsenius yaeyamensis* (Aoyagi, 1954)	1,2	A
541	*Entomacrodus decussatus* (Bleeker, 1858)	1	A
542	*Entomacrodus striatus* (Quoy and Gaimard, 1836)	1-3,5,8	C
543	*Entomacrodus thalassinus* (Jordan and Seale, 1906)	1,2	A
544	*Exallias brevis* (Kner, 1868)	1	A
545	*Istiblennius chrysospilos* (Bleeker, 1857)	1,5	A
546	*Istiblennius edentulus* (Forster, 1801)	1-3	B
547	*Istiblennius lineatus* (Valenciennes, 1836)	1	A
548	*Istiblennius meleagris* (Valenciennes, 1836)	1-4,5	C
549	*Laiphognathus multimaculatus* Smith, 1955	2,3	B
550	*Meiacanthus grammistes* (Valenciennes, 1836)	1-3,5	C
551	*Omobranchus germaini* (Sauvage, 1883)	1-8	D
552	*Omobranchus rotundiceps* (Macleay, 1881)	3	B

No.	Family and Species	Regions	Dn
553	*Parablennius postoculomaculatus* Bath and Hutchins, 1986	1,2,5-9,11	E*
554	*Petroscirtes breviceps* Valenciennes, 1836	1-3,5,7,8	C
555	*Petroscirtes mitratus* Rüppell, 1830	1-3,5,8	C
556	*Plagiotremus rhinorhynchos* (Bleeker, 1852)	1-3,5,6,8-10	D*
557	*Plagiotremus tapeinosoma* (Bleeker, 1857)	1-3,5,8	D
558	*Salarias fasciatus* (Bloch, 1786)	1-3	B
559	*Stanulus talboti* Springer, 1968	1-3	B
	CONGROGADIDAE		
560	*Blennodesmus scapularis* Günther, 1872	1-3	B
561	*Congrogadus subducens* (Richardson, 1843)	1,3	B
	NOTOGRAPTIDAE		
562	*Notograptus guttatus* Günther, 1867	1	A
	TRIPTERYGIIDAE		
563	*Enneapterygius* species 1	1,3	A*
564	*Enneapterygius* species 2	1	A*
565	*Enneapterygius* species 3	3,5,7	?*
566	*Helcogramma decurrens* McCulloch and Waite, 1918	2-12	H
567	*Helcogramma striata* Hansen, 1986	1,3	B
568	*Lepidoblennius marmoratus* (Macleay, 1878)	7-11	J
569	*Norfolkia brachylepis* (Schultz, 1960)	1-3,5,6,8	D
570	*Norfolkia clarkei* (Morton, 1888)	11,12	K
571	*Norfolkia incisa* Kuiter, 1986	8-11	J
572	*Trianectes bucephalus* McCulluch and Waite, 1918	11,12	K
573	*Trianectes fasciatus* (Scott, 1957)	11	K
	CLINIDAE		
574	*Cristiceps aurantiacus* Castelnau, 1879	8,11	I
575	*Cristiceps australis* Valenciennes, 1836	5,11	I
576	*Heteroclinus eckloniae* (McKay, 1970)	11	J
577	*Heteroclinus forsteri* (Castelnau, 1872)	11	K
578	*Heteroclinus heptaeolus* (Ogilby, 1885)	9	J
579	*Heteroclinus roseus* (Günther, 1861)	6,8-11	I
580	*Heteroclinus* species 1	4,6,8,9,11	I*
581	*Heteroclinus* species 2	11	K*
582	*Heteroclinus* species 3	11,12	K*
583	*Heteroclinus* species 4	3	?*
584	*Ophiclinops varius* (McCulloch and Waite, 1918)	11	K
585	*Ophiclinus antarcticus* Castelnau, 1872	11	J
586	*Ophiclinus brevipinnis* George and Springer, 1980	11	K
587	*Ophiclinus gracilis* Waite, 1906	6,8,9,11,12	J
588	*Ophiclinus ningulus* George and Springer, 1980	11	J
589	*Ophiclinus pectoralis* George and Springer, 1980	8,9,11	G*
590	*Sticharium dorsale* Günther, 1867	8-11	J

No.	Family and Species	Regions	Dn
	CALLIONYMIDAE		
591	*Synchiropus morrisoni* Schultz, 1960	1	A
592	*Synchiropus papilio* (Günther, 1864)	4,6,8,9,11	H
	GOBIESOCIDAE		
593	*Alabes* species 1	11	?*
594	*Alabes* species 2	8	?*
595	*Aspasmogaster liorhynchus* Briggs, 1955	11	K
596	*Aspasmogaster occidentalis* Hutchins, 1984	6,8-11	G
597	*Aspasmogaster tasmaniensis* (Günther, 1861)	9,11	J
598	*Cochleoceps bicolor* Hutchins, 1991	7-11	J
599	*Diademichthys lineatus* (Sauvage, 1883)	1,2	A
600	*Lepadichthys frenatus* Waite, 1904	2-5	C*
601	*Parvicrepis parvipinnis* (Waite, 1906)	7,9-12	J
602	*Parvicrepis* species 1	7,11	J*
603	*Parvicrepis* species 2	11	K*
604	Gobiesocid species 1	7,11	J*
605	Gobiesocid species 2	7,11	J*
	GOBIIDAE		
606	*Amblyeleotris periophthalma* (Bleeker, 1853)	1	A
607	*Amblyeleotris wheeleri* (Polunin and Lubbock, 1977)	1	A
608	*Amblygobius phalaena* (Valenciennes, 1837)	1-5,8	D
609	*Asterropteryx semipunctatus* Rüppell, 1828	1,2,5	C
610	*Barbuligobius boehlkei* Lachner and Mckinney, 1974	4,6,11	?*
611	*Bathygobius cocosensis* (Bleeker, 1854)	1-3,5	B
612	*Bathygobius fuscus* (Rüppell, 1830)	1,5	C
613	*Bathygobius laddi* (Fowler, 1931)	1,2	A
614	*Callogobius depressus* (Ramsay and Ogilby, 1886)	6,8-11	J
615	*Callogobius mucosus* (Günther, 1872)	5,8-11	J
616	*Callogobius sclateri* (Steindachner, 1880)	1	A
617	*Callogobius* species 1	1,2,4-6	C*
618	*Callogobius* species 2	5,6	?*
619	*Cryptocentrus fasciatus* (Playfair and Günther, 1867)	1-3	B
620	*Ctenogobiops pomastictus* Lubbock and Polunin, 1977	1,2	A
621	*Eviota bimaculata* Lachner and Karnella, 1980	2-11	F*
622	*Eviota infulata* (Smith, 1956)	5	?*
623	*Eviota melasma* Lachner and Kailola, 1980	1,3,5	A
624	*Eviota sebreei* Jordan and Seale, 1906	1	A
625	*Eviota smaragdus* Jordan and Seale, 1906	3,5	?
626	*Eviota storthynx* (Rofen, 1959)	3,5	?
627	*Eviota zebrina* Lachner and Karnella, 1978	1	A
628	*Eviota* species 1	1	A*
629	*Eviota* species 2	2,3	?*
630	*Eviota* species 3	2,3	?*
631	*Exyrias belissimus* (Smith, 1959)	2	?*

No.	Family and Species	Regions	Dn
632	*Favonigobius lateralis* (Macleay, 1881)	7,8,10,11	H*
633	*Fusigobius duospilus* Hoese and Reader, 1985	1-3,5	C
634	*Fusigobius neophytus* (Günther, 1877)	1,3	B
635	*Fusigobius* species	1,3	B*
636	*Gnatholepis scapulostigma* Herre, 1953	1-3,5,8	C
637	*Gobiodon citrinus* (Rüppell, 1838)	1,2	B
638	*Gobiodon histrio* (Valenciennes, 1837)	1,2,3	B
639	*Gobiodon quinquestrigatus* (Valenciennes, 1837)	1,3	B
640	*Gobiopsis bravoi* (Herre, 1927)	1,2	A
641	*Istigobius decoratus* (Herre, 1927)	1-3	B
642	*Istigobius nigroocellatus* (Günther, 1873)	1,3	B
643	*Priolepis cincta* (Regan, 1908)	1-3,5	C
644	*Priolepis nuchifasciatus* (Günther, 1874)	1-7	C*
645	*Priolepis semidoliatus* (Valenciennes, 1837)	1-3	B
646	*Priolepis* species	2-4	?*
647	*Silhouettea hoesei* Larson and Miller, 1986	1	A
648	*Trimma okinawae* (Aoyagi, 1949)	1-3	B
649	*Trimma* species	1,2	A*
650	*Valenciennea immaculatus* Ni Yong, 1981	1,3	B
651	*Valenciennea longipinnis* (Lay and Bennett, 1839)	1-3	B
652	*Valenciennea muralis* (Valenciennes, 1837)	1	A
653	*Valenciennea puellaris* (Tomiyama, 1956)	1,3,5	B
654	*Valenciennea* species	3	?*
	ELEOTRIDIDAE		
655	*Nesogobius* species	8-11	J*
656	*Thalasseleotris adela* Hoese and Larson, 1987	8,9,11	J
	MICRODESMIDAE		
657	*Ptereleotris evides* (Jordan and Hubbs, 1925)	1-3,8	B
658	*Ptereleotris hanae* (Jordan and Snyder, 1901)	1	A
	ACANTHURIDAE		
659	*Acanthurus dussumieri* Valenciennes, 1835	1,2	A
660	*Acanthurus grammoptilus* Richardson, 1843	1-6	B
661	*Acanthurus lineatus* (Linnaeus, 1758)	1	A
662	*Acanthurus mata* (Cuvier, 1829)	1,3	B
663	*Acanthurus nigricans* (Linnaeus, 1758)	1	A
664	*Acanthurus nigrofuscus* (Forsskål, 1775)	1,2,6,8	B
665	*Acanthurus olivaceus* Forster, 1801	1,3	B
666	*Acanthurus triostegus* (Linnaeus, 1758)	1-5,8	D
667	*Ctenochaetus strigosus* (Bennett, 1828)	1,2	A
668	*Naso brevirostris* (Valenciennes, 1835)	1	A
669	*Naso fageni* Morrow, 1954	1,2	A
670	*Naso lituratus* (Forster, 1801)	1,2	A
671	*Naso tuberosus* Lacépède, 1802	1-3	B
672	*Naso unicornis* (Forsskål, 1775)	1-3,5,8	B

No.	Family and Species	Regions	Dn
673	*Zebrasoma scopas* (Cuvier, 1829)	1,2,5	C
674	*Zebrasoma veliferum* (Bloch, 1797)	1-3,5,8	C
	ZANCLIDAE		
675	*Zanclus cornutus* (Linnaeus, 1758)	1,2	A
	SIGANIDAE		
676	*Siganus fuscescens* (Houttuyn, 1782)	1-8	C
677	*Siganus doliatus* Cuvier, 1830	1,2	A
678	*Siganus lineatus* (Valenciennes, 1835)	1,2	A
679	*Siganus punctatus* (Forster, 1801)	1,8	A
680	*Siganus trispilos* Woodland and Allen, 1977	1,2	A
	SCOMBRIDAE		
681	*Grammatorcynus bicarinatus* (Quoy and Gaimard, 1824)	1-3,5,8	D
682	*Scomberomorus commerson* (Lacépède, 1800)	1-3,5	D
683	*Scomberomorus queenslandicus* Munro, 1943	2	B
	BALISTIDAE		
684	*Balistapus undulatus* (Park, 1797)	1	A
685	*Balistoides viridescens* (Bloch and Schneider, 1801)	8	?*
686	*Melichthys niger* (Bloch, 1786)	1	A
687	*Melichthys vidua* (Solander, 1844)	1	A
688	*Pseudobalistes fuscus* (Bloch and Schneider, 1801)	1,2	A
689	*Rhinecanthus aculeatus* (Linnaeus, 1758)	1,2	A
690	*Rhinecanthus rectangulus* (Bloch and Schneider, 1801)	1	A
691	*Sufflamen bursa* (Bloch and Schneider, 1801)	1	A
692	*Sufflamen chrysopterus* (Bloch and Schneider, 1801)	1-3	B
693	*Sufflamen fraenatus* Latreille, 1804	1-3	B
	MONACANTHIDAE		
694	*Acanthaluteres brownii* (Richardson, 1846)	6-11	J
695	*Acanthaluteres vittiger* (Castelnau, 1873)	6-11	I
696	*Brachaluteres jacksonianus* (Quoy and Gaimard, 1824)	7-11	J
697	*Cantherhines fronticinctus* (Günther, 1866)	1,3	B
698	*Cantherhines pardalis* (Rüppell, 1837)	1-3	B
699	*Eubalichthys bucephalus* (Whitley, 1931)	10	I*
700	*Eubalichthys cyanoura* Hutchins, 1987	6,8-11	I
701	*Eubalichthys mosaicus* (Ramsay and Ogilby, 1886)	6-9,11	I
702	*Meuschenia flavolineata* Hutchins, 1977	6-11	I
703	*Meuschenia freycineti* (Quoy and Gaimard, 1824)	7,11	J
704	*Meuschenia galii* (Waite, 1905)	6,8-11	I
705	*Meuschenia hippocrepis* (Quoy and Gaimard, 1824)	6-12	I
706	*Meuschenia venusta* Hutchins, 1977	10,11	H*
707	*Monacanthus chinensis* (Osbeck, 1765)	1,3-7	D
708	*Oxymonacanthus longirostris* (Bloch and Schneider, 1801)	1-3,5	C
709	*Pervagor janthinosoma* (Bleeker, 1854)	1-3	B*

No.	Family and Species	Regions	Dn
710	*Scobinichthys granulatus* (Shaw, 1790)	3,5-12	H*
	OSTRACIIDAE		
711	*Anoplocapros lenticularis* (Richardson, 1841)	5-11	I
712	*Anoplocapros robustus* (Fraser-Brunner, 1941)	3-11	H
713	*Aracana aurita* (Shaw, 1798)	6-9,11,12	I
714	*Ostracion cubicus* Linnaeus, 1758	1-3,5,7	B
715	*Ostracion meleagris* Shaw, 1796	1-3	B
716	*Tetrosomus concatenatus* (Bloch, 1786)	8	D*
	TETRAODONTIDAE		
717	*Arothron hispidus* (Linnaeus, 1758)	1-5	B*
718	*Arothron manilensis* (de Proce, 1822)	1	A
719	*Arothron stellatus* (Bloch and Schneider, 1801)	1-3	B
720	*Canthigaster coronata* (Vaillant and Sauvage, 1875)	1	A
721	*Canthigaster janthinoptera* (Bleeker, 1855)	1	A
722	*Omegophora armilla* (McCulloch and Waite, 1915)	8-11	J*
723	*Omegophora cyanopunctata* Hardy and Hutchins, 1981	8-11	J*
724	*Torquigener pleurogramma* (Regan, 1903)	3-8,11	H
	DIODONTIDAE		
725	*Diodon holocanthus* Linnaeus, 1758	1-3,7	B
726	*Diodon hystrix* Linnaeus, 1758	1,2	A
727	*Diodon liturosus* Shaw, 1804	1	A
728	*Diodon nicthemerus* Cuvier, 1818	6,8-12	J

NOTES ON APPENDIX

(9) *Asymbolus* species – an undescribed species which is currently being studied by L. Compagno. It is illustrated in Hutchins and Swainston (1986).

(21) *Orectolobus* species – this undescribed species is currently being studied by L. Compagno. It is illustrated in Hutchins and Swainston (1986).

(40) *Gymnothorax prasinus* – Glover (1983) reported one specimen from Cape Radstock in far western SA, which is treated here as extralimital.

(42) *Gymnothorax woodwardi* – although not yet recorded to the north of Shark Bay, this species is tentatively included in the distribution category E on the basis of unsubstantiated reports of its occurrence in Exmouth Gulf.

(51) *Spratelloides robustus* – the distribution of this migratory species in the past has included the Dampier Archipelago (Whitehead 1985; Hutchins and Swainston 1986; Paxton *et al.* 1989). However, examination of material at WAM suggests that records of this species to the north of Shark Bay are mostly misidentifications of *S. delicatulus* (50).

(54) *Paraplotosus* species – an undescribed species which is currently being studied by N. Feinberg and J. Gomon. It is illustrated in Allen and Swainston (1988).

(55) *Plotosus lineatus* – a school of small juveniles was reported from Esperance in December, 1979 (A. Longbottom, pers. comm.). It is considered here to represent an extralimital record.

(56) *Aulopus purpurissatus* – the distribution given here is only tentative. WAM records indicate that at least two individuals have been observed in the Coral Bay area, and one captured at the Mackerel Islands off Onlsow (just to the north of Exmouth Gulf). As this species prefers deeper water reefs than those surveyed during this study, its distribution may extend further north than that given here. Nevertheless, the reports included above are all treated as extralimital.

(65) *Histiophryne cryptacanthus* – the distribution of this species, according to Pietsch and Grobecker (1987), is Taiwan, Philippines, Indonesia, Papua New Guinea, WA, SA, and NSW. WAM material examined during the present study ranged from Cape Cuvier (near Point Quobba) to the Recherche Archipelago. Most shallow reef specimens came from the south coast region between the Recherche Archipelago and Geographe Bay, where it is apparently common. To the north of Geographe Bay, records are more sporadic (Perth to the Houtman Abrolhos, and Cape Cuvier). The apparent preference of this species for south coastal waters of the state (including SA, where it is also numerous, see Pietsch and Grobecker, 1987), indicates a more temperate distribution than suggested by the first-mentioned range above. Therefore, I have tentatively treated the WA population as being confined to south-western waters (the Cape Cuvier record, in this context, is considered to be extralimital).

(72) *Brosmophyciops* species – an apparently undescribed species which is currently being studied by D. Cohen.

(76) *Microbrotula* species – this apparently undescribed species is currently being studied by D. Cohen.

(77) *Ogilbia* species 1 – an apparently undescribed species which is currently being studied by D. Cohen.

(78) *Ogilbia* species 2 – an apparently undescribed species which is currently being studied by D. Cohen.

(79) *Ogilbia* species 3 – this apparently undescribed species is currently being studied by D. Cohen. It is illustrated in Allen and Swainston (1988).

(82) *Cleidopus gloriamaris* – this species was recorded by Paxton *et al.* (1989) as occurring at the Rowley Shoals off the North West Shelf. However, this record is based on a misidentification of *Monocentris japonicus*, a species ranging from Shark Bay northwards. On the basis of my surveys, the northern limit in WA for *C. gloriamaris* is Kalbarri, although WAM catalogue entries indicate that it has been trawled off Shark Bay. It has also been trawled at the western end of the Great Australian Bight.

(84) *Optivus* species – this unidentified species is known from a single specimen collected at Cheyne Beach.

(94) *Aulostomus chinensis* – Allen and Swainston (1988) recorded this tropical species to as far south as Fremantle. This was based on a specimen (P.7934, now lost) questionably from Trigg Island, near Fremantle, and another (P.5805) from deep water off Shark Bay. As the species was not found south of Coral Bay during this investigation, the former record is considered to be erroneous and the latter as representing an extralimital record.

(111) *Phycodurus eques* – this species was recently found at Jurien Bay (B. McKay, pers. comm.). In the absence of additional material from this area, the record is treated here as extralimital.

(116) *Glyptauchen panduratus* – the distribution given here is only tentative as little is known about this species in WA seas. As well as the single specimen collected at the Recherche Archipelago during this study, it is known from its type locality of King George Sound, and a sighting at Rottnest Island (Hutchins and Swainston, 1986).

(120) *Pterois volitans* – this species has been reported once from the old tanker jetty at Esperance on the south coast (A. Longbottom, pers. comm.). This is considered to represent an extralimital record.

(127) *Sebastapistes* species – this unidentified species is currently being studied by S. Poss.

(130) *Cocotropus* species – this unidentified species is currently being studied by S. Poss. It is illustrated in Allen and Swainston (1988).

(131) *Neoaploactis tridorsalis* – Paxton *et al.* (1989) recorded this species as tropical, ranging from Rottnest Island to Exmouth Gulf in WA, and also occurring in the Capricorn Group at the southern end of the Great Barrier Reef. However, I could find no specimens from Exmouth Gulf at WAM, the northernmost being from Shark Bay. An additional unreported specimen at WAM was collected from Victor Harbour, South Australia. This suggests that the species may be more warm temperate than tropical. The shortage of specimens, however, precludes a more accurate assessment.

(141) *Acanthistius serratus* – Glover (1978) reported an individual from Ceduna in far western SA. However, this record is treated here as extralimital.

(144) *Caesioperca* species – this undescribed species is currently being studied by P. Heemstra. It is illustrated in Hutchins and Swainston (1986).

(145) *Caesioscorpis theagenes* – the distribution given here is tentative as the species was not found north of Shark Bay during this study. However, judging by its presence in moderate numbers in the latter area and its type locality in the region of Point Quobba, it is expected to range north to the vicinity of Coral Bay. This species rarely strays into south coastal waters.

(155) *Epinephelus coioides* – occasionally caught by recreational fishermen from the Quinns Rock area, just to the north of Perth. One individual was also captured by an amateur fisherman just to the north of Cape Leeuwin, but not retained (identified from photograph).

(159) *Epinephelus lanceolatus* – this species has in the past been regularly recorded to as far south as Rottnest Island. The report of this species by Kailola and Jones (1981) from South Australia is treated as an example of an individual being carried by ocean currents to an area well outside its usual range (see Hutchins and Swainston 1986: 7). Therefore the southern limit of the normal range for this species is considered to be Rottnest Island.

(167) *Hypoplectrodes wilsoni* – the distribution given here for this infrequently collected species is only tentative as it has yet to be recorded east of Cheyne Beach. However, based on its apparent abundance in the latter area, I would expect it to range further eastwards.

(186) *Paraplesiops sinclairi* – the distribution given here for this secretive species is only tentative. It was collected on several occasions from the Recherche Archipelago during this study. Previously it was known from one specimen taken at Lancelin.

(207) *Apogon rueppellii* – this tropical species is one of the most abundant fishes in Cockburn Sound, near Perth, where it prefers seagrass beds and adjacent reefs. Unlike all other tropical species recorded for this area, its numbers are still reasonably prominent southwards, at least to Geographe Bay. Stragglers have been found to Albany.

(212) *Apogon victoriae* – reports to the north of Shark Bay for this species are sparse, but one reliable sighting has been made at Norwegian Bay (near Ningaloo homestead).

(227) *Vincentia punctata* – Hutchins and Swainston (1986) gave Shark Bay as the northern limit of the range for this species; however, this was based on incorrect data entries in the WAM catalogues. The northernmost record taken during the present study was Port Denison.

(233) *Carangoides fulvoguttatus* – there is a WAM specimen of this tropical species from Augusta (near Cape Leeuwin), and it has been observed at Rottnest Island. These are treated as an extralimital records.

(235) *Carangoides orthogrammus* – there is an extralimital specimen at WAM from Fremantle.

(237) *Caranx lugubris* – one specimen was speared at Rottnest Island. Additional reports suggest that this species, although rare in WA mainland waters, is usually found northwards from Ningaloo Reef.

(239) *Caranx sexfasciatus* – there is an extralimital specimen at WAM from just north of Cape Leeuwin.

(241) *Gnathanodon speciosus* – there are extralimital specimens at WAM from Fremantle and Denmark (near Torbay).

(242) *Pseudocaranx dentex* – there is an extralimital specimen at WAM from Exmouth Gulf.

(246) *Seriola dumerili* – an extralimital specimen at WAM was captured from Albany.

(249) *Trachurus novaezelandiae* – there are several specimens from the Exmouth Gulf region at WAM. These are treated here as extralimital.

(262) *Lutjanus sebae* – individuals have been caught infrequently by professional fisherman from as far south as the Houtman Abrolhos.

(271) *Pentapodus vitta* – this species is treated here as a subtropical species, even though its distribution ranges into tropical waters. It is most numerous in the coastal embayments of Cockburn Sound and Shark Bay, although it is also common at the offshore Houtman Abrolhos. It occurs in progressively smaller numbers northwards from Shark Bay, but the species is still reasonably numerous in Exmouth Gulf and at the Muiron Islands. It's northernmost records come from the Dampier Archipelago, where it is occurs in low numbers only. In the south, stragglers have been found to Albany.

(306) *Upeneichthys stotti* – the distribution given here is only tentative. This species mostly inhabits trawling grounds (30-60 m), infrequently being sighted on shallow reefs. Based on the prominent numbers trawled from King George Sound (Albany), it is expected to range further east, probably to the Recherche Archipelago.

(309) *Schuettea woodwardi* – this species is still considered endemic to WA even though several small juveniles were observed at Ceduna, SA in 1981 (see also 325 below).

(316) *Pempheris* species 1 – this apparently undescribed species is currently being studied by R. Mooi

(317) *Pempheris* species 2 – in the past, this apparently undescribed species has often been misidentified as *P. oualensis* (see Hutchins and Swainston 1986). It is currently being studied by R. Mooi.

(318) *Pempheris* species 3 – this undescribed species is currently being studied by R. Mooi. It is illustrated in Hutchins and Swainston (1986).

(319) *Girella tephraeops* – several juveniles of this species were sighted in rock pools at Kalbarri, and another from Point Quobba is at WAM. These are treated here as extralimital.

(324) *Microcanthus strigatus* – recorded in only low numbers to the north of Coral Bay.

(325) *Neatypus obliquus* – Glover and Branden (1983) reported this species from three locations in far western SA. Glover considered that these records indicated a sustained extension of range, a finding with which I can't concur. All were recorded at approximately the same time (March, 1982), which seems to indicate a chance, one-off dispersal across the Great Australian Bight via the Leeuwin Current. Without evidence to suggest that this dispersal is a continuing phenomenon, I prefer not to include SA in its normal range.

(326) *Scorpis aequipinnis* – rarely found to the north of Lancelin during this study. The two individuals sighted at South Passage, Shark Bay, are considered extralimital.

(331) *Platax teira* – several individuals have been found as far south as Albany, but are considered to represent extralimital records.

(333) *Chaetodon assarius* – this species is reasonably numerous in the Ningaloo Reef area, but absent from the Muiron Islands and further north. Extralimital records based on trawl caught material from off the Montebello Islands (one specimen) and the Recherche Archipelago (one specimen) have been reported.

(336) *Chaetodon citrinellus* – all records to the south of Ningaloo involve such low numbers that I believe they represent extralimital examples only.

(347) *Chaetodon trifasciatus* – this species was rarely found to the south of Ningaloo.

(355) *Heniochus diphreutes* – the distribution given here is only tentative. Besides the Shark Bay records, the only other WAM material from the study area was trawled from off Kalbarri.

(368) *Paristiopterus gallipavo* – Hutchins and Swainston (1986) recorded this species as ranging as far north as Carnarvon (Shark Bay) based on a specimen at WAM. However, it appears this was an error. In the WAM catalogue, the collection locality of Point Peron, near Perth, was incorrectly allocated the latitude and longitude of Cape Peron in Shark Bay. Thus the northernmost record for the species is now Rottnest Island.

(372) *Abudefduf sordidus* – this species was rarely found to the south of Shark Bay, and all such records are considered to be extralimital.

(396) *Parma bicolor* – the distribution given here is only tentative as it has yet to be recorded to the north of Rottnest Island. However, the preferred depth range for this species (30 m and over) has received little attention along the west coast, other than at Rottnest Island. I consider that future surveys will extend the range of this species northwards to at least Port Denison.

(421) *Aplodactylus westralis* – this species has been recorded for SA in low numbers only. Until more thorough surveys have been conducted in western SA, it is considered only tentatively to be a part of the SA fauna.

(424) *Cheilodactylus rubrolabiatus* – extralimital specimens have been recorded from the Coral Bay area and Ceduna in SA.

(426) *Nemadactylus valenciennesi* – one individual reliably reported from Port Denison is considered to be extralimital.

(427) *Sphyraena barracuda* – two individuals of this species have been recorded from south-western WA, one from Albany (at WAM) and one from Fremantle. Both are treated here as representing extralimital records.

(430) *Sphyraena obtusata* – this species was rarely found to the south of Rottnest Island. Hutchins and Swainston (1986) stated that reports of this species from SA (e.g., Scott *et al.* 1974) may be

misidentifications of *Dinolestes lewini* (228). Nevertheless, the possibility of pelagic young being carried by the Leeuwin Current into SA cannot be discounted.

(439) *Bodianus frenchii* – one individual of this warm-temperate species has been captured at the Mackerel Islands, north of Exmouth Gulf. However, it is here treated as an extralimital record.

(443) *Cheilinus fasciatus* – besides this record for the Houtman Abrolhos, the species in WA waters is known only from near Broome and the Rowley Shoals, both well to the north of the study area. Therefore I am unsure what distribution to allocate to this species.

(449) *Choerodon jordani* – the distribution given here is only tentative. All WAM material is from the Houtman Abrolhos; the only other WA records are based on several sightings from Shark Bay made during this study.

(453) *Coris auricularis* – this species was found only in low numbers to the north of Shark Bay. These are all considered to be extralimital.

(460) *Epibulus insidiator* – there is a single specimen at WAM from the Houtman Abrolhos, which is considered to represent an extralimital record.

(492) *Suezichthys cyanolaemus* – this species was found only in low numbers to the south of Rottnest Island.

(495) *Thalassoma janseni* – this species in WA is known from only one observation at South Passage, Shark Bay. Until additional material or reports become available, its distribution along the west coast must remain obscure.

(500) *Thalassoma septemfasciata* – this species is reasonably numerous at Rottnest Island but has not yet been recorded further south.

(525) *Opisthognathus* species – this undescribed species is so far known only from specimens collected at the Houtman Abrolhos. It is currently being studied by W. Smith-Vaniz, and is illustrated in Allen and Swainston (1988).

(529) *Parapercis ramsayi* – additional material at WAM was collected from Ocean Reef, just to the north of Perth, and Cape Naturaliste.

(531) *Limnichthys fasciatus* – WAM material can be divided into two distributional groupings, one from the Recherche Archipelago to Rottnest Island and the other from Point Quobba to the Dampier Archipelago. The species has so far not been collected between these two ranges. However, this material apparently represents only one species (Nelson, pers. comm.). Therefore, its range is tentatively given here as the Recherche Archipelago to the Dampier Archipelago, and included in category O.

(532) *Aspidontus dussumieri* – several specimens of this tropical species have been trawled from the Jurien Bay area, but are treated here as extralimital.

(536) *Cirripectes hutchinsi* – this species was reasonably numerous in the Ningaloo area, but absent from the Muiron Islands and further northwards (the report of this species at the Damper Archipelago by Hutchins and Swainston, 1986, was based on a misidentification). It was also rarely found to the south of Rottnest Island.

(553) *Parablennius postoculomaculatus* – this subtropical species was rarely found to the north of Coral Bay and to the east of Cape Leeuwin.

(556) *Plagiotremus rhinorhynchos* – a tropical species which was rarely found to the south of Rottnest Island.

(563) *Enneapterygius* species 1 – an undescribed species which is currently being studied by R. Fricke. It is illustrated in Allen and Swainston (1988).

(564) *Enneapterygius* species 2 – an undescribed species which is currently being studied by R. Fricke.

(565) *Enneapterygius* species 3 – known only from several specimens taken at Shark Bay and the Houtman Abrolhos. It was also photographed underwater at Woodman Point, near Perth, and is illustrated in Hutchins and Swainston (1986).

(580-583) *Heteroclinus* species 1-4 – descriptions of these undescribed species are being prepared for publication by D. Hoese.

(589) *Ophiclinus pectoralis* – WAM material of this recently discovered species indicates a distribution ranging from the Recherche Archipelago to Rottnest Island. However, as it is reasonably abundant at the latter locality, it probably ranges further north, at least to Jurien Bay.

(593-594) *Alabes* species 1-2 – these apparently undescribed species are currently being studied by me.

(600) *Lepadichthys frenatus* – often identified as *L. sandaracatus* Whitley, but the differences between the two are minor. The distribution given here, however, is tentative, as this tropical species has yet to be collected from WA's north-west coast.

(602-603) *Parvicrepis* species 1-2 – these undescribed species are currently being studied by me.

(604-605) Gobiesocid species 1-2 – these undescribed species are currently being studied by me.

(610) *Barbuligobius boehlkei* – this apparently tropical species was unknown in WA until 11 specimens were collected in 1983 from Israelite Bay. Since then, additional material has been found at Port Denison (3 specimens) and Kalbarri (4 specimens). However, it is not possible to accurately describe its distribution in WA based on these records. I strongly suspect that the Israelite Bay specimens are extralimital.

(617-618) *Callogobius* species 1-2 – these undescribed species are currently being studied by D. Hoese.

(621) *Eviota bimaculata* – one extralimital specimen has been recorded from western SA by Lachner and Karnella (1980).

(622) *Eviota infulata* – the only other material at WAM was collected from the Rowley Shoals, so its distribution in WA is at present uncertain.

(628-630) *Eviota* species 1-3 – specimens of these apparently undescribed species are awaiting investigation.

(631) *Exyrias belissimus* – this species is known in WA from specimens collected only at Coral Bay and the Rowley Shoals.

(632) *Favonigobius lateralis* – additional specimens at WAM were collected from the Houtman Abrolhos and Shark Bay.

(635) *Fusigobius* species – an undescribed species which is currently being studied by D. Hoese.

(644) *Priolepis nuchifasciatus* – additional material at WAM includes three specimens which were collected from the Swan River at Fremantle. These were the basis of Allen and Swainston's 1988 erroneous record of *P. semidoliatus* (645) for this locality.

(646) *Priolepis* species – this undescribed species is currently being studied by R. Winterbottom and M. Burridge.

(649) *Trimma* species – this undescribed species is currently being studied by D. Hoese and R. Winterbottom. It is illustrated in Allen and Swainston (1988).

(654) *Valenciennea* species – this undescribed species is currently being studied by D. Hoese and H. Larson.

(655) *Nesogobius* species – this undescribed species is currently being studied by D. Hoese. It is illustrated in Hutchins and Swainston (1986).

(685) *Balistoides viridescens* – only two specimens of this tropical species have been recorded for waters of mainland WA, both from the Rottnest Island area. Therefore, the distribution of this species in WA is unclear.

(699) *Eubalichthys bucephalus* – essentially a deeper water species, it was recorded only once from inshore reefs during this survey (it has been trawled as far north as the Houtman Abrolhos). However, in NSW, it is reasonably common on shallow coastal reefs.

(706) *Meuschenia venusta* – the distribution given here is only tentative. Besides the records from the south coast, the only other material known from WA are 2 trawl-caught specimens, 1 from off Garden Island (near Rottnest Island) and 1 from Shark Bay.

(709) *Pervagor janthinosoma* – one extralimital specimen at WAM was collected from the Houtman Abrolhos.

(710) *Scobinichthys granulatus* – there is a separate population of this species in Shark Bay, which grows to about half the maximum length of the southern population (Houtman Abrolhos southwards). However, both forms otherwise are identical, and are treated here as conspecific.

(716) *Tetrosomus concatenatus* – juveniles of this normally trawl-caught species are often found washed ashore on beaches along the west coast. At Rottnest Island during this study, individuals were infrequently sighted in shallow rocky areas. It has been recorded as far south as Albany.

(717) *Arothron hispidus* – this tropical species has been found as far south as Fremantle (Chubb *et al.* 1979). However, records to the south of Shark Bay are considered to be extralimital.

(722) *Omegophora armilla* – normally an inhabitant of deeper offshore areas, this species is often found also in the vicinity of shallow reefs of south-western Australia. However, two museum records of trawl-caught specimens are noteworthy. One is from off the Montebello Islands and the other from York Sound in the Kimberley. The collection details of the first are possibly erroneous as the WAM registration number attached to the specimen (P.9366) differs from that recorded in the catalogue (P.9368). The second is considered accurate (see Hardy and Hutchins 1981), even though extensive CSIRO trawling in the region between North West Cape and the Kimberley (known as the North West Shelf) has not produced additional specimens of this species.

(723) *Omegophora cyanopunctata* – this species has so far been found only in low numbers in SA. Until more thorough surveys are conducted in western SA, it will be treated here as tentatively occurring in both WA and SA.

museum

ISBN 0-7309-5583-4