

**FISHERIES
RESEARCH
BULLETIN**

Number 13

**Fish and Crustacea
of the
Western Australian South Coast
Rivers and Estuaries**

BY

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1974



**WESTERN AUSTRALIAN
MARINE RESEARCH LABORATORIES
DEPARTMENT OF FISHERIES AND FAUNA
PERTH, WESTERN AUSTRALIA**

CORRIGENDUM

Lenanton, R.C.J. (1974) Fish and Crustacea of the Western Australian south coast rivers and estuaries Fish Bull West Aust. 13, 1-17.

Page 7, column 2, line 26 substitute *Acanthaluteres* for
Acanthaloteres

Page 8, column 1, line 11, substitute Gonorhynchidae for
Gonorynchidae

Page 8, column 2, line 31, substitute *kumu* for *kuma*

Page 8, column 2, line 38, substitute *Aracana* for *Arcana*

Page 9, column 4, line 14, after WAM 112/72 include WAM
192/72.

Page 11, substitute Oldfield for Oldfeild.

Page 13, column 1, line 26, substitute *granulatis* for *granueatis*

Page 14, column 1, line 27, substitute GONORHYNCHIDAE
for GONCRYNCHIDAE

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ABSTRACT

A one year survey was undertaken to provide a preliminary check list of the fish fauna of the Western Australian south coast rivers and estuarine systems. Crustaceans collected during the survey were also included in the check list.

Species have been recorded from estuarine systems and other localities within four broad categories:—

1. Permanently open systems.
2. Seasonally closed systems.
3. Normally closed systems
4. Permanently closed systems or coastal lagoons.

The greatest number of species was recorded from the permanently open systems, and the least number from the normally and permanently closed systems.

When commercial teleosts recorded from the different categories of estuarine systems were classified as marine, estuarine-marine or estuarine, the estuarine-marine species were the most abundant.

The relationship between the extent of the opening of the estuarine system to the ocean, and the success of recruitment of commercial species into the seasonally and normally closed systems is discussed.

Some estuarine-marine species appear to be capable of breeding within estuarine systems which are closed off from the ocean.

1. INTRODUCTION

In past years, the estuaries of the south coast of Western Australia (Figure 1), were reasonably isolated and little known by most people. Only the few local inhabitants of the area used the estuaries for professional and amateur fishing and for recreational purposes. In recent years, general usage of these estuaries has increased, resulting in the inevitable conflicts between the various users. In order to evaluate the effects of these various pressures on the estuaries, and to resolve these conflicts, a good understanding of the normal functioning of the estuarine eco-systems is required. A first step towards this is the identification and documentation of the different species of fauna and flora which inhabit these estuaries.

The objective of the present survey was to attempt to compile a preliminary check list of the fish fauna of these estuaries. Collections of undocumented species made on dates subsequent to the initial survey period, will be added to the check list at a later date.

This work is part of a comprehensive study of the estuarine fauna and environment of South Western Australia, in relation to usage and development.

2. METHODS

(a) Source of specimens

(i) Survey material

Specimens were collected during the twelve month period from July 1971 to July 1972 from the south coast estuarine systems listed below, in order of their situation along the coast from west to east, and numbered 1–11 in Figure 1.

1. Hardy Inlet and the Blackwood River.
2. Broke Inlet and the Shannon River.
3. Nornalup and Walpole Inlets and the Deep, Frankland and Walpole Rivers.
4. Irwin Inlet and the Kent and Bow Rivers.
5. Parry Inlet.
6. Wilson Inlet and the Denmark and Hay Rivers.
7. Oyster Harbour and King and Kalgan Rivers.
8. Princess Royal Harbour. (A semi-enclosed marine embayment).
9. Beaufort Inlet and the Pallinup River.
10. Wellstead Inlet and Bremer River.
11. Stokes Inlet and the Young and Lort Rivers.

For the purpose of the survey, an estuarine system has been regarded as comprising an estuary (termed 'Inlet' in Western Australia) and the rivers which flow into the estuary.

(ii) Museum Specimens

Western Australian museum records were searched and records made of all fish specimens collected from the south coast rivers and estuaries, prior to the 1971–72 survey.

(b) Methods of collection of survey specimens

(i) Collection drums

At each of the estuaries listed, a responsible local resident was provided with a large drum of preservative, specimen bags and labels. Both professional and amateur fishermen were encouraged, through the medium of the press and information posters, to register specimens taken from the various estuarine systems. Periodically throughout the survey, specimens held in the drums were collected and submitted to museum staff for identification.

(ii) Field collections

Research staff also made collections of species whilst involved in field work in the relevant areas. Mesh nets, seine nets, a small benthic dredge and hand scoop nets were used to collect the specimens. From a combination of these two methods records were obtained of both the common species, collected by the professional fishermen, and the more uncommon species, usually detected by the amateur fishermen, the general public, and the Department of Fisheries and Fauna research staff. All specimens have been retained in the collection of the Western Australian Museum.

3. RESULTS

The scientific and common name, Western Australian Museum collection number, and the location and date of capture were recorded for each species collected. Teleost species were grouped into their appropriate families on the basis of the classification of Greenwood, Rosen, Weitzman and Myers, (1966); Elasmobranchs and Petromyzones, Scott (1962); and Crustaceans, Hall (1927–29) (Table 1). A small number of the specimens collected were identified from descriptions published in separate papers.

Each individual estuarine system has been divided into four broad and somewhat arbitrary categories.

- (i) Permanently open systems—systems which have a permanent connection with the sea.
- (ii) Seasonally closed systems—systems which become cut off from the sea at some time during each year.
- (iii) Normally closed systems—systems which remain closed to the sea for several years at a time.
- (iv) Permanently closed systems or coastal lagoons—systems which have remained disconnected from the sea in recent years.

These categories are based on the frequency of opening of the sand bar, which is situated across the entrance of the estuary to the sea. Whether or not an estuarine system remains open to the sea, depends mainly on two factors:—

- (a) The amount of fresh water from land drainage entering the system, and
- (b) The extent to which high energy ocean swells deposit recent calcareous sand across the estuary mouth.

Natural opening may be anticipated by the Public Works Department or Shire Councils by artificially opening some of the south coast estuaries, e.g., Wilson Inlet.

In Table 2, each estuarine system has been allotted to one of these four categories. Also included in Table 2 are records of museum specimens collected from localities, usually rivers, e.g., Waychinicup River, other than those included in the survey.

An attempt was also made in Table 2 to classify commercially important teleost species, into the three following habitat groups:—

- (i) Estuarine:—Species known from the estuaries and rivers only.
- (ii) Estuarine-marine:—Species found both in the ocean and in estuaries, presumably able to tolerate brackish water conditions of the estuaries for prolonged periods. Includes species which spend only part of their life history in estuaries.
- (iii) Marine:—Species known only to the ocean, which on occasion however, will penetrate into the tidal regions of the estuaries. Presumably stenohaline.

Check lists from Millard and Brockhuysen (1970); Tong and Elder (1968); and Cowper (1965); the fish identification texts of Scott (1962); Roughley (1966); Munro (1956–61); and Grant (1965); and the publications of Thomson (1966), Caton (1966), Lenanton (1970) and Blackburn (1950), are the sources of information referred to in classifying species according to their habitat preferences. Any doubtful species are listed in parentheses.

4. DISCUSSION

The four categories of estuarine systems (Section 3) occur over a wide geographic and climatic range; from Hardy Inlet (Cape Naturaliste) in the west, with an average rainfall annually of 39.3 in. and the Oyster Harbour/Princess Royal Harbour area (Albany) with 39.6 in.; to the Stokes Inlet/Dalyup River area (Esperance) in the east with 26.7 in. (Climatic Averages

Australia 1956) (Figure 1). The permanently open systems are usually located on the more westerly section of the south coast where the rainfall is highest and more consistent from year to year, while the normally closed systems occur on the more easterly section of the coast where the rainfall is lower and more seasonal in occurrence.

The survey was not designed to compare species either between individual systems, or different areas within the one system; nor between species collected in different seasons.

However it did allow for comparisons to be made between the different types of commercially important teleost species recorded from the four categories of estuarine systems. (Table 3.)

The estuarine-marine type was dominant throughout the three systems which at some time were open to the ocean. Many of these species, such as *Mugil cephalus*, *Aldrichetta forsteri*, *Sillago punctata*, *Chrysophrys unicolor*, *Pomatomus saltator*, *Australuzza novahollandiae*, *Engraulis australis fraseri* and *Achoerodus gouldii* are capable of spending a portion of their life cycle (usually the early stages) in the estuaries, moving into the ocean at some later stage in their life. The presence of the above species in seasonally closed and normally closed systems, depends to a great extent on these estuaries having a satisfactory opening to the ocean at the time these species are ready to enter the estuaries. For example *Sillago punctata*, *Achoerodus gouldii* and *Chrysophrys unicolor* are all thought to actively enter Wilson Inlet at some age less than 1 year old.

Recruitment into the estuary may be adversely affected if water in the opening of this estuary to the ocean is extremely turbulent as a result of the action of ocean swell in the shallow entrance at the time the fish are ready to enter the estuary.

Some estuarine-marine species are capable of breeding within the normally closed systems. Newly hatched young and adults of the species *Engraulis australis fraseri*, *Mugil cephalus*, *Aldrichetta forsteri*, and *Ammotretis rostratus* have been found in a normally closed system known to have been closed off from the sea for three years.

The estuarine-marine species *Cnidogobius macrocephalus* is capable of utilising both marine and estuarine environments as a permanent habitat. It occurs in all systems that are at some time open to the sea, apparently being unable to tolerate the extreme range of temperatures and salinities which prevail in permanently closed systems.

There were consistently few marine species found in these estuaries (Table 3). Those that were recorded probably came from the tidal region whilst the estuary was open to the ocean. Occasionally marine species such as *Arripis georgianus* may be trapped in a seasonally or normally closed system.

The estuarine species *Mylio butcheri* which usually lives in almost completely fresh water, persists in the permanently closed systems by moving upstream into fresh pools at times when the lower river and estuary experience conditions of extreme hypersalinity.

A lack of knowledge of the biology of recorded species not mentioned above precluded them from being considered in similar fashion to the commercial teleost species.

As was expected the greatest number of different species were recorded from the permanently open systems of more stable temperatures and salinity, and the least number from the permanently closed systems (Table 4).

It should be noted that the absence of certain species from a particular estuary does not necessarily imply that the species never occurs in that estuary. Apart from the chance that they were not encountered, it may only be that the species was not present in the estuary under conditions which prevailed at the time of sampling.

5. ACKNOWLEDGMENTS

I am grateful to Mr. P. Yewers who carried out most of the field work. To Mr. R. McKay and Mr. B. Hutchins for identifying the Teleosts, Elasmobranchs and Petromyzons and Mrs. M. Shepherd for identifying the Crustaceans. To all the south coast professional and amateur fishermen and collection drum holders who were responsible for a great number of the specimens collected.

To Dr. D. Hancock for critically reading the manuscript.

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Table 1
PRELIMINARY CHECK LIST OF THE FISH AND CRUSTACEA OF THE WESTERN AUSTRALIAN SOUTH COAST ESTUARIES AND RIVERS

	Scientific Name	Common Name	W.A. Museum Collection Number	Location and Date of Collection
ELASMOBRANCHII				
Triakidae	<i>Mustelus antarcticus</i> Gunther, 1870	Gummy shark	P20200	NW. 7/9/71, PR. 20/10/71
	<i>Furgaleus ventralis</i> (Whitley), 1943	Whiskery shark	P21685	PR. 19/1/72
Orectolobidae	<i>Orectolobus maculatus</i> (Bonnaterre), 1788	Wobbegong	P20199	PR. 20/10/71
Rhinobatidae	<i>Trygonorhina fasciata</i> Muller and Henle, 1841	Fiddler ray		O. 25/9/71
Hemiscyllidae	<i>Parascyllum variolatum</i> (Dumeril), 1853	Varied catshark	P642	H. 26/12/18
Torpedinidae	<i>Hypnos monopterygium</i> (Shaw and Nodder), 1795	Numbfish	P21686	O. 31/12/71
Dasyatidae	<i>Dasyatis brevicaudata</i> (Hutton), 1875	Smooth stingray		I. -/5/72
PETROMYZONES				
Mordaciidae	<i>Geotria australis</i> Gray, 1851	Pouch or Wide mouthed lamprey	P3261, P1519, P12646, P20273, P2877, P1134-6	H. 11/8/49, NW. -/2/36, BR. 5/9/71, I. 25/5/45, PR. -/12/30, WI. 9/4/65
TELEOSTOMI				
Mugilidae	<i>Aldrichetta forsteri</i> (Cuvier and Valenciennes), 1836	Yelloweye mullet	P20010-12	H. 29/8/71, NW. 7/9/71, O. 6/10/71, BR. 3/9/71, I. 12/9/71, PA. 16/9/71, WI. 15/7/71, 21/9/71, BF. 1/10/71, WL. 27/9/72
	<i>Mugil cephalus</i> Linnaeus, 1758	Sea mullet	P20279, P20247-48, P20024, P20049, P200256	H. 29/8/71, NW. 7/9/71, O. 25/9/71, BR. 3/9/71, I. 12/9/71, PA. 16/9/71, WI. 18/7/71, 21/9/71, BF. 1/10/71, WL. 27/9/72
Sillaginidae	<i>Sillago punctata</i> Cuvier and Valenciennes, 1829	King George Whiting	P20254, P20015-16, P20052	H. 30/8/71, NW. 7/9/71, O. 6/10/71, BR. 3/9/71, I. 12/9/71, PA. 16/9/71, WI. 15/7/71, BF. 1/10/71
	<i>Sillago schomburgkii</i> Peters, 1865	Western sand whiting	P20193, P21669	H. 30/8/71, NW. 10/9/71, I. 17/7/72, O. 22/11/71, PR. 15/12/71, BR. 3/9/71
	<i>Sillago bassensis</i> Cuvier and Valenciennes, 1829	School whiting	P21878	S. 24/2/72
Plotosidae	<i>Cnidoglanis macrocephalus</i> (Cuvier and Valenciennes), 1840	Cobbler	P21171, P20176, P21162-63, P20054, P21160	H. 29/10/71, NW. 7-10/9/71, O. 25/9/71, BR. 8/9/71, I. 12/9/71, WI. 16/5/71, 21/9/71, BF. 2/10/71, WL. 28/9/71
Arripidae	<i>Arripis georgianus</i> (Cuvier and Valenciennes), 1831	Ruff or Herring	P20022-23, P21826, P21672, P21876-77	H. 30/8/71, NW. 7-10/9/71, O. 6/10/71, BR. 3/9/71, I. 12/9/71, I. 22/12/71, WI. 18/7/71, WL. 29/2/72, S. 24/2/72
	<i>Arripis trutta esper</i> Whitley, 1949-50	Australian salmon	P20272, P20278	O. 25/9/71, BR. 5/9/71, I. 22/12/71, 31/6/72, WI. 21/9/71, BF. 31/6/72
Exocoetidae	<i>Hemiramphus melanochir</i> Cuvier and Valenciennes, 1846	Dusky sea or South Australian garfish	P21818-19, P21875	I. 12/9/71, WI. 31/1/72, S. 24/2/72
	<i>Hemiramphus sp.</i>	Garfish	P20180, P20028	PR. 21/10/71, WI. 18/7/71
Sparidae	<i>Chrysophrys unicolor</i> Quoy and Gaimard, 1824	Snapper	P20018, P20050-51	H. 13/9/72, I. 15/9/71, WI. 18/7/71
	<i>Mylio butcheri</i> Munro, 1949	Black Bream	P21679, P21684, P4978, P20027-29, P20199, P20281-85, P21671, P20250-51, P21817, P20183-86	H. 28/8/71, NW. 7/9/71, O. 22/11/71, BR. 3/9/71, I. 12/9/71, WI. 15/7/71, BF. 1/10/71, WL. 2/10/71, S. 8/12/71, s. 26/11/59
	<i>Rhabdosargus sarba</i> (Forsk.) 1775	Tarwhine	P20179, P20252, P21822-23	H. 29/8/71, 13/9/72, NW. 10/9/71, O. 16/11/71, BR. 3/9/71, I. 15/9/71, PA. 22/12/71, WI. -/8/71, BF. 4/10/71, WL. -/12/71
Platycephalidae	<i>Platycephalus fuscus</i> Cuvier and Valenciennes, 1829	Dusky flathead	P3345	NW. 7/9/71, O. 6/10/71, WI. 20/7/50
	<i>Platycephalus bassensis westralie</i> Whitley, 1938	Sand flathead	P21828-30, P21675, P21676	WI. 8/10/71, WL. 29/2/72, S. 24/2/72

Table 1

PRELIMINARY CHECK LIST OF THE FISH AND CRUSTACEA OF THE WESTERN AUSTRALIAN SOUTH COAST ESTUARIES AND RIVERS—continued

	Scientific Name	Common Name	W.A. Museum Collection Number	Location and Date of Collection
	<i>Platycephalus laevigatus</i> Cuvier and Valenciennes, 1829	Rock flathead	P3346	PR. 20/7/50
Carangidae	<i>Platycephalus</i> sp.	Flathead		I. 8/6/72, BF. 8/9/72
	<i>Usacaranx georgianus</i> Cuvier and Valenciennes, 1883	Trevally	P21681, P20253, P20025-26, P21824-25, P21673, P21681	NW. 7/9/71, O. 6/10/71, BR. 3/9/71 WI. 18/7/71, WL. 29/2/72, S. 8/12/71
	<i>Seriola hippos</i> Gunther, 1876	Samson fish	P21680	S. 8/12/71
	<i>Seriola grandis</i> Castelnau, 1872	Yellowtail kingfish	P3033	T. 11/7/46
Pleuronectidae	<i>Trachurus mccullochi</i> Nichols, 1920	Yellowtail	P21690	PR. 12/1/72
	<i>Ammotretis rostratus</i> Gunther, 1862	Long snouted flounder	P20260-64, P. 21907-10, P21832, P20258-59	O. 13/11/71, BR. 5/9/71, I. 12/9/71, PA. 16/9/71, WI. 5/1/72, BF. 1/10/71, WL. 29/2/72
	<i>Ammotretis elongatus</i> McCulloch, 1914	Elongated flounder	P11781	O. 22/7/63
Bothidae	<i>Pseudorhombus jenynsii</i> (Bleeker), 1855	Sole or Small toothed flounder	P21911, P362	H. 6/10/71, O. 10/8/72, WL. 22/2/16
Pomatomidae	<i>Pomatomus saltator</i> (Linnaeus), 1758	Tailor	P20192, P20173, P2007	H. 23/10/71, NW. 9/12/71, O. 13/11/71, I. 12/9/71, WI. 15/7/71
Gempylidae	<i>Thyrstes atun</i> (Euphrasen), 1741	Snoek or Barracouta		O. 24/10/72
Sphyraenidae	<i>Australuzza novahollandiae</i> (Gunther), 1860	Snook or Short finned sea pike	P20190	H. 13/9/72, PR. 18/10/71
Engraulidae	<i>Engraulis australis fraseri</i> Gunther, 1868	Southern anchovy	P20178, P20267-70, P20030-45, P20255, P21677-78	NW. 10/9/71, O. 16/11/72, BR. 5/9/71, I. 12/9/71, WI. 18/7/71, BF. 1/10/71, S. 8/12/71
Cheilodactylidae	<i>Nemadactylus carponotatus</i> (Richardson), 1842	Queen snapper or Blue morwong	P21896	S. 24/2/72
	<i>Psilocranium nigricans</i> (Richardson), 1850	Dusky morwong	P20280	O. 2/12/71
	<i>Goniistius gibbosus</i> (Richardson), 1841	Banded or Black and white morwong	P2401	I. 21/1/43
Cynoglossidae	<i>Cynoglossus broadhursti</i> , Waite, 1905	Southern tongue sole		I. 12/9/71
Soleidae	<i>Strabozebrias cancellatus</i> (McCulloch), 1916	Banded or Harrowed sole	P381	O. 30/5/16
Balistidae	<i>Weerutta ovalis</i> Scott, 1964	Deep-bodied leather jacket	P22039	O. 17/3/72
	<i>Navodon multiradiatus</i> (Gunther), 1870	Six spined leather jacket	P21776, P21827	H. 13/9/72, O. 3/3/72, WI. 1/11/71
	<i>Scobinichthys granulatis</i> (White), 1790	Rough leather jacket	P22040	O. 17/3/72
	<i>Meuschenia hippocrepis</i> (Quoy and Gaimard), 1824	Horse-shoe leather jacket	P22041	O. 17/3/72
	<i>Acanthaloteres brownii</i> (Richardson), 1846	Spiny-tailed leather jacket	P20187	PR. 18/10/71
	<i>Brachaluteres</i> sp.	Pigmy leather jacket	P21689	PR. 2/2/72
	<i>Navodon australis</i> (Donovan), 1824	Velvet leather jacket	P21879-80	S. 24/2/72
	<i>Pseudomonacanthus</i> sp.	Leather jacket		H. 13/9/72
Scombridae	<i>Scomber australasicus</i> Cuvier and Valenciennes, 1832	Common or Slimy mackerel	P4746	PA. 15/6/59
Labridae	<i>Achoerodus gouldii</i> (Richardson), 1843	Blue groper	P200247, P21161, P20019-20020	BR. 3/9/71, WI. 15/7/71
	<i>Pseudolabrus punctulatus</i> (Gunther), 1862	Blue spotted parrot fish	P21836	WI. 5/1/72
Kyphosidae	<i>Scorpius aequipinnis</i> , Richardson, 1848	Sweep	P21835	WI. -/7/71
	<i>Kyphosus sydneyanus</i> (Gunther), 1886	Silver drummer	P21747	PR. 26/1/72, WI. 21/11/71
	<i>Melambaphes zebra</i> (Richardson), 1846	Zebra fish	P21833, P20017, P20170, P2462, P20248	H. 6/10/71, PR. 18/10/43, BR. 3/9/71, WI. 16/1/72
Tetraodontidae	<i>Sphaeroides pleurogramma</i> (Regan), 1903	Banded toadfish	P20172, P20249, P20265-66, P21674, P21683	H. 23/10/71, NW. 10/9/71, BR. 3/9/71, I. 12/9/71, WL. 29/2/72, S. 19/2/72
	<i>Contusus richei</i> (Freminville), 1873	Prickly toadfish	P21821, P361	H. 13/9/72, WI. 31/1/72, WL. 22/2/16
Gobiidae	<i>Ellogobius olorum</i> (Sauvage), 1880	Blue spot goby	P9473-86, P21682, P10055-57	H. 30/8/71, NW. 6/9/71, BR. 4/9/71, I. 14/9/71, PA. 17/8/71, WI. 5/8/64, BF. 2/10/71, S. 19/2/72, s. 28/3/59
	<i>Glossogobius suppositus</i> (Sauvage), 1880	South west goby		H. 13/9/72, O. 24/9/71, I. 14/9/71, PA. 17/9/71, WI. 19/9/71

Table 1

PRELIMINARY CHECK LIST OF THE FISH AND CRUSTACEA OF THE WESTERN AUSTRALIAN SOUTH COAST ESTUARIES AND RIVERS—continued

	Scientific Name	Common Name	W.A. Museum Collection Number	Location and Date of Collection
	<i>Callogobius mucosus</i> (Gunther), 1871....	Sculptured goby	P10050, P21820	O. 22/7/63, I. 12/9/71, WI. 22/11/71
	<i>Gobius lateralis</i> Macleay, 1881	Long finned goby	P10063	O. 22/7/63
Gerridae	<i>Gerres australis</i> Castelnau, 1875	Roach		O. -/-/72
Apogonidae	<i>Gronovichthys ruppelli</i> (Gunther), 1859	Gobbleguts		O. 24/9/71
Atherinidae	<i>Atherina microstoma</i> Gunther, 1861	Small mouthed hardy head	P21881-95	S. 24/2/72
	<i>Atherinisoma</i> sp.	Hardy head	P19614-20	H. 30/8/71, 13/9/72, NW. 9/9/71, O. 24/9/71, BR. 4/9/71, I. 14/9/71, PA. 17/9/71, WI. 19/9/71, BF. 1/10/71, WL. 27/9/72, f. -/-/71
Clinidae	<i>Cristiceps australis</i> Cuvier and Valenciennes, 1836	Crested weedfish	P2319, P6184	O. 30/9/41, WI. 14/1/63
	<i>Petraites roseus</i> Ogilby, 1885	Weedfish	P3257	NW. -/7/49
	<i>Clinus</i> sp.	Common weedfish	P21687	O. 31/12/72
Odacidae	<i>Neoodax frenatus</i> (Gunther), 1862	Brindled rock whiting	P21761	O. 3/3/72
	<i>Haletta semifasciata</i> (Cuvier & Valenciennes), 1840	Blue rock whiting	P20189	PR. 18/10/72
Syngnathidae	<i>Stigmatopora nigra</i> Kaup, 1853	Wide bodied pipe fish	P6275	O. 20/7/63
	<i>Syngnathus phillipi</i> Lucas, 1891	Port Phillips pipe fish	P6276	O. 20/7/63
	<i>Phyllopteryx lucasi</i> Whitley, 1931	Lucas' sea-dragon	P1146	T. -/1/31
Scorpaenidae	<i>Gymnapistes marmoratus</i> (Cuvier & Valenciennes), 1829	Devilfish	P20181, P21172-78, P21912	BR. 17/7/72, O. 21/10/71, PR. 21/10/71, BF. 3/10/71, WL. 27/9/71
	<i>Neosebastes scabriceps</i> (Whitley), 1935	Little scorpion fish	P14625-27	O. 15/12/65
Elopidae	<i>Elops australis</i> Regan, 1909	Giant herring	P7243, P8690	O. 30/4/64, wy. 22/6/64
Mullidae	<i>Upeneichthys porosus</i> (Cuvier & Valenciennes), 1829	Red mullet	P20174, P20191	H. 23/9/71, PR. 18/10/71
Theraponidae	<i>Therapon humeralis</i> (Ogilby), 1899	Trumpeter	P20175	H. 23/9/71
	<i>Helotes sexlineatus</i> (Quoy & Gaimard), 1825	Striped perch	P20277	H. 13/9/72, O. 25/9/71
Gonorynchidae	<i>Gonorhynchus greyi</i> (Richardson), 1845	Ratfish or Sand fish	P21816	H. 13/9/72, BR. 18/7/72, WI. 2/2/72
Serranidae	<i>Acanthistius serratus</i> Cuvier & Valenciennes, 1828	Wirrah	P1888	NW. 14/7/38
Aplodactylidae	<i>Crinodus lophodon</i> (Gunther), 1859	Rock cale	P4728	WI. 31/12/59
	<i>Dactylosargus arctidens</i> (Richardson), 1839	Sea carp	P20204	PR. 2/11/71
Enoplosidae	<i>Enoplosus armatus</i> (White), 1790	Old wife	P20201, P21868-74, P20046	PR. 20/10/71, WI. 18/7/71, S. 24/2/72
Triglidae	<i>Chelidonichthys kuma</i> (Lesson & Garnot), 1826	Red gurnard	P20055, P20196	PR. -/10/71, WI. 16/5/71
Pempheridae	<i>Schuetta woodwardi</i> Waite, 1905	Woodward's pemferet	P21834	WI. 16/1/72
Moridae	<i>Physiculus barbatus</i> (Gunther), 1863	Southern or Bearded rock cod	P21913, P3032	PR. 11/7/46, WI. 20/7/72
Uranoscopidae	<i>Ichthyoscopus barbatus</i> Mees, 1960	Fringed stargazer	P16777	WI. 22/7/69
Ostraciontidae	<i>Caprichthys gymnura</i> McCulloch & Waite, 1915	Horned boxfish	P1220	T. -/3/32
	<i>Arcana ornata</i> (Gray), 1838	Ornate cowfish	P20202	PR. 20/10/71
Trachichthyidae	<i>Trachichthys australis</i> Shaw & Nodder, 1799	Roughy	P21668	O. 12/1/72
Aploactidae	<i>Aploactisoma milesii milesii</i> (Macleay), 1881	Velvet fish	P21741	O. 30/12/71
Echeneidae	<i>Remora remora</i> (Linnaeus), 1758	Stout suckerfish	P2869	O. 19/2/45, PR. 11/7/72
Diodontidae	<i>Dicotylichthys jaculiferus</i> (Cuvier), 1818	Porcupine fish	P35	NW. 20/6/13
	<i>Atopomycterus nichthemerus</i> (Cuvier), 1818	Globe fish	P2613	O. 26/4/44
	<i>Allomycterus pilatus</i> Whitley, 1931	Porcupine fish	P21670	PR. 8/1/72
Chaetodontidae	<i>Vinculum sexfasciatum</i> (Richardson), 1842	Six banded coral fish or Moon lighter	P21688	PR. 26/1/72
Echelidae	<i>Muraenichthys breviceps</i> Gunther, 1876	Short-headed worm-eel	P13441	O. 20/7/63
Muraenidae	<i>Gymnothorax woodwardi</i> McCulloch, 1912	Woodward's moray eel	P20171	H. 29/10/71
Ophichthidae	<i>Ophisurus serpens</i> (Linnaeus), 1758	Serpent eel	P20177, P5262, P1685-86	H. 15/10/71, NW. 5/6/36, g. -/7/62
	<i>Calamuraena calamus</i> (Gunther), 1870	Fringe-lipped snake eel	P5901	O. 17/11/63
Kuhliidae	<i>Edelia vittata</i> Castelnau, 1873	Westralian pigmy perch	P5962, P7460, P2878-80, P14781-82, P15766	wy. 20/2/64, BR. 30/5/64, I. 25/5/45, T. 4/6/63, m. -/10/67

Table 1

PRELIMINARY CHECK LIST OF THE FISH AND CRUSTACEA OF THE WESTERN AUSTRALIAN SOUTH COAST ESTUARIES AND RIVERS—continued

Scientific Name		Common Name	W.A. Museum Collection Number	Location and Date of Collection
Galaxiidae	.... <i>Brachygalaxias nigrostriatus</i> (Shipway), 1953	Black striped minnow	.... P7477-7573	BR. 30/5/64
	<i>Lepidogalaxias salamandroides</i> Mees, 1961	Mud minnow	.... P7446-7451, P7578-81	BR. 30/5/64
	.... <i>Galaxias occidentalis</i> Ogilby, 1899	Western jollytail	.... P2615-6, P3869, P5963, P4535	H. 27/4/44, O. 13/12/55, wy. 20/2/64, WL. 29/3/59
	.... <i>Galaxias truttaceus hesperius</i> Whitley, 1944	Western mountain trout	.... P8042, P8043-50, P19273-434	BF. 12/12/59, s. 28/3/59, f. -/-/71
Serranidae	.... <i>Bostockia porosa</i> Castelnau, 1873	Night fish	.... P3660, P7452-56, P8264, P15165	O. 20/5/54, BR. 31/5/64, T. 31/5/64, -/10/67
Theraponidae	.... <i>Amphitherapon caudavittatus</i> (Richardson), 1845	Yellowtail grunter	.... P5417	BR. 9/10/61
Cyprinidae	.... <i>Carassius carassius</i> (Linnaeus), 1758	Crucian carp	.... P3798	H. 18/3/55
Poeciliidae	.... <i>Gambusia affinis</i> (Baird & Girard), 1853	Mosquito fish	.... P7574	wa. 30/5/64, BF. 2/10/71
Serranidae	.... <i>Maccullochella macquariensis</i> (Cuvier & Valenciennes), 1829	Murray cod	.... P402	T. 15/6/16
Salmonidae	.... <i>Salmo gairdneri</i> Richardson, 1836	Rainbow trout	.... P21837	WI. 12/10/71
CRUSTACEA				
Portunidae	.... <i>Portunus pelagicus</i> (Linnaeus)	Blue manna crab	.... WAM112/72, WAM90/72, WAM89/72	H. 15/10/71, I. 12/6/72, O. 14/12/71, WI. 2/2/72, S. 24/2/72
Alpheidae	.... <i>Ovalipes australiensis</i> Stephenson	Sand crab	.... WAM88/72, 205/72	H. -/-/72, WI. -/2/72
Penaeidae	.... <i>Apheus</i> sp.	Snapping shrimp	....	H. -/-/71
	.... <i>Metapeneas dalli</i> Racek, 1957	Greasy back prawn	....	NW. 14/9/71
Paguridae	.... <i>Penaeus latisulcatus</i> Kishinouye	King prawn	.... WAM209/72	I. 7/6/72
	.... <i>Pagurus</i> sp.	Hermit Crab	.... WAM91/72	O. 31/12/71
Xanthidae	.... <i>Ozius truncatus</i> (H. Milne Edwards)	Reef crab	.... WAM92/72	O. 14/12/71
	.... <i>Heteropanope serratifrons</i> (Kinahan)	Smooth handed crab	.... WAM208/72	H. 14/10/72
Palaemonidae	.... <i>Leander litoreus</i> (McCulloch)	Shore prawn	.... WAM121/72	S. 24/2/72
	.... <i>Palaemonetes australis</i> Dakin	Shrimp	.... WAM207/72	H. 14/10/72
Grapsidae	.... <i>Leptograpsodes octodentatus</i> (H. Milne Edwards), 1837	Burrowing shore crab	.... WAM206/72	H. 14/10/72
	.... <i>Cyclograpsus audouinii</i> (H. Milne Edwards)	Smooth shore crab	.... WAM210/72	H. 14/10/72

ABBREVIATIONS FOR SAMPLING LOCATIONS REFERRED TO IN THE CHECK LIST

H	Hardy Inlet and the Blackwood River	WI	Wilson Inlet and the Denmark and Hay Rivers
NW	Nornalup-Walpole Inlets and the Deep, Frankland and Walpole Rivers	T	Torbay Inlet and Marbellup Creek
O	Oyster Harbour and the Kalgan and King Rivers	BF	Beaufort Inlet and the Pallinup River
PR	Princess Royal Harbour	WL	Wellstead Inlet and the Bremer River
g	Gardner River	f	Fitzgerald River
wa	Warren River	S	Stokes Inlet and the Young and Lort Rivers
BR	Broke Inlet and the Shannon River	m	Moats Lagoon
I	Irwin Inlet and the Bow and Kent Rivers	s	Lake Gore and the Dalyup River
PA	Parry Inlet		

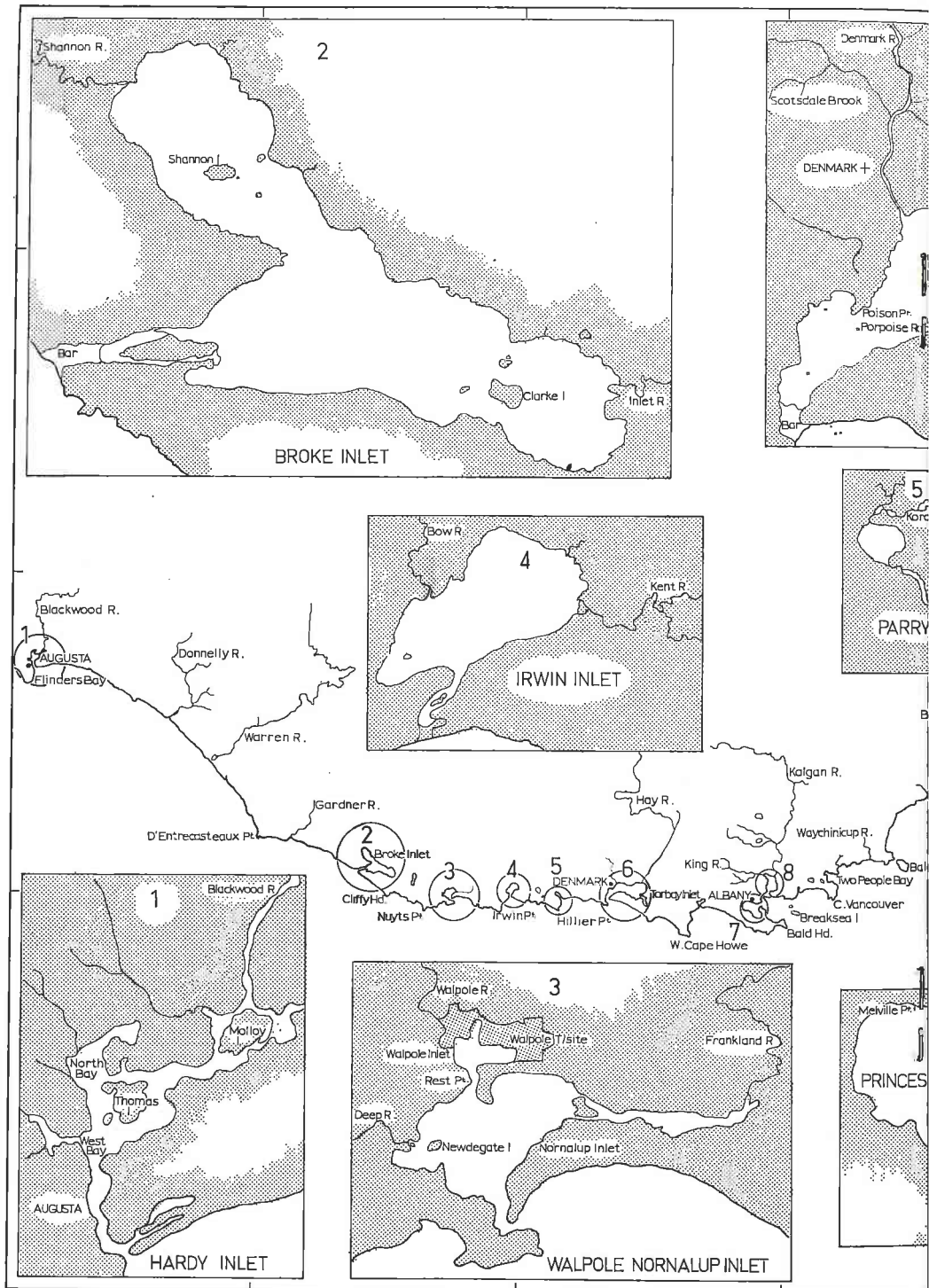
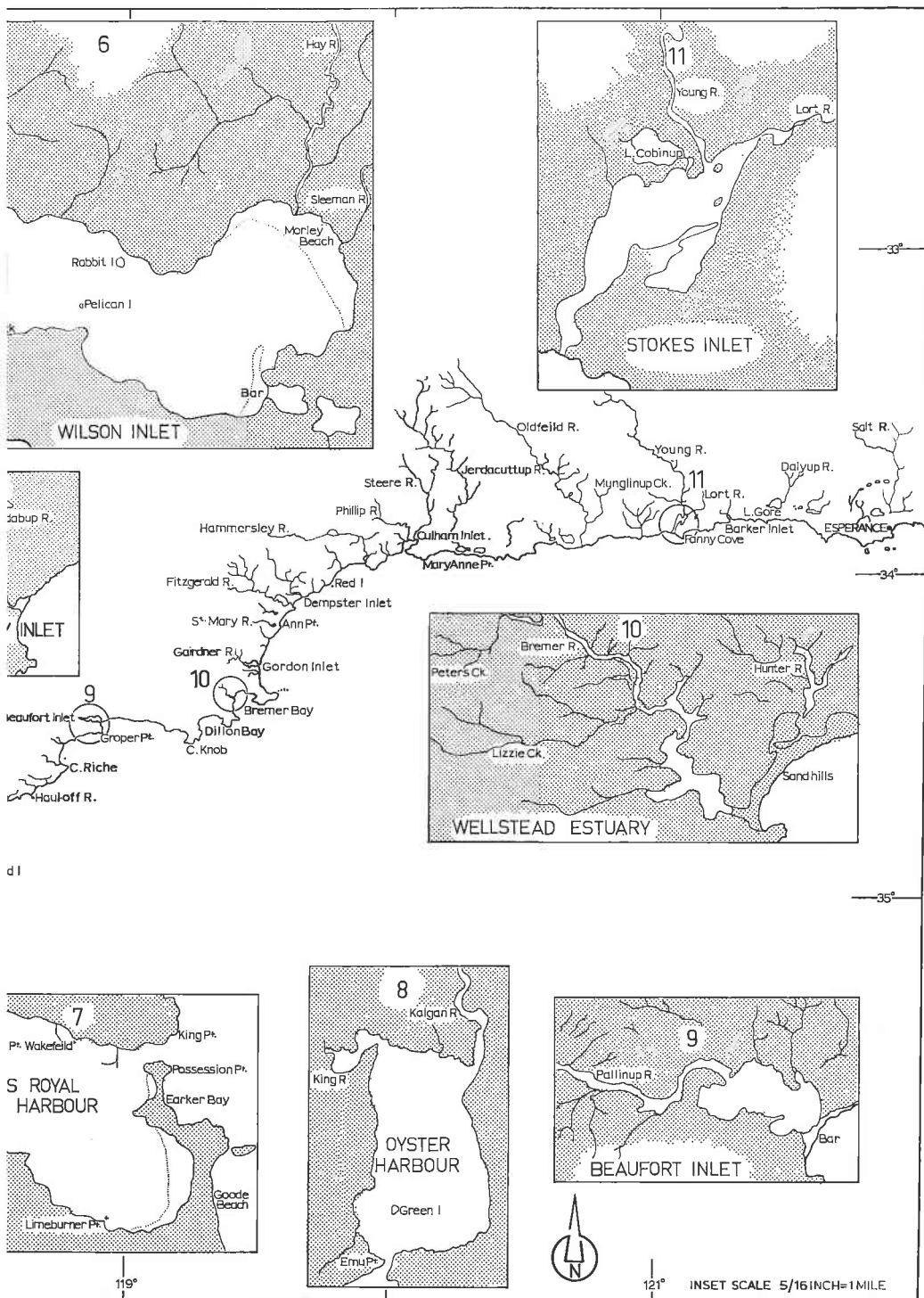


Fig. 1. Rivers and estuaries of the south coast of Western Australia.



showing insets numbered 1—11, of the estuarine systems surveyed.

Table 2

A LIST OF SPECIES COLLECTED FROM LOCALITIES WITHIN THE CATEGORIES OF PERMANENTLY OPEN SYSTEM (P.O.S.); SEASONALLY CLOSED SYSTEMS (S.C.S.); NORMALLY CLOSED SYSTEMS (N.C.S.) AND PERMANENTLY CLOSED SYSTEMS (P.C.S.); INDICATING WHERE POSSIBLE THE DIFFERENT TYPES OF COMMERCIALY IMPORTANT SPECIES.

Species	Type	P.O.S.					S.C.S.					N.C.S.			P.C.S.			
		Hardy Inlet	Normalup and Walpole Inlets	Oyster Harbour	Princess Royal Harbour	Waychinnicup River	Gardner River	Warren River	Broke Inlet	Irwin Inlet	Parry Inlet	Wilson Inlet	Torbay Inlet	Beaufort Inlet	Wellstead Inlet	Fitzgerald River	Stokes Inlet	Moats Lagoon (Two People Bay area)	Lake Gore and Dayup River
ELASMOBRANCHII																		
HEMISCYLLIDAE																		
<i>Parascyllium variolatum</i>		x																
TRIAKIDAE																		
<i>Mustelus antarcticus</i>			x															
<i>Furgaleus ventralis</i>																		
RHINOBATIDAE																		
<i>Trygonorhina fasciata</i>				x														
ORECTOLOBIDAE																		
<i>Orectolobus maculatus</i>					x													
TORPEDINIDAE																		
<i>Hypnos monopterygium</i>				x														
DASYATIDAE																		
<i>Dasyatis brevicaudata</i>									x									
PETROMYZONES																		
MORDACHIDAE																		
<i>Geotria australis</i>		x	x					x	x	x	x							
TELEOSTOMI—Commercial Species																		
MUGILIDAE																		
<i>Aldrichetta forsteri</i>	Estuarine—Marine	x	x	x				x	x	x	x		x					
<i>Mugil cephalus</i>	Estuarine—Marine	x	x	x				x	x	x	x		x	x				
SILLAGINIDAE																		
<i>Sillago punctata</i>	Estuarine—Marine	x	x	x				x	x	x	x		x					
<i>Sillago schomburgkii</i>	Estuarine—Marine	x	x	x	x			x	x	x	x							
<i>Sillago bassensis</i>	Marine																x	
PLOTOSIDAE																		
<i>Cnidoglanis macrocephalus</i>	Estuarine—Marine	x	x	x				x	x		x		x	x				
ARRIPIDAE																		
<i>Arripis georgianus</i>	Marine	x	x	x				x	x	x	x		x	x			x	
<i>Arripis trutta esper.</i>	Marine							x	x	x	x		x	x			x	
EXOCOETIDAE																		
<i>Hemiramphus melanochir</i>	Estuarine—Marine								x		x		x	x			x	
<i>Hemiramphus sp.</i>											x		x	x			x	
SPARIDAE																		
<i>Chrysophrys unicolor</i>	Estuarine—Marine	x							x		x		x	x				
<i>Rhabdosargus sarba</i>	Estuarine—Marine	x	x	x				x	x		x		x	x				
<i>Mylio butcheri</i>	Estuarine	x	x	x				x	x	x	x		x	x			x	x
PLATYCEPHALIDAE																		
<i>Platycephalus fuscus</i>	Estuarine—Marine		x	x							x							
<i>Platycephalus bassensis westralie</i>	Estuarine—Marine										x							
<i>Platycephalus laevigatus</i>	Marine										x			x			x	
<i>Platycephalus sp.</i>									x									
CARANGIDAE																		
<i>Usacaranx georgianus</i>	Estuarine—Marine		x	x														
<i>Seriola hippos</i>	Marine							x									x	
<i>Seriola grandis</i>	Marine																x	

Table 2—continued

Species	Type	P.O.S.					S.C.S.					N.C.S.			P..S.C			
		Hardy Inlet	Nornalup and Waipole Inlets	Oyster Harbour	Princess Royal Harbour	Waychinnicup River	Gardiner River	Warren River	Broke Inlet	Irwin Inlet	Parry Inlet	Wilson Inlet	Torbay Inlet	Beaufort Inlet	Wellstead Inlet	Fitzgerald River	Stokes Inlet	Moats Lagoon (Two People Bay area)	Lake Gore and Dulyup River
<i>Trachurus maccullochi</i>	Estuarine-Marine				X													
PLEURONECTIDAE																		
<i>Ammotretis rostratus</i>	Estuarine-Marine			X				X	X	X			X	X				
<i>Ammotretis elongatus</i>	Estuarine-Marine			X														
BOTHIDAE																		
<i>Pseudorhombus jenynsii</i>	Estuarine-Marine	X		X										X				
POMATOMIDAE																		
<i>Pomatomus saltator</i>	Estuarine-Marine	X	X	X					X									
GEMPYLIDAE																		
<i>Thyrstites atun</i>	Marine			X														
SPHYRAENIDAE																		
<i>Australuzza novaeollandiae</i>	Estuarine-Marine	X			X													
ENGRAULIDAE																		
<i>Engraulis australis fraseri</i>	Estuarine-Marine		X	X				X	X				X				X	
CHEILODACTYLIDAE																		
<i>Nemadactylus carponotatus</i>	Estuarine-Marine			X													X	
<i>Psilocranium nigricans</i>	Marine								X									
<i>Goniistius gibbosus</i>	Marine								X									
CYNOGLOSSIDAE																		
<i>Cynoglossis broadhursti</i>	(Estuarine-Marine)								X									
SOLEIDAE																		
<i>Sirabozebrias cancellatus</i>	(Estuarine-Marine)			X														
BALISTIDAE																		
<i>Weerutta ovalis</i>	Estuarine-Marine			X														
<i>Navodon multiradiatus</i>	Estuarine-Marine	X		X										X				
<i>Scobinichthys granueitii</i>	Estuarine-Marine			X														
<i>Meuschenia hippocrepis</i>	Estuarine-Marine			X														
<i>Acanthaluteres brownii</i>	Estuarine-Marine																	
<i>Brachaluteres sp.</i>	Estuarine-Marine				X													
<i>Navodon australis</i>	Estuarine-Marine																X	
<i>Pseudomonacanthus sp.</i>	Estuarine-Marine	X																
SCOMBRIDAE																		
<i>Scomber australasicus</i>	Estuarine-Marine									X								
LABRIDAE																		
<i>Achoerodus gouldii</i>	Estuarine-Marine							X										
<i>Pseudolabrus punctulatus</i>	Estuarine-Marine													X				
TELEOSTOMI—Non-commercial Species																		
KYPHOSIDAE																		
<i>Scorpius aequipinnis</i>																		
<i>Kyphosus sydneyanus</i>																		
<i>Melambaphes zebra</i>		X					X	X	X									
TETRAODONTIDAE																		
<i>Sphaeroides pleurogramma</i>		X	X					X	X								X	
<i>Contusus richiei</i>		X												X				
GOBIIDAE																		
<i>Ellogobius olorum</i>		X	X					X	X	X			X				X	X
<i>Glossogobius suppositus</i>		X		X														
<i>Callogobius mucosus</i>				X														
<i>Gobius lateralis</i>				X														
GERRIDAE																		
<i>Gerres australis</i>				X														

Table 2—continued

Species	Type	P.O.S.					S.C.S.						N.C.S.			P.C.S.		
		Hardy Inlet	Normalup and Waipole Inlets	Oyster Harbour	Princess Royal Harbour	Waychinnicup River	Gardner River	Warren River	Broke Inlet	Irwin Inlet	Parry Inlet	Wilson Inlet	Torbay Inlet	Beaufort Inlet	Wellstead Inlet	Fitzgerald River	Stokes Inlet	Moats Lagoon (Two People Bay area)	Lake Gore and Dalyup River
APOGONIDAE																		
<i>Gronovichthys ruppelli</i>				X														
ATHERINIDAE																		
<i>Atherina microstoma</i>		X	X	X				X	X	X		X	X	X		X		
<i>Atherinisoma</i> sp.																		
CLINIDAE																		
<i>Cristiceps australis</i>				X							X							
<i>Clinus</i> sp.				X														
<i>Petraites roseus</i>			X	X														
ODACIDAE																		
<i>Neoodax frenatus</i>				X														
<i>Haletta semifasciata</i>					X													
SYNGNATHIDAE																		
<i>Stigmatopora nigra</i>				X														
<i>Syngnathus phillipi</i>				X														
<i>Phyllopteryx lucasi</i>												X						
SCORPAENIDAE																		
<i>Gymnapistes marmoratus</i>				X	X			X					X	X				
<i>Neosebastes scabriceps</i>				X	X													
ELOPIDAE																		
<i>Elops australis</i>				X		X												
MULLIDAE																		
<i>Upeneichthys porosus</i>		X			X													
THERAPONIDAE																		
<i>Therapon humeralis</i>		X																
<i>Helotes sexlineatus</i>		X		X														
GONCRYNCHIDAE																		
<i>Gonorhynchus greyi</i>		X						X			X							
SERRANIDAE																		
<i>Acanthistius serratus</i>			X															
APLODACTYLIDAE																		
<i>Crinodus lophodon</i>																		
<i>Dactylosargus arctidens</i>					X						X							
ENOPLOSIDAE																		
<i>Enoplosus armatus</i>					X						X					X		
TRIGLIDAE																		
<i>Cheilodichthys kumu</i>					X						X							
PEMPHERIDAE																		
<i>Schuetta woodwardi</i>											X							
MORIDAE																		
<i>Physiculus barbatus</i>					X						X							
URANOSCOPIDAE																		
<i>Ichthyoscopus barbatus</i>											X							
OSTRACIONTIDAE																		
<i>Caprichthys gymnura</i>												X						
<i>Arcana ornata</i>					X													
TRACHICHTHYIDAE																		
<i>Trachichthys australis</i>				X														

Table 2—continued

Species	Type	P.O.S.					S.C.S.						N.C.S.			P.C.S.		
		Hardy Inlet	Normalup and Walpole Inlets	Oyster Harbour	Princess Royal Harbour	Waychinicup River	Gardiner River	Warren River	Broke Inlet	Irwin Inlet	Parry Inlet	Wilson Inlet	Forbay Inlet	Beaufort Inlet	Wellstead Inlet	Fitzgerald River	Stokes Inlet	Moats Lagoon (Two People Bay area)	Lake Gore and Dalyp River
APLOACTIDAE																		
<i>Aploactisoma milesii milesii</i>				x														
ECHENEIDAE																		
<i>Remora remora</i>				x	x													
DIODONTIDAE																		
<i>Dicotylichthys jaculiferus</i>			x															
<i>Atopomycterus nictemerus</i>				x														
<i>Allomycterus pilatus</i>					x													
CHAETODONTIDAE																		
<i>Vinculum sexfasciatum</i>					x													
EHELIDAE																		
<i>Muraenichthys breviceps</i>				x														
MURAEINIDAE																		
<i>Gymnothorax woodwardi</i>		x																
OPHICHTHIDAE																		
<i>Ophisurus serpens</i>		x	x				x											
<i>Calamuraena calamus</i>				x														
TELEOSTOMI—Freshwater Endemic Species																		
KUHLIIDAE																		
<i>Edelia vittata</i>								x	x			x					x	
GALAXIIDAE																		
<i>Brachygalaxias nigrostriatus</i>									x	x								
<i>Lepidogalaxias salamandroides</i>									x	x				x				
<i>Galaxias occidentalis</i>		x					x											
<i>Galaxias truttaceus hesperius</i>													x		x			x
SERRANIDAE																		
<i>Bostockia porosa</i>				x					x			x						
THERAPONIDAE																		
<i>Amphiterapon caudavittatus</i>									x									
TELEOSTOMI—Freshwater Introduced Species																		
CYPRINIDAE																		
<i>Carassius carassius</i>		x																
POECILIIDAE																		
<i>Gambusia affinis</i>									x				x					
SERRANIDAE																		
<i>Maccullochella macquariensis</i>												x						
SALMONIDAE																		
<i>Salmo gairdneri</i>																		
CRUSTACEA																		
PORTUNIDAE																		
<i>Portunus pelagicus</i>		x		x												x		
<i>Ovalipes australiensis</i>		x																
ALPHEIDAE																		
<i>Apheus sp.</i>		x																

Table 2—continued

Species	Type	P.O.S.					S.C.S.					N.C.S.			P.C.S.			
		Hardy Inlet	Normalup and Waipole Inlets	Oyster Harbour	Princess Royal Harbour	Waychinnicup River	Gardner River	Warren River	Broke Inlet	Irwin Inlet	Parry Inlet	Wilson Inlet	Torbay Inlet	Beaufort Inlet	Wellstead Inlet	Fitzgerald River	Stokes Inlet	Moats Lagoon (Two People Bay area)	Lake Gore and Dalyup River
<i>PENAEIDAE</i>																		
<i>Metapeneas dalli</i>																	
<i>Penaeus latisulcatus</i>		X						X									
<i>PAGURIDAE</i>																		
<i>Pagurus sp.</i>			X														
<i>XANTHIDAE</i>																		
<i>Ozius truncatus</i>																	
<i>Heteropanope serratifrons</i>	X		X														
<i>PALAEEMONIDAE</i>																		
<i>Leander litoreus</i>																	
<i>Palaemonetes australis</i>	X														X		
<i>GRAPSIDAE</i>																		
<i>Leptograpsodes octodentatus</i>	X																
<i>Cyclograpsus audouinii</i>	X																

Table 3

THE NUMBER AND PERCENTAGE OF TYPES OF COMMERCIALY IMPORTANT TELEOST SPECIES RECORDED FROM THE DIFFERENT CATEGORIES OF ESTUARINE SYSTEMS OF THE SOUTH COAST OF WESTERN AUSTRALIA

Categories of Systems Types of Species	Permanently Open		Seasonally Closed		Normally Closed		Permanently Closed	
	No.	%	No.	%	No.	%	No.	%
Estuarine	1	3	1	4	1	6	1	100
Estuarine/Marine	24	80	19	79	13	72	...	...
Marine	5	17	4	17	4	22	...	...
Total	30		24		18		1	

Table 4

THE NUMBER OF SPECIES OF THE CLASSES TELEOSTOMI, ELASMOBRANCHII, PETROMYZONES AND CRUSTACEA RECORDED FROM THE FOUR CATEGORIES OF ESTUARINE SYSTEMS, OF THE SOUTH COAST OF WESTERN AUSTRALIA

System Class	Permanently Open Systems	Seasonally Closed Systems	Normally Closed Systems	Permanently Closed Systems
	No.	No.	No.	No.
TELEOSTOMI—				
Commercial Species	31	26	19	1
Non-commercial Species	42	21	7	1
Freshwater Endemic Species	3	5	2	2
Freshwater Introduced Species	1	3	1	...
Total	77	55	29	4
ELASMOBRANCHII	6	1	...	...
PETROMYZONES	1	1	...	...
CRUSTACEA	10	3	2	...
Total	94	60	31	4