

Reef Fishes of Conservation Concern in South Australia

A Field Guide



*In the end, we will conserve only what we love,
we will love only what we understand,
and we will understand only what we are taught.*
— Baba Dioum, 1968.

by Janine L. Baker, Marine Ecologist



SUPPORTED BY THE Adelaide and Mount Lofty Ranges
Natural Resources Management Board

Acknowledgments

Thanks to the Adelaide and Mt Lofty Ranges Natural Resources Management (AMLR NRM) Board for supporting the development of this field guide. Particular thanks to Janet Pedler and Liz Millington at AMLR NRM Board for guidance, advice and support. I am grateful to DENR, especially Patricia von Baumgarten and Simon Bryars, for part-supporting my time in writing an e-book on South Australian fishes, from which much of the information in this field guide was derived. Thanks to all of the marine researchers and divers who generously provided images for this guide. In alphabetical order, they include: James Brook, Adrian Brown, Simon Bryars, Helen Crawford, Graham Edgar, Chris Hall, Barry Hutchins, Rudie Kuitert, Paul Macdonald, Phil Mercurio, David Muirhead, Kevin Smith and Rick Stuart-Smith. The keen eye and skill of these photographers have significantly contributed to the visual appeal and educational value of the work. A photograph from the internet has also been included, and thanks to the photographer Richard Ling for making his image of *Girella tricuspidata* available in the public domain. I am grateful to Graham Edgar, Scoresby Shepherd and Simon Bryars for taking the time to edit and proofread the draft text. Thanks to Céline Lawrence for formatting the draft booklet for web-based printing and hard copy printing. Thanks also to the Marine Life Society of South Australia for their ongoing commitment to public education about South Australian reef fishes. Last, but by no means least, thanks to those who read this guide: if your understanding and appreciation of potentially threatened South Australian reef fishes are thus heightened, then the guide will have served one of its main purposes.

Dedication

This booklet is dedicated to my friends and colleagues Dr Scoresby Shepherd AO and Dr David Muirhead. Scoresby's ecological perspicacity and life-long commitment to researching South Australia's marine environment are inspirational. I am also indebted to David Muirhead, whose commitment over several decades to photographing the fauna and flora of South Australia's coastal waters, and widely sharing those images, has enabled thousands of Australians to see and appreciate the rich marine biodiversity of our temperate waters.

Citation: Baker, J.L. (2011) *Reef Fishes of Conservation Concern in South Australia - A Field Guide*. Booklet produced with support from the Adelaide and Mt Lofty Ranges Natural Resources Management Board, South Australia.

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This publication was made with the assistance of a grant from the Adelaide and Mount Lofty Ranges Natural Resources Management Board. Views expressed are those of the author and not necessarily those of the Board, and the Board accepts no responsibility for the accuracy of information contained herein.

Introduction

The coastal waters of South Australia (SA) are home to dozens of different reef fish species. This booklet provides information about 23 of those species, plus one multi-species group of related fishes, but excludes reef fishes known mainly from deeper continental shelf and slope waters, such as Knifejaw *Oplegnathus woodwardi* and the potentially threatened Ocean Leatherjacket *Nelusetta ayraudi*.

The guide provides:

- a simple description of each species, including differences in colour and/or markings between males, females and juveniles;
- information on the distribution and habitat, and, for some species, notes on the diet and behaviour;
- a brief summary of the fisheries for each species at both Commonwealth and State levels, including targeted fishing and bycatch; and
- discussion of the vulnerable characteristics of each species.

The species in this guide were chosen because each has one or more of various life history characteristics that increase their susceptibility to population decline over time. Examples include :

- existence over a relatively narrow depth range, with some species being limited to reefs in shallow coastal waters;
- territoriality / strong site association with the “home” reefs, and limited movement away from those areas;
- slow growth, large size and long life span (in the absence of fishing);
- late age or size at maturity (i.e. late onset of reproduction);

- low reproductive output and limited dispersal of young;
- specific population structure (including, in some species, harems that are dominated by a single male, and sex-change in individuals over time);
- ease of capture, and low survival probability when the fishes are caught and released.

These characteristics, particularly in combination, can decrease the resilience of reef fish populations to threatening processes such as localised over-fishing, and habitat damage to nearshore reefs. Coupled with these on-going stresses, is lack of knowledge of the population sizes, biology and ecology of most of these species, and the increasing threat of impacts from the effects of global warming, such as ocean acidification, warmer sea temperatures and altered wind, wave and current patterns.

This booklet aims to assist divers and snorkellers, fishers, marine students, and anyone else with an interest in reef fishes, to identify South Australia’s reef fishes of potential conservation concern, and provides an up-to-date summary of knowledge about those species. It is hoped that the information herein will promote a greater understanding of, and appreciation for, these fishes. For example, large males of the charismatic western blue groper, which can live for decades, start life as small green female “parrotfish”, regularly caught and chopped up for bait by some fishers who are unaware of the identity. Similarly, some of the uncommon and less abundant leatherjacket species, when accidentally caught whilst fishers are targeting more desirable species, are purposely killed because they are seen as “damn leatherjackets which steal the bait”. It is hoped that this guide will help foster a greater awareness of the vulnerability of reef fish species in southern coastal waters, and assist with their conservation over the long term.

Harlequin Fish

Othos dentex

Description

Reddish, orange, olive green or pink on dorsal side, with large yellow to green blotches on lower half of body, and bright blue spots or dashes on head and sides. Large red blotch under pectoral fin. Yellowish, orange or coppery coloured fins. Grows to about 76cm, but not commonly seen at that size.

Distribution

Occurs in Western Australia and South Australia, and less abundant in the latter State. Previously, might have occurred in Port Phillip Bay in Victoria, based on specimens collected during late 19th century, but no longer occurs there. In SA, there are records from Encounter Bay through to the eastern Great Australian Bight.

Habitat

Found on moderately exposed coastal rocky reefs, near reef drop-offs, over high relief reef patches surrounded by flatter bottom, in caves, and under ledges. Also recorded around shipwrecks. The depth range is narrow, from a few metres to at least 30m deep, but usually seen below 10m.



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Diet

Harlequin Fish is a “sit-and-wait” ambush predator, that feeds on various small fish species, and possibly also crustaceans and molluscs.

Fisheries

Caught in low numbers in shark fishery gill nets in Commonwealth-managed fisheries, and in WA. An infrequent catch of lobster pots in WA and SA. Caught mainly by anglers, charter boat fishers and spear fishers in WA and SA. Considered a prize catch for recreational fishers and usually retained when caught.

Vulnerability

Harlequin fish has a strong reef association and slow moving habit, and thus can easily be caught by lines, spears and other gear. It is a relatively long-lived species (> 40 years), and belongs to the Serranidae family, whose members maintain a specific ratio of males to females in the population, and numbers per group. Fishing may be the main threatening process, and can interrupt the population balance, yet there are few controls on numbers caught. Survival of caught and released fish is likely to be low. This species is considerably less abundant in SA than in WA. Habitat impacts, such as sedimentation and nutrient pollution on reefs may also adversely affect populations.

Black-banded Seaperch

Hypoplectrodes nigroruber

Description

Pale yellowish, brownish, greyish or pink body. Four dark red, brown or black bands across body, and irregular spotting on dorsal surface. Grows to about 30cm.

Distribution

From NSW through to Kalbarri area in WA, including northern Tasmania. Recorded in South Australia mainly from the Great Australian Bight, the gulfs region, and Investigator Strait.

Diet

Black-banded Seaperch feeds on small fishes.

Habitat

Adults are found on sheltered to moderately exposed reefs, often in caves, crevices or under ledges. Also recorded on artificial reefs, around shipwrecks and under jetties. Known mainly from 3m to 35m deep, but bycatch data indicate that it may also occur deeper.



Fisheries

Minor bycatch of commercial long-lines, and lobster pots. Caught incidentally by anglers; also caught by spear fishers, and a minor catch of charter boat fishers. This species is also taken in low numbers for the aquarium trade.

Vulnerability

This species has a strong reef association and slow moving habit and thus can easily be caught by spears and other gear. It belongs to the family Serranidae, whose members maintain a specific ratio of males to females in the population, and numbers per group. Fishing can interrupt the population balance. Habitat impacts, such as sedimentation and nutrient pollution on nearshore reefs may also adversely affect populations in some areas, but species-specific data are lacking.

Brown-spotted Wrasse / Orange-spotted Wrasse

Notolabrus parilus

Description

Males dark brown or greyish brown, with a broken horizontal white band along side of body, and gold or brown spots on scales. Females and juveniles lighter brown or greenish, with white patches on scales, and grey and brown barring across body. Grows to about 49cm, but specimens of that size are uncommon.

Distribution

Ranges from Shark Bay in WA around the southern coastline, to southern Victoria. Most abundant in WA, particularly the south-west, less common and in smaller numbers in SA, and extremely rare in Victoria, which is the edge of the range. The species has been recorded from most parts of the SA coast, from the Great Australian Bight (where it is common) through to the Victorian border. It is uncommon in south-eastern South Australia.

Habitat

Found around rocky reefs with macroalgae, in sheltered, moderately exposed and sub-maximally exposed areas. Found from about 1m deep to 20m deep, occasionally deeper. Juveniles sometimes occur in seagrass beds.

Fisheries

Caught commercially in low numbers, and as bycatch in rock lobster pots (sometimes retained and used as bait). Also caught by spear fishers, and by anglers in SA and WA, possibly in increasing numbers in recent years due to declines in more desirable, heavily fished species.

Vulnerability

Brown-spotted Wrasse are strongly site-associated in shallow, nearshore reef habitat, and they are most vulnerable to capture in such areas. Protogynous hermaphroditism - i.e. sex change from female to male - in this species may also increase vulnerability, because population structure may become imbalanced in heavily fished areas. Habitat impacts, such as sedimentation and nutrient pollution on nearshore reefs may also adversely affect populations.

Female



© R. Kuiter

Male



© D. Muirhead

Blue-throated Wrasse

Notolabrus tetricus

Description

Males variable in colour (greyish, greenish blue or reddish-orange base), with pale head, blue throat and chin, yellow pectoral and ventral fins, and distinct vertical white bar along side of body. Females and juveniles mottled greenish or brownish, often with a large vertical dark patch and adjacent white patches along sides of body. Grows to about 50cm, but specimens of that size are uncommon. Average size range is 30cm to 45cm for males, and 20cm to 35cm for females.

Distribution

Found in south-eastern Australia, from Sydney area in NSW, through Victoria and South Australia. This species is a dominant component of the shallow reef fish fauna in northern Tasmania, Victoria and SA.

Habitat

Found around sheltered to exposed rocky reefs, often with macroalgae. Ranges from 1m to about 160m deep. Adults are generally found close to the sea floor on rocky reefs, in deeper waters than juveniles. Immature fish are often found in shallower waters, around kelps and other macroalgae, and near seagrasses.



Fisheries

In Victoria and Tasmania, caught commercially in traps and on hand lines for the live fish market. Common bycatch in rock lobster pots (and often retained for bait). Minor bycatch in Commonwealth-managed scalefish and shark fisheries. Caught easily and regularly by anglers, commonly using lines, and by gillnets in south-eastern Australia. Also caught by spear fishers. There are size limits and bag limits in some States.

Vulnerability

Blue-throated Wrasse are territorial and strongly site-associated with nearshore reefs. They are long-lived (>15 years); attain a large size; have a late age at sexual maturity; and exist in size-based, hierarchical harems (only 1 male, with a number of females). The protogynous hermaphroditism - i.e. sex change - in this species may also increase population vulnerability. Intense fishing, by removing the large males and large females, can affect reproductive success and reduce the number of small Blue-throated Wrasse entering the population. In some areas, fishers can severely affect populations by fishing the males (which preferentially take the bait), ultimately causing a decline in wrasse numbers. Habitat impacts, such as sedimentation and nutrient pollution on nearshore reefs may also adversely affect wrasse populations.



Purple Wrasse

Notolabrus fucicola

Description

Dusky purple, blue, green or brownish body, darker on dorsal side. Four to five evenly spaced, yellowish blotches at base of dorsal fin, and yellow blotch or bar above operculum. Females similar to males. Grows to about 45cm, slightly larger in New Zealand.

Distribution

Most common in Tasmania and Victoria, and occurs in smaller numbers in southern NSW and south-eastern SA. Also found in New Zealand.

Habitat

Found around exposed reefs (particularly those with kelp and other large brown canopy macroalgae), from the shallow subtidal to about 90m deep.



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Diet

A selective forager, which feeds mainly on small, hard-shelled animals such as crustaceans (e.g. amphipods and crabs), and bivalve and gastropod molluscs.

Fisheries

In Victoria and Tasmania, caught commercially in traps and on hand-lines for the live fish market. Common bycatch in rock lobster pots in Tasmania and south-eastern SA (and often retained for bait). Caught by anglers in south-eastern Australia (particularly Tasmania) using lines, gill nets and other nets. Also caught by spear fishers. There are size limits and bag limits in some States.

Vulnerability

Purple Wrasse are territorial and strongly site-associated with nearshore reefs, and long-lived (>20 years). Aggressive competition by wrasses for food makes them easy to catch by fishing from rocks, wharves and boats. There are examples in south-eastern Australia of localised declines, most likely due to over-fishing. Habitat impacts, such as sedimentation and nutrient pollution on nearshore reefs may also adversely affect wrasse populations.



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Western Blue Groper

Achoerodus gouldii

Description

A large fish, with prominent fleshy lips. Juveniles greyish green or greenish brown. Females and older juveniles greenish. Large males blue, sometimes with white band on edge of pectoral fins and tail fin. Grows to about 160cm.

Distribution

From Houtman Abrolhos in Western Australia, through South Australia to Port Phillip Bay in Victoria, but not common in the latter State. In SA, there are records from all parts of the State, from the Great Australian Bight through to the south East.

Habitat

Young juveniles settle in sheltered macroalgae on shallow rocky bottom. Generally, juveniles usually occur in shallow, relatively protected waters such as lagoons less than 5m deep, adjacent to exposed coasts. Sub-adults are more common in inshore waters on exposed coasts. Adults (>60 cm long) are usually in waters deeper than 10m, around rocky reef habitats, including island edges, caves / caverns, crevasses, vertical rock faces, large rock outcrops with overhangs, “bommies”, and gutters. Depth range is from 1m to about 80m, mostly in the shallow part of the range.

Juvenile (left) with Silver Drummer



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Female



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Adult Male



© A. Brown

Adult Male



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Diet

Juveniles mainly eat small crustaceans, and bivalve and gastropod molluscs. The diet of sub-adults and adults also includes small crustaceans, but an increasing proportion of larger crustaceans (such as crabs), as well as molluscs such as abalone, and sea urchins, are taken with increasing size of groper, as they adopt a wider range of feeding modes.

Fisheries

Caught commercially in WA using various gear in several fisheries. Previously caught in lesser numbers in SA. Fishers in SA are no longer permitted to land and sell groper. Also part of the bycatch in Commonwealth-managed finfish and shark fisheries operating off SA, with catches of 1 to 2.5 tonnes per annum, and a per trip possession limit. Caught in rock lobster pots, with data indicating a likely bycatch of 100-200 groper per annum in south-eastern SA. Popular target for charter boat fishers, anglers and spear fishers. There are minimum legal sizes, bag and boat limits in SA and WA, and an area closure (gulf waters, and Investigator Strait) in SA.

Vulnerability

A long-lived (to 70 years), slow-growing, late-maturing, site-associated, nearshore reef fish species which has a strong population structure, and changes sex with age. It is slow-moving and inquisitive, and will approach divers and fishing boats. Species with these characteristics are vulnerable to over-exploitation and decline. Also, groper which are caught and released are likely to die of internal injury. Habitat impacts, such as sedimentation and nutrient pollution on nearshore reefs may also adversely affect populations. In SA, this species is listed by Reef Watch as “In Peril”.

Dusky Morwong

Dactylophora nigricans

Description

A long, slender fish; adults to 1.2m and more than 13kg, but smaller in fished areas. Greenish grey, brownish grey or silvery grey body. Juveniles grey with orange / copper spots.

Distribution

Relatively common and widely distributed, from NSW through to WA, including Tasmania. Ranges in South Australia from the Great Australian Bight through to the South East.

Diet

Dusky Morwong is an omnivore, that eats mainly brown macroalgae, but also feeds on polychaete worms, and small crustaceans (isopods and amphipods) from the shallows.



Habitat

Juveniles usually occur in shallow waters, on reefs covered with macroalgae, or in seagrass beds. Adults are often in mixed habitats of seagrass, sand and reef edges. Also known from artificial reefs and wrecks, and around jetties. Occurs from the shallows to at least 30m deep.



Fisheries

Target and non-target species for commercial fishers; also bycatch of shark nets. Caught by anglers and spear fishers, and as a traditional Aboriginal food.

Vulnerability

Due to their slow-moving habit and strong association with reefs and seagrass beds, both adults and juveniles are easy to catch using a number of fishing methods, and are particularly susceptible to spear-fishing and gill-netting. Habitat impacts, such as nutrient pollution and sedimentation may also adversely affect populations, but species-specific data are lacking.

Southern Blue Morwong / Queen Snapper

Nemadactylus valenciennesi



Description

Adults darker blue above and pale blue below, with narrow yellow lines on head, radiating from eye. Single dark spot on each side of body, and yellow spots or lines on dorsal, anal and tail fins. Juveniles pale blue, with yellow and blue lines along body. Grows to about 100cm, but specimens of that size are uncommon.

Distribution

Found mostly in WA and SA. Recorded in low numbers in Victoria, and rarely in NSW, at the edge of the range. In SA, ranges from Great Australian Bight (GAB) through to South East.

Habitat

Found on reefs over a wide depth range (3m to about 240m). Associated with high profile reefs (such as “drop-offs”), low profile reef, and also mixed reef/sand or reef/gravel habitats. The species has also been recorded over artificial reefs, around shipwrecks, and under jetties.



Behaviour

Juveniles usually occur in shallower waters than adults, and move out from nearshore reefs as they approach maturity. Adults may aggregate around reef structures. Research in WA has shown that there may be a geographic migration for spawning, when fish mature.

Fisheries

Caught commercially in WA and SA, using a variety of gear types (e.g. hand line, and by-product of gill net, long line, and trawl fishing in WA). Also, caught commercially in the GAB trawl fishery, and in low numbers in several other Commonwealth-managed fisheries. Popular and highly esteemed species for recreational anglers and charter boat fishers in SA and WA, and largest numbers are taken in WA. There are size limits and bag/boat limits for catches by anglers. Also taken by spear fishers.

Vulnerability

Southern Blue Morwong is a relatively long-lived species (to 20+ years). The existence of inshore nursery areas, and the migratory and aggregative nature of this fish make it vulnerable to exploitation and depletion. Large, reef-aggregated morwong are easy to find, and to capture. There is intense fishing pressure on this species when aggregations of adults are found over offshore reefs.

Banded Morwong

Cheilodactylus spectabilis

Description

Silvery to pale brown base colour, with 7 or 8 evenly spaced reddish brown, dark brown or black bands on side. Front bands angled forward; rear bands almost vertical. Fins dark on edges, and reddish at base. Grows to more than 75cm (rarely reported to 100cm).

Distribution

Banded Morwong occurs in New Zealand, NSW, Victoria, Tasmania and Bass Strait islands, and South Australia. More abundant in Tasmania and New Zealand than other parts of the range. Distribution in SA ranges from the South East to eastern Great Australian Bight.

Habitat

Generally occurs on shallow coastal reefs, particularly higher wave-energy reefs, such as reefs off exposed rocky headlands. Common around kelp and other large macroalgae, and in the vicinity of caves, crevices and overhangs on high relief reef. Adults occur in deeper waters than juveniles.

Diet

Banded Morwong has a varied diet, comprising groups such as crustaceans (e.g. amphipods and small crabs), molluscs (e.g. abalone and chitons), polychaete worms and echinoderms (e.g. sea urchins and brittle stars).

Fisheries

Caught commercially and recreationally in large mesh gillnets in Tasmania. Also caught commercially for the live fish market in Tasmania and Victoria. Bycatch in rock lobster pots (and sometimes retained for bait). Minor bycatch in Commonwealth-managed scalefish and shark fisheries. Caught regularly by spear fishers across the range, less commonly caught by anglers.

Vulnerability

Banded Morwong is large, very long-lived (to 95 years), highly territorial, and easy to catch. This species has complex spawning behaviour, low productivity, and recruitment strength may be highly variable from year to year. Fishing larger sizes and older age classes heavily, can reduce the number of reproductive year classes and thus reduce the ability of such reef fishes to maintain viable populations. Recent research indicates accelerated growth rates and earlier onset of maturity in south-eastern Australian populations over recent decades.



Southern Blue Devil

Paraplesiops meleagris

Description

Dark greyish blue body with small, bright blue spots. Faint dark bars sometimes occur along sides of body in adults. Some large adults have a blue ring on the operculum. Juveniles have larger spots on head than body (which is only faintly spotted), and large black blotches on dorsal, anal and caudal fins. Grows to about 36cm, but usually seen at smaller sizes.

Distribution

From southern Victoria through to Houtman Abrolhos in WA, but more common in South Australia than at edges of range. Recorded in SA from the Great Australian Bight through to at least Encounter Bay, usually in low numbers.

Habitat

Found on exposed and moderately exposed reefs, often in caves, crevices or under ledges. It has also been recorded in the vicinity of artificial reefs and shipwrecks. Ranges from about 5m to at least 45m deep.



Diet

This species feeds on bony fishes, and crustaceans (such as crabs) that live on the sea floor.

Fisheries

Southern Blue Devil is taken by spear fishers and anglers in some areas of SA and WA. It is also a bycatch of commercial long-lines in SA. Southern Blue Devil is taken under licence in WA to supply the specialist aquarium market, and specimens are mostly exported (some are sold nationally).

Vulnerability

This species is territorial, has a strong association with reefs in shallow waters, is slow moving and inquisitive, and is easy to approach. These characteristics make it easy to catch (e.g. by spear). Southern Blue Devil is a long-lived species, to at least 50 years. Adults are solitary or form "pair bonds" and reproduce on the "home" reef. Young blue devils are sometimes observed in the same caves as the adults. It is likely that reproductive capacity and dispersal are low, given the habits and population dynamics of this species. Fishing may be a significant impact on some populations. Degradation of reefs, such as sedimentation, may also adversely affect populations in some areas, but there are no species-specific data. In SA, this species is listed by Reef Watch as "In Peril".

Long-snouted Boarfish

Pentaceropsis recurvirostris

Description

Silvery-grey coloured body with several broad black bands, including one at dorsal fin base; two on sides of body; one on top of head to lower jaw, and black bands through fins. Juveniles are not distinctly banded, and have large brownish or blackish blotches on the body, dorsal and anal fins. There are venomous spines at the start of the dorsal fin. Grows to about 50cm.

Distribution

From southern NSW through to southern WA, including Tasmania and the Bass Strait islands. Recorded in South Australia from the Great Australian Bight through to Kangaroo Island and Encounter Bay, in low numbers.

Diet

This species feeds on brittle stars (and feather stars), polychaete worms and brown macroalgae.



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Habitat

Found on exposed and moderately exposed reefs, often near caves, crevices or under ledges. Commonly recorded on reefs with kelp and other canopy macroalgae. Also found over artificial reefs, around shipwrecks and under jetties. Ranges from about 4m to 260m deep.



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Fisheries

Bycatch of Commonwealth-managed trawl and shark net fisheries. Also taken commercially in shark nets and gill nets in various State fisheries across southern Australia. Popular target for recreational anglers, netters and spear fishers because it is considered to be a good table fish. Collected in some areas for the aquarium trade.

Vulnerability

Due to territorial nature around nearshore reefs, and slow movements, Long-snouted Boarfish are easily speared, and are also caught by other gear. In deeper waters, the species is susceptible to capture by trawls and gill nets. In some parts of Tasmania, there have been concerns about over-fishing, excess catches of small specimens, and population depletion, resulting in a current legal minimum size limit, and prohibition on spearing Boarfish in that State. In Victoria, populations are considered to have declined on heavily fished reefs, and sightings of the species in such areas are becoming increasingly rare. Because boarfishes are site-associated reef fishes that feed on the bottom, damage to the sea floor (e.g. from processes such as trawling) may adversely affect populations on some parts of the continental shelf; however no studies have been undertaken. In SA, this species is listed by Reef Watch as "In Peril".

Brown-spotted Boarfish

Paristiopterus gallipavo

Description

Pale grey with darker, brownish bands and patches on body. Brown spots on head, nape and on the brown body parts. Grows to at least 74cm, but usually seen at smaller sizes. Sometimes confused with the yellow-spotted form of the closely related species Giant Boarfish *Paristiopterus labiosus*.

Distribution

From central coast of SA (e.g. gulfs region and Kangaroo Island) through to central coast of WA. Most records in SA are from the Great Australian Bight.

Habitat

Found near the bottom, including over various types of reefs, across the continental shelf. Broad depth range, from about 10m to 260m, but mostly recorded between 75m and 200m, in commercial trawling grounds.



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Diet

Generally, boarfishes feed on sea cucumbers, various types of marine worms, brittle stars, bivalve molluscs and other invertebrates.

Fisheries

A target species of trawl fishing in the Great Australian Bight, and also a retained bycatch of other Commonwealth-managed fisheries for sharks and scalefishes operating off SA and WA. Taken by anglers and spear fishers, because it is considered to be a good table fish, but in lower numbers than in commercial fisheries.

Vulnerability

Commercial fishing is likely to be the main threatening process. Some fisheries in southern Australia take dozens of tonnes per annum, despite no knowledge of Brown-spotted Boarfish population sizes, or the sustainability of fishing them. Has been listed in a Commonwealth assessment as a "high risk" species - i.e. highly susceptible to population impacts from trawling. Generally, boarfish are site-associated reef fish species that feed on the bottom. In some areas, damage to the benthos (e.g. by trawling) may have a negative impact on boarfish populations; however no specific studies have been undertaken.



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Six-spined Leatherjacket

Meuschenia freycineti

Description

Southern form has a greenish, yellowish or grey body, with squiggly blue to brown lines on head, and dorsal side. Males have 5 to 8 (often 6) spines on each side near tail base. Dorsal and anal fins are yellow. Juveniles and females often have several dark stripes along body, and lack much of the blue patterning that is characteristic of the males.

Distribution

From NSW through to Jurien Bay in WA, including Tasmania. Recorded in South Australia from the Great Australian Bight through to the upper South East.

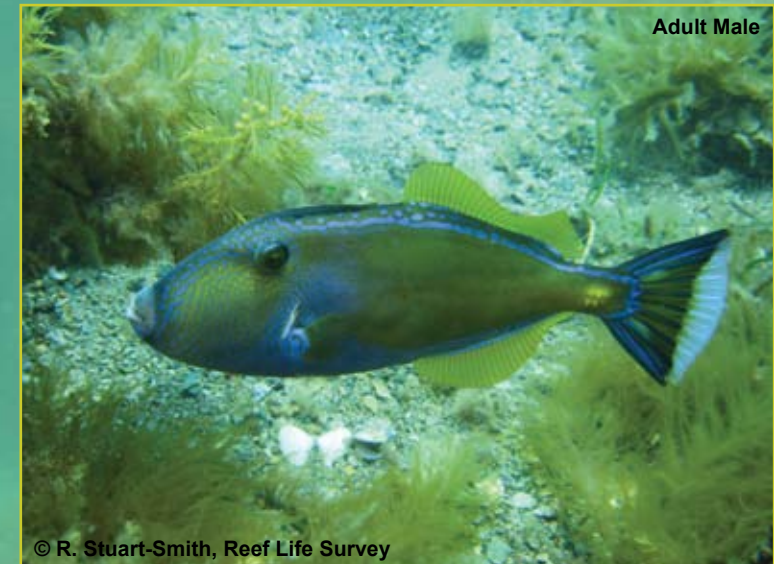


Diet

Adults eat echinoderms (e.g. sea urchins), and gastropod molluscs. Juveniles eat epiphytic algae, and small fauna found in seagrass beds (e.g. hydroids, molluscs, crustaceans, polychaete worms).

Habitat

Adults are found on sheltered to semi-exposed reefs, often with dense cover of macroalgae. This species is also associated with patch reefs (e.g. with invertebrate cover) in sand, and with structures such as shipwrecks, artificial reefs, and jetties. Juveniles are abundant in coastal seagrass beds, and have also been recorded in estuaries. Ranges from 0m to about 50m deep, occasionally deeper (e.g. 100m).



Fisheries

Caught commercially in southern Australia by traps, hauling nets, hook and line, and as bycatch in trawls, gill nets and rock lobster pots, across the range. Also caught by anglers and spear fishers.

Vulnerability

Vulnerable characteristics include large size; strong reef association; aggregation during breeding season, and ease of capture. Leatherjackets reproduce at localised scales, presumably with a low level of dispersal, and these characteristics can increase their vulnerability to site-specific impacts. Fishing may be a threatening process in some areas. In Victoria, loss of seagrass cover due to pollution is reported to have reduced populations of this species.

Blue-lined Leatherjacket (Gale's Leatherjacket)

Meuschenia galii

Description

Males greenish grey to yellowish brown with bright blue or pale lines and spots on body. Head markings similar to those on Six-spined Leatherjacket. Fins are greenish or almost transparent; tail is mainly orange, with two bright blue bars and a bright blue edge. Females lack the blue edge on the tail fin. Juveniles are usually covered with blue spots, and often have 2 or 3 dark brown stripes on side of body. Grows to about 35cm.

Distribution

From Wilsons Promontory area of Victoria through to Shark Bay in WA. More common in south-western Australia than in the eastern part of the range. Recorded in South Australia from the Great Australian Bight through to the Fleurieu Peninsula and Kangaroo Island.

Behaviour

In some habitats, the Blue-lined Leatherjacket mixes with other leatherjacket species.



Habitat

Found around exposed and moderately exposed reefs, including those with dense cover of macroalgae. Ranges from about 2m deep to 30m deep.

Fisheries

Caught commercially in unknown numbers, because State fisheries do not separate leatherjacket catch statistics by species. Also a bycatch of rock lobster fisheries in SA and WA, and taken by charter boat fishers in some areas (e.g. eastern Great Australian Bight), but species-specific catch statistics are not collated for leatherjackets in these fisheries. Taken by anglers and spear fishers, in unknown numbers.

Vulnerability

This species has a strong association with reefs, over a relatively shallow depth range. Leatherjackets reproduce at localised scales, presumably with a low level of dispersal, and these characteristics can increase their vulnerability to site-specific impacts. It is not known to what extent fishing and bycatch may be a threatening process, because population numbers of Blue-lined Leatherjacket are not known, and species-specific catch statistics are not collated. Populations from nearshore reefs may also be vulnerable to impacts from land-based processes that cause reef degradation.

Spiny-tail / Spiny-tailed Leatherjacket

Acanthaluteres brownii

Description

Males are various shades of green, yellowish green or brownish green, with blue lines on head and dorsal surface, breaking up into blue spots along sides of body. Posterior part of body has a brighter base colour (e.g. yellow). Bright yellow or orange patch (caudal peduncle) in front of the tail, with 4 spines each side.

Females are similar to males, but lack the orange-yellow caudal peduncle, and body lines and stripes are less distinct. Juveniles are greenish grey and mottled, mostly lacking the blue stripes and spots, but have a dark blotch or stripe on the side, behind the eye. A moderately large leatherjacket, growing to about 46cm.

Distribution

From Rottnest Island in WA through to Kangaroo Island and Encounter Bay in SA. More common in southern WA than in SA.

Habitat

Found around sheltered and moderately exposed reefs, and adjacent seagrass beds in bays, where the species is sometimes seen in large groups. Ranges from about 2m deep to at least 25m deep, and there are records from deeper waters in some areas (e.g. Great Australian Bight).

Fisheries

Caught commercially in SA and WA but exact catches unknown because State fisheries do not separate leatherjacket catch statistics by species. Caught in the bycatch of rock lobster pots in western part of SA, possibly in the order of several hundred individuals per annum. Taken by anglers and spear fishers in SA and WA, with quantities rarely recorded.

Vulnerability

Leatherjackets reproduce at localised scales, presumably with a low level of dispersal, and these characteristics can increase their vulnerability to site-specific impacts. Bycatch, particularly in rock lobster pots, may be a threatening process, but the impacts of bycatch mortality cannot easily be determined, because there are no population size estimates across the range of this leatherjacket species.

There are reports from south-eastern Australia that populations have declined in some areas subject to heavy spear fishing pressure.

This species has a strong association with coastal reefs and seagrass beds, and populations from nearshore areas may be vulnerable to impact from land-based processes that cause habitat degradation.



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Horseshoe Leatherjacket

Meuschenia hippocrepis



Description

Males mainly green and blue, with patches of yellow on sides of body; white mark near pectoral fin, and dark bar on cheek. Black, yellow-ringed, horseshoe-shaped mark on side of body. Caudal peduncle near tail with 4 spines on each side is larger on males than on females and juveniles. Females and older juveniles are similar in appearance to males, but less brightly coloured, and females have no black bar on cheek. Young juveniles are pale pinkish colour with blotches on side of body, and an indistinct horseshoe mark. Grows to about 64cm, but rarely seen at that size.

Distribution

Northern half of Tasmania, and from Wilsons Promontory in Victoria through to Houtman Abrolhos in WA. Recorded in South Australia from the Great Australian Bight through to the South East.

Diet

This species is a “picker” that feeds on molluscs, sponges, and echinoderms.

Behaviour

Horseshoe Leatherjackets are inquisitive and will sometimes approach or follow divers. If threatened, they retreat into caves or under ledges or other cover.

Habitat

Found around coastal reefs of various wave exposure levels. Sometimes occurs in groups, in reef areas rich in kelp. Usually found from 3m to about 20m deep.

Fisheries

Caught commercially across the range but exact catches unknown because State fisheries do not separate leatherjacket catch statistics by species. One of the most common fishes in the bycatch of rock lobster pots across SA, with data from the 2000s showing that thousands of specimens are caught per annum. Also caught in WA as part of the specialist aquarium trade. Taken by recreational gill nets in Tasmania, and by anglers and spear fishers across southern Australia, with quantities rarely recorded.

Vulnerability

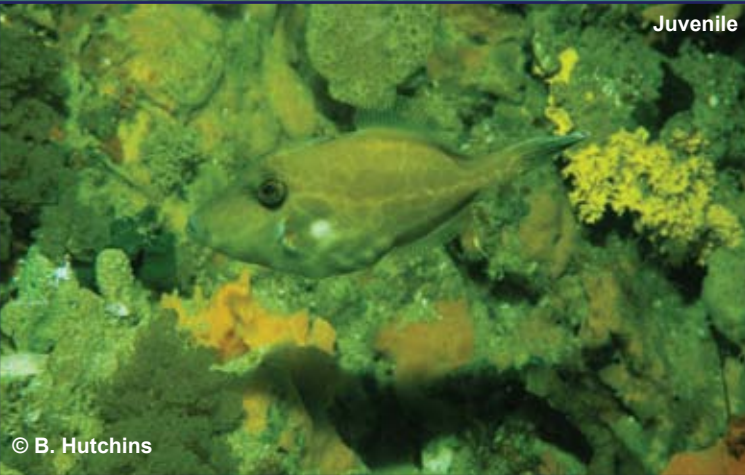
This species has a strong association with coastal reefs and seagrass beds, and populations from nearshore areas may be vulnerable to impacts from land-based processes that cause habitat degradation. Leatherjackets reproduce at localised scales, presumably with a low level of dispersal, and these characteristics can increase their vulnerability to site-specific impacts. Bycatch, particularly in rock lobster pots, may be a threatening process, but the impacts of bycatch mortality cannot easily be determined, because there are no population size estimates across the range of this leatherjacket species. There are reports from south-eastern Australia that populations have declined in some areas subject to heavy spear fishing pressure.



Gunn's Leatherjacket (Velvet Leatherjacket)

Eubalichthys gunnii

Juvenile



© B. Hutchins

Description

Yellowish brown to dark bluish grey body, with a distinct network of mosaic-like patches on the sides of body. Head is often darker than the body. Males usually have a pale line extending from the eye to the tail fin. Juveniles are pale or gold / orange, with white-edged, brown mosaic-like patches all over body. A moderately large leatherjacket, growing to about 45cm (rarely larger).

Distribution

Around Tasmania, and from Wilsons Promontory in Victoria through to South Australia. Recorded in SA from the Great Australian Bight through to the South East, in low numbers. Less common in SA than in the eastern part of the range.

Behaviour

Gunn's Leatherjacket is considered to be a "shy" species, that rarely ventures far from caves.

Habitat

Found around exposed coastal reefs (particularly areas with caves and crevices) and deeper water reef outcrops, extending down to mid continental shelf. Juveniles sometimes seen in bays and estuaries. Known from about 4m deep (juveniles) to 150m deep (adults).

Fisheries

Incidental bycatch of Commonwealth-managed trawl fishing in south-eastern Australia. Sometimes caught by gill nets in Tasmania. Minor bycatch of scallop dredging in Bass Strait, and of prawn trawls and rock lobster pots in SA. Taken by anglers and spear fishers in some areas.

Vulnerability

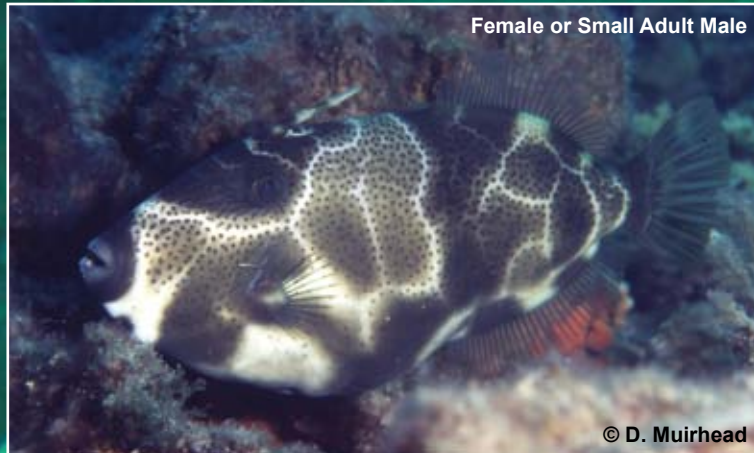
This species has a strong association with reefs. Leatherjackets reproduce at localised scales, presumably with a low level of dispersal, and these characteristics can increase their vulnerability to site-specific impacts. It is not known to what extent fishing and bycatch may be a threatening process, because population numbers of Gunn's Leatherjacket are not known, and species-specific catch statistics are rarely collated. Populations may also be vulnerable to impacts from processes that cause reef degradation.



© G. Edgar

Blue-tailed Leatherjacket

Eubalichthys cyanoura



Description

Adults are pale green, pale brown or dark brown, with numerous closely packed dark spots. Large adult males have few markings, and a bright blue tail band. Females, small adult males and juveniles have a mosaic-like pattern of light and dark blotches over the body, but only the males have the distinctive blue tail band. A moderately large leatherjacket, growing to about 42cm.

Distribution

Ranges from approximately Port Denison area in WA through to Gulf St Vincent and Kangaroo Island in SA. Less common in SA than in the western part of the range.

Habitat

Found around sheltered and moderately exposed coastal reefs, from about 3m deep to 20m deep.

Diet

This species is reported to be a benthic carnivore, but specific details about its diet are lacking.

Behaviour

Blue-tailed Leatherjacket is considered to be a “shy” species, and is rarely seen because of its habits.

Fisheries

Possibly taken in low numbers as bycatch in some commercial fisheries, but catches unknown because State fisheries do not separate leatherjacket catch statistics by species. Possibly taken in low numbers by anglers and spear fishers, but considered to be “shy”, which may reduce its susceptibility to capture.

Vulnerability

This species has a strong association with reefs, over a relatively shallow depth range. Leatherjackets reproduce at localised scales, presumably with a low level of dispersal, and these characteristics can increase their vulnerability to site-specific impacts. It is not known to what extent fishing and bycatch may be a threatening process, because population numbers of Blue-tailed Leatherjacket are not known, and species-specific catch statistics are not collated. Populations from nearshore reefs may also be vulnerable to impact from land-based processes that cause reef degradation.



Brown-striped Leatherjacket

Meuschenia australis



© G. Edgar

Description

Males greenish brown to yellowish brown, with yellow head, blue throat and blue fin bases, blue line below the dorsal fin, and blue tail with black border. Females and juveniles brown, green or whitish, with 4 to 5 brownish stripes on body, and numerous dark brown spots on belly and head. Grows to about 38cm, but usually seen at smaller sizes in fished areas.

Distribution

Brown-striped Leatherjackets are found in Tasmania and Victoria, and parts of south-eastern South Australia. In Bass Strait, they have been recorded around islands such as the Kent group. In South Australia, this species has been recorded in Encounter Bay, and in waters of the South East. This species is less common in SA than in south-eastern Australia.

Diet

This species is reported to eat sponges, echinoderms (including sea urchins), hydrozoans and large molluscs.

Habitat

Found around moderately and sub-maximally exposed coastal reefs, particularly reefs with cover of kelp or other canopy macroalgae. Juveniles sometimes recorded in seagrass beds. Ranges from the shallows to more than 20m (as evidenced by rock lobster pot bycatch records).

Behaviour

Brown-striped Leatherjacket has a broader home range (e.g. greater than 1750 square metres) compared with some of the other site-associated leatherjacket species.

Fisheries

Possibly taken in some commercial fisheries, as this species is reported in fish market sale statistics (and may be mixed with catches of *M. freycineti*). Exact catches unknown because State fisheries do not separate leatherjacket catch statistics by species. Minor bycatch of commercial gill nets, scallop dredges and rock lobster pots in Tasmania. A common part of the bycatch of rock lobster pots in south-eastern SA, with hundreds (to thousands) of specimens estimated to be caught per annum. Also taken by recreational gill netting in Tasmania, and by spear fishers and anglers in some areas.

Vulnerability

This species has a strong association with reefs, over a relatively shallow depth range. Leatherjackets reproduce at localised scales, presumably with a low level of dispersal, and these characteristics can increase their vulnerability to site-specific impacts. Bycatch, particularly in rock lobster pots, may be a threatening process, but the impacts of bycatch mortality cannot easily be determined, because there are no population size estimates across the range of this leatherjacket species. There are reports from south-eastern Australia that populations have declined in some areas subject to heavy spear fishing pressure. Populations from nearshore reefs may be vulnerable to impacts from land-based processes that cause reef degradation.

Banded Sweep

Scorpis georgiana / *Scorpis georgianus*

Description

Silver grey to brownish grey, with several broad grey to black vertical bands. Small juveniles are brown with orange stripes. Fins are a dusky colour with a white anterior edge. Grows to about 46cm, but rarely seen at that size.

Distribution

Banded Sweep ranges from Kalbarri in WA southwards to South Australia, and is more numerous in the western part of the range. Recorded across SA from the eastern Great Australian Bight through to the upper South East, usually in low numbers compared with the more common Sea Sweep *Scorpis aequipinnis*.

Habitat

Adults are commonly found on shallow reefs, and also in caves and under ledges, in shallow waters. Also found on artificial reefs and around shipwrecks and occasionally in seagrass beds. Small juveniles are often found under floating macroalgae, and they settle on reefs later in life, as adults. Depth range is from the intertidal (small juveniles) to about 35m deep.



Diet

Banded Sweep reportedly eat zooplankton and molluscs such as abalone.

Fisheries

Caught commercially in SA and WA, often with the related species *Scorpis aequipinnis*, and in lower numbers. Minor bycatch in rock lobster pots. Caught by anglers and charter boat fishers in SA and WA, where there are bag limits. A minimum size limit also applies in SA. Caught by spear fishers in SA and WA, and was reported to be one of the species most commonly taken in some parts of SA, during spear fishing competitions in past decades.

Vulnerability

Banded Sweep is a strongly territorial species found over a relatively narrow depth range, and therefore may be vulnerable to localised depletion. This schooling reef species is vulnerable to capture using hand-lines and long-lines, nets, and spears. Fishing has the potential to have an impact at localised scales, but data are lacking. Populations in some nearshore areas may also be susceptible to indirect impacts due to damage of reef habitats. The species is curious and will often approach divers, which may result in some populations being vulnerable to disturbance.

Rock Ling

Genypterus tigerinus



Description

Mostly grey, with some white, particularly around the mouth. Dark grey or black spots and blotches on body and head. Dark fins with narrow white margins. Grows to about 120cm long, but usually seen at smaller sizes.

Distribution

Found in southern Australia (from central New South Wales coast through to south-western WA) and New Zealand. Most records in SA are from the gulfs region, with few records also from Kangaroo Island and the upper and lower South East.

Habitat

Juveniles inhabit seagrass-lined estuaries, and also occur under objects or small reef patches within seagrass beds. Adults inhabit reef areas to at least 60m deep, and in shallow waters are often found under rocky ledges, in caves and rocky recesses, where they remain during the day. Also found around jetties, shipwrecks, and various types of artificial reef. In deeper waters (e.g. 50m), adults have been recorded in invertebrate-dominated reef and sand habitat.

Diet

Rock Ling eat rock lobsters, seagrass-dwelling fishes, and crabs.

Fisheries

Previously caught commercially in considerable numbers by gill net fishing in Tasmania, particularly during the 1990s (e.g. 10 to 30+ tonnes per annum). Also caught commercially in low numbers in all States where it occurs. Minor bycatch of prawn trawling in NSW and SA. Caught in low numbers in various Commonwealth-managed fisheries that use trawls, gill nets and other gear. Minor bycatch of rock lobster and blue crab fisheries in SA. Caught by recreational fishers using spears (especially), gill nets and hand lines.



Vulnerability

Juveniles in shallow nearshore seagrass beds may be vulnerable to decline from habitat impacts. Adults are large, slow-moving and site-associated on shallow reefs and other underwater features, and are thus vulnerable to capture by fishers. Fishing is considered to be the main threatening process, and there are examples of this species disappearing from areas that are heavily targeted by spear fishers and gill netting. Apart from fishing, populations might be at risk from long term climatic changes.

Scorpaenidae and Neosebastidae: Scorpionfishes and Gurnard Perches

Description

Members of both families of these fishes have a large head with spiny ridges; large eyes and mouth; broad, wing-like pectoral fins, and strong, often venomous fin spines, especially the dorsal fins.

Distribution

Southern Red Scorpionfish *Scorpaena papillosa* and Common Gurnard Perch *Neosebastes scorpaenoides* range from New South Wales through to SA. Gulf Gurnard Perch *N. bougainvillii*, Black-spotted Gurnard Perch *N. nigropunctatus* and Bighead Gurnard Perch *N. pandus* are found in WA and SA, and there are unconfirmed reports of the latter from Victoria and Tasmania. The Thetis Fish *N. thetidis* is found from NSW through to WA, and the Little Gurnard Perch *Maxillicosta scabriceps* ranges from Victoria to WA. The Southern Gurnard Perch *M. meridianus* is found in Victoria, Tasmania and SA.

Habitat

Most species in southern Australia are found on reefs in continental shelf waters. Some species also occur in sandy habitats. Several are also found in shallow seagrass beds and estuaries.



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Diet

Scorpionfishes and gurnard perches eat small fishes, squid, crabs and other small crustaceans (prawns, amphipods), marine worms and occasionally molluscs.

Fisheries

Species that are also found in deeper waters, such as *Neosebastes scorpaenoides*, are part of the bycatch in Commonwealth-managed trawl and gill net fisheries in south-eastern Australia. During the early part of the 20th century *N. thetidis* was caught in large numbers by trawling off the NSW coast. Some species (e.g. *Maxillicosta scabriceps*) are part of the bycatch in SA prawn trawls. *N. pandus* reportedly is a significant part of the bycatch in rock lobster pots in SA, with hundreds to thousands of specimens recorded per annum. *Scorpaena papillosa* has been collected commercially in Tasmania for the aquarium trade. Some of these fishes are also taken (in low numbers, due to their benthic, reef-dwelling habits) by anglers and spear fishers.

Vulnerability

Members of these two families are benthic, site-associated reef fishes of limited mobility. Such characteristics increase their vulnerability to site-specific impacts. It is not known to what extent commercial bycatch may be a threatening process, but population impacts are likely to have occurred in some parts of southern Australia, based on previous data.

Luderick / Blackfish

Girella tricuspidata

Description

Greenish grey on dorsal side, yellowish head and pectoral fins, and silvery grey on side of body and belly. Base colour is darker on individuals in estuaries. Vertical lines (usually 11) below dorsal fin. Grows to about 70cm long, but mostly seen at smaller sizes.

Distribution

Ranges from Hervey Bay in Queensland, around south-eastern Australia, to Spencer Gulf in SA. Most common in NSW and Victoria. Uncommon in SA and Tasmania. Also occurs in New Zealand, particularly around the North Island. Most records in SA are from the gulfs region, with few records also from Encounter Bay and Kangaroo Island.

Behaviour

Luderick school in large numbers in some areas. In south-eastern Australia, Luderick migrate seasonally prior to spawning. Fish from estuaries make spawning runs to sea. Some Luderick migrate along the coast during the spawning season, which differs in timing in each State.



© R. Ling

Habitat

Luderick is a shallow water fish, known mainly from 0m to 20m. It occurs in a variety of different habitat types, including estuaries; tidal rivers, lakes and pools; mangroves; seagrass beds; rocky foreshores and shallow rocky reefs; kelp beds and other macroalgae-dominated reef areas; also around jetties, and other near-shore habitats. Seagrass-lined estuaries are an important habitat for juvenile Luderick in south-eastern Australia.

Fisheries

Luderick are intensively fished by commercial fishers in NSW and Victoria, using hauling nets, gill nets and other gear. This species is also taken commercially in Queensland and Tasmania, and in low numbers in SA. Commercial catches are greatest where seagrass is most abundant. A bycatch of prawn trawling in NSW, and eel fishing in Victoria. Luderick is heavily fished by anglers and sports fishers in Queensland, NSW and Victoria, and is also taken by recreational gill nets, other nets and lines in Tasmania. Also taken by spear fishers.

Vulnerability

Luderick is highly valued as a food fish. It is found in accessible nearshore areas and is caught using a variety of methods, though not easily caught on a line (given the vegetarian diet of Luderick). Catch and release mortality of juveniles is reported to be high. Luderick also aggregate at spawning times. All of these factors increase the vulnerability of this species to over-exploitation. Many shallow estuaries and coastal seagrass beds in which Luderick are found, are susceptible to habitat degradation, which may threaten some populations. There are indications that declines in the Luderick population in some parts of Victoria were linked to seagrass dieback over several decades. In NSW, there are examples of periodic mass “fish kills” of Luderick due to de-oxygenation of estuarine waters, from drainage of acid sulphate soil sediments, and rapid flooding of contaminated pasture-land drainage into rivers. Also, in SA there are few estuarine areas which can support this species, and most of those areas are subject to ongoing habitat degradation.

Bight Redfish / Red Snapper

Centroberyx gerrardi

Description

Appears silver and red striped due to colour and pattern of scales. Red head, with white band near operculum, and white lateral line. Red fins, with white anterior margins. Dark eye, surrounded by red. Grows to about 66cm long, but mostly seen at smaller sizes.

Distribution

Ranges from southern Victoria / Bass Strait and northern Tasmania, through to Lancelin area in WA. Found in greatest numbers in the Great Australian Bight, which is the centre of distribution.

Habitat

Bight Redfish occur on exposed reefs (including high relief reefs with caves, and also flatter vegetated reefs), and also over silty and sandy substrates on the continental shelf and upper slope. The depth range is broad, from less than 10m, to more than 300m. Mostly found from 80m - 200m.



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Fisheries

Bight Redfish is a target species of trawl fishing in Commonwealth-managed waters of the Great Australia Bight, with catches in the order of hundreds of tonne (occasionally more than 1,000 tonnes) per annum. Also a minor catch in other Commonwealth-managed fisheries for sharks and scalefishes, and in the gill net fishery off southern WA. Also caught commercially in SA waters, with decreasing catches during the past decade to the late 2000s. Catches in SA State waters are an order of magnitude lower than those in WA. Charter boat fishers and anglers target this species on offshore reefs in SA and WA. Bight Redfish are also taken in lower numbers by spear fishers in some areas.

Vulnerability

Bight Redfish is a long lived species (to at least 70 years), and fisheries data indicate that older age classes are being depleted from the population. Based on size structure of the catch, it is also likely that a significant proportion of the commercial catch is of reproductively immature fish. Catch quotas remain high, and over-fishing may be a major threatening process for this species in southern Australia.



© D. Muirhead

Glossary

angler: A person who fishes with a rod and line.

ambush predator: Carnivorous animals that capture prey by stealth or cunning, adopting a “sit-and-wait” approach. They often hide motionless and wait for prey to come within striking distance.

bivalve: A mollusc which has a soft, laterally compressed body enclosed within two shells (valves) hinged together.

bycatch: The portion of a fishing catch that is discarded as unwanted or commercially unusable.

byproduct: The portion of a fishing bycatch that is retained for sale, but was not part of the target catch.

chiton: a marine mollusc that lives on rocks and has a shell consisting of eight overlapping calcareous plates.

Commonwealth-managed: Fisheries which are managed by Australian government authority, based in Canberra.

dorsal: Pertaining to the top surface, or back of an animal e.g. dorsal fin is attached to the top side of a fish.

epiphytic: Relating to epiphytes, which are plants that grow on other plants.

gastropod: A mollusc which typically has a one-piece coiled shell (but some are shell-less), and a flattened muscular foot joined to a head bearing stalked eyes.

gill net: A fishing net set vertically in the water, to catch fishes or sharks (usually by their gills) when they swim into the net.

harem: A group comprising one male fish with several females who are associated with that male.

long line: A method of fishing that uses heavy fishing line, usually several to many kilometres long, with a series of baited hooks on shorter lines, set horizontally at intervals, using floats.

low productivity: In terms of fish reproduction, having a low output.

macroalgae: Large (i.e. non-microscopic) algae that grow attached to surfaces in the sea. Also known as seaweed.

mollusc: An invertebrate which has a soft unsegmented body, usually enclosed in a shell.

nutrient pollution: Contamination of marine waters by excessive inputs of nutrient. It is a primary cause of eutrophication, in which excess nutrients (usually nitrogen or phosphorus) stimulate growth of nuisance algae, which can smother seagrasses, macroalgae and the marine animals on the sea floor, and also reduce the dissolved oxygen content of the water.

pectoral: Pertaining to the chest or breast. Pectoral fins are attached to the upper sides of a fish, behind the head.

protogynous hermaphrodite: A fish which starts out as female and changes sex to male later in life.

scalefish: Usually refers to bony fishes, with scales (which therefore excludes the cartilaginous fishes, such as sharks, rays and skates).

sedimentation: The process of depositing sediment. In the marine environment, sedimentation from land-based sources can degrade reefs and seagrass beds, by smothering marine plants and animals, and reducing light penetration in the water.

Serranidae: A large family of carnivorous fishes, containing the tropical groupers, sea basses and many other large fishes. Serranids are often brightly coloured, and long-lived, and many species are protogynous hermaphrodites.

sub-maximal: Below the maximum.

subtidal: In a tidally influenced area, a marine or estuarine environment that lies below the mean low water mark, and therefore is submerged.

territorial: Behaviour relating a single fish, a mating pair, or a small group of fishes that occupy an area and often vigorously defend it against intruders, especially those of the same species.

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