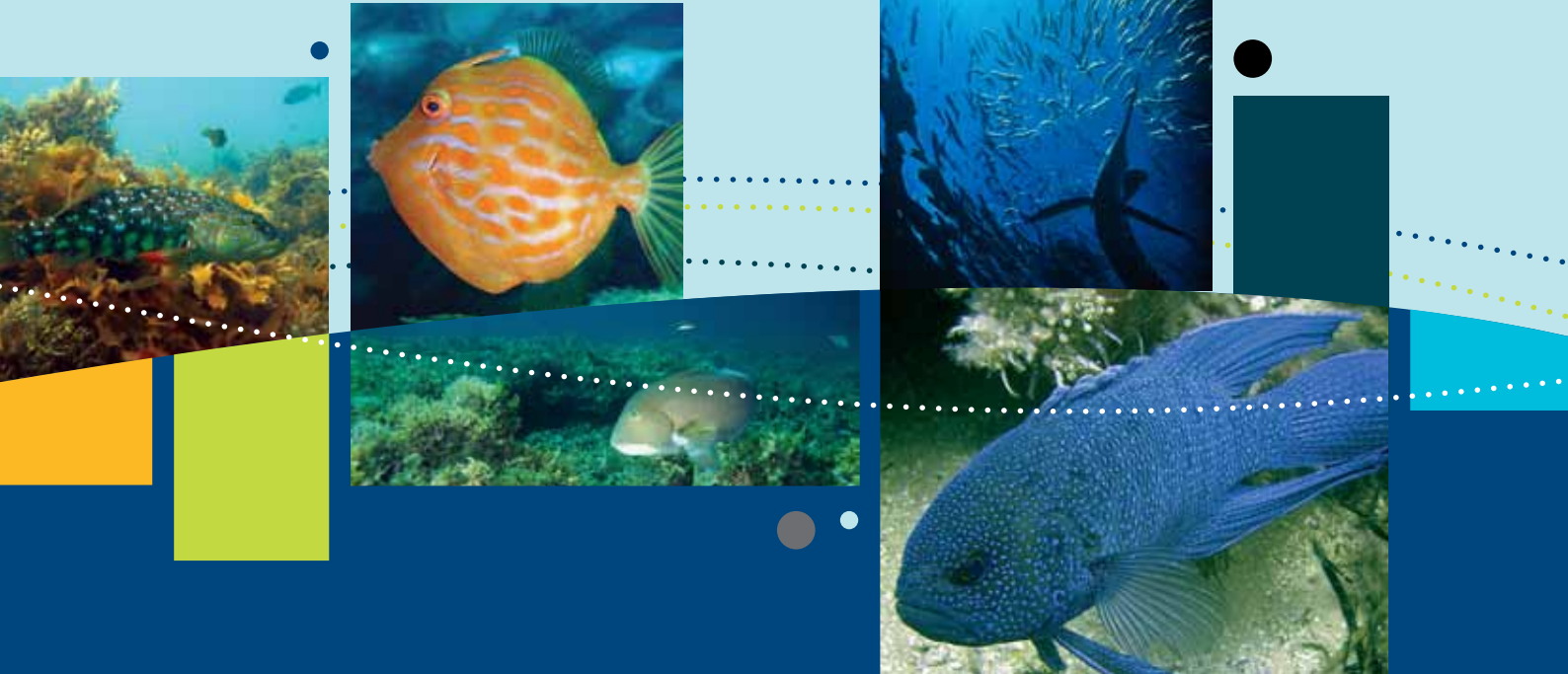




**Australian Government**

**Department of Sustainability, Environment,  
Water, Population and Communities**



# Species group report card —bony fish

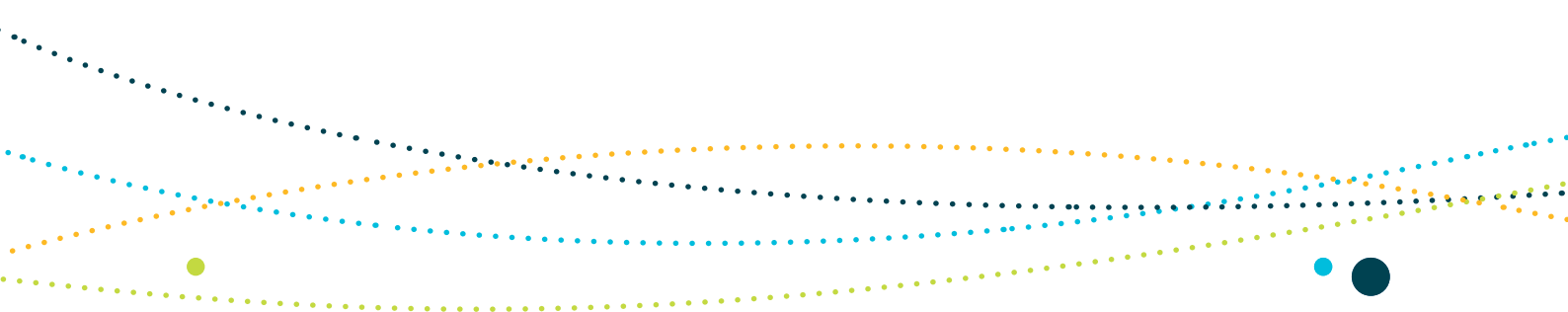
Supporting the draft marine bioregional  
plan for the South-west Marine Region

prepared under the *Environment Protection and Biodiversity Conservation Act 1999*

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# Species group report card—bony fish

## Supporting the draft marine bioregional plan for the South-west Marine Region

prepared under the *Environment Protection and Biodiversity Conservation Act 1999*

### Report cards

The primary objective of the report cards is to provide accessible and up-to-date information on the conservation values found in Commonwealth marine regions. This information is maintained by the Department of Sustainability, Environment, Water, Population and Communities and is available online through the department's website ([www.environment.gov.au](http://www.environment.gov.au)).

Reflecting the categories of conservation values, there are three types of report cards:

- species group report cards
- marine environment report cards
- heritage places report cards.

### Species group report cards

Species group report cards are prepared for large taxonomic groups that include species identified as conservation values in a region; that is, species that are listed under Part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and live in the Commonwealth marine area for all or part of their lifecycle. All listed threatened, migratory and marine species and all cetaceans occurring in Commonwealth waters are protected under the EPBC Act and are identified in the relevant marine bioregional plans as conservation values.

Species group report cards focus on species for which the region is important from a conservation perspective; for example, species of which a significant proportion of the population or an important life stage occurs in the region's waters.

For these species, the report cards:

- outline the conservation status of the species and the current state of knowledge about its ecology in the region
- define biologically important areas; that is, areas where aggregations of individuals of a species display biologically important behaviours
- assess the level of concern in relation to different pressures.

## 1. Bony fish of the South-west Marine Region

Conservation values in marine bioregional plans include species listed under Part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that live in the Commonwealth marine area or for which the Commonwealth marine area is necessary for a part of the lifecycle. All listed threatened, migratory and marine species and all cetaceans occurring in the South-west Marine Region are identified as conservation values. Key ecological features have also been identified through the marine bioregional planning process to more precisely define areas and features of importance in the Commonwealth marine environment. Two key ecological features identified in the South-west Marine Region are groups of bony fish. These are small pelagic fish and demersal slope fish communities in the Central Western Province. The marine environment report card discusses the key ecological features that have been identified in the South-west Marine Region.

The fish fauna of the South-west Marine Region is diverse, with more than 900 species occupying a large variety of habitats. However, only three species of bony fish known to occur in the region are listed under the EPBC Act as threatened or listed marine species:

- orange roughy (*Hoplostethus atlanticus*), which is listed as a threatened species in the conservation dependent category
- southern blue fin tuna (*Thunnus maccoyii*), which is listed as a threatened species in the conservation dependent category and
- Günther's pipehorse (*Solegnathus lettiensis/S. guentheri*), which is a listed marine species.

This report card provides information on these three species of bony fish. Another 15 species of syngnathids (seahorses, sea dragons, pipefish and pipehorses) and solenostomids (ghost pipefish) that are listed as marine species under the EPBC Act may occur in parts of the South-west Marine Region (see Attachment 1 for a complete list). However, due to uncertainty about their occurrence in the region, these species have not been considered in this report card.<sup>1</sup>

### Orange roughy

Orange roughy lives in cold, deep waters in the Atlantic, Pacific and Indian oceans. In Australia, orange roughy is found across the southern half of the continent, from central New South Wales through to southern Western Australia, including Tasmania. It also occurs on seamounts and ocean ridges south of Australia and on the South Tasman and Lord Howe rises. It is most common at depths of 700–1000 m, but has occasionally been found at depths as shallow as 180 m, and as deep as 1800 m (DSEWPaC 2010). Orange roughy is known to aggregate to spawn in areas in the South-west Marine Region.

### Southern blue fin tuna

Southern bluefin tuna are a highly migratory species that occur globally in waters between 30°S and 50°S, though is mainly found in the eastern Indian Ocean and in the south western Pacific Ocean (CCSBT, 2009a). Southern blue fin tuna are known to be among the fastest ocean swimmers in the world and can travel at bursts of up to 70km/hr while feeding. They tend to school to feed and are carnivorous, feeding on fish, squid, krill and salps.

In Australian waters, Southern bluefin tuna ranges from northern Western Australia, around the southern region of the continent, to northern New South Wales. It has a single known spawning ground in the Indian Ocean between Java and northern Western Australia. The southernmost portion of the spawning ground lies within Australia's Exclusive Economic Zone (Phillips and Findlay, 2008).

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<sup>1</sup> For additional information on bony fish in the region that are not addressed in this report card, see the report *South-west Marine Region: ecosystems and key species groups*, which contains separate reviews of the inshore, shelf and slope demersal fish species, syngnathids (seahorses, pipefish and sea dragons), and large pelagic, small pelagic and mesopelagic species. It is available online at [www.environment.gov.au/coasts/mbp/south-west](http://www.environment.gov.au/coasts/mbp/south-west).

Juvenile southern bluefin tunas tend to move south from the spawning ground to the south west of Australia in their first years of life. The warm Leeuwin Current which begins near the spawning ground and is strongest in April, right after the spawning period, helps sweep the juvenile tunas down the West Australian coast to the Great Australian Bight and beyond. Surface schooling juveniles are associated seasonally with the continental shelf region of the Great Australian Bight, but it is not known what fraction of the juvenile stock is present (TSSC 2005).

Juvenile southern blue fin tuna are found in coastal waters off southern Australia during the summer months (December to April) and spend winters in deeper, temperate oceanographic waters (Bestley et al. 2008; CCSBT 2009a; Phillips et al. 2009). After reaching approximately five years of age they are seldom found in near shore surface areas.

### Günther's pipehorse

Günther's pipehorse is found in temperate to tropical waters around Western Australia, the Northern Territory, the Arafura Sea and Indonesia (Pogonoski, Pollard & Paxton 2002). Part of its known range extends into the South-west Marine Region, and it is probably resident in the region throughout the year.

### **Biologically important areas**

Biologically important areas are areas where aggregations of individuals of a species display biologically important behaviours. Based on available information, biologically important areas have been identified where possible for listed threatened species and for listed marine species where the region is considered to support a significant proportion of the population or an important life history stage. Biologically important areas have not yet been identified for bony fish in the South-west Marine Region.

## **2. Vulnerabilities and pressures**

### Vulnerabilities

Orange roughy is believed to be one of the longest lived fish species; examinations of their otoliths (ear bones) suggest maximum ages of 125–156 years. Its longevity means that the species is very slow growing and does not reach sexual maturity for many years. Orange roughy also has relatively low fecundity. As a result of these life history characteristics, the species has very low resilience to fishing, because the likelihood of a fish being caught before it has reproduced is statistically much higher than for other species (DSEWPaC 2010).

The life history characteristics of the southern blue fin tuna also make it vulnerable to over fishing. It is a long lived species (up to 40+ years), slow growing, late maturing (approximately 12 years) and highly migratory with only one known spawning ground. This single spawning area and its late sexual maturity means juveniles are vulnerable to over exploitation. Commercial fishing of juvenile and pre-adults for grow-out aquaculture farming harvest of wild caught juveniles (primarily in South Australia) mean that these fish are caught before they have been able to reproduce. Also, due to the highly migratory nature of the species, it is targeted by fishing fleets from a number of nations, both on the high seas and in the Exclusive Economic Zones of Australia, New Zealand, Indonesia and South Africa The stock is slow to recover from depletion relative to other shorter-lived fish species, including most other species of tuna (SEWPaC 2010).

Further research is needed for Günther's pipehorse to provide information on basic biological and population dynamics characteristics, and accurate distribution and depth data to identify key habitats (DSEWPaC 2010). However, it is known that some groups of syngnathids have particular microhabitat preferences, mainly occupying the edges of particular habitat types (e.g. seagrass, sand or reef, or sand interfaces). Syngnathids feed in the water column, on or near the substrate. Most eat small invertebrates,

such as mysids in the zooplankton and small amphipods on surfaces. A few species also eat other invertebrates (e.g. shrimp), and larval fishes (Baker 2007).

Many of the life history characteristics of syngnathids make them susceptible to impacts and vulnerable to population decline. Most syngnathids have low population densities, with relatively low reproductive potential (Baker 2007). Based on their habitat preferences, population dynamics and limiting life history characteristics, syngnathid populations can be vulnerable to site-specific impacts. Natural vulnerability is exacerbated by a number of anthropogenic impacts.

#### Assessment of pressures

On the basis of current information, pressures have been assessed for three species of bony fish in the region: orange roughy, southern bluefin tuna and Günther's pipehorse.

A description of the pressure assessment process, including the definition of substantial impact used in this assessment, is provided in the *Overview of marine bioregional plans* available at **[www.environment.gov.au/coasts/mbp/index.html](http://www.environment.gov.au/coasts/mbp/index.html)**.

A summary of the pressure assessment for bony fish is provided in Figure 1. Only pressures identified as *of concern* or *of potential concern* are discussed in further detail below.

Bony fish species	Pressures																			
	Sea level rise	Changes in sea temperature	Change in oceanography	Ocean acidification	Chemical pollution or contaminants	Nutrient pollution	Changes in turbidity	Marine debris	Noise pollution	Light pollution	Physical habitat modification	Human presence at sensitive sites	Nuisance species	Extraction of living resources	Bycatch	Oil pollution	Collisions with vessels	Collision or entanglement with infrastructure	Disease	Invasive species
Günther's pipehorse	Blue	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow	Blue	Blue	Blue	Blue	Blue
Orange roughy	Blue	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow	Blue	Blue	Blue	Blue	Blue
Southern blue fin tuna	Blue	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Yellow	Blue	Blue	Blue	Blue	Red	Blue	Blue	Blue	Blue	Blue	Yellow

**Figure 1 Assessment of the level of concern associated with the effects of pressures on selected bony fish species of the South-west Marine Region**

Legend		<i>of concern</i>		<i>of potential concern</i>		<i>of less or no concern</i>
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### ***Climate change (changes in sea temperature)***

Changes in sea temperature are assessed as being *of potential concern* for orange roughy, southern bluefin tuna and Günther's pipehorse.

Modelling studies predict that sea surface temperatures around Australia will increase by 1–2 °C by 2030 and 2–3 °C by 2070; similarly, the temperature of Australia's oceans at 500 m depth are predicted to increase by up to 1 °C by 2070 (Hobday et al. 2006).

While orange roughy most commonly occurs at depths of 700–1000 m (McClatchie et al. 2006), it is known to inhabit waters as shallow as 180 m. Seawater warming at depth is expected to have significant implications for benthic and demersal fish (such as orange roughy). While the species in the South-west Marine Region has not experienced stock decline and collapse as in the south-east region, this pressure is *of potential concern* for this species, given its conservation dependent status and vulnerability inherent in its life history traits.

Due to the very low stock of southern blue fin tuna it is considered highly susceptible to environmental variability. Temperature of the ocean strongly influence the distribution of pelagic fish species, including southern bluefin tuna (Reddy et al. 1995). Hence changes in sea temperature, oceanography and increasing acidification of the oceans have been assessed as *of potential concern*. High sea temperatures at the spawning grounds of the southern blue fin tuna in the north-east Indian Ocean may be of particular concern as further increases in temperatures are predicted in these waters over the next 50 years.

Syngnathids tend to have specific habitat preferences within small home ranges (McClatchie et al. 2006). Populations can be vulnerable to site-specific impacts, and the existence of suitable habitat may determine their abundance within their geographic ranges. Given predicted impacts resulting from climate change syngnathids are susceptible as they have low mobility, which may limit their ability to find and adapt to new habitats.

### ***Climate change (changes in oceanography)***

Changes in oceanography are assessed as *of potential concern* for orange roughy, Günther's pipehorse and southern blue fin tuna. The strength of the Leeuwin Current has decreased slightly since the 1970s. This weakening is expected to continue, although this prediction currently has low confidence (Feng, Weller & Hill 2009). The weakening of the Leeuwin Current is likely to have implications for the productivity of the region, with uncertain and yet potentially significant effects on a broad range of species (Feng, Weller & Hill 2009).

Günther's pipehorse has a diet of small crustaceans and larval fish; the species might be affected by climate-related changes to the region's productivity and trophic processes. While it appears more common in waters off Albany, there is uncertainty about the species' distribution in the region and its use of the region's habitats. Orange roughy might also be affected by the climate-related effects on the region's productivity and trophic dynamics. Changes in productivity are likely also to affect the pelagic ecosystems and the harvested species at the top of the food chain. The impact of climate change on the winter southern bluefin tuna feeding grounds in the southern ocean may be significant (Sarmiento et al. 2004 cited in Hobday et al 2008).

### ***Ocean acidification***

Ocean acidification has been assessed as *of potential concern* for orange roughy, Günther's pipehorse and southern blue fin tuna. Ocean acidification is considered *of potential concern* for all species assessed. Ocean acidity has increased by 30 per cent across all oceans since the late 18th century (pH of open ocean waters has decreased from 8.2 to 8.1) and the rate of this increase is estimated to be 100 times faster than any change in acidity experienced by marine organisms for at least the past 20 million years (Orr et al. 2009). Projected changes in Australia's marine environment by 2070 include a decline in pH of 0.2

units (Lawrence, Ridley & Lundy 2007). The potential effects of increased ocean acidity on fish species are not well understood. It is believed that for some invertebrates and fish, accumulation of CO<sub>2</sub> in the body may result in morphological changes, and impact metabolic state, physical activity and reproduction (Orr et al. 2009). Effects on phytoplankton and zooplankton are also likely to disrupt trophic dynamics and affect fish species and communities (Hobday et al. 2006), which are important food resources for fish.

### **Noise Pollution**

Noise pollution has been assessed as *of potential concern* for southern blue fin tuna. Research on the effects of noise disturbance on fish is limited and mostly confined to physiological impacts. Behavioural responses observed to date range from no overt response to substantial avoidance movements that may displace fish from their normal location (Popper and Hastings 2009; Popper, McCauley & Fewtrell 2002). Two to four year old southern bluefin tuna are known to feed regularly during spring and summer in the waters of the Great Australian Bight; during this time, they grow at a faster rate than winter, presumably due to a combination of warmer waters and abundant food. Sustained noise disturbance off the waters of the Great Australian Bight during their feeding season has the potential, to impact on growth and, indirectly, survivorship on those year classes exposed to the disturbance (C Davies, CSIRO, pers. comm., 28 March 2011). There are currently no management measures specifically aimed at assessing and mitigating effects of noise on fish.

### **Extraction of living resources**

Extraction of living resources has been assessed as a pressure *of concern* for the southern blue fin tuna.

Juvenile southern bluefin tuna are harvested in the Great Australian Bight by Australian purse seine fishing vessels. Southern bluefin tuna was listed in 2010 as conservation dependent under the EPBC Act, because of the decline in the size of the spawning stock since the 1990s. The decline in southern blue fin tuna has occurred between the late 1950s and the mid 1990s and the stock has remained at very low levels since (TSSC 2010).

The species is targeted by fishing fleets from a number of nations, both on the high seas and in the Exclusive Economic Zones of Australia, New Zealand, Indonesia and South Africa. The fishery is managed globally by the international Commission for the Conservation of Southern Bluefin Tuna, which has already established measures to ensure rebuilding of the spawning stock. The Commission will continue to assess the effectiveness of its management measures and implement further measures as required.

Southern bluefin tuna was listed as conservation dependent under the EPBC Act on the advice of the Threatened Species Scientific Committee (TSSC). The TSSC's complete conservation assessment for the southern blue fin is available at:

**[www.environment.gov.au/biodiversity/threatened/species/pubs/69402-listing-advice.pdf](http://www.environment.gov.au/biodiversity/threatened/species/pubs/69402-listing-advice.pdf)**

### **Bycatch**

Bycatch is assessed as *of potential concern* for orange roughy and Günther's pipehorse. Due to orange roughy's conservation dependent status, long life and low recruitment, bycatch is a pressure *of potential concern* for the species. In 2009, the total allowable catch for orange roughy remained at bycatch levels (50 t) for the Albany/Esperance zone in the Great Australian Bight Trawl Sector of the Southern and Eastern Scalefish and Shark fishery, and a zero commercial catch was reported (Wilson, Curtotti & Begg 2010). A deepwater management strategy has been implemented to address the requirements for the Orange Roughy Conservation Program. Given the low catch levels and the deepwater management strategy, orange roughy remains assessed as not subject to overfishing. There has been no targeting of orange roughy in the Western Deepwater Trawl Fishery since 2005–06. The status of the stock is uncertain as there are no current estimates of biomass (Wilson, Curtotti & Begg 2010). Bycatch mitigation measures are part of the Orange Roughy Conservation Program, but some level of bycatch remains

unavoidable through the operation of the fisheries (AFMA 2006). Bycatch is *of potential concern* due to the uncertainty that remains about the effectiveness of management.

Little is known about the biology, ecology, behaviour, population dynamics, critical habitats, full distribution (geographical and depth range) and relative abundance of southern Australian pipehorses. Information on the level of bycatch is limited, particularly at the species level, for pipehorses and other syngnathids. However, syngnathids are likely to be susceptible to effects from fishing due to their life history characteristics (Baker 2007), and bycatch is *of potential concern* for Günther's pipehorse. Günther's pipehorse is caught accidentally in trawl nets. Due to the level of uncertainty about the population levels, it is difficult to assess the effects of bycatch mortality.

### **3. Current protection measures**

The orange roughy and the southern blue fin tuna are listed as threatened species in the conservation dependent category under section 179 of the EPBC Act. The Günther's pipehorse is listed as a marine species under section 248 of the EPBC Act.

Alongside the EPBC Act, a broad range of sector-specific management measures to address environmental issues and mitigate impacts apply to activities that take place in Commonwealth marine areas. These measures give effect to regulatory and administrative requirements under Commonwealth and state legislation for activities such as commercial and recreational fishing, oil and gas exploration and production, ports activities and maritime transport. In some instances, as in the case of shipping, these measures also fulfil Australia's obligations under a number of international conventions for the protection of the marine environment from pollution and environmental harm.

Section 179 of the EPBC Act specifies that species of fish listed in the conservation dependent category must be the focus of a plan of management in force under a law of the Commonwealth or of a State or Territory that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised. In the case of the orange roughy and the southern blue fin tuna the plans in force to stop the decline of, and support the recovery of, these species are:

- Orange Roughy Conservation Program (AFMA 2006)
- Southern Bluefin Tuna Fishery Management Plan 1995 (Commonwealth of Australia 2010)

#### *International agreements*

- Convention for the Conservation of Southern Bluefin Tuna 1994  
[www.ccsbt.org/docs/pdf/about\\_the\\_commission/convention.pdf](http://www.ccsbt.org/docs/pdf/about_the_commission/convention.pdf)

For more information on conservation listings under the EPBC Act and related management objectives and protection measures, visit the following sites:

- [www.environment.gov.au/coasts/species/marine-species-list.html](http://www.environment.gov.au/coasts/species/marine-species-list.html) (listed marine)
- [www.environment.gov.au/epbc/protect/species-communities.html](http://www.environment.gov.au/epbc/protect/species-communities.html) (listed threatened).

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## Attachment 1 Listed bony fish in the South-west Marine Region

Species (common name/scientific name)	Conservation status
Orange roughy ( <i>Hoplostethus atlanticus</i> )	Conservation dependent
Southern blue fin tuna ( <i>Thunnus maccoyii</i> )	Conservation dependent
Günther's pipehorse, Indonesian pipehorse ( <i>Solegnathus lettiensis/Solegnathus guentheri</i> )	Marine

Other species of syngnathid that may occur in parts of the South-west Marine Region include:

- robust spiny pipehorse, robust pipehorse (*Solegnathus robustus*)
- shaggy pipefish, prickly pipefish (*Hypselognathus horridus*)
- leafy sea dragon (*Phycodurus eques*)
- weedy sea dragon, common sea dragon (*Phyllopteryx taeniolatus*)
- Gale's pipefish (*Campichthys galei*)
- Brock's pipefish (*Halicampus brocki*)
- bentstick pipefish, bendstick pipefish, short-tailed pipefish (*Trachyrhamphus bicoarctatus*)
- Port Phillip pipefish (*Vanacampus phillipi*)
- wide-body pipefish (*Stigmatopora nigra*)
- bony-headed pipefish (*Nannocampus subosseus*)
- West Australian seahorse (*Hippocampus subelongatus*)
- western spiny seahorse, narrow-bellied seahorse (*Hippocampus angustus*)
- short-headed seahorse, short-snouted seahorse (*Hippocampus breviceps*)
- southern potbelly seahorse, potbelly seahorse, pot-bellied seahorse (southern form of *Hippocampus abdominalis* = '*Hippocampus bleekeri*').

There is only one species of the family Solenostomidae (ghost pipefish) that may occur in the region. This is the blue-finned ghost pipefish or robust ghost pipefish (*Solenostomus cyanopterus*).

