

Species Fact Sheet

New Zealand orange roughy

Hoplostethus atlanticus



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Other names: red roughy (Australia), rosy soldierfish (Canada), beryx de nouvelle-zelande (France), hoplostete orange, granatbarsch (Germany), pesce arancio (Italy), deepsea perch, sea perch, slimehead (New Zealand).

Orange roughy fisheries are a testament to unsustainable fishing. The species is long-lived, slow growing and late maturing, making it extremely vulnerable to overfishing. In New Zealand, where most of the catches are now taken, the orange roughy fishery has been managed under the quota management system since the early 1980s, but under that system the stocks have been decimated.

The state of New Zealand's orange roughy fishery speaks for itself:

- **All the stocks are now overfished (less than 30% of their population remaining)**
- **Three stocks were fished to collapse (less than 10% remaining) and are now closed – one reached a low of 3%**
- **Two further stocks are at or near the point of collapse and may be closed shortly**
- **All the stocks still being fished are in decline or their population trend is unknown**

Orange roughy is fished by bottom trawling, which mainly trawl on seamounts where these heavy trawls destroy unique and vulnerable deep-sea habitats. These trawlers also catch and kill a range of vulnerable and endangered fish, birds and marine mammal species.

“Three factors that inhibit sustainability are the species' low productivity, ease of capture, and high value. Measures that would help to enhance sustainability include better information about recruitment (particularly the location and abundance of pre-recruits) and, in New Zealand, longer-term management decision making.” – Francis and Clarke 2005¹

“They have low levels of sustainable yields, are vulnerable to overfishing, and have slow recovery rates.” – Clarke 2001²

Distribution and biology

Orange roughy is a deep-sea species found at depths of 700–1500 m throughout New Zealand's Exclusive Economic Zone (EEZ) and on seamounts (underwater mountains) on the high seas, west and east of New Zealand.

Orange roughy are slow growing, mature late (at 23–32 years) and can live as long as 120 years. Compared to other finfish, they produce a low number of eggs. Orange roughy grow to about 50 cm long and around 3.5 kg in weight, but the average size caught in the fishery is around 35 cm.³ The species forms sporadic dense spawning and non-spawning aggregations

that are easily targeted by fisheries. Due to these life characteristics, orange roughy is described as having a low resilience and high to very high vulnerability to fishing.⁴

Scientists have little data on the early life stages of orange roughy – the larvae, juvenile fish, and recruitment (young fish joining the fishable adult population). It is speculated by scientists that due to poor recovery of orange roughy stocks it is possible that recruitment is sporadic and good recruitment years occur only every decade or so. This lack of recruitment data is a major challenge for accurately assessing the sustainability of fisheries.

Commercial value and quota ownership

Fishing for orange roughy in New Zealand's EEZ and nearby waters is mainly undertaken by New Zealand owned and flagged vessels. Almost 90% of the quota is owned by just five groups: Aotearoa Fisheries/Te Ohu Kaimoana (TOKM) (35%), Sanfords (32%), Talley Group (9%), Anton Trawling (7%), and Vela fisheries (5%).

Most New Zealand orange roughy is exported and the fishery earned about \$62 million in exports. Catches peaked at 57,000 t in 1989 but are now about 13,000 t and still declining.⁵

Key concerns with the orange roughy fishery

Overfishing

The inherent vulnerability of orange roughy to fishing, the lack of important data for accurate stock assessments, and poor management decisions, have together contributed to overfishing of orange roughy stocks.

Concerns about fishing for orange roughy started in the mid-1980s with questions over the sustainability of fisheries targeting stocks on the Challenger Plateau and on the Chatham Rise. The first round of management cuts in orange roughy catches started in the late 1980s and continued through the 1990s.

A stock by stock review of recent assessments published by the New Zealand Ministry of Fisheries⁶ paints a poor picture of the current state of the stocks (see Table 1 for a summary). The quota management system has not protected orange roughy from over-exploitation.⁷

None of the stocks are above the estimated level required to produce the maximum sustainable yield (estimated as 30% of the original unfished biomass). All but one of the stocks are at levels below 20% of their original sizes, and three stocks are below 10% – the level used to define a collapsed stock.⁸

The Puysegur management area was the first closed in 1997 after the orange roughy stock reached 7% of the unfished sized. The Challenger area followed in 2001 after the stock dropped to 3% of its original size – this fishery had an annual catch of over 10,000 tonnes in the late 1980s. In 2007, concern over the state of the West Coast South Island stock led to the closure of this fishery.⁹ All three remain closed but there are moves to re-open the Challenger fishery.

Table 2. State of New Zealand’s orange roughy stocks: remaining biomass, current catch limit, and estimated current yield at May 2010.¹⁰

Fishing Area	Stock Status (%Bo)	Stock Trend	Catch Quota
ORH 1: Mercury-Colville – Ohena Box	Overfished or collapsed (10–15%)	Unknown	30 tonnes
ORH 1: other areas	Unknown	Unknown	1,370 tonnes
ORH 2A: North/East Cape	Overfished (24%)	Unknown	200 tonnes
ORH 2A: (South) 3A and 2B: East Coast North Island	Overfished (17-18%)	Unknown	1,500 tonnes
ORH 3B: NW Chatham’s Rise	Likely collapsed (11% in 2006)	Declining	750 tonnes
ORH 3B: East and south Chatham’s Rise	Overfished (11.6% in 2010)	Declining	6,570 tonnes
ORH 3B: Puysegur	Collapsed (7% in 1997)	Unknown	Zero (Closed 1997)
ORH 3B: Southern areas	Unknown	Declining	1,850 tonnes
ORH 7A: Challenger	Collapsed (3% in 2000)	Unknown	Zero (Closed 2001)
ORH 7B: West Coast South Island	Collapsed (<12% in 2006)	Unknown	Zero (Closed 2007)

B₀: biomass of original unfished stock; TAC: total allowable catch.

The Chatham Rise is the site of the largest orange roughy fishery, targeting several stocks, and was once promoted by the Ministry of Fisheries and the fishing industry as an example of a sustainable orange roughy fishery. Latest information shows the sorry state of this area. The North-West Chatham Rise stock was last assessed at around 11% of its original size. The recent assessment of the East and South Chatham Rise assessment, more uncertain due to the number of fisheries involved, is as low as 11.6% of its original size.

Concerns have also been expressed for stocks on the high seas including the North West Challenger fishery in the Tasman Sea. The South Pacific Regional Fisheries Agreement has agreed interim measures to protect deepwater fish stocks and vulnerable marine ecosystems; however, this has yet to be fully implemented and there are no agreed sustainable catch limits.

Throughout the history of the New Zealand orange roughy fisheries, the fishing industry have opposed fishery closures, disputed cuts to quotas and continually pressed for the least precautionary catch reduction options.¹¹ For example, when given the choice between taking large decreases in catch at a later date while maintaining current catches (known as ‘hard’ landings) or small sequential decreases in catches (‘soft’ landings) the industry has preferred the former – a choice favouring short term profits that has failed to protect stocks. The main quota holder (Antons) for the Northern North Island area successfully opposed, in court, the catch reductions agreed by the Minister of Fisheries. There have also been concerns over misreporting of orange roughy catches in the north of the North Island where one fisher was successfully prosecuted.

In contrast, the Australian conservation plan for orange roughy includes: closure of all but one of its depleted orange roughy fisheries; a management target of maintaining the one healthy orange roughy stock at over 60% of its unfished size; bycatch limits for other

fisheries that occasionally catch orange roughy; and a ban on trawling below 700m in the south-eastern region of Australian waters, which encompasses an area covering 89% of historical orange roughy catches.^{12,13}

Bottom trawling on seamounts

Orange roughy is caught predominantly by bottom trawlers targeting both spawning and non-spawning aggregations, principally over underwater mountains or 'seamounts' or other ocean features.¹⁴

The negative impacts of bottom trawling – dragging or bouncing fishing nets, and their associated heavy rollers and chains, along the seafloor – have been well established. Trawling removes, damages, displaces or kills animals and plants living in or on the seabed in the path of the trawl and destroys the three-dimensional structures of the seabed. Orange roughy trawls have been notorious for using heavy and destructive gear.

Seamounts are home to a wide large range of unusual, often unique, and largely undiscovered deep-sea species. Studies in New Zealand show that the diversity of species living on seamounts can vary widely with different species dominating on each seamount – even seamounts within the same mountain complex can show significant differences.¹⁵ Each seamount is effectively an individual, unique ecosystem. Given this level of diversity it is possible that orange roughy trawling has already caused extinctions of species that scientists have yet to discover.

The deep-sea marine ecosystems of seamounts are especially vulnerable to the impacts of fishing.^{16, 17} There are many delicate and slow-growing deep-sea species, such as cold water corals, sponges, bryozoans and other species – these are broken, crushed or torn up by bottom trawls. Many tens of tonnes of corals are caught annually in deepwater fisheries¹⁸ and entire coral habitats have been destroyed:

“Analyses of camera data revealed that unfished seamounts possessed a relatively large amount of stony coral habitat comprising live *Solenosmilia variabilis* and *Madrepora oculata* (predominantly on the seamount peaks) whereas fished seamounts had relatively little coral habitat.” Clark and Rowden 2009¹⁹

Cold-water corals can live for thousands of years and these habitats could take as long to recover from trawl damage.

Bycatch of vulnerable and endangered species

Orange roughy usually makes up 90% or more of the targetted catch in spawning and feeding aggregations. Other commercial species caught include species with similar biological characteristics to orange roughy (i.e. long-lived, slow-growing and highly vulnerable to fishing) such as black, smooth and spiky oreos, and black cardinal fish.²⁰ Many stocks of these species have also been reduced to low levels, like the black cardinal fish.

Deepwater sharks represented about 7% of the catch taken in orange roughy fisheries with the main species caught being seal shark (*Dalatias licha*) and shovelnose dogfish (*Deania calcea*).²¹ The type of shark species caught and their proportion in the total catch varies

within the orange roughy fisheries on the high seas. When caught, most of these sharks are either thrown overboard dead, or are finned and then dumped. Little is known about deepwater sharks but those that have been studied tend to have very slow growth rates and produce few young – deep-water sharks are in serious decline in various ocean regions where they are caught in deep-sea fisheries.²²

The orange roughy fishery also takes a number of threatened fish species including basking sharks *Cetorhinus maximus*.²³ This species is listed with Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)²⁴ and Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS).²⁵

Albatrosses and petrels are caught in the orange roughy fishery.^{26, 27} About half the species caught are threatened albatross. Fur seals are caught in the fishery and the orange roughy fishery near the Auckland Islands has also caught threatened New Zealand sea lions.

Other orange roughy fisheries

Orange roughy fisheries have faced similar issues around the world – serial depletion of stocks and destruction of seamount habitats, with little sign of recovery for either. In 2006 orange roughy was added to the Australian threatened species listing under the Australian Environment Protection and Biodiversity Conservation Act 1999.^{28, 29}

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