Chapter 25
Heard Island and McDonald Islands Fishery

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FIGURE 25.1 Area of the Heard Island and McDonald Islands Fishery, 2015

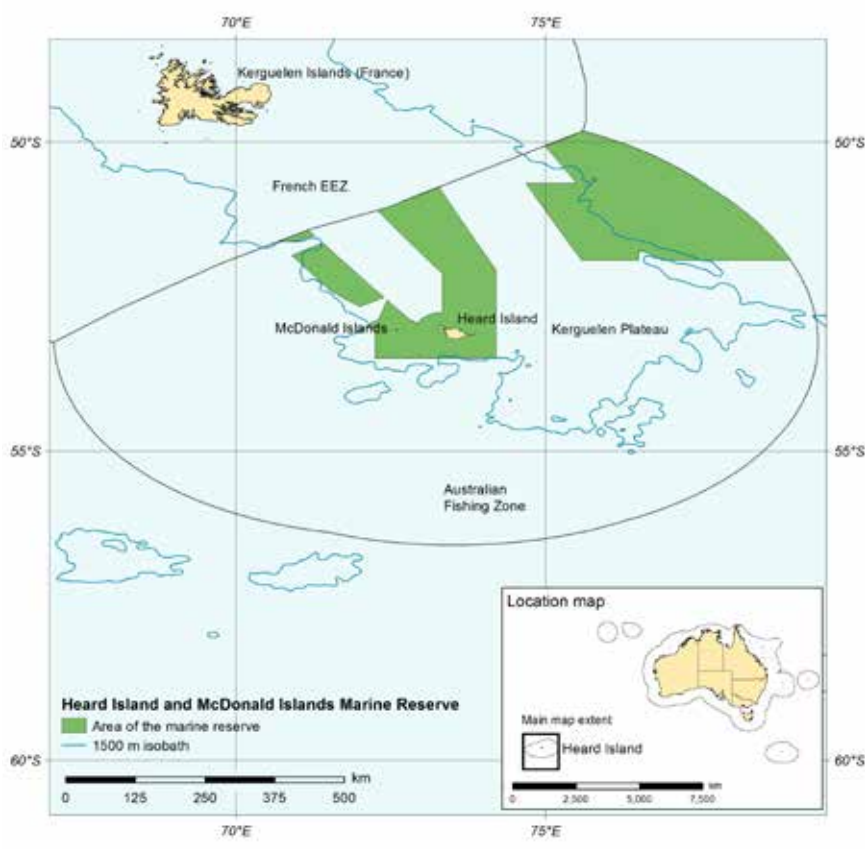


TABLE 25.1 Status of the Heard Island and McDonald Islands Fishery

Status	2014		2015		Comments
Biological status	**Fishing mortality**	**Biomass**	**Fishing mortality**	**Biomass**	
Mackerel icefish (*Champsocephalus gunnari*)					TACs are set in accordance with a precautionary harvest strategy.
Patagonian toothfish (*Dissostichus eleginoides*)					TACs are set in accordance with a precautionary harvest strategy. Most recent estimates of biomass are above the limit reference point.
Economic status	Estimates of NER are not available but are likely positive for 2013–14 and 2014–15 because the TACs for Patagonian toothfish were mostly caught.				

Notes: **NER** Net economic returns. **TAC** Total allowable catch.

Fishing mortality	Not subject to overfishing	Subject to overfishing	Uncertain
Biomass	Not overfished	Overfished	Uncertain

25.1 Description of the fishery

Area fished

The Australian external territory of Heard Island and McDonald Islands (HIMI) is in the southern Indian Ocean (Figure 25.1), within the area covered by the Convention on the Conservation of Antarctic Marine Living Resources. The islands and their surrounding territorial waters (out to 12 nautical miles [nm]) are closed to fishing and regulated under the *Environment Protection and Management Ordinance 1987*, administered by the Australian Antarctic Division (AAD) of the Australian Government Department of the Environment. A 1 nm buffer zone around the territorial waters of HIMI extends the area closed to fishing to 13 nm. The HIMI Marine Reserve was declared in October 2002 and then expanded in March 2014 by proclamation after scientific assessment. The reserve now totals 71 200 km^2. Waters between 12 and 200 nm from HIMI are part of the Australian Fishing Zone (AFZ). The *Heard Island and McDonald Islands Marine Reserve management plan 2014–2024* (Department of the Environment), made pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), provides the management regime for the reserve.

Fishing methods and key species

Demersal trawl and demersal longline are the main methods used in the fishery, although trawl is being phased out. The key target species are Patagonian toothfish (*Dissostichus eleginoides*) and mackerel icefish (*Champsocephalus gunnari*). The fishery also has catch limits for bycatch species, such as deep-sea skates (Rajidae) and grey rockcod (*Lepidonotothen squamifrons*) based on assessments of long-term annual yield (Constable et al. 1998). The catch limits for unicorn icefish (*Channichthys rhinoceratus*) and grenadiers (*Macrourus* spp.), another group of bycatch species, were updated in 2015 based on assessments undertaken by the AAD (Dell et al. 2015; Maschette & Dell 2015). The catch limits are regularly reviewed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Scientific Committee and are considered precautionary.

Management methods

The AAD, in collaboration with industry, regularly conducts fisheries-independent, random-stratified trawl surveys for target species (Patagonian toothfish and mackerel icefish) to collect relative abundance data, particularly of juvenile age classes. Harvest strategies for the target species are consistent with the precautionary approach implemented by the CCAMLR and have been used to set catch limits since the mid 1990s. The harvest strategies developed for the Heard Island and McDonald Islands Fishery (HIMIF) are considered more precautionary than the guidelines of the Commonwealth Fisheries Harvest Strategy Policy (DAFF 2007). For mackerel icefish, the reference point dictates that the spawning stock biomass be maintained at 75 per cent of the level that would occur in the absence of fishing at the end of a two-year model projection. For Patagonian toothfish, the reference points dictate that median escapement of the spawning biomass at the end of a 35-year projection period is 50 per cent of median pre-exploitation level and that the probability of the spawning biomass dropping below 20 per cent of its pre-exploitation median level is less than 10 per cent over the projection.

The importance of the target species (especially mackerel icefish) as prey in the subantarctic ecosystem is taken into account, and catch limits must be sufficiently precautionary to ensure that the abundance of these species meets the ecological needs of dependent species (for example, seabirds and marine mammals). Mackerel icefish in the HIMIF was initially certified as sustainable by the Marine Stewardship Council (MSC) in March 2006 and was recertified in June 2011. Patagonian toothfish in the HIMIF was certified as sustainable by the MSC in March 2012.

Illegal, unreported and unregulated (IUU) longline fishing within the HIMI AFZ, targeting Patagonian toothfish, was a significant problem from the mid 1990s. However, following Australian surveillance and enforcement activities in the area (in cooperation with adjoining nations in the CCAMLR region, notably France), no IUU fishing vessels have been detected since 2004 inside the Australian Exclusive Economic Zone (EEZ) adjacent to HIMI or the French EEZ surrounding the Kerguelen Islands.

Fishing effort

Effort in the HIMIF has been relatively stable, with two to four vessels active at any one time since a total allowable catch (TAC) was first set in the mid 1990s. However, as a result of the higher TAC, seven vessels were active in 2014–15.

Catch

Catches of mackerel icefish have been variable over time. It is a short-lived species, exhibiting periodic, large, dominant year-classes. This allows high catches for a year or two. Once that year-class dies out and the next cohort is growing, catches are reduced because less biomass is available to the fishery.

Catches of Patagonian toothfish have been more stable over time, with little variation since 2000–01, although the catch in 2014–15 increased in response to the increased TAC.

TABLE 25.2 Main features and statistics for the HIMIF

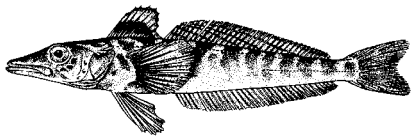
Fishery statistics a	2013–14 fishing season			2014–15 fishing season		
Stock	**TAC (t)**	**Catch (t)**	**Real value (2013–14)**	**TAC (t)**	**Catch (t)**	**Real value (2014–15)**
Mackerel icefish	1 267	1 074	Confidential	309	10	Confidential
Patagonian toothfish	2 730	2 744 **b**	Confidential	4 410	4 279	Confidential
Fishery-level statistics						
Effort	97 trawl days 8 765 910 hooks 0 pots hauled			57 trawl days 16 139 770 hooks 0 pots hauled		
Fishing permits	4 quota SFR holders			4 quota SFR holders		
Active vessels **c**	4			7		
Observer coverage	100% vessel coverage			100% vessel coverage		
Fishing methods	Demersal longline, demersal trawl, midwater trawl, pot (fish traps)					
Primary landing ports	Port Louis (Mauritius), Nelson (New Zealand), Albany (Western Australia)					
Management methods	Input controls: limited entry, gear restrictions, temporal and spatial closures Output controls: TACs and ITQs Other: move-on provisions if bycatch thresholds are reached					
Primary markets	International: United States, Japan, China, eastern Europe—frozen					
Management plan	Heard Island and McDonald Islands Fishery Management Plan 2002 (amended 2011)					

a Fishery statistics are provided by fishing season, unless otherwise indicated. Season is 1 December to 30 November. Real-value statistics are by financial year. **b** 14 t was deducted from the 2014–15 season quota to take account of the overcatch of the previous year. **c** All vessels carry two observers on each trip.
Notes: **ITQ** Individual transferable quota. **SFR** Statutory fishing right. **TAC** Total allowable catch.

Rough seas
Austral Fisheries

25.2 Biological status

Mackerel icefish (*Champsocephalus gunnari*)



Line drawing: FAO

Stock structure

A single stock of mackerel icefish is considered to exist at HIMI; no genetic variation among sites around HIMI has been found (Williams et al. 1994). Genetic studies have indicated that the population at HIMI is distinct from other icefish populations in the southern Atlantic Ocean (Kuhn & Gaffney 2006). Mackerel icefish at HIMI and the Kerguelen Plateau in the French EEZ are considered distinct stocks because of their different spawning season, and growth rates (Williams et al. 2001).

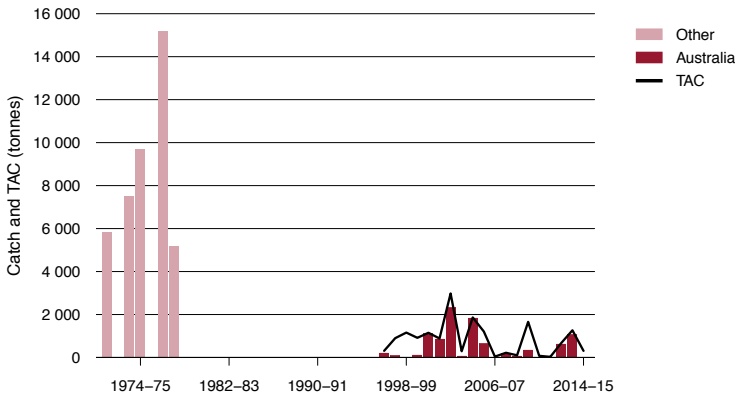
Catch history

The catch history of icefish has been sporadic, with very high and unregulated catches taken by Soviet and Polish fleets across the Kerguelen Plateau in the 1970s, before the declaration of the EEZ around the Kerguelen Islands by France and the AFZ around HIMI. Considerable uncertainty exists as to where these earlier catches were taken relative to the current maritime boundaries. The initial TAC for icefish was set by the CCAMLR in 1995. Since then, catches have generally followed the TAC, which takes into account the large natural fluctuations in abundance of the fish (Figure 25.2), except for 2014–15, when catches were well under the TAC. This was a result of fishers concentrating their efforts in 2014–15 on the more valuable Patagonian toothfish, for which the TAC was higher than in recent years.

Stock assessment

A random stratified trawl survey in May 2015 provided information on the abundance and age structure of the mackerel icefish stock (Nowara et al. 2015). As noted in previous years, multiple year-classes were present, with the 2+ year-class estimated to account for 69 per cent of the biomass (Welsford 2015). The stock assessment estimated the current biomass at 5 123 t (Welsford 2015). Yields of 482 t for the 2015–16 season and 357 t for the 2016–17 season were estimated to satisfy the CCAMLR decision rules, assuming that the entire 2014–15 TAC was taken. In 2014–15, only 3 per cent of the TAC was taken, due to the focus on Patagonian toothfish. Because the dominant 2+ year-class cohort is made up of relatively small fish and may not be well sampled by the survey gear, the estimated yields may change following the 2016 survey. A TAC of 482 t for the 2015–16 season was endorsed by the CCAMLR (CCAMLR 2015a, b).

FIGURE 25.2 Catch and TAC of mackerel icefish in the HIMIF, 1971–72 to 2014–15



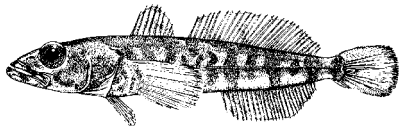
Note: **TAC** Total allowable catch.
Source: Australian Fisheries Management Authority

Stock status determination

Based on the low 2014–15 catch, the harvest rate relative to the stock biomass estimate (which, under the harvest strategy, allows for a high rate of escapement) and the robust nature of the assessment (which includes fisheries-independent data), the stock is determined to be **not overfished** and **not subject to overfishing**.

Fishing vessel
Austral Fisheries

Patagonian toothfish (*Dissostichus eleginoides*)



Line drawing: FAO

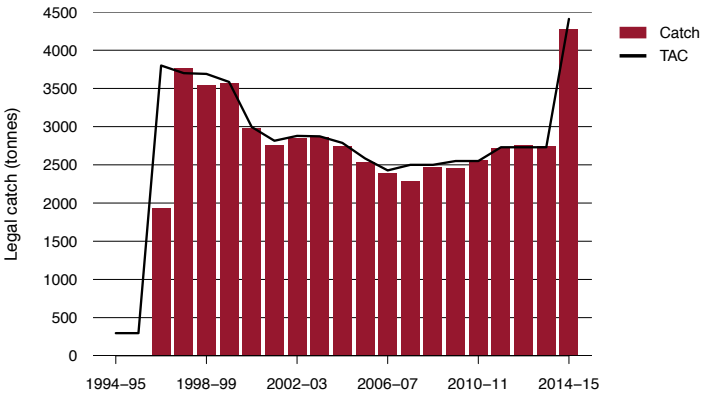
Stock structure

The Patagonian toothfish stock at HIMI is considered to comprise a population distinct from other regional toothfish populations in the south-west Pacific and Atlantic oceans (Appleyard et al. 2002). However, no genetic variation has been found among populations in the western Indian Ocean sector of the Southern Ocean (that is, HIMI, Crozet Islands, Kerguelen Islands, Marion Island and Prince Edward Islands; Appleyard et al. 2004). Data from tagging studies (for example, Welsford et al. 2011; Williams et al. 2002) indicate that, while adult toothfish at HIMI are relatively sedentary and usually recaptured within 15 nm of their point of release, in some cases they travel significant distances. For example, toothfish tagged at HIMI have been recaptured approximately 800 nm and 1 000 nm away on the Kerguelen and Crozet plateaus, respectively. Thus, toothfish in the Indian Ocean sector of the Southern Ocean may form a metapopulation, with some limited connectivity between the populations. The stock structure of toothfish on the Kerguelen Plateau is being further investigated in collaboration with French scientists so that population models of toothfish in the area can be refined and management can be improved across the Kerguelen Plateau (Welsford et al. 2011). For the purposes of the assessment, the HIMI toothfish population is considered to be distinct.

Catch history

Catch of Patagonian toothfish in the HIMIF has declined slightly since the late 1990s, but was relatively stable from the early 2000s to 2013–14 and has mirrored the TAC (Figure 25.3). Because of the higher TAC, catches were greater in 2014–15 and the highest since 1994–95.

FIGURE 25.3 Catch and TAC of Patagonian toothfish in the HIMIF, 1994–95 to 2014–15



Note: **TAC** Total allowable catch.
Source: Australian Fisheries Management Authority

Stock assessment

The 2015 assessment for Patagonian toothfish (Ziegler & Welsford 2015) used the most recent version of the integrated assessment model CASAL, and included abundance estimates obtained from the survey, standardised catch-per-unit-effort and catch-at-age proportions, and other fishery and biological data inputs. In addition, recommendations from the 2014 CCAMLR Working Group on Fish Stock Assessment (WG-FSA), and the 2015 Working Group on Statistics, Assessment and Modelling were also considered. These recommendations included using updated ageing data up to 2014, full tagging data from 2014 and partial tagging data from 2015; updating the growth model; and changing the priors for catchability, unfished biomass (B_0) and year-class strength (Ziegler & Welsford 2015).

The assessment agreed by the 2015 WG-FSA estimated that the spawning biomass was 64 per cent of unfished levels ($SB_{2015}/SB_0 = 0.64$; range 0.59–0.69), although the unfished spawning biomass estimate was less than the previous estimate (CCAMLR 2015a). A catch limit of 3 405 t satisfied the CCAMLR decision rules and was the recommended TAC for 2015–16 and 2016–17 (CCAMLR 2015a, b). This TAC is lower than that set for 2014–15 because of the inclusion of tagging data in the model, which drives a lower estimate of unfished biomass.

Stock status determination

Given the relatively high spawning biomass, the precautionary TAC that satisfies the CCAMLR decision rules, the robust nature of the stock assessment and the extensive CCAMLR review process, the stock is classified as **not overfished** and **not subject to overfishing**.

25.3 Economic status

Key economic trends

The TAC for Patagonian toothfish has been fully caught in recent years, indicating that positive net economic returns (NER) are likely to have been generated for this species. Patagonian toothfish has constituted, on average, more than 90 per cent of the fishery's annual gross value of production over the past decade. The stock biomass of mackerel icefish varies naturally from year to year, and, as a result of low estimated biomass, mackerel icefish was not targeted in the 2010–11 and 2011–12 fishing seasons; in 2010–11, only a research TAC was in place, and industry opted not to target icefish given this low TAC. Since 2012–13, a commercial TAC has been re-established for mackerel icefish, reflecting increased estimated abundance. Only a small percentage of the TAC was left uncaught in both the 2012–13 and 2013–14 fishing seasons. In 2014–15, there was an increase in the TAC for Patagonian toothfish, which was mostly caught, indicating that NER for the fishery are positive.

In contrast, mackerel icefish catch fell significantly in 2014–15 as its TAC was sharply reduced because of the natural fluctuation in the stock size. Patagonian toothfish was targeted at the expense of the mackerel icefish catch because of its higher value and increased TAC.

Management arrangements

A harvest strategy, consistent with the principles of the CCAMLR, is in place for the fishery. The primary management control uses individual transferable quotas (ITQs), in conjunction with input controls. The use of ITQs provides the best chance of achieving maximum efficiency, subject to the fishery's precautionary harvest strategy and strict operational constraints on vessels. Given the low levels of quota latency, positive NER are likely to be generated in the fishery in a manner that is consistent with the conservative ecological objectives.

25.4 Environmental status

The HIMIF is exempt from export controls under the EPBC Act until 9 May 2017. Recommendations associated with this exemption include continuing to investigate Patagonian toothfish population dynamics and connectivity in the wider Kerguelen area, building on the cooperative work that has been developed over the past several years, and ensuring that this cooperative work is considered in toothfish assessments and management actions. Australia continues to work with France on toothfish stocks on the Kerguelen Plateau. For example, in 2011, a joint population status assessment in both EEZs on the Kerguelen Plateau was presented to the CCAMLR (Candy et al. 2011), and a workplan for ongoing cooperative work to improve toothfish stock assessments was agreed.

Three ecological risk assessments were completed in the HIMIF by gear type: demersal trawl, midwater trawl and demersal longline. No risk assessment has been done for fish traps. The Sustainability Assessment of Fishing Effects (level 3) assessment for all gear types found that the estimated fishing mortality was generally low for all non-target fish species, and that no species was at high risk (Zhou et al. 2009). Ecological risk management for all gear types focuses on how Australian Fisheries Management Authority (AFMA) will continue to monitor interactions with bycatch and protected species in a manner consistent with CCAMLR principles (AFMA 2009a, b, c).

AFMA publishes quarterly reports of logbook interactions with species protected under the EPBC Act on its website. In the HIMI longline fishery in 2015 (calendar year), two southern elephant seals (*Mirounga leonina*) became entangled in the longlines and died. One Antarctic fur seal (*Arctocephalus gazella*) died after it was entangled and possibly previously foul hooked. One rockhopper penguin (*Eudyptes chrysocome*) was also hooked and died. Interactions with three northern giant petrels (*Macronectes halli*) also occurred—two were released alive and one was dead. The deceased bird may have collided with the superstructure of the vessel in a snow storm.

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