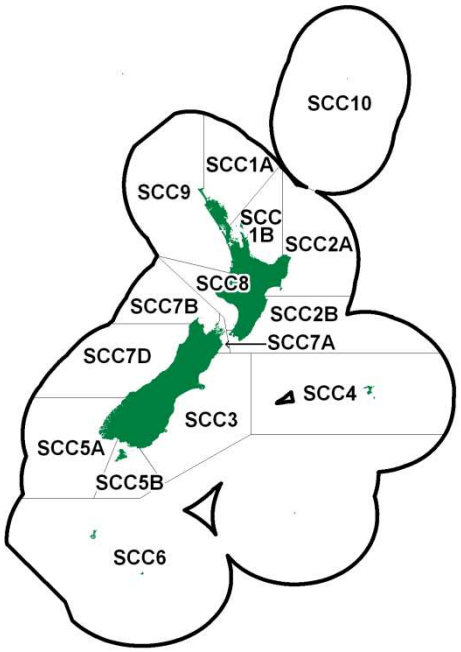
SEA CUCUMBER (SCC)

(*Australostichopus mollis*)



1. FISHERY SUMMARY

Sea cucumbers were introduced into the Quota Management System on 1 April 2004. The fishing year is from 1 April to 31 March. A breakdown of the Total Allowable Catch (TAC) for each Quota Management Area (QMA) is listed in Table 1 and shown in Figure 1. Each TAC is made up of a Total Allowable Commercial Catch (TACC) plus customary and recreational allowances and, in SCC 3, an allowance for mortality associated with fishing. Most TACs have remained unchanged since entering the QMS, but TACs for SCC 3 and SCC 7B were increased on 1 April 2018 and the TAC for SCC 7A was increased in 2019.

1.1 Commercial fisheries

More than 100 species of sea cucumber are found in New Zealand waters, but *Australostichopus mollis* is the only species of commercial value, and the only species for which exploratory commercial fishing has taken place. Sea cucumbers are targeted mainly by diving, although some targeted dredging and beam trawling occurs (e.g., in SCC 3), and they are also a common bycatch of bottom trawl and scallop dredge fisheries. Sea cucumber landings of all species are reported as a single code (SCC), although most reported landings are probably *A. mollis*. Sea cucumbers are on Schedule 6 of the Fisheries Act 1996, and as such can be returned to the sea if expected to survive.

Table 1: Recreational and customary non-commercial allowances (t), Total Allowable Commercial Catches (TACC, t), and Total Allowable Catch (TAC, t) as declared for SCC on introduction into the QMS in October 2004.

Fishstock	Description	TACC	Recreational allowance	Customary allowance	Other sources of mortality	TAC
SCC 1A	East Northland	2	3	2	–	7
SCC 1B	Hauraki Gulf and Bay of Plenty	2	4	2	–	8
SCC 2A	East coast and Gisborne	2	1	1	–	4
SCC 2B	Wairarapa and Wellington	5	4	2	–	11
SCC 3	South-East (Coast)	48	2	1	3	54
SCC 4	South East (Chatham Rise)	2	1	1	–	4
SCC 5A	Fiordland	2	1	1	–	4
SCC 5B	Southland and Stewart Island	2	1	1	–	4
SCC 6	Sub-Antarctic	0	0	0	–	0
SCC 7A	Challenger (Marlborough Sounds)	15	2	1	–	18
SCC 7B	Challenger (Nelson)	14	2	1	–	17
SCC 7D	Challenger (Westland)	2	1	1	–	4
SCC 8	Central (West)	2	1	1	–	4
SCC 9	Auckland (West)	2	1	1	–	4
SCC 10	Kermadec	0	0	0	–	0

Table 2: TACCs and reported landings (t) of sea cucumber by Fishstock. From 1990–91 to 2000-01 the reported landings are those landings that went to Licensed Fish Receivers (LFRs), and from 2001-02 to present, reported landings are as reported on Monthly Harvest Returns (MHRs). Until 2003–04, management areas were the same as FMAs; since then FMAs 1, 2, 5, and 7 were subdivided. [Continued on next pages]

	SCC 1		SCC 1A		SCC 1B	
Fishing year	Landings	TACC	Landings	TACC	Landings	TACC
1990–91	0	–	–	–	–	–
1991–92	0	–	–	–	–	–
1992–93	0	–	–	–	–	–
1993–94	0	–	–	–	–	–
1994–95	0	–	–	–	–	–
1995–96	0	–	–	–	–	–
1996–97	0	–	–	–	–	–
1997–98	0	–	–	–	–	–
1998–99	0	–	–	–	–	–
1999–00	0	–	–	–	–	–
2000–01	0.04	–	–	–	–	–
2001–02	0.16	–	–	–	–	–
2002–03	0.41	–	–	–	–	–
2003–04*	0.07	N/A	0	2	0	2
2004–05	N/A	N/A	0	2	1.49	2
2005–06	N/A	N/A	0	2	1.43	2
2006–07	N/A	N/A	0	2	2.09	2
2007–08	N/A	N/A	0.12	2	2.18	2
2008–09	N/A	N/A	0.12	2	0.53	2
2009–10	N/A	N/A	0.18	2	1.78	2
2010–11	N/A	N/A	0.01	2	1.40	2
2011–12	N/A	N/A	1.47	2	2.01	2
2012–13	N/A	N/A	0.36	2	1.68	2
2013–14	N/A	N/A	0	2	1.61	2
2014–15	N/A	N/A	0.70	2	1.84	2
2015–16	N/A	N/A	0.09	2	1.78	2
2016–17	N/A	N/A	0.04	2	2.00	2
2017–18	N/A	N/A	0.29	2	1.98	2
2018–19	N/A	N/A	0.14	2	1.82	2
2019–20	N/A	N/A	0.01	2	1.57	2
2020–21	N/A	N/A	0.01	2	2.04	2
2021–22	N/A	N/A	0.09	2	0.18	2

	SCC 2		SCC 2A		SCC 2B	
Fishing year	Landings	TACC	Landings	TACC	Landings	TACC
1990–91	0	–	–	–	–	–
1991–92	0	–	–	–	–	–
1992–93	0	–	–	–	–	–
1993–94	0	–	–	–	–	–
1994–95	0	–	–	–	–	–
1995–96	0	–	–	–	–	–
1996–97	0	–	–	–	–	–
1997–98	0	–	–	–	–	–
1998–99	0	–	–	–	–	–
1999–00	0	–	–	–	–	–
2000–01	0	–	–	–	–	–
2001–02	0.36	–	–	–	–	–
2002–03	0.03	–	–	–	–	–
2003–04*	N/A	N/A	0	2	0	5
2004–05	N/A	N/A	0	2	0	5
2005–06	N/A	N/A	0	2	0	5
2006–07	N/A	N/A	0	2	0	5
2007–08	N/A	N/A	0	2	0	5
2008–09	N/A	N/A	0	2	0	5
2009–10	N/A	N/A	0	2	0.19	5
2010–11	N/A	N/A	0	2	0.05	5
2011–12	N/A	N/A	0	2	0.67	5
2012–13	N/A	N/A	0	2	0.11	5
2013–14	N/A	N/A	0	2	0.19	5
2014–15	N/A	N/A	0	2	2.37	5
2015–16	N/A	N/A	0	2	0.56	5
2016–17	N/A	N/A	0	2	1.49	5
2017–18	N/A	N/A	0.14	2	0.87	5
2018–19	N/A	N/A	0	2	1.00	5
2019–20	N/A	N/A	0	2	0.95	5
2020–21	N/A	N/A	0	2	0.47	5
2021–22	N/A	N/A	0	2	0.15	5

Table 2 [continued]

	SCC 3		SCC 4		SCC 6	
Fishing year	**Landings**	**TACC**	**Landings**	**TACC**	**Landings**	**TACC**
1990–91	0	–	–	–	0	–
1991–92	0	–	–	–	0	–
1992–93	0	–	–	–	0	–
1993–94	0	–	–	–	0	–
1994–95	0	–	–	–	0.12	–
1995–96	0	–	–	–	0	–
1996–97	0	–	–	–	0	–
1997–98	0	–	–	–	0	–
1998–99	0	–	0.01	–	0	–
1999–00	0	–	0	–	0.05	–
2000–01	0.01	–	0	–	0	–
2001–02	0.68	–	1.48	–	9.28	–
2002–03	0.65	–	0.13	–	12.56	–
2003–04*	1.54	2	0.12	2	4.07	0
2004–05	1.14	2	0	2	4.77	0
2005–06	2.85	2	0	2	0.31	0
2006–07	2.70	2	0	2	0	0
2007–08	3.67	2	0	2	0	0
2008–09	3.80	2	0	2	0	0
2009–10	0.37	2	0.01	2	0	0
2010–11	0.78	2	0.01	2	0	0
2011–12	3.40	2	0	2	0	0
2012–13	8.54	2	0	2	0	0
2013–14	6.72	2	0.01	2	0	0
2014–15	2.18	2	0	2	0	0
2015–16	7.20	2	0.19	2	0	0
2016–17	1.84	2	0.08	2	0	0
2017–18	0.34	2	0.08	2	0	0
2018–19	18.31	48	0	2	0	0
2019–20	24.32	48	0.01	2	0	0
2020–21	16.34	48	0.32	2	0	0
2021–22	23.82	48	0	2	0	0

	SCC 5		SCC 5A		SCC 5B	
Fishing year	**Landings**	**TACC**	**Landings**	**TACC**	**Landings**	**TACC**
1990–91	0	–	–	–	–	–
1991–92	0	–	–	–	–	–
1992–93	0	–	–	–	–	–
1993–94	0	–	–	–	–	–
1994–95	0	–	–	–	–	–
1995–96	0	–	–	–	–	–
1996–97	0	–	–	–	–	–
1997–98	0	–	–	–	–	–
1998–99	0	–	–	–	–	–
1999–00	0	–	–	–	–	–
2000–01	0	–	–	–	–	–
2001–02	0	–	–	–	–	–
2002–03	5.82	–	–	–	–	–
2003–04*	0.27	–	0	2	0	2
2004–05	–	–	0	2	0.01	2
2005–06	–	–	0	2	0	2
2006–07	–	–	0	2	0	2
2007–08	–	–	0	2	0	2
2008–09	–	–	0	2	0.02	2
2009–10	–	–	0	2	0	2
2010–11	–	–	0	2	0.01	2
2011–12	–	–	0.31	2	0.37	2
2012–13	–	–	0	2	0.11	2
2013–14	–	–	0	2	1.81	2
2014–15	–	–	0.70	2	2.14	2
2015–16	–	–	1.85	2	1.80	2
2016–17	–	–	1.26	2	2.00	2
2017–18	–	–	1.79	2	2.13	2
2018–19	–	–	0.37	2	0.86	2
2019–20	–	–	1.42	2	2.13	2
2020–21	–	–	1.41	2	1.94	2
2021–22	–	–	1.40	2	1.63	2

Table 2 [continued]

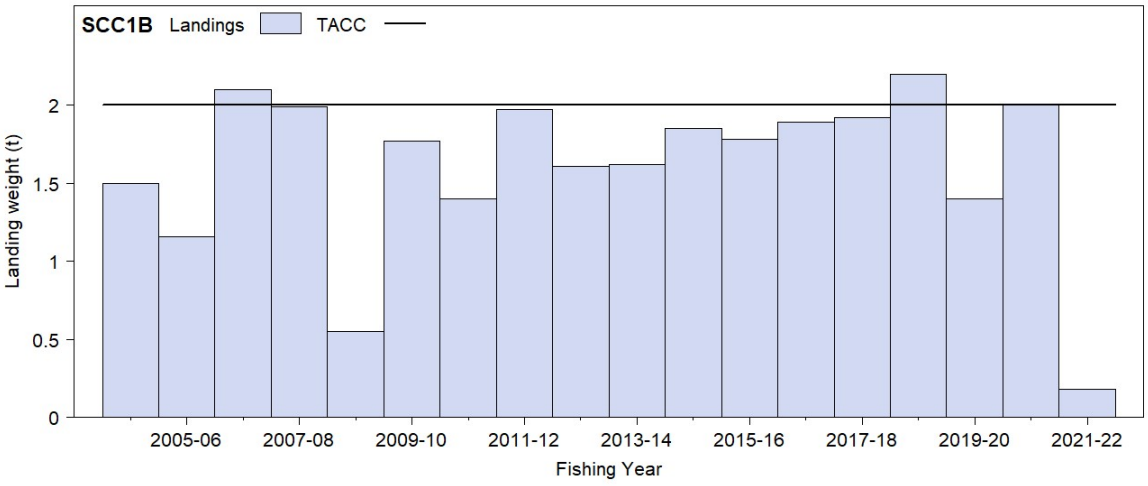
Fishstock	SCC 7		SCC 7A		SCC 7B		SCC 7D	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1990–91	0.07	–	–	–	–	–	–	–
1991–92	0.06	–	–	–	–	–	–	–
1992–93	0.32	–	–	–	–	–	–	–
1993–94	0	–	–	–	–	–	–	–
1994–95	0.56	–	–	–	–	–	–	–
1995–96	3.31	–	–	–	–	–	–	–
1996–97	0.12	–	–	–	–	–	–	–
1997–98	0	–	–	–	–	–	–	–
1998–99	0	–	–	–	–	–	–	–
1999–00	0.02	–	–	–	–	–	–	–
2000–01	0	–	–	–	–	–	–	–
2001–02	0	–	–	–	–	–	–	–
2002–03	0.19	–	–	–	–	–	–	–
2003–04*	–	–	0	5	0	5	0	2
2004–05	–	–	2.97	5	1.01	5	0	2
2005–06	–	–	5.47	5	0.12	5	0	2
2006–07	–	–	0.17	5	0.04	5	0	2
2007–08	–	–	8.34	5	0	5	0.02	2
2008–09	–	–	4.19	5	0	5	0	2
2009–10	–	–	4.31	5	1.36	5	0	2
2010–11	–	–	5.09	5	5.46	5	0	2
2011–12	–	–	4.78	5	4.70	5	2.15	2
2012–13	–	–	4.97	5	4.27	5	0	2
2013–14	–	–	5.10	5	5.23	5	0	2
2014–15	–	–	4.97	5	5.06	5	0	2
2015–16	–	–	5.45	5	5.03	5	0	2
2016–17	–	–	4.98	5	4.96	5	0	2
2017–18	–	–	5.04	5	5.04	5	0	2
2018–19	–	–	4.92	5	13.45	14	0	2
2019–20	–	–	14.29	15	13.56	14	0	2
2020–21	–	–	13.27	15	7.97	14	0	2
2021–22	–	–	15.79	15	5.27	14	0	2

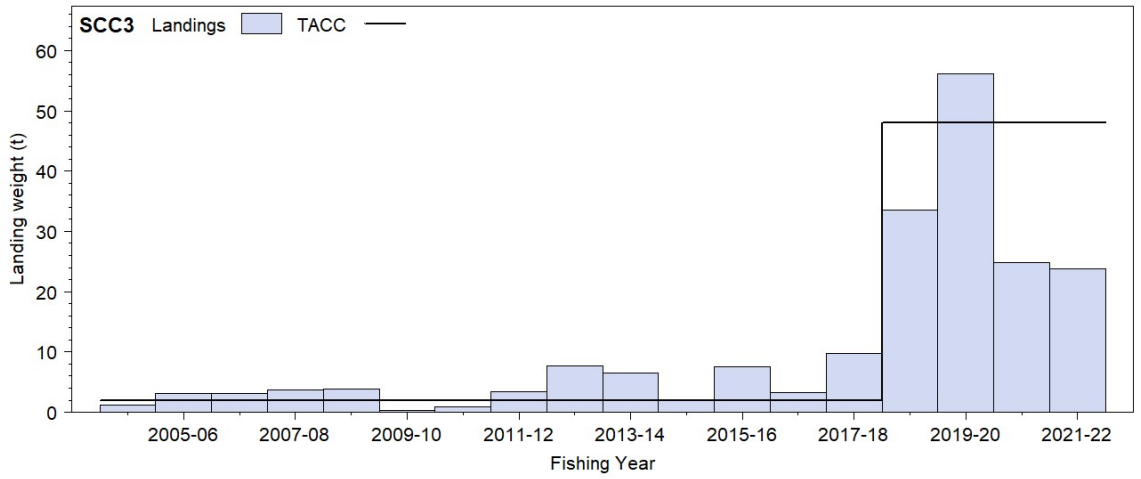
Fishing year	SCC 8		SCC 9		Total	
	Landings	TACC	Landings	TACC	Landings	TACC
1990–91	0	–	0	–	0.07+	–
1991–92	0	–	0	–	0.06+	–
1992–93	0	–	0	–	0.32+	–
1993–94	0	–	0	–	0+	–
1994–95	0	–	0	–	0.68+	–
1995–96	0	–	0	–	3.31+	–
1996–97	0	–	0	–	0.12+	–
1997–98	0	–	0.05	–	0.05	–
1998–99	0	–	0	–	0.01	–
1999–00	0	–	0	–	0.07	–
2000–01	0	–	0	–	0.05	–
2001–02	0	–	0	–	11.96	–
2002–03	0	–	0	–	19.79**	–
2003–04*	0	–	0	2	6.07	35
2004–05	0	2	0.02	2	11.41	35
2005–06	0	2	0	2	10.18	35
2006–07	0	2	0.01	2	5.01	35
2007–08	0	2	0	2	14.33	35
2008–09	0	2	0.07	2	8.73	35
2009–10	0	2	0.03	2	8.23	35
2010–11	0	2	0.14	2	12.95	35
2011–12	0.23	2	0.14	2	20.23	35
2012–13	0.91	2	0.13	2	21.08	35
2013–14	1.11	2	0	2	21.78	35
2014–15	2.04	2	0.16	2	22.16	35
2015–16	1.99	2	0	2	25.94	35
2016–17	2.00	2	0.14	2	20.79	35
2017–18	2.00	2	0.06	2	19.76	35
2018–19	2.01	2	0.01	2	42.89	90
2019–20	0.21	2	0	2	58.47	100
2020–21	0.35	2	0	2	44.12	100
2021–22	0.15	2	0	2	48.48	100

*The 2003-04 fishing year occurred between 01/10/03 – 31/03/04. SCC was introduced into the QMS on 1 April 2004 at which point it changed from an October to April fishing year.

**In 2002–03 50 kg were reportedly landed, but the QMA was not recorded. This amount is included in the total landings for that year,

+In 1990–1997, catch was reported, but no QMA was, therefore only the total is shown.





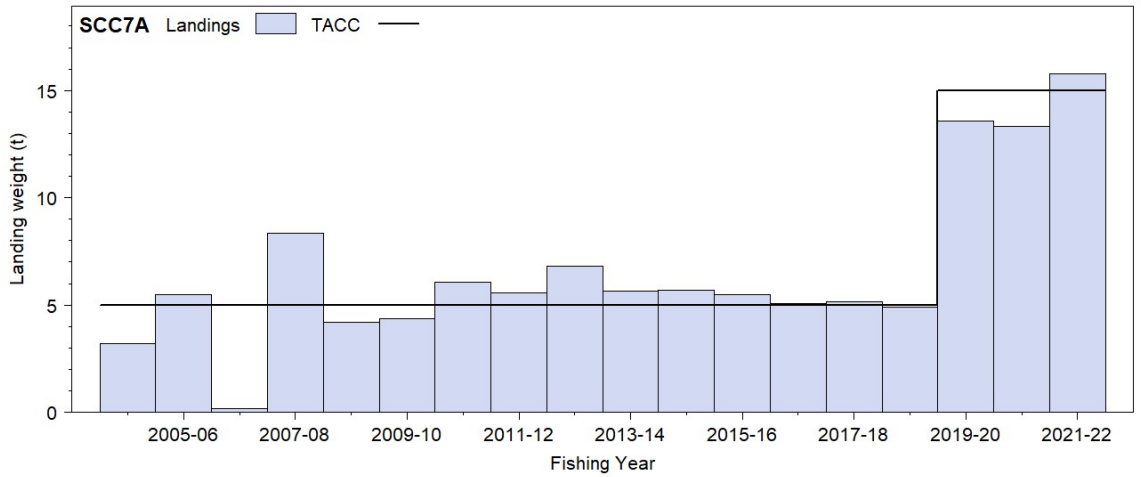


Figure 1: Reported commercial landings and TACC for SCC 1B (Hauraki Gulf, Bay of Plenty), SCC 3 (South East Coast) and SCC 7A (Challenger Marlborough Sounds), Note that these figures do not show data prior to entry into the QMS. [Continued on next page]

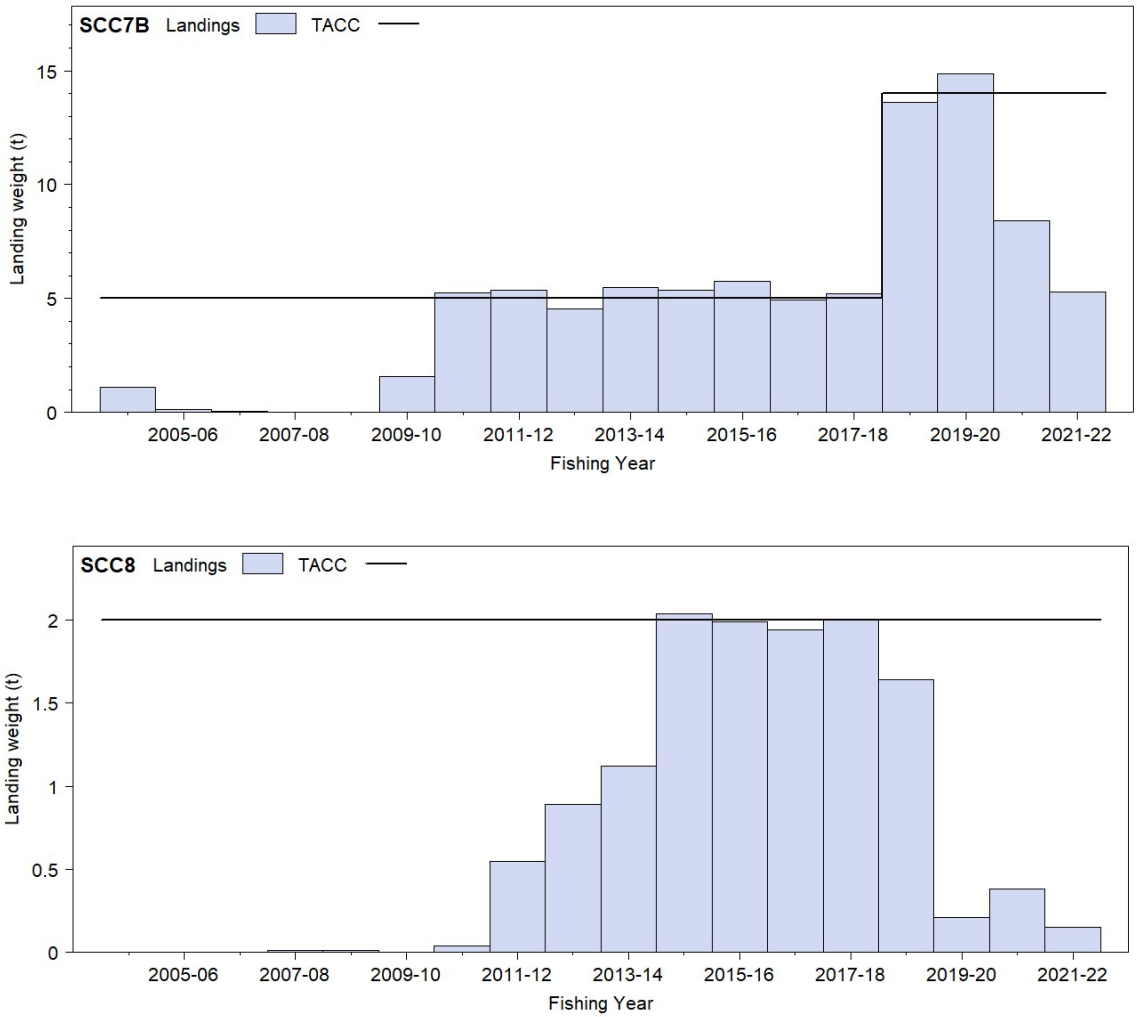


Figure 1 [Continued]: Reported commercial landings and TACC for SCC 7B (Challenger Nelson), and SCC 8 (Central).

Between 1990 and 2001 about 45% of the catch was taken as bycatch in scallop dredging in Tasman Bay and Golden Bay. About 13% was taken as bycatch in bottom trawling around the Auckland Islands, and about 38% was taken by diving. The remainder of the bycatch has been reported from midwater trawls, rock lobster pots, and bottom longlines. Catches were taken by diving from Fisheries Statistical Area 031 (Fiordland) in 1990–91 (when a special permit was being operated), and 1995–96.

Prior to 2000–01 reported total landings did not exceed 5 t, however landings increased rapidly to almost 22 t by 2003–04, declined to 5 t in 2006–07, before increasing to about 20 t in 2011–12. Landings were maintained around this level (except for a drop to 14 t in 2016–17, before increasing to 41 t in 2018–19 and 58 t in 2019–20 (Table 2). Most of these landings came from SCC 3, SCC 7A and SCC 7B. Fishing for sea cucumber within the Marlborough Sounds (SCC 7A) has been managed under a voluntary catch spreading plan. The historical landings and TACC for the main SCC stocks are depicted in Figure 1.

1.2 Recreational fisheries

Recreational fishing surveys indicate that sea cucumbers are not caught by recreational fishers. It is likely that members of the Asian and Pacific Island communities harvest sea cucumber, but their fishing activity is poorly represented in the recreational surveys.

1.3 Customary non-commercial fisheries

There is very limited quantitative information on customary non-commercial use of sea cucumber. In 2010, the harvest of 100 sea cucumbers was permitted in SCC1B and 100 were reported caught.

1.4 Illegal catch

There is qualitative evidence to suggest significant illegal, unreported, unregulated (IUU) activity in this fishery.

1.5 Other sources of mortality

There is no quantitative information on other sources of mortality, although sea cucumbers are often taken as a bycatch in bottom trawl and dredge fisheries.

2. BIOLOGY

Australostichopus mollis is distributed throughout New Zealand waters, as far south as the Snares Islands. It also occurs off the west and south coasts of Australia. It is found in shallow water of sheltered coastline in a wide range of habitats from rocky shores to sandy bottoms. It is common off north-east New Zealand, Fiordland, the Marlborough Sounds, and Stewart Island, and displays a preference for sheltered coastlines with complex and diverse habitats. *A. mollis* is less common on exposed coasts, but, if present, tends to be in deeper water.

Sea cucumbers are mobile detritus feeders and form part of the benthic epifaunal community. If disturbed, they can eviscerate their entire gut which can then be regenerated. They tend to be sedentary in suitable habitat, but can move away relatively quickly if stressed.

Little is known about the biology of *A. mollis*. They have an annual reproductive cycle and spawn between November and February. The sexes are separate and develop synchronously. They are broadcast spawners (eggs and sperm are released into the water column) and, following fertilisation, they undergo a 3- to 4-week larval phase before settlement. Populations from sheltered areas such as fiords and sheltered bays may be largely 'self-seeding', whereas larvae released on open coasts may disperse more widely.

There is some evidence that recruitment and growth are both patchy and variable. Recruited individuals appear in the adult population at about 10–12 cm (40–60 g) and adults grow to about 18–20 cm (180 g). During an exploratory fishing survey in Fiordland (SCC 5A) in 1989, divers observed small *A. mollis* under rubble, suggesting that pre-recruit sea cucumbers may have different habitat preferences to adults. By contrast, comprehensive surveying in the Mahurangi Harbour (SCC 1B) showed the substratum at sites with high densities of juveniles to be dominated by silt and mud with large shell fragments (over 10 cm) of the horse mussel *Atrina zelandica* (Morrison 2000). The restricted distribution of juveniles at this locality was shown to be unrelated to sediment type and was theorised to be a consequence of localised effects such as predation or larval settlement (Slater & Jeffs 2010). Caging studies comparing growth at different densities underneath and away from a Coromandel mussel farm (SCC 1B) showed that growth ranged from a 15.4% increase in weight over 6 months, at a density of 2.5 per m^2 under a mussel farm, to a 13.9% decrease in weight over 2 months, at a density of 15 per m^2 away from the mussel farm (Slater & Carton 2007). Age at maturity is thought to be about 2 years, and the life span of *A. mollis* is thought to be between 5 and 15 years.

3. STOCKS AND AREAS

The management of sea cucumbers is based on 15 QMAs, which are a combination of existing and sub-divided FMAs. Although there is currently little biological or fishery information which could be used to identify stock boundaries, the QMAs recognise that sea cucumbers are a sedentary shallow water species, and that many sheltered populations may be isolated and vulnerable to localised depletion. Finer scale QMAs, therefore, provide a mechanism whereby stocks can be managed more appropriately. Also, because it is likely that the same group of commercial fishers will be targeting kina and sea cucumbers, and because there are some similarities in their respective habitats, the QMAs for sea cucumber are the same as those for kina.

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

There are no estimates of fishery parameters or abundance for any sea cucumber fishstock.

4.2 Biomass estimates

There are no biomass estimates for any sea cucumber fishstock overall, although estimates exist for some discrete subareas.

For Fiordland, crude biomass estimates of 59, 89, 97, and 134 t for Thompson, Bradshaw, Charles, and Doubtful sounds respectively are reported by Mladenov & Gerring (1991), and Mladenov & Campbell (1998). Their survey did not include the outer coastline, but, extrapolating to all fiords between Puysegur Point and Cascade Point, they estimated a total biomass of 1937 t in the 0 to 20 m depth range.

Dive transect surveys were conducted in Queen Charlotte Sound (SCC 7A) and in the Hauraki Gulf (SCC 1B) in 2014 (Williams et al. 2016). The two locations were identified by fishers as important areas that currently support commercial sea cucumber harvesting by breath-hold diving. The objective of the surveys was to estimate sea cucumber biomass in key fishery areas to inform fisheries management on sustainable harvest limits. The surveys included estimated coastline lengths of 109 km (within SCC 7A) and 78 km (within SCC 1B), and covered the depth range 2–15 m. A stratum area method of biomass estimation generated commercial size sea cucumber biomass estimates of 88 t split weight[1] (95%CI = 58–115 t) in SCC 7A and 38 t split weight (95%CI = 22–59 t) in SCC 1B within the areas surveyed. These estimates may be conservative because the transect searches did not account for cryptic sea cucumbers hidden from the divers (*e.g.*, in inaccessible reef cracks and crevices). The surveys did not account for sea cucumbers in waters deeper than 15 m, which could be available to fishers using underwater breathing apparatus (UBA), and the areas surveyed represent only small proportions of the overall SCC stock areas, for which catch limits are set.

In 2017 a dredge survey of *A. mollis* was conducted in deeper water (60–120 m) off the north Canterbury coast in SCC 3 (Tuck et al. 2017). The total population biomass estimated for the survey area was 3207 t green weight or 1329 t split weight; considering only sea cucumbers with a split weight of 63 g or greater (on the basis of a previously estimated marketable SCC selectivity curve) led to a commercial biomass of 619 t split weight. The survey area was considerably smaller than the QMA.

4.3 Yield estimates and projections

There are no estimates of *MCY* for any sea cucumber fishstock.

There are no estimates of *CAY* for any sea cucumber fishstock.

5. STATUS OF THE STOCKS

There are no estimates of reference or current biomass for any sea cucumber fishstock.

6. FOR FURTHER INFORMATION

Alcock, N (2000) Brooding behaviour of two New Zealand cucumariids (Echinodermata: Holothuroidea) (Abstract). 10th International Echinoderm Conference 31 January– 4th February 2000 University of Otago, Dunedin, New Zealand.

Beentjes, M P (2003) New species into the QMS - sea cucumber. Final Research Report for Ministry of Fisheries Research Project MOF200203D, Objective 1. 13 p. (Unpublished report held by Fisheries New Zealand, Wellington).

Bradford, E (1998) Harvest estimates from the 1996 national marine recreational fishing surveys. New Zealand Fisheries Assessment Research Document 1998/16. 27 p. (Unpublished report held by NIWA library, Wellington).

Bradford, E; Fisher, D; Bell, J (1998) National marine recreational fishing survey 1996: overview of catch and effort results. *NIWA Technical Report* 18. 55 p.

Chantal, C; Byrne, M (1993) A review of recent developments in the world sea cucumber fisheries. *Marine Fisheries Review* 55: 1–13.

Conrad, C; Sloan, N A (1989) World Fisheries for echinoderms. *In* Caddy, J.F. (Eds). Marine Invertebrate Fisheries, pp. 647–663. Wiley and sons, New York.

[1] Split weight is an industry processed state where the abdomen is cut to release internal water and gut contents.

Dawbin, W H (1948) Auto–evisceration and regeneration of the viscera in the holothurian *Stichopus mollis* (Hutton). *Transactions of the Royal Society of New Zealand* 77: 497–523.

Mladenov, P V; Campbell, A (1998) Resource evaluation of the sea cucumber (*Stichopus mollis*) in the environmentally sensitive Fiordland region of New Zealand. Proceedings of the 9th International Echinoderm Conference San Francisco. 481–487.

Mladenov, P V; Gerring, P (1991) Resource evaluation of the sea cucumber (*Stichopus mollis*) in Fiordland, New Zealand. Marine Science and Aquaculture Research Centre, University of Otago. 34 p.

Morgan, A (1999) Overview: aspects of sea cucumber industry research and development in the South Pacific. *SPC Bêche–de–mer Information Bulletin* 12: 15–17.

Morgan, A (2000a) Sea cucumber farming in New Zealand. *Australasia Aquaculture* August–September 2000: 54–55.

Morgan, A (2000b) Sea cucumbers in demand. *Seafood New Zealand* July 2000: 69–70.

Morgan, A (2003) Variation in reproduction and development of the temperate sea cucumber *Stichopus mollis*. PhD thesis, University of Auckland, Auckland.

Morrison, M A (2000) Mahurangi Harbour Habitat Map. NIWA Information Series no. 13., National Institute of Water and Atmospheric Research, Wellington, NZ: Map 1 p. colour.

Pawson, D L (1970) The marine fauna of New Zealand: Sea cucumbers (Echinodemata: Holothuroidea). *Bulletin of the New Zealand Department of Scientific and Industrial Research Bulletin* 201. 69 p.

Pawson, D L (2002) A new species of bathyal elasipod sea cucumber from New Zealand (Echinodermata: Holothuroidea). *New Zealand Journal of Marine and Freshwater Research* 36: 333–338.

Sewell, M A (1990) Aspects of the ecology of *Stichopus mollis* (Echinodermata: Holothuroidea) in north eastern New Zealand. *New Zealand Journal of Marine and Freshwater Research* 24: 87–93.

Sewell, M A (1992) Reproduction of the temperate aspidochirate *Stichopus mollis* (Echinodermata: Holothuroidea) in New Zealand. *Ophelia 35*: 103–121.

Slater, M J; Carton, A G (2007) Survivorship and growth of the sea cucumber *Australostichopus (Stichopus) mollis* (Hutton 1872) in polyculture trials with green-lipped mussel farms. *Aquaculture* 272(1–4): 389–398.

Slater, M J; Jeffs, A G (2010) Do benthic sediment characteristics explain the distribution of juveniles of the deposit-feeding sea cucumber Australostichopus mollis? *Journal of Sea Research* 64(3): 241–249.

Tuck, I D; Williams, J R; Fenwick, M; Roberts, C L (2017) Dredge survey of sea cucumbers in SCC 3, 2017. *New Zealand Fisheries Assessment Report 2017/53*. 23 p.

van Eys, S; Philipson, P W (1986) The market for beche-de-mer from the Pacific Islands. Chapter 11, *Marine Products Marketing*. p. 207–223.

Williams, J R; Roberts, C L; Middleton, C J (2016) Dive surveys of sea cucumbers in Queen Charlotte Sound (SCC 7A) and Hauraki Gulf (SCC 1B), 2014. *New Zealand Fisheries Assessment Report* 2016/58. 26 p.