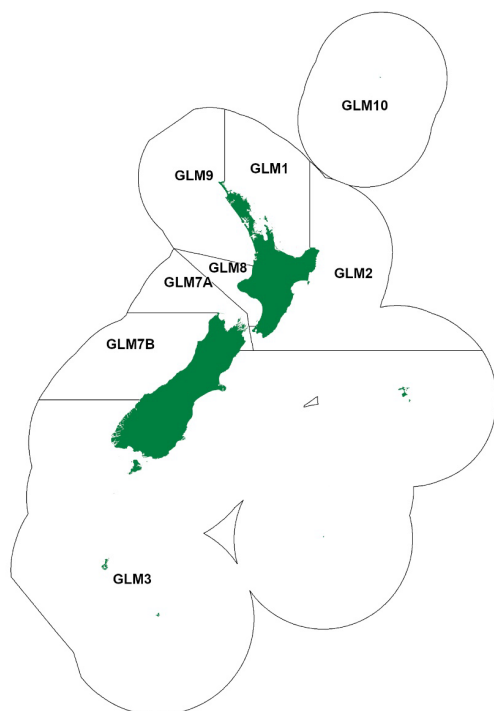


GREEN-LIPPED MUSSEL (GLM)*(Perna canaliculus)*

Kuku, Kutai

**1. FISHERY SUMMARY**

Green-lipped mussels were introduced into the Quota Management System on 1 October 2004. The fishing year is from 1 October to 31 September other than FMA GLM 9, for which the fishing year was changed in 2022 to run from 1 April to 31 March to reduce adverse impacts on beach users and the environment. A breakdown of the Total Allowable Catch (TAC) for each Quota Management Area (QMA) is listed in Table 1.

Table 1: Current Total Allowable Catch (TAC, t), customary and recreational allowances (t), and Total Allowable Commercial Catches (TACC, t) for green-lipped mussel.

Fishstock	Description	TAC (t)	Customary allowance	Recreational allowance	TACC (t)
GLM 1	Auckland (East)	415	243	162	10
GLM 2	Central (East)	35	15	10	10
GLM 3	3, 4, 5 and 6 combined	155	87	58	10
GLM 7A	Nelson/Marlborough	1 548	29	19	1 500
GLM 7B	West coast	23	8	5	10
GLM 8	Central (Egmont)	43	26	17	0
GLM 9	Auckland (West)	233	59	39	135
GLM 10	Kermadec	0	0	0	0
Total		2 452	467	310	1 675

1.1 Commercial fisheries

Commercial harvesting of green-lipped mussels began with handpicking of inter-tidal beds in the late nineteenth century and expanded in 1927 with the development of a dredge fishery for sub-tidal mussels in the Hauraki Gulf. Following a brief decline in catch rates from 1935–45, landings increased steadily to peak in 1961 at more than 2000 t. Overexploitation of the Hauraki Gulf beds caused the fishery to close in 1966. A second dredge fishery developed in Tasman Bay and Kenepuru Sound in 1962; however, under an open access regime this fishery also declined within five years.

Between 2004 and 2006 the majority of reported landings were taken from GLM 7A (up to 411 t). However, between 2007–15 landings in GLM7 were < 10 t and no landings have been reported since 2014–15. From 2007, the majority of commercial landings have been as mussel spat caught in GLM 9

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to supply the aquaculture industry. Prior to green-lipped mussels being introduced into the QMS, a permit was required to harvest spat attached to beach cast seaweed. GLM 9 landings have exceeded the TACC in 2009–10, 2014–15, 2015–16, 2016–17, 2018–2019 and 2021–2022. Recent estimated landings of green-lipped mussels are shown in Table 2, while Figure 1 shows the historical landings and TACC for the three main GLM stocks. Since 2019–20, no commercial landings have been reported outside of GLM 9.

Table 2: Reported landings (t) of Green-lipped mussel and actual TACCs (t) from 2004–05 to the present.

Fishstock	GLM 1		GLM 2		GLM 3		GLM 7A	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
2004–05	6.2	10	0	10	0.2	10	410.9	1 500
2005–06	12.5	10	0.2	10	0.2	10	229.0	1 500
2006–07	7.8	10	0	10	0	10	84.3	1 500
2007–08	3.5	10	0	10	< 0.1	10	7.4	1 500
2008–09	6.7	10	0	10	< 0.1	10	0.1	1 500
2009–10	4.4	10	0	10	< 0.1	10	< 1	1 500
2010–11	1.0	10	0	10	0	10	1.4	1 500
2011–12	0.5	10	0	10	0	10	0.1	1 500
2012–13	0.6	10	0	10	0	10	0	1 500
2013–14	0.1	10	0	10	0	10	8.3	1 500
2014–15	< 0.1	10	0	10	0	10	8.3	1 500
2015–16	0.1	10	0	10	0	10	0	1 500
2016–17	0.2	10	0	10	0	10	0	1 500
2017–18	< 0.1	10	0	10	0	10	0	1 500
2018–19	0	10	0	10	0.7	10	0	1 500
2019–20	0	10	0	10	0	10	0	1 500
2020–21	0	10	0	10	0	10	0	1 500
2021–22	0	10	0	10	0	10	0	1 500

Fishing year	GLM 9		Total	
	Landings	TACC	Landings	TACC
2004–05	121.3	180	539	1 720
2005–06	93.0	180	335	1 720
2006–07	136.9	180	229	1 720
2007–08	141.7	180	153	1 720
2008–09	67.9	180	75	1 720
2009–10	183.3	180	187	1 720
2010–11	78.1	180	80	1 720
2011–12	162.0	180	163	1 720
2012–13	129.0	180	130	1 720
2013–14	159.9	180	167	1 720
2014–15	207.0	180	215	1 720
2015–16	203.4	180	203	1 720
2016–17	208.9	180	209	1 720
2017–18	151.9	180	152	1 720
2018–19	139.3	135	140	1 675
2019–20	94	135	94	1 675
2020–21	111	135	111	1 675
2021–22	178	135	178	1 675

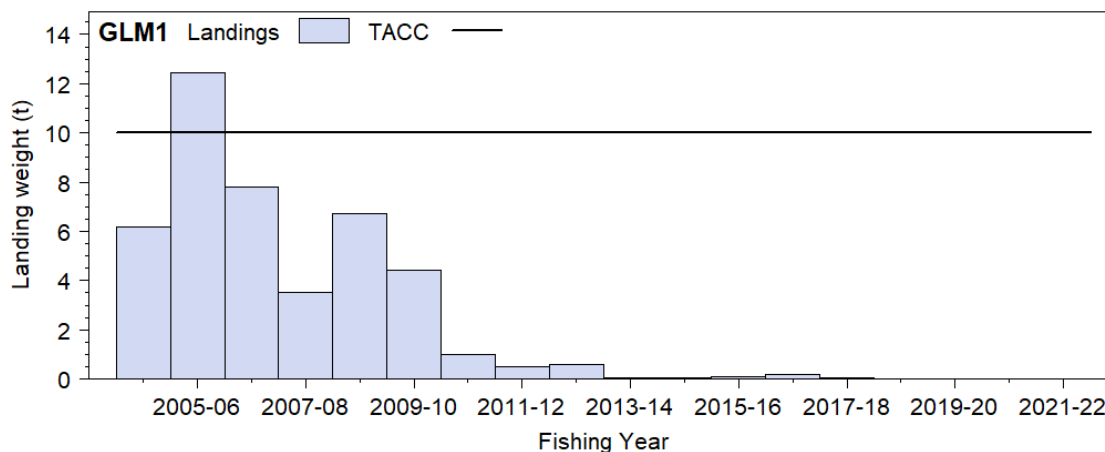


Figure 1: Reported commercial landings and TACC for GLM 1 (Auckland East). Note that these figures do not show data prior to entry into the QMS. [Continued on next page]

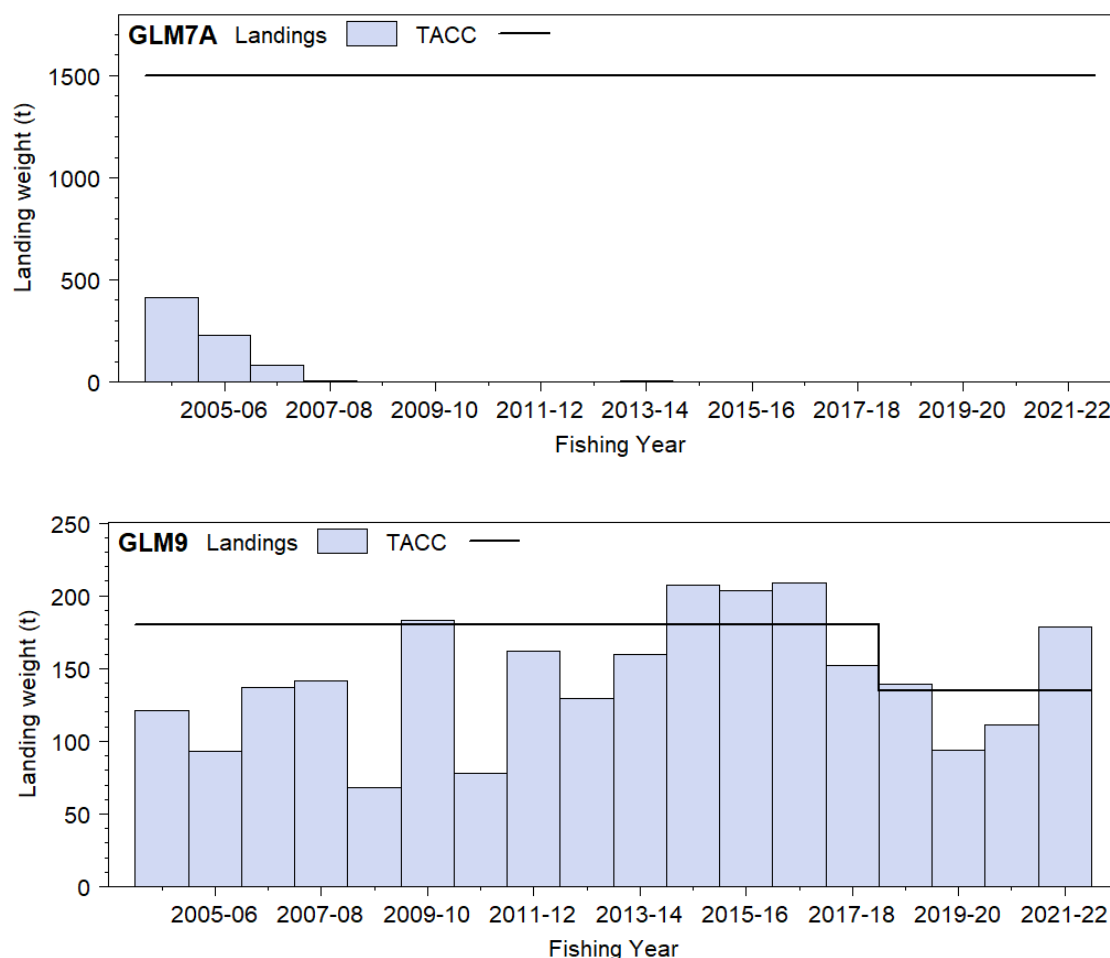


Figure 1 [Continued]: Reported commercial landings and TACC GLM 7A (Nelson Marlborough), and GLM 9 (Auckland West). Note that these figures do not show data prior to entry into the QMS.

1.2 Recreational fisheries

Recreational harvest estimates for green-lipped mussels have been obtained from the 1996, 2000 and 2001 national telephone diary surveys of recreational fishers (Table 3). Estimates of green-lipped mussels from the 1996 survey are only available for FMA 1. No weights were available from the surveys to estimate recreational harvest by tonnage. The Recreational Technical Working Group has reviewed the harvest estimates from the national telephone diary surveys and considered that the estimates from the 1996 survey are unreliable because the survey contained a methodological error. The estimated number of green-lipped mussels from the 2000 and 2001 surveys is also considered to be unreliable. In response to these problems and the cost and scale challenges associated with onsite methods, a National Panel Survey was conducted for the first time throughout the 2011–12 fishing year (Wynne-Jones et al. 2014). The panel survey used face-to-face interviews of a random sample of 30 390 New Zealand households to recruit a panel of fishers and non-fishers for a full year. The panel members were contacted regularly about their fishing activities and harvest information collected in standardised phone interviews. The panel survey was repeated in 2017–18 (Wynne-Jones et al. 2019).

1.3 Customary non-commercial fisheries

Green-lipped mussels are very important to customary fishing. This species was used extensively by Māori, appearing in middens throughout the country. The species continues to be important to Māori and, anecdotally, a number of customary fishers have noted its importance as a resource in a number of areas. Green-lipped mussels form an important fishery for customary non-commercial, but the total annual catch is not known.

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Table 3: Harvest estimates of mussels (000s of individuals of *P. canaliculus* combined) from the 1996, 2000 and 2001 national recreational surveys, by FMA (Bradford 1998, Boyd et al. 2004) and the national panel surveys in 2011–12 and 2017–18 (Wynne-Jones et al. 2014, Wynne-Jones et al. 2019).

Area	Number (thousands)	CV
1996 (telephone-diary)		
GLM 1	818	
GLM 2		
GLM 3		
GLM 5		
GLM 7		
GLM 8		
GLM 9		
2000 (telephone diary)		
GLM 1	1 308	
GLM 2	8	
GLM 3	402	
GLM 5	1	
GLM 7	3	
GLM 8	242	
GLM 9	25	
2002 (telephone diary)		
GLM 1	949	
GLM 2	22	
GLM 3	187	
GLM 5	36	
GLM 7	363	
GLM 8	-	
GLM 9	148	
2011–12 (national panel survey)		
GLM 1	576	
GLM 2	56	
GLM 3	73	
GLM 5	8	
GLM 7	78	
GLM 8	39	
GLM 9	154	
GLM total	983	
2017–18 (national panel survey)		
GLM 1	147	0.29
GLM 2	54	0.44
GLM 3	44	0.41
GLM 5	23	0.49
GLM 7	55	0.42
GLM 8	3	0.72
GLM 9	17	0.46
GLM total	342	

Māori customary fishers utilise the provisions under both the recreational fishing regulations and the various customary regulations. Many tangata whenua harvest green-lipped mussels under their recreational allowance and these are not included in records of customary catch. Customary reporting requirements vary around the country. Customary fishing authorisations issued in the South Island and Stewart Island would be under the Fisheries (South Island Customary Fishing) Regulations 1999. Many rohe moana / areas of the coastline in the North Island and Chatham Islands are gazetted under the Fisheries (Kaimoana Customary Fishing) Regulations 1998 which require reporting on authorisations. In the areas not gazetted, customary fishing permits would be issued would be under the Fisheries (Amateur Fishing) Regulations 2013, where there is no requirement to report catch.

The information on Māori customary harvest under the provisions made for customary fishing can be limited (Table 4). These numbers are likely to be an underestimate of customary harvest as only the catch approved and harvested in kilograms and numbers are reported in the table.

While little information is available, the green-lipped mussels remain an important element of customary fishing throughout many parts of New Zealand and efforts are being made collaboratively with iwi to manage populations in localised areas, e.g., Ōhiwa Harbour Implementation Forum.

1.4 Illegal catch

Current levels of illegal harvest are not known.

1.5 Other sources of mortality

There is no quantitative information.

Table 4: Fisheries New Zealand records of customary harvest of green-lipped mussels (approved and reported as weight (kg) and in numbers), since 2005-06. – no data.

Stock	Fishing year	Weight (kg)		Numbers	
		Approved	Harvested	Approved	Harvested
GLM 1	2009–10	280	25	1 000	700
	2010–11	470	120	725	545
	2011–12	80	30	75	50
	2014–15	530	500	350	300
	2015–16	445	440	–	–
	2016–17	340	80	160	45
	2017–18	–	–	300	200
	2013–14	–	–	350	350
GLM 2	2013–14	–	–	350	350
GLM 3	2005–06	–	–	225	75
	2006–07	–	–	1 410	694
	2007–08	–	–	4 569	4 284
	2008–09	–	–	9 820	7 920
	2009–10	–	–	2 890	2 175
	2010–11	–	–	1 900	1 900
	2011–12	–	–	1 905	1 725
	2012–13	–	–	4 115	3 300
	2013–14	–	–	300	100
	2014–15	–	–	–	–
	2015–16	–	–	9 430	7 934
	2016–17	–	–	3 150	1 224
	2017–18	–	–	600	308
	2018–19	–	–	400	203
	2019–20	–	–	12 295	8 677
	2020–21	–	–	600	200
	2021–22	–	–	2 150	1 515
GLM 7B	2006–07	200	200	–	–
	2007–08	–	–	200	200
	2016–17	–	–	650	650

2. BIOLOGY

The green-lipped mussel is a filter-feeding mollusc. While distributed throughout New Zealand, it is most common in central and northern parts where it frequently forms dense beds of up to 100 m². This species is absent from the Chatham Islands and other offshore islands. It is typically a bivalve of the lower shore and open coast and is found from the mid-littoral to depths of over 50 m. The species can grow to over 240 mm in shell length (anterior-posterior axis).

The green-lipped mussel is a dioecious (uni-sexual) broadcast spawner. Gonadal development takes place at temperatures above 11°C and is also related to food availability, environmental conditions, and stock origin. Most spawning occurs in late spring to early autumn, but larvae can be present all year. Sexual maturity has been observed in some populations to begin from 27 mm shell length, with most individuals sexually mature by 40 mm shell length. Sexual maturity is reached in the first year, and females can produce up to 100 million eggs per season. Fertilisation is largely dependent on the proximity of adults.

Settlement processes associated with marine farms have been well studied, but less is known about natural settlement. The planktonic stage (pediveligers) of the green-lipped mussel is ready to settle at 220–350 µm in length, after a three to five week larval phase. The larvae swim only vertically but they can be transported large distances by currents and tides. Settlement is most intense from late winter to early summer, but is highly variable spatially and temporally. In the wild, larvae settle over a wide range of depths, preferring fine filamentous substrata including hydroids, bryozoans, and filamentous and turfing algae. Settlement is completed with the attachment of byssus threads and subsequent metamorphosis.

Primary settlement onto beds of adult mussels is uncommon, but can take place on surrounding algae and on the byssi of adults. Secondary settlement, after a form of byssopelagic migration or mucous drifting, is thought to be the means by which most juveniles recruit into mussel beds. The spat detaches from the substrate by severing the byssus threads and the secreted mucous strand, this enables it to swim or drift to new areas for attachment. Juvenile mussels may move numerous times like this before settling on adult mussel beds. This drifting ability is lost once spat reach about 6 mm in shell length.

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There is little information on age, growth and natural mortality, particularly for wild populations, however recent evidence suggests that stock origin can have a significant effect on their growth indicating a large genetic component. Green-lipped mussels in suspended culture typically grow from 10 to 75 mm shell length in six months, to 111–115 mm in one year, and to 195 mm in three and a half years. Growth is typically faster in cultured situations compared with natural beds, which are often overcrowded, are on exposed coasts, and are not constantly submerged so feeding is discontinuous. At Piha and West Tamaki Head, green-lipped mussel growth is variable, with individuals reaching 20–70 mm shell length in their first year.

3. STOCKS AND AREAS

Green-lipped mussels are distributed in seven of the ten FMAs (1–3, 5 and 7–9) but are most common in the central and northern parts of New Zealand.

There is little information on stock structure, recruitment patterns, or other biological characteristics. There appears to be strong genetic structuring of the New Zealand green-lipped mussel population, with a northern and southern group being differentiated by frequency shifts in common haplotypes, and the occurrence of a unique haplotype in the South Island west coast population. The southern-northern population split occurs south of Cook Strait.

4. STOCK ASSESSMENT

There are no stock assessments or biomass estimates for green-lipped mussels.

5. STATUS OF THE STOCKS

For all Fishstocks there is insufficient information to estimate current stock status.

However, some localised information is available. Green-lipped mussel populations have been intermittently surveyed in Ōhiwa Harbour since 2006. What this monitoring has shown is a reduction in the historical distribution of green-lipped mussels within the harbour along with a > 99% reduction in abundance in the decade since 2006 across all size-classes due to sediment deposition.

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