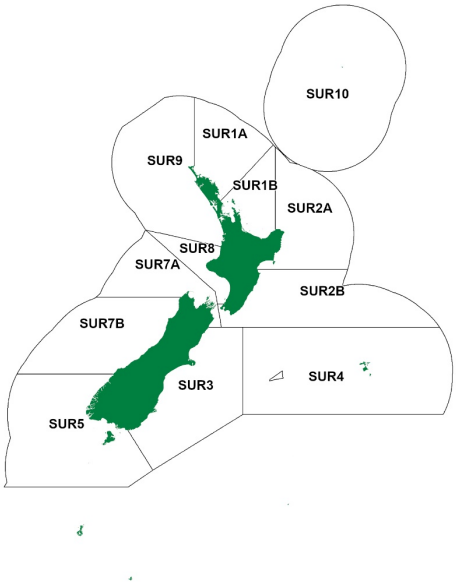
KINA (SUR)

(*Evechinus chloroticus*)
Kina



1. FISHERY SUMMARY

South Island kina was introduced into the Quota Management System in October 2002. North Island kina was introduced into the Quota Management System from October 2003. Five Quota Management Areas based on the FMAs 3, 4, 5, 7A (Marlborough Sounds) and 7B (west coast) were created in the South Island and seven Quota Management Areas based on the FMAs 1A (Auckland-North), 1B (Auckland-South), 2A (Central (East-North)), 2B (Central (East-South)), 8, 9 and 10 were created in the North Island. Current allowances, TACCs and TACs are summarised in Table 1. The historical landings and TACC values for the main SUR stocks are depicted in Figure 1.

Table 1: Current Total allowable catches (TAC, t) allowances for customary fishing, recreational fishing, and other sources of mortality (t) and Total Allowable Commercial Catches (TACC, t) for kina.

	TAC	Customary	Recreational	Other Mortality	TACC
SUR 1A	172	65	65	2	40
SUR 1B	324	90	90	4	140
SUR 2A	204	60	60	4	80
SUR 2B	102	35	35	2	30
SUR 3	42	10	10	1	21
SUR 4	255	20	7	3	225
SUR 5	480	10	10	5	455
SUR 7A	238	80	20	3	135
SUR 7B	26	10	5	1	10
SUR 8	26	12	12	1	1
SUR 9	33	11	11	1	10
SUR 10	0	0	0	0	0

1.1 Commercial fisheries

Most kina are found in waters less than 10 m deep and are harvested by breath-hold diving, although about 10% of the total catch in 1998–99 was by taken by dredge in SUR 7. Some target dredging also occurs in SUR 7. There is no minimum legal size for kina. Almost all of the roe harvested in this fishery is consumed on the domestic market. In 1988–89, competitive TACCs were established in the more important FMAs but not in east Northland (SUR 1) or at the Chatham Islands (SUR 4), both of which developed into productive fisheries in the 1990s (Table 2). On 1 October 1992 the Ministry of Fisheries placed a moratorium on the issue of permits to commercially harvest kina. The kina fishery has evolved considerably since the imposition of the moratorium. Where present, the competitive TACCs were either not caught or were exceeded, both by wide margins. Much of the increase in catch observed in SUR 5 in the early 1990s can be attributed to an experimental fishery developed in SUR 5, between

Puysegur Point and Breaksea Island. The short-lived Kina Development Programme harvested kina from Dusky Sound in 1993 under special permit. In recent years landings have fluctuated around the TACCs for SUR 1A, 1B, 5 and 7A. Landings have generally remained well below the TACCs in other FMAs, but increased to 17 t (TACC 20 t) in SUR 3 in 2019–20, and have exceeded 170 t in 2016–17, 2017–18 and 2019–20 in SUR 4 (TACC 225 t).

Table 2: Total reported landings (t greenweight) of kina (SUR) by FMA and fishing year by all methods and target species. [Continued on next page].

	SUR 1		SUR 1A		SUR 1B	
Year	Landings	TACC	Landings	TACC	Landings	TACC
1983	66.2	–	–	–	–	–
1984	81.4	–	–	–	–	–
1985	64.5	–	–	–	–	–
1986	72.0	–	–	–	–	–
1987	52.1	–	–	–	–	–
1988	22.1	–	–	–	–	–
1989	35.5	–	–	–	–	–
1990	10.0	–	–	–	–	–
1991	71.5	–	–	–	–	–
1992	78.7	–	–	–	–	–
1993	89.7	–	–	–	–	–
1994	150.7	–	–	–	–	–
1995	155.9	–	–	–	–	–
1996	174.5	–	–	–	–	–
1997	161.6	–	–	–	–	–
1998	134.8	–	–	–	–	–
1999	201.4	–	–	–	–	–
2000	297.4	–	–	–	–	–
2001	184.5	–	–	–	–	–
2001–02	237.0	–	–	–	–	–
2002–03	211.2	–	–	–	–	–
2003–04	1.7	–	26.9	40	111.0	140
2004–05	–	–	20.9	40	131.1	140
2005–06	–	–	41.0	40	138.6	140
2006–07	–	–	37.1	40	147.3	140
2007–08	–	–	31.7	40	140.4	140
2008–09	–	–	30.5	40	130.6	140
2009–10	–	–	40.8	40	129.9	140
2010–11	–	–	31.7	40	122.1	140
2011–12	–	–	37.9	40	134.2	140
2012–13	–	–	38.7	40	145.4	140
2013–14	–	–	43.4	40	139.3	140
2014–15	–	–	39.7	40	147.5	140
2015–16	–	–	40.9	40	131.6	140
2016–17	–	–	39.6	40	142.7	140
2017–18	–	–	38.7	40	136.2	140
2018–19	–	–	36.5	40	133.3	140
2019–20	–	–	35.1	40	143.7	140

	SUR 2		SUR 2A		SUR 2B	
Fishing year	Landings	TACC	Landings	TACC	Landings	TACC
1983	33.0	–	–	–	–	–
1984	180.3	–	–	–	–	–
1985	83.8	–	–	–	–	–
1986	139.1	–	–	–	–	–
1987	142.6	–	–	–	–	–
1988	154.1	–	–	–	–	–
1989	92.8	–	–	–	–	–
1990	282.4	–	–	–	–	–
1991	87.2	–	–	–	–	–
1992	37.3	–	–	–	–	–
1993	170.4	–	–	–	–	–
1994	176.7	–	–	–	–	–
1995	129.7	–	–	–	–	–
1996	41.2	–	–	–	–	–
1997	49.9	–	–	–	–	–
1998	36.5	–	–	–	–	–
1999	20.2	–	–	–	–	–
2000	14.5	–	–	–	–	–
2001	11.4	–	–	–	–	–
2001–02	3.0	–	–	–	–	–

Table 2 [Continued]

	SUR 2		SUR 2A		SUR 2B	
Fishing year	**Landings**	**TACC**	**Landings**	**TACC**	**Landings**	**TACC**
2002–03	30.4	–	–	–	–	–
2003–04	0	–	14.5	80	4.6	30
2004–05	–	–	6.5	80	1.4	30
2005–06	–	–	22.1	80	0.2	30
2006–07	–	–	13.8	80	< 0.1	30
2007–08	–	–	18.0	80	0.2	30
2008–09	–	–	19.8	80	< 0.1	30
2009–10	–	–	0.1	80	0.3	30
2010–11	–	–	4.1	80	< 0.1	30
2011–12	–	–	5.9	80	1.1	30
2012–13	–	–	10.6	80	0	30
2013–14	–	–	10.1	80	3.8	30
2014–15	–	–	18.8	80	2.3	30
2015–16	–	–	17.8	80	2.5	30
2016–17	–	–	9.3	80	13.4	30
2017–18	–	–	21.8	80	7.9	30
2018–19	–	–	13.4	80	13.2	30
2019–20	–	–	13.2	80	7.8	30
	–	–				

	SUR 3		SUR 4		SUR 5	
Fishing year	**Landings**	**TACC**	**Landings**	**TACC**	**Landings**	**TACC**
1983	4.8	–	11.3	–	0.5	–
1984	14.4	–	4.0	–	0.9	–
1985	4.0	–	7.4	–	4.6	–
1986	6.2	–	52.7	–	0.2	–
1987	2.4	–	28.4	–	4.3	–
1988	1.7	–	76.5	–	2.3	–
1989	0.8	–	216.6	–	19	–
1990	4.1	–	190.0	–	13.4	–
1991	21.3	–	35.3	–	166.9	–
1992	15.8	–	192.9	–	272.2	–
1993	9.9	–	21.8	–	*530.3	–
1994	8.8	–	55.3	–	327.2	–
1995	7.1	–	100.7	–	342.9	–
1996	6.0	–	99.5	–	446.4	–
1997	5.4	–	225.7	–	171.6	–
1998	3.8	–	303.1	–	91.2	–
1999	38.4	–	168.2	–	120.6	–
2000	50.4	–	396.5	–	106.3	–
2001	11.2	–	472.6	–	69.8	–
2001–02	5.2	–	368.0	–	184.9	–
2002–03	0.3	21	167.3	225	132.5	245
2003–04	0.3	21	114.8	225	199.1	245
2004–05	0.5	21	91.7	225	350.4	455
2005–06	< 0.1	21	70.2	225	473	455
2006–07	3.2	21	108.3	225	423	455
2007–08	2.1	21	147.4	225	276.2	455
2008–09	4.2	21	135.6	225	294.9	455
2009–10	5.1	21	89.7	225	320.4	455
2010–11	5.2	21	134.9	225	339.2	455
2011–12	4.3	21	137.7	225	402	455
2012–13	4.8	21	76.2	225	474.8	455
2013–14	0.4	21	101.2	225	462.8	455
2014–15	0.2	21	75.2	225	458.4	455
2015–16	4.1	21	116.3	225	453.1	455
2016–17	8.6	21	220.0	225	460.1	455
2017–18	< 0.1	21	189.4	225	421.6	455
2018–19	2.3	21	94.8	225	466.7	455
2019–20	17.6	21	173.4	225	439.4	455

	SUR 7		SUR 7A		SUR 7B	
Fishing year	**Landings**	**TACC**	**Landings**	**TACC**	**Landings**	**TACC**
1983	26.3	–	–	–	–	–
1984	55.1	–	–	–	–	–
1985	99.6	–	–	–	–	–
1986	86.6	–	–	–	–	–
1987	52.6	–	–	–	–	–
1988	175.6	–	–	–	–	–
1989	6.2	–	–	–	–	–
1990	41.5	–	–	–	–	–
1991	56.3	–	–	–	–	–
1992	114.4	–	–	–	–	–
1993	210.2	–	–	–	–	–
1994	98.2	–	–	–	–	–
1995	149	–	–	–	–	–
1996	142.2	–	–	–	–	–

Table 2 [Continued]

	SUR 7		SUR 7A		SUR 7B	
Fishing year	**Landings**	**TACC**	**Landings**	**TACC**	**Landings**	**TACC**
1997	121.7	–	–	–	–	–
1998	144.7	–	–	–	–	–
1999	113.9	–	–	–	–	–
2000	87.9	–	–	–	–	–
2001	80.1	–	–	–	–	–
2001–02	31.7	–	–	–	–	–
2002–03	1.3	–	63.2	135	0	10
2003–04	0	–	85.4	135	0	10
2004–05	–	–	101.3	135	-	10
2005–06	–	–	72.1	135	5.3	10
2006–07	–	–	117.3	135	9.2	10
2007–08	–	–	134.6	135	6.5	10
2008–09	–	–	128.7	135	6.1	10
2009–10	–	–	119.7	135	3.5	10
2010–11	–	–	97.4	135	7.2	10
2011–12	–	–	131.6	135	6	10
2012–13	–	–	115.5	135	5	10
2013–14	–	–	126.3	135	0	10
2014–15	–	–	142.8	135	0	10
2015–16	–	–	134.0	135	2.5	10
2016–17	–	–	138.6	135	0	10
2017–18	–	–	121.3	135	0	10
2018–19	–	–	131.0	135	0	10
2019–20	–	–	136.1	135	0	10

	SUR 6, 8 & 9		Total	
Fishing year	**Landings**	**TACC**	**Landings**	**TACC**
1983	3.6	–	157	
1984	0.3	–	342	
1985	0.9	–	275	
1986	2	–	360	
1987	0.1	–	283	
1988	–	–	432	
1989	1.5	–	372	
1990	6.5	–	548	
1991	4.4	–	443	
1992	5	–	717	
1993	–	–	1 032	
1994	2.3	–	820	
1995	89.5	–	975	
1996	0.1	–	910	
1997	0.2	–	736	
1998	1.4	–	716	
1999	0.5	–	663	
2000	0.1	–	956	
2001	3.1	–	832	
2001–02	–	–	829.7	
2002–03	0.9	–	607.4	636
2003–04	3.8	11	562.3	937
2004–05	0.9	11	704.7	1147
2005–06	4.0	11	826.5	1147
2006–07	8.6	11	868	1147
2007–08	5.8	11	762.9	1147
2008–09	3.4	11	753.8	1147
2009–10	2.3	11	711.9	1147
2010–11	2.5	11	741.9	1147
2011–12	8.2	11	862.1	1147
2012–13	4.0	11	875	1147
2013–14	9.1	11	896	1147
2014–15	7.9	11	885	1147
2015–16	2.5	11	901	1147
2016–17	10.3	11	952	1147
2017–18	0.5	11	947	1147
2018–19	4.8	11	891.5	1147
2019–20	5.9	11	972.2	1147

Data from 1989 and 1990 are combined from the FSU and CELR databases. – indicates no recorded catch. Data for the period 1983 to 1999 are from Andrew (2001), and have been groomed. Catch estimates for 2000 and 2001 are taken directly from MFish. * includes 133 t caught in Dusky Sound experimental fishery. Catches from SUR 6, 8, and 9 have been pooled because too few permit holders recorded catches in these FMAs to report them singly.

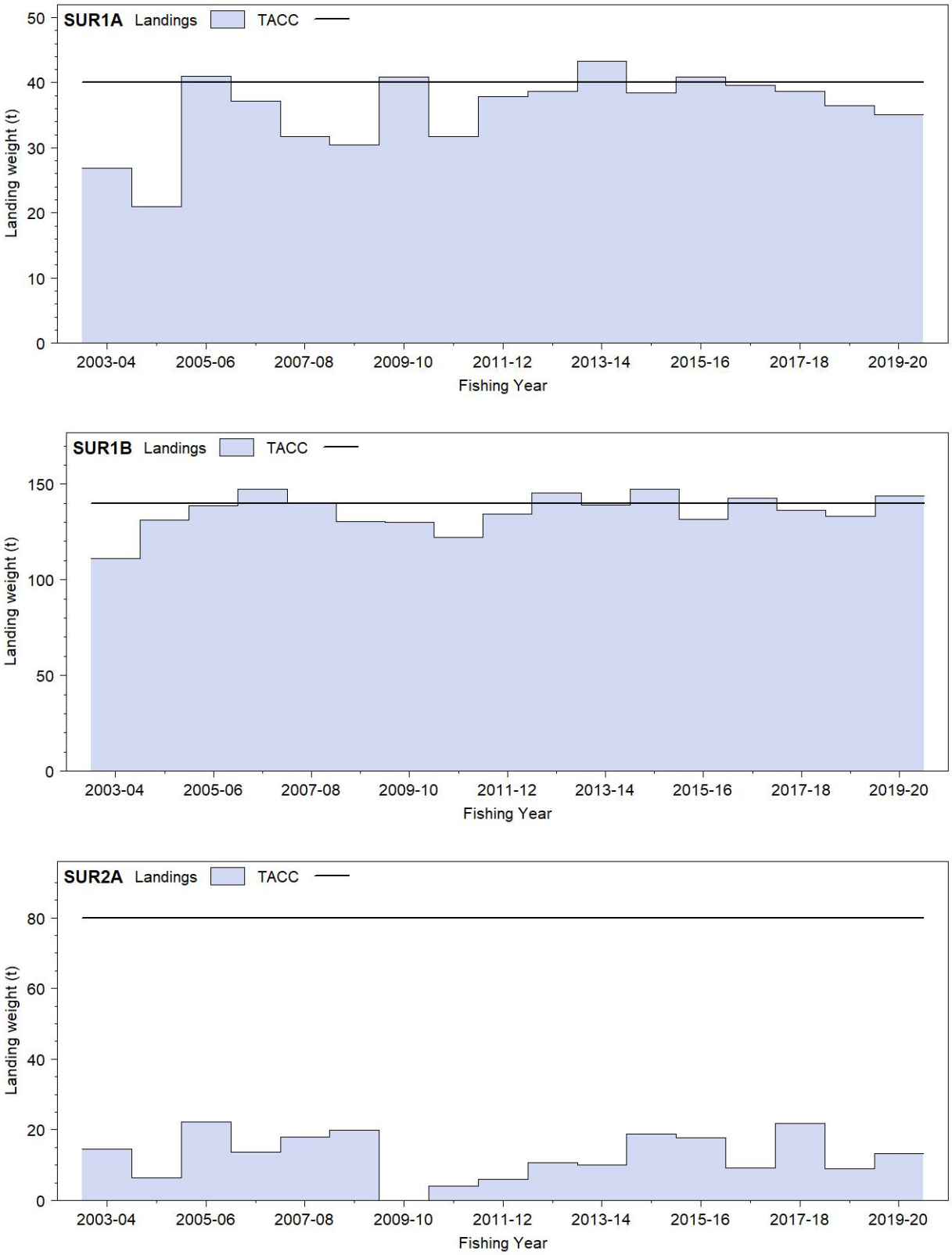


Figure 1: Reported commercial landings and TACC for the nine main SUR stocks. From top: SUR 1A (Northland), SUR 1B (Hauraki Gulf, Bay of Plenty) and SUR 2A (East Coast). Note that these figures do not show data prior to entry into the QMS for SUR 1A to SURB 2B [Continued on next page]

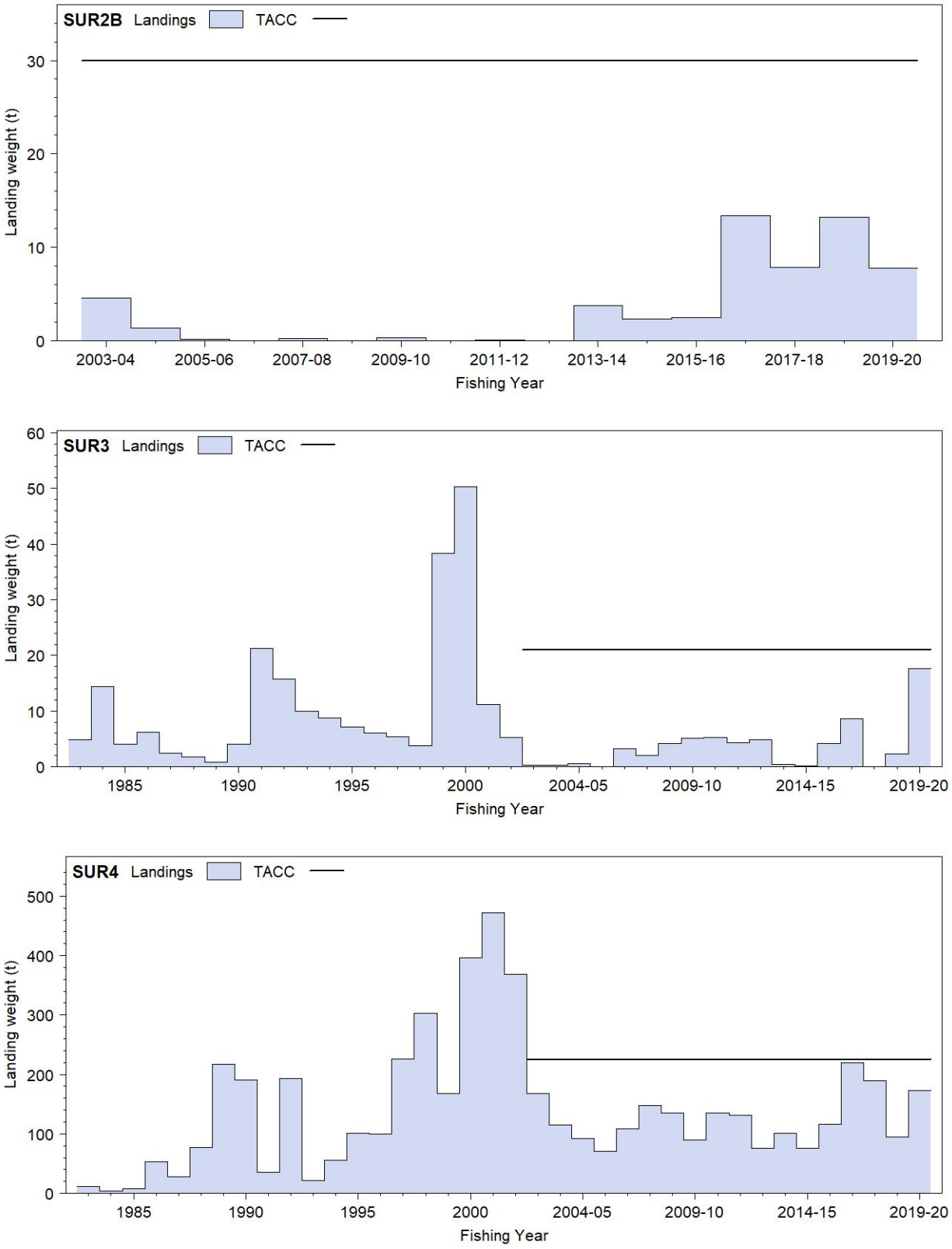


Figure 1: Reported commercial landings and TACC for the nine main SUR stocks. From top: SUR 2B (Wairarapa, Wellington), SUR 3 (South East Coast) and SUR 4 (South East Chatham Rise). Note that these figures do not show data prior to entry into the QMS for SUR 1A to SURB 2B. [Continued next page]

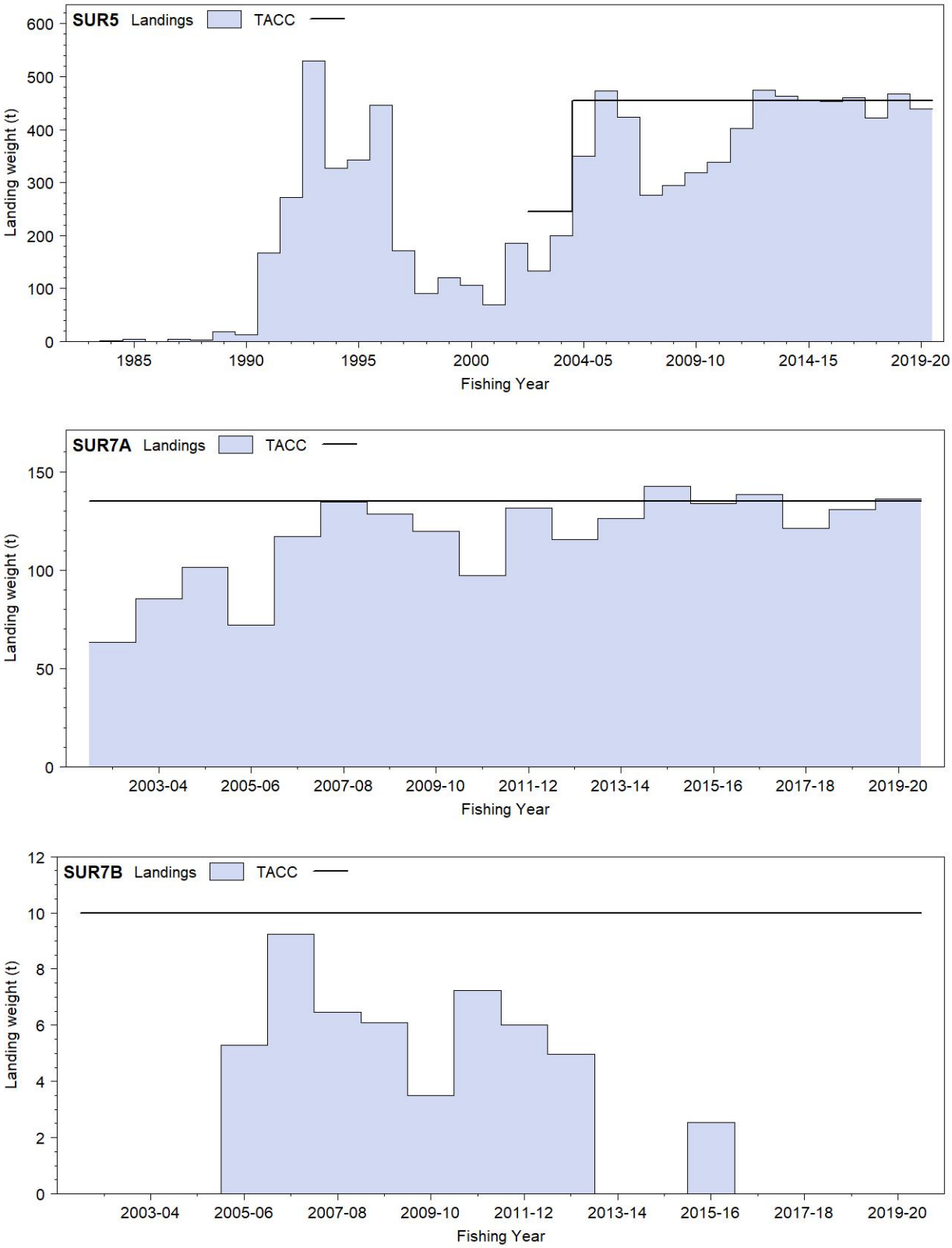


Figure 1 [Continued]: Reported commercial landings and TACC for the nine main SUR stocks. From top: SUR 5 (Southland), SUR 7A (Challenger Nelson Marlborough) and SUR 7B (Challenger Westland). Note that these figures do not show data prior to entry into the QMS for SUR 7A to SUR 7B.

1.2 Recreational fisheries

Recreational catch was estimated using telephone-diary surveys in 1993–94, 1996 (Fisher & Bradford 1998, Bradford 1998) and 2000 (Boyd & Reilly 2002, Boyd et al 2004) (Table 3). There are no estimates of recreational catch from the Chatham Islands. In many instances, insufficient kina were caught to provide reliable estimates of the error associated with the estimates of total harvest. The harvest

estimates provided by these telephone-diary surveys are no longer considered reliable for various reasons. A Recreational Technical Working Group concluded that these harvest estimates should be used only with the following qualifications: a) they may be very inaccurate; b) the 1996 and earlier surveys contain a methodological error; and c) the 2000 and 2001 estimates are implausibly high for many important fisheries. 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. 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. Harvest estimates for kina (in numbers) are given in Table 3 (from Wynne-Jones et al 2014, no estimates of mean weight were available from boat ramp surveys, Hartill & Davey 2015, Wynne-Jones et al 2019).

For the early telephone-diary surveys, catches in numbers were converted to catch in tonnes by assuming an average whole weight of 248.3 g per kina based on equal proportions across a size range 60–110 mm TD and a test diameter-weight relationship ($W = (6.27\times10^{-4})TD^{2.88}$) from Dusky Sound (unpublished data). These estimates of catch in tonnes should be considered as indicative only and may be very inaccurate. No estimates of mean weight were available to convert catches in numbers from the national panel survey to catch in tonnes.

Table 3: Estimates of recreational harvest of kina using telephone-diary surveys (1993–94, 1996, and 2000 surveys) and the national panel surveys (2011–12 and 2017–18).

Area	Number (thousands)	CV	Catch (t)*
1993–94 (telephone-diary)			
East Northland	109	0.60	27.1
Hauraki Gulf	14	-	3.5
Bay of Plenty	648	0.49	160.9
SUR 1	801	0.41	198.9
SUR 9	30	0.72	7.4
1996 (telephone-diary)			
SUR 1	316	0.24	78.5
SUR 2	61	-	15.1
SUR 3	12	-	3.0
SUR 5	20	-	5.0
SUR 7	2	-	0.5
SUR 8	43	-	10.7
SUR 9	30	-	7.4
2000 (telephone-diary)			
SUR 1	1 793	0.35	445.2
SUR 2	1 026	0.57	254.7
SUR 3	8	0.58	2.0
SUR 5	70	1.01	17.4
SUR 7	2	1.01	0.5
SUR 8	85	0.85	21.1
SUR 9	82	0.67	20.4
2011–12 (national panel survey)			
SUR 1	2 019	0.86	-
SUR 2	107	0.32	-
SUR 3	12	0.59	-
SUR 5	10	0.73	-
SUR 7	12	0.67	-
SUR 8	61	0.43	-
SUR 9	58	0.62	-
SUR total	2 279	0.73	-
2017–18 (national panel survey)			
SUR 1	296	0.21	-
SUR 2	181	0.24	-
SUR 3	5	0.68	-
SUR 5	10	0.44	-
SUR 7	2	0.95	-
SUR 8	34	0.38	-
SUR 9	12	0.85	-
SUR total	540		-

*Data as numbers caught supplied by Ngai Tahu Development Corporation. Catch in kilograms was estimated using the conversion rules described in the paragraph above.

1.3 Customary non-commercial fisheries

There is an important customary non-commercial harvest of kina by Māori for food. Limited quantitative information on the level of customary take is available from Fisheries New Zealand. These numbers are likely to be an underestimate of customary harvest as only the catch in numbers and kilograms are reported in the table below (Table 4).

Table 4: Fisheries New Zealand records of customary harvest of kina (reported as weight (kg) and numbers), since 1998-99. – no data. [Continued next page]

	SUR 1A				SUR 1B			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
1998–99	–	–	–	–	–	–	–	–
1999–00	–	–	–	–	–	–	–	–
2000–01	–	–	–	–	–	–	–	–
2001–02	–	–	–	–	–	–	–	–
2002–03	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	1 200	750
2004–05	–	–	–	–	–	–	400	210
2005–06	–	–	–	–	1 790	1 040	–	–
2006–07	850	850	7 300	7 300	12 055	9 785	6 025	5 475
2007–08	2 890	2 890	6 900	6 900	11 225	9 285	12 230	10 130
2008–09	3 290	3 290	1 900	1 900	11 540	8 940	10 524	9 924
2009–10	1 760	1 760	1 400	1 400	11 615	8 995	9 500	7 750
2010–11	3 570	3 570	–	–	26 582	20 142	21 890	19 050
2011–12	9 575	8 775	900	600	4 990	2 900	1 450	1 400
2012–13	9 704	9 210	2 300	2 170	4 325	3 460	400	400
2013–14	610	610	3 900	3 900	480	360	–	–
2014–15	–	–	–	–	16 495	15 265	2 700	2 150
2015–16	–	–	–	–	5 550	3 950	1 260	383
2016–17	–	–	–	–	1 885	1 175	5 950	3 173
2017–18	–	–	–	–	260	80	8 175	5 000
2018–19	–	–	–	–	2 120	1 883	2 820	1 645
2019–20	–	–	–	–	–	–	–	–

	SUR 2A				SUR 2B			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
1998–99	–	–	200	200	–	–	–	–
1999–00	–	–	2 350	460	–	–	–	–
2000–01	–	–	–	–	–	–	–	–
2001–02	–	–	100	80	–	–	–	–
2002–03	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	1 350	1 350
2004–05	–	–	600	440	–	–	900	900
2005–06	–	–	7 500	4 940	–	–	200	200
2006–07	–	–	55 806	41 546	–	–	–	–
2007–08	–	–	60 546	46 599	–	–	–	–
2008–09	–	–	54 050	46 427	–	–	18 055	14 940
2009–10	–	–	17 100	13 640	–	–	2 700	1 510
2010–11	–	–	71 950	66 222	–	–	–	–
2011–12	–	–	102 160	87 639	–	–	–	–
2012–13	–	–	127 090	101 162	–	–	–	–
2013–14	–	–	132 715	98 129	–	–	–	–
2014–15	–	–	63 410	52 181	–	–	200	130
2015–16	–	–	20 030	16 072	–	–	460	420
2016–17	–	–	50 400	33 483	–	–	–	–
2017–18	–	–	11 400	5 950	–	–	–	–
2018–19	–	–	33 020	12 894	–	–	–	–
2019–20	–	–	–	–	–	–	–	–

	SUR 3				SUR 4			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
1998–99	–	–	–	–	–	–	–	–
1999–00	–	–	–	–	–	–	–	–
2000–01	–	–	–	–	–	–	–	–
2001–02	–	–	2 070	819	–	–	–	–
2002–03	–	–	650	150	–	–	–	–
2003–04	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–
2005–06	–	–	1 075	401	–	–	–	–
2006–07	–	–	2 020	1 417	–	–	–	–
2007–08	–	–	4 880	4 134	–	–	–	–
2008–09	–	–	3 099	968	–	–	–	–
2009–10	–	–	1 600	1 283	–	–	460	429

Table 4 [Continued]

	SUR 3				SUR 4			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
2010–11	–	–	17 170	16 092	–	–	–	–
2011–12	–	–	3 660	2 436	17	17	–	–
2012–13	–	–	5 600	4 629	–	–	–	–
2013–14	–	–	3 850	1 160	–	–	90	88
2014–15	–	–	1 910	1 382	–	–	40	40
2015–16	–	–	3 006	2 265	–	–	162	102
2016–17	–	–	1 805	1 570	–	–	310	310
2017–18	–	–	300	192	24	24	125	125
2018–19	–	–	–	–	50	50	–	–
2019–20	–	–	7 351	4 646	–	–	–	–

	SUR 5				SUR 7A			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
1998–99	–	–	–	–	–	–	–	–
1999–00	–	–	–	–	–	–	–	–
2000–01	–	–	730	520	–	–	–	–
2001–02	–	–	4 810	4 039	–	–	–	–
2002–03	–	–	3 440	2 255	–	–	–	–
2003–04	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–
2005–06	–	–	700	700	–	–	–	–
2006–07	–	–	260	260	50	10	–	–
2007–08	–	–	7 715	7 715	–	–	1 220	960
2008–09	–	–	7 450	7 125	–	–	1 570	1 198
2009–10	–	–	2 380	1 706	–	–	2 170	2 040
2010–11	–	–	300	300	–	–	–	–
2011–12	–	–	2 659	2 659	–	–	–	–
2012–13	–	–	5 680	5 680	–	–	–	–
2013–14	–	–	1 000	910	–	–	–	–
2014–15	–	–	–	–	–	–	–	–
2015–16	–	–	3 840	3 170	–	–	–	–
2016–17	–	–	2 500	2 410	–	–	–	–
2017–18	–	–	2 150	2 150	–	–	–	–
2018–19	–	–	–	–	–	–	–	–
2019–20	–	–	900	900	–	–	–	–

	SUR 7B				SUR 8			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
1998–99	–	–	–	–	–	–	–	–
1999–00	–	–	–	–	–	–	–	–
2000–01	–	–	–	–	–	–	–	–
2001–02	–	–	–	–	–	–	–	–
2002–03	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–
2005–06	–	–	–	–	–	–	–	–
2006–07	–	–	250	250	–	–	–	–
2007–08	–	–	–	–	–	–	–	–
2008–09	–	–	–	–	–	–	–	–
2009–10	–	–	–	–	–	–	–	–
2010–11	–	–	–	–	–	–	–	–
2011–12	–	–	–	–	–	–	–	–
2012–13	–	–	–	–	–	–	300	80
2013–14	–	–	–	–	–	–	–	–
2014–15	–	–	–	–	–	–	–	–
2015–16	–	–	–	–	–	–	–	–
2016–17	–	–	70	70	–	–	–	–
2017–18	–	–	–	–	–	–	–	–
2018–19	–	–	–	–	–	–	300	150
2019–20	–	–	–	–	–	–	–	–

	SUR 9			
	Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested
1998–99	–	–	–	–
1999–00	–	–	–	–
2000–01	–	–	–	–
2001–02	–	–	–	–
2002–03	–	–	–	–
2003–04	–	–	–	–
2004–05	–	–	–	–
2005–06	–	–	–	–

Table 4 [Continued]

	SUR 9			
	Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested
2006–07	–	–	–	–
2007–08	50	50	–	–
2008–09	–	–	1 400	900
2009–10	100	80	–	–
2010–11	120	120	–	–
2011–12	350	320	–	–
2012–13	40	40	3 150	3 150
2013–14	400	280	500	380
2014–15	80	80	–	–
2015–16	–	–	–	–
2016–17	–	–	–	–
2017–18	–	–	–	–
2018–19	–	–	–	–
2019–20	–	–	–	–

1.4 Illegal catch

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

1.5 Other sources of mortality

Although there is no minimum legal size for kina, some incidental mortality is likely because roe quality (recovery rate and colour) is commonly assessed by opening 'test' kina underwater. These animals are not subsequently landed. There are no estimates of the magnitude to this incidental mortality.

2. BIOLOGY

The biology and ecology of kina has been extensively studied; this literature has most recently been reviewed by Barker (2001). *Evechinus chloroticus* is found throughout New Zealand and the sub-Antarctic Islands. Kina has an annual reproductive cycle which culminates in spawning between November and March (Dix 1970, Walker 1984, McShane et al 1994a, 1996, Lamare & Stewart 1998, Lamare 1998). Size at maturity appears to vary considerably and may be as small as 30 mm and as large as 75 mm TD (Dix 1970, Barker et al 1998). In Dusky Sound, kina are reproductively mature at 50–60 mm T.D. (McShane et al 1996). Within these seemingly consistent patterns in the seasonality of the reproductive cycle there are many differences in the gonad size at small spatial scales.

Settlement is likely to vary between years and appears to differ among locations and habitats (Dix 1972, Walker 1984). Laboratory work has shown that kina larval mortality increased with increasing concentrations of suspended sediment at realistic concentrations (Phillips & Shima 2006). In the field, but not in the laboratory, development abnormalities were found associated with suspended sediment concentrations; this suggests the importance of other environmental factors associated with terrestrial runoff (Schwarz et al 2006). Juvenile settlement and mortality has also been observed to increase with sediment at realistic concentrations in a size-specific manner in the laboratory; this agrees with juvenile patterns of distribution observed in the field (Walker 2007). Few small kina were observed in any of the surveys in Dusky Sound (McShane et al 1993). These results suggest that the productivity of stocks in Fiordland may be low and that recruitment over-fishing is a real possibility.

There is relatively little information available on the interactions between kina and its predators and competitors. Although a wide range of fish and invertebrates eat kina, there is limited evidence that these species control or limit populations of kina in Fiordland. Work in a marine reserve, where large predators such as reef fishes and crayfish are abundant, indicates that predators can control numbers of kina surviving the transition from crevice-bound to open substratum grazing (Cole & Keuskamp 1998, Babcock et al 1999). Babcock et al (1999) have drawn a direct link between the increases in snapper and crayfish populations and the long-term decline in kina populations in the Leigh Marine Reserve. There is, however, no evidence that high kina densities limit rock lobster populations (Andrew & MacDiarmid 1991). It is likely, however, that changes in the abundance of kina, and the consequent changes in habitat representation, are part of a complex set of interacting processes, including but not exclusively, increased predation.

Kina compete with a range of invertebrate herbivores, including paua. There is no published evidence that high densities of kina limit paua populations in Fiordland. McShane (1997) reported that paua are abundant in Dusky Sound, and in Chalky and Preservation Inlets, but are rare in the fjords.

Lamare & Mladenov (2000) estimate that kina grow 8–10 mm in their first year of life. Growth rates will vary considerably depending on local conditions but kina may take 8–9 years to reach 100 mm TD, and very large individuals may reach ages of more than 20 years (Lamare & Mladenov 2000).

3. STOCKS AND AREAS

There appear to be few genetic differences in kina populations from Leigh (North Auckland) and Stewart Island (Mladenov et al 1997), which suggests that there is at least some mixing among populations. There is no direct evidence that populations of kina at the Chatham Islands differ genetically from those on the mainland, nor is there evidence that "populations" of kina at the Chatham Islands are dependent on the dispersal of larvae from the mainland.

4. STOCK ASSESSMENT

Although there is a wealth of information on the biology and ecology of this species (see Barker 2001 for reviews), there is relatively little that can be used to assess the status of exploited stocks. There have been no assessments of sustainable yield nor are there estimates of biomass or trends in relative abundance for any Fishstock (Annala 1995).

4.1 Estimates of fishery parameters and abundance

Andrew (2001) reported catch rates from both dive and dredge fisheries but advised caution in the interpretation of catch rate information of sedentary invertebrates, like kina, gathered at broad spatial scales.

Indices of relative abundance using timed swims have been reported for Ariel Reef in SUR 2 (Anderson & Stewart 1993), Chatham Islands (Schiel et al 1995, Naylor & Andrew 2002), and D'Urville Island and Arapawa Island in SUR 7 (McShane et al 1994a). Numerous surveys of kina have been done over the last 30 years in fished areas, mostly by university-based researchers (e.g. Dix 1970, Choat & Schiel 1982, Schiel et al 1995, Cole & Keuskamp 1998, Babcock et al 1999, Wing et al 2001). Naylor & Andrew (2002) reported a range of densities for kina around Chatham Island from 0.17/m^2 (northwest Chatham Island) to 1.6/m^2 (south east Chatham Island). These were generally lower than estimates made in the mid 1990s by Schiel et al (1995) (0.2/m^2 to 6/m^2). By contrast, even lower kina densities of around 0.1/m^2 were reported by McShane et al (1994a) for both Arapawa and D'Urville Island. Dix (1970) reported much higher mean relatively high densities of kina ranging from 2.2/m^2 in Queen Charlotte Sound to 6/m^2 at Kaikōura.

4.2 Biomass estimates

McShane & Naylor (1993) reported biomass estimates of 2500 and 500 t respectively for D'Urville and Arapawa Islands (SUR 7), presumably based on an expansion of density estimates reported in McShane et al (1994a) by an area estimate, however, the methods are not detailed.

Biomass was estimated for Dusky Sound and Chalky Inlet (SUR 5) prior to Dusky Sound being opened as an experimental fishery in May 1993 (McShane & Naylor 1991, 1993). Productivity and biomass was to be estimated by depletion methods but this was unsuccessful because only 133 t of the projected 1000 t was caught (McShane et al 1994b) and this catch was insufficient to cause a measurable change in the estimated biomass of kina.

4.3 Yield estimates and projections

MCY has not been estimated for any SUR fishstock. Within SUR 5, an *MCY* estimate of sustainable yield within Dusky Sound and Chalky Inlet was reported in Annala (1995). This estimate used Method 1 of Annala (1995) for new fisheries based on surveys done by McShane & Naylor (1991, 1993) and

an estimate of a reference fishing mortality derived from McShane et al (1994a). The estimated annual sustainable yield of 275 t for these two areas has never been harvested because they are closed to commercial fishing except under special permit.

CAY has not been estimated for any SUR fishstock.

5. STATUS OF THE STOCKS

For all Fishstocks it is not known if current catch levels or TACCs are sustainable, or if they are at levels which will allow the stocks to move towards a size that will support sustainable yields.

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