Fisheries New Zealand
Tini a Tangaroa

Review of Sustainability Measures for New Zealand scallops (SCA 1 & SCA CS) for 2022/23

Fisheries NZ Discussion Paper No: 2021/30

ISBN No: 978-1-99-101997-4 (online)
ISSN No: 2624-0165 (online)

December 2021

New Zealand Government

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1 Stocks being reviewed

New Zealand Scallop (SCA 1 and SCA CS) – Northland and Coromandel

Pecten novaezelandiae, kuakua/tipa

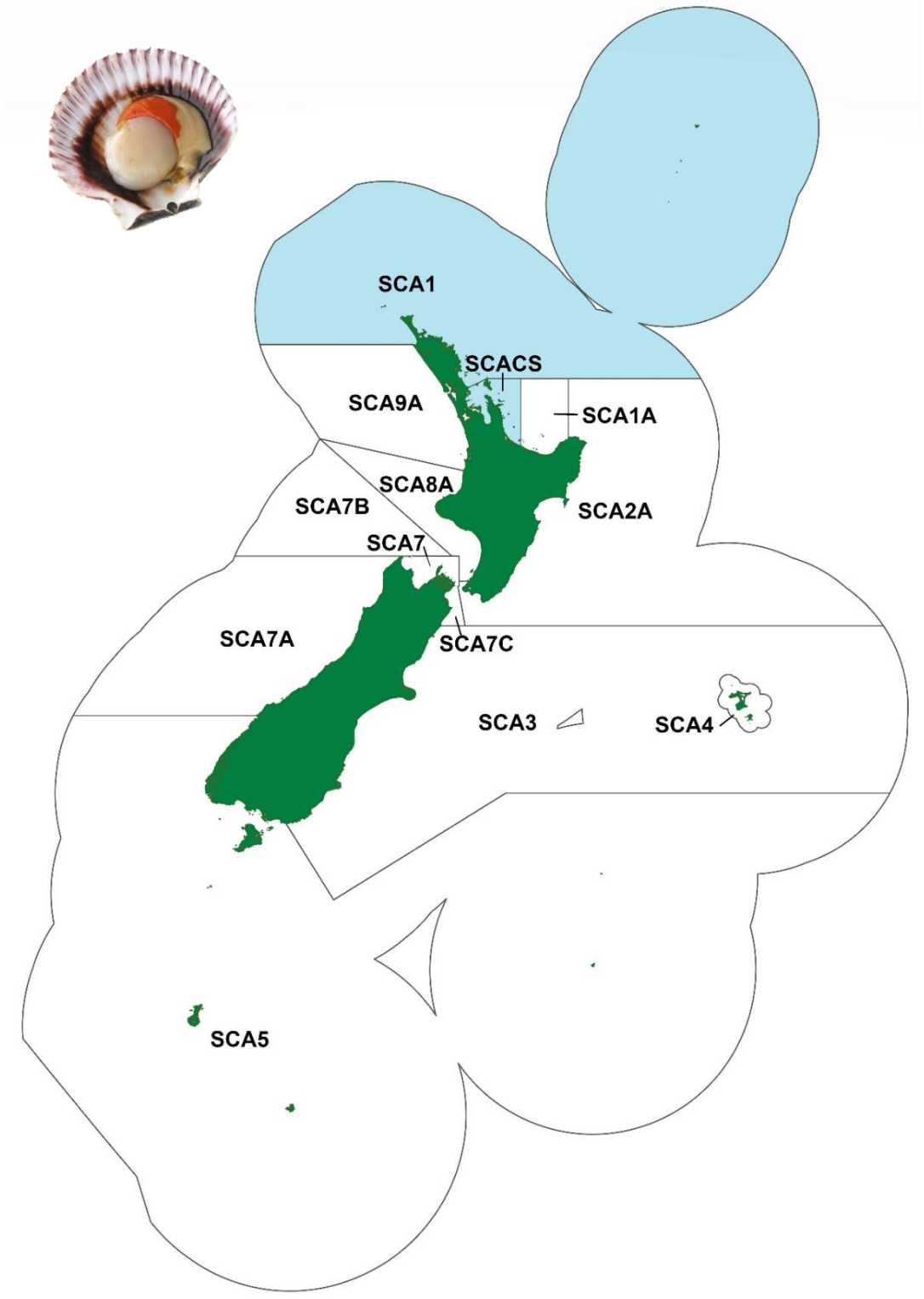

Figure 1: Quota Management Areas (QMAs) for New Zealand scallop, with Northland (SCA 1) and Coromandel (SCA CS) scallop stocks highlighted.

2 Summary

1. Scallops are an iconic New Zealand shellfish species, and they are an important part of the coastal marine ecosystem. They are highly valued by tangata whenua and recreational fishers as kaimoana, and they support localised commercial fishing, processing, and retail industries. They are also valued by the public, many of whom enjoy them at restaurants, fish shops and events or festivals around the country.

2. Fisheries New Zealand (FNZ) is proposing measures aimed at rebuilding the North Island scallop fisheries in the Northland (SCA 1) and Coromandel (SCA CS) Quota Management Areas (QMAs) (Figure 1). This includes proposed catch limit reductions for the fishing year starting on 1 April 2022.

3. Surveys carried out in 2021 show an overall decline in the biomass and abundance in both SCA 1 and SCA CS from historical levels, with substantial declines in many core scallop beds since the previous survey.

4. FNZ considers that the current biomass and abundance of scallops in SCA 1 and SCA CS are at levels that do not support sustainable fishing at the current catch limits and allowances. In some areas, the abundance and density of scallops may be lower than that required for successful spawning, which may be affecting repopulation and the contribution of spat to surrounding scallop beds. This poses a risk whereby the overall biomass and distribution of scallops may continue to decline in SCA 1 and SCA CS.

5. FNZ is proposing three management options to support a recovery of the Northern scallop fisheries. The first option proposes a full closure of both fisheries to recreational and commercial scallop harvest, under section 11 of the Fisheries Act 1996 (the Act), to promote the maximum recovery potential. Two other options recognise that these fisheries could also recover while some level of ongoing utilisation is provided for. These options utilise combinations of reduced catch limits with spatial closures and method restrictions to reduce impacts on scallop beds and promote recovery.

6. FNZ considers that closures would help safeguard mature and juvenile scallops from direct fishing mortality, incidental fishing mortality and indirect fishing impacts. They would give the beds an opportunity to rest and help rebuild the stocks. The closures would reduce utilisation opportunities in the short term; however, this would be balanced by anticipated improved fishery productivity in the future for both stocks.

7. Temporary closures are an effective management tool that have been previously used to stimulate recovery and enhance productivity in scallop fisheries overseas and within New Zealand. In areas that have experienced habitat change such as Southern scallops (SCA 7), closures alone have been less effective. Some scallop beds in SCA 1 and SCA CS, despite experiencing no intense fishing for more than 10 years, have biomass below historical levels.

8. FNZ has undertaken pre-consultation engagement with tangata whenua and key stakeholders on preliminary findings of the surveys to inform development of proposed management changes in the Northland and Coromandel scallop fisheries.

9. Initial feedback from tangata whenua and stakeholders indicates agreement that there is a sustainability concern in our scallop fisheries and that a management change is appropriate. Discussions with the fishing industry - commercial fishers, quota holders and processors, have

indicated they believe some level of sustainable harvest can be maintained in both fisheries. They have signalled they will provide FNZ with their suggested measures to achieve this.

10. FNZ considers that the longer-term approach to scallop management also needs to be reviewed. The proposed measures will protect the scallop fisheries in the short-medium term and provide opportunity for stocks to recover while FNZ works with tangata whenua and stakeholders to develop an updated long-term management approach.

11. FNZ is proposing three options for SCA 1 and SCA CS as outlined in Table 1 below:

Table 1: Proposed changes to TAC, TACC and allowances for SCA 1 and SCA CS under proposed options.

SCA 1							
Option	TAC	TACC	Allowances			Management	
			Customary Māori	Recreational	Other mortality		
Current settings	30	10	7.5	7.5	5		
Option 1	30	10	7.5	7.5	5	Full closure (s11)	
Option 2	9.5 ↓ (20.5 t)	0 ↓ (10 t)	7.5	1 ↓ (6.5 t)	1 ↓ (4 t)	Partial Spatial closure (s11) and TAC, TACC and allowances	Recreational dredging prohibited
Option 3	16 ↓ (14 t)	0 ↓ (10 t)	7.5	7.5	1 ↓ (4 t)	TAC, TACC and allowances	
SCA CS							
Option	TAC	TACC	Allowances			Management	
			Customary Māori	Recreational	Other mortality		
Current settings	81	50	10	10	11		
Option 1	81	50	10	10	11	Full closure (s11)	
Option 2	19 ↓ (62 t)	5 ↓ (45 t)	10	3 ↓ (7 t)	1 ↓ (10 t)	Partial Spatial closure (s11) and TAC, TACC and allowances	
Option 3	14 ↓ (67 t)	0 ↓ (50 t)	10	3 ↓ (7 t)	1 ↓ (10 t)	TAC, TACC and allowances	Recreational dredging prohibited

12. FNZ welcomes feedback and submissions on these options.

3 Why the Need for Change?

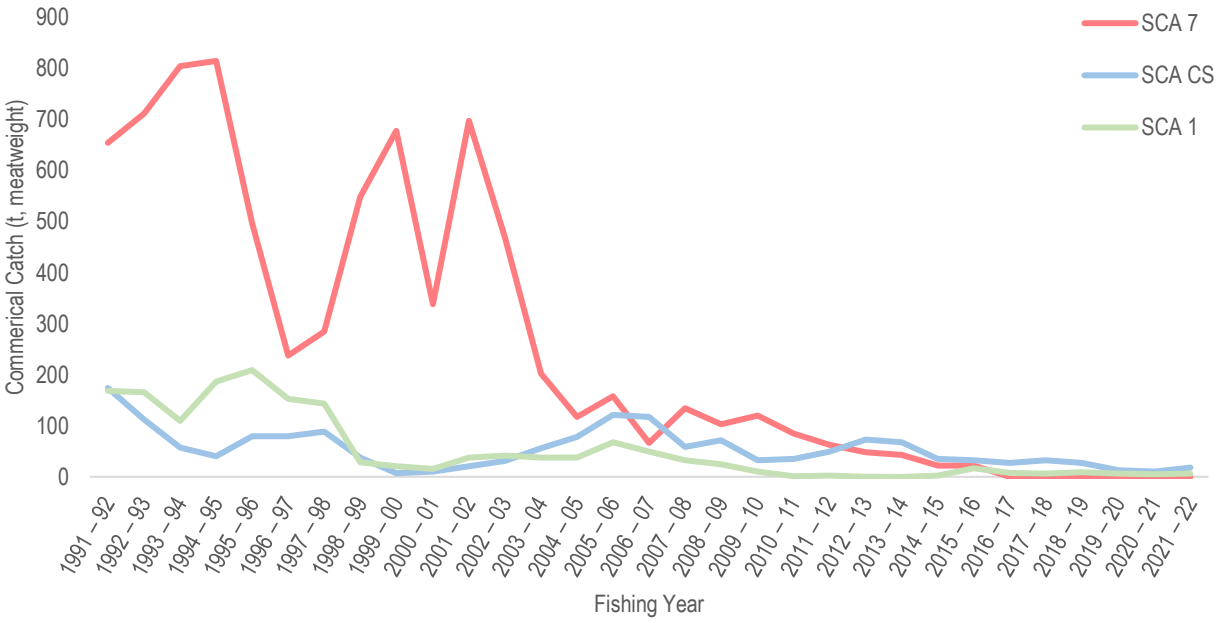

Figure 2: Historical commercial catch in the three main New Zealand scallop fisheries, Northland (SCA 1), Coromandel (SCA CS) and Southern (SCA 7) scallop fisheries from 1991 to 2022. The 2021-22 fishing year is incomplete.

13. Both SCA 1 and SCA CS have experienced substantial declines in abundance and biomass over time, much like the now closed southern scallop fishery (SCA 7). Once highly productive fisheries are now at historical lows in many areas. These declines in abundance are also reflected in substantial decreases in commercial catches (Figure 2). However, a variety of fishing-related and environmental stressors impact scallop populations and are contributing to the general decline in scallop populations observed around New Zealand.

3.1 Fishing-related stressors

14. Targeted dredging for scallops directly impacts populations by the removal of individuals, the incidental mortality of scallops that come into contact with the dredge but are not caught, and those under the size limit which are caught and returned to the sea. It also has impacts on the benthic environment through direct contact with the sea floor and damage to benthic communities.

15. The available information on scallop abundance in all the known fisheries shows a steep decline. This is not necessarily a result of fishing alone. However continued fishing is of concern, particularly where the remaining beds have low densities.

16. Scallops are ‘broadcast spawners’ and need to be close to other scallops during spawning to ensure that sperm concentrations are high enough to fertilise the eggs released. It is known that

high density scallop beds are disproportionately more important for fertilisation success. The density required to ensure success is not known.

17. In addition, sediment disturbance such as from dredging and bottom trawling indirectly affects scallop populations in the short and longer term. While there is limited overlap between trawl and dredge fisheries currently, repeated fishing activity in certain areas is likely to be having an impact. The increased accuracy of technology supporting dredging operations also allows specific targeting and intensification of fishing in areas known to have high density of scallops.

18. This concentrated fishing effort contributes to the overall impacts on scallop beds, including deep beds likely important for spat supply for the wider fisheries. Some of these beds have been discovered and depleted. A likely consequence is a loss of spat supply.

19. Within the Hauraki Gulf Marine Park, overlap between trawl activity and scallop beds will be considered as part of the proposal to establish defined 'trawl corridors' that will limit the areas where bottom trawling can continue to operate. With the introduction of electronic reporting and Global Position Reporting (GPR) on commercial fishing vessels, Fisheries New Zealand has the ability, through fine scale data, to monitor any notable overlap between fisheries and methods.

20. Short term effects of sediment disturbance include the resuspension of fine sediments by the physical disturbance of the dredge, and this can reduce feeding and growth. In the longer term, dredging can modify the structure of the sea floor and communities, so they no longer provide suitable settlement surfaces for spat and habitat for supporting healthy populations. After some three weeks in the water column, spat attach to fine filamentous structures on the sea floor provided by tube worms, hydroids, and filamentous algae. There is evidence that the survival of juvenile scallops is greater in more complex habitats with more emergent life than in less complex habitats.

3.2 Non-fishing stressors

21. Environmental stressors unrelated to fishing, such as sediment from land, contribute to impacts on scallop populations by affecting water quality in localised sheltered waters where scallops are found.

22. Scallops are filter feeders and rely on suspended microalgae and detritus as food for their growth and maintaining condition. Studies have shown that suspended sediments disrupt feeding, decrease growth, and increase mortality in scallops.

23. For example, previously productive scallop habitat in Golden Bay and Tasman Bay appears to have changed over the last 30 years and is no longer able to support healthy scallop beds despite being closed to scallop fishing for many years. While commercial fishers still reseed juvenile scallops in these areas (at a reduced scale), the scallops do not generally survive. There is some evidence that, as for many overseas scallop fisheries, the drivers of this change include a range of human-induced impacts, including sediment from land-based activities (such as forestry and agriculture) as well as fishing.

24. Another potential stressor could be chemicals used on land and entering the coastal marine environment along with sediments. However, there is no specific information available on which chemicals and what impacts they might be having.

25. The Coromandel scallop populations were affected by the 'black gill' bacterial infection in the late 1990s. No large-scale scallop mortality was associated with the infection, but specific impacts on the populations are not understood. The disease caused the scallops to have poor condition and flavour, and periods of the season saw no fishing.

26. The ‘parchment worm’ (*Chaetopterus sp.*) [1], a tube worm, also affected the northern scallop populations in the late 1990s by appearing in great numbers and occupying sandy substrates also inhabited by scallops. It is not known if this was an indigenous or invasive species, but it and the ‘black gill’ disease curtailed fishing for scallops while it was prevalent. The prevalence of the parchment worm declined naturally over time.

3.3 SCA 1 and SCA CS

27. The best available information suggests there is a sustainability risk to the scallop populations in SCA 1 and SCA CS. There are no accepted target and limit reference points for both stocks and the biomass that will support the maximum sustainable yield has not been estimated.

28. Historically, SCA 1 and SCA CS have been managed based on baseline Total Allowable Catch (TAC), Total Allowable Commercial Catch (TACC) and allowances (customary Māori, recreational and other sources of mortality). When information about the abundance of scallops within a fishing year became available, the Minister could agree to an in-season increase to the TAC that was based on the sustainable yield available that year (the Current Annual Yield (CAY)[2]). If the TAC was increased, allowances could be altered, and additional Annual Catch Entitlement (ACE) generated for commercial fishing. The TAC and allowances would revert to the baseline at the start of the next fishing year. This approach was considered to enable the maximum sustainable yield (MSY) to be achieved on average over time and allowed some utilisation to be available at almost any level of abundance.

29. FNZ considers that the SCA 1 and SCA CS fisheries are not responding to the current management approach. There is a risk that current catch limits are not maintaining the stock at or above, or moving the stock towards or above, a level that can produce the MSY.

30. The most recent survey information shows that, in most recreationally and commercially fished areas, there has been a reduction in biomass since the previous survey. In some areas, the biomass is at levels experienced historically when the fishery was impacted by disease and the *Chaetopterus* parchment worm. There are no current reports of disease or organisms impacting scallops in the North Island scallop fisheries.

31. Some areas within SCA 1 and SCA CS have low biomass despite having no commercial fishing activity in recent years.

32. The relationship between scallop beds within SCA 1 and SCA CS is not currently well understood. Some scallop beds appear to have received no significant recruitment for several years. Results from a preliminary genetics study suggest that at least one large scallop bed, thought to support recruitment into other commercial beds, may have declined considerably. It may be important to protect areas that provide spat to recruit into and build the stocks back to historical levels.

33. FNZ considers action is required to respond to the observed declines in biomass and abundance of the SCA 1 and SCA CS stocks and to ensure the ongoing reproductive potential of these fisheries is maintained.

[1] *Chaetopterus sp*. builds large clumps of parchment-like tubes and renders dredging for scallops impossible (because the dredge fills with tubes and therefore cannot catch scallops).
[2] The current annual yield (CAY) is calculated yearly, and it incorporates fluctuations of scallop populations by applying a fixed reference level of fish mortality to the current fishable biomass. CAY provides a time varying estimate of the Maximum Sustainable Yield (MSY) but remains a constant proportion of the fish population.

4 About the stocks

4.1 Fishery characteristics

34. Scallops are considered a ‘shared’ species, highly valued by tangata whenua and all stakeholders, while also being an important part of the marine ecosystem. Worldwide, and in New Zealand, scallop populations are highly variable, with “boom and bust” cycles occurring in all main fisheries based on environmental conditions.

35. SCA 1 and SCA CS were impacted by the arrival of “black gill” and *Chaetopterus* tubeworm in the late 1990s and early 2000s. The impact of this event can be seen in catch history and biomass estimates. After a period of reduced fishing, both stocks recovered well in most areas with peaks in recruitment occurring in the years following.

36. All commercially caught scallops, and some recreational catch, are taken by dredges. Dredge fishing is known to have negative impacts on scallop growth, populations and the habitat that supports them. Sedimentation and land use impacts have also been identified as a significant cause of population decline, particularly in coastal areas.

37. Scallop fisheries are highly regulated, with catch limits and spatial, seasonal, and method restrictions in place. Generally, commercial fishers are prohibited from accessing key customary and recreational scallop beds across the SCA 1 and SCA CS QMAs.

38. Scallops are regularly taken under customary authorisations and are identified as a taonga species by the Te Hiku o te Ika, Mid-North, and Mai i ngā Kuri a Whārei ki Tihirau Iwi Fisheries Forums.

39. Scallops in SCA 1 and SCA CS are amongst the top three shellfish species harvested by recreational fishers. The most common method for recreational harvest is diving/hand gathering, however, there is also recreational dredging activity in the northern scallop fisheries, which can be concentrated in popular and easily accessible beds/areas.

40. The commercial scallop fishery supplies scallops to the domestic market and is responsible for most of the overall scallop catch. All northern commercial scallops are caught using ‘Victorian box dredges.’ Commercial fishers report that this dredge design suits the northern fishery conditions, which includes corrugated seabed environments.

41. In SCA 1, most of the commercial catch is landed from beds in Bream Bay, however, beds in Pakiri, Rangaunu Bay and Spirits Bay have been fished historically. Recreational catch is widespread, but popular areas with known high recreational activity include Whangarei Harbour and the Bay of Islands.

42. In SCA CS, six beds (Barrier, Colville, Hauraki Gulf, Mercury, Bay of Plenty, and Waiheke) are commercially fished. Like SCA 1, recreational scallop fishing is widespread in SCA CS with popular areas including beds in the Little Barrier, Kawau Bay, Inner Hauraki Gulf/Firth of Thames, eastern Coromandel, and Mercury Island areas.

4.2 Biology

43. Endemic to New Zealand, scallops (*P. novaezelandiae*), or kuakua/tipa, are suspension feeding bivalves found in a variety of coastal habitats across New Zealand – particularly in semi-enclosed areas where circulating currents are thought to retain larvae.

44. Scallops are functional hermaphrodites, meaning that they possess both male and female reproductive organs and can produce the associated eggs and sperm. They generally reach sexual maturity at approximately 70 mm shell length and usually mature by the end of their first year. Scallops, however, contribute little to the spawning pool until the end of their second year as year 1 scallops contain around 500,000 eggs each while year 4 and 5 scallops can contain over 40 million eggs each.

45. Scallops may spawn sporadically from August to February, but spawn prolifically over the summer months.

46. Like other broadcast spawners, high density beds and close proximity (to other scallops) are vital for successful fertilisation of the eggs that are released and ongoing recruitment.

47. Fertilisation is followed by a planktonic larval stage lasting about three weeks before attaching to substrate. Spat detach and begin the free-living stage of their life cycle when they reach around 5 mm.

48. Scallop populations are highly variable from one year to the next due to the variability in annual recruitment. This is a result of their high fecundity, variability in larval and adult mortality, as well as growth rates in adults. This variability in populations is more noticeable in areas of high fishing mortality and where fisheries are supported by one or two-year classes.

49. Scallop populations fluctuate naturally and are susceptible to environmental degradation. Potential stressors to scallops, other than fishing, include:

    - stressors resulting from human activity, such as nutrient enrichment and sediment loading.
    - environmental stressors, such as changes in salinity, pH levels, climate change, and temperature; and
    - biological stressors, such as harmful algal blooms and diseases/parasite events.

4.3 Management background

50. The SCA 1 fishery extends from Ahipara, on the west coast of the North Island, over to Leigh on the east coast (Figure 1). SCA 1 was introduced to the Quota Management System (QMS) in 1997 and a TAC of 75 tonnes was set. It was last reviewed in April 2020, with the TAC, TACC and other sources of mortality allowances being significantly reduced in response to available information suggesting a long-term decline in the abundance.

51. The SCA CS fishery extends south from Leigh to Maketu and encompasses the Hauraki Gulf and the Western Bay of Plenty (Figure 1). SCA CS was introduced to the QMS in 2002 and an initial TAC of 48 tonnes was set. Catch limits and allowances have fluctuated over time based on available information. The stock was last reviewed in 2016, with the TAC reduced from 131 tonnes (set in 2013) to 81 tonnes.

52. Catch limits, allowances and reported catches are described using meatweight, which is the calculated weight of the scallop after the shell, gut and gill is removed. To determine meatweight, the unprocessed weight (greenweight) is divided by 8.0, the Gazetted conversion factor.

53. The Coromandel Scallop Fishers Association (CSFA) in SCA CS currently manages the commercial fishery at fine scale with a voluntary Catch Per Unit Effort (CPUE) approach. This additional management approach operates within the limits of the TACC and has rules that are intended to protect individual scallop beds within the wider QMA from overfishing. While this fine scale voluntary management approach is likely to distribute fishing activity across the available beds and prevent concentration of fishing in certain areas, it is not known if the current rules are effective at maintaining sustainable stock levels.

54. The TAC for SCA 1 and SCA CS can be varied under section 13 of the Act. Section 13(2A) of the Act specifies requirements for setting a TAC where, as is the case for SCA 1 and SCA CS, the current level of the stock or the level of the stock that can produce the maximum sustainable yield (MSY) is not able to be estimated reliably using the best available information. In such cases, the Minister must set a TAC using the best available information, and that is not inconsistent with the objective of maintaining the stock at or above, or moving the stock towards or above, a level that can produce MSY.

55. In these fisheries, there is also the ability to increase the TAC within a fishing year based upon information about abundance during the year. SCA 1 and SCA CS are included on Schedule 2 of the Act, which lists stocks whose abundance is variable and allows for an in-season management adjustment approach. Such increases apply only for that fishing year. This paper considers the 'baseline' TAC and does not relate to an in-season increase.

56. For more information about the QMS go to https://www.mpi.govt.nz/law-and-policy/legal-overviews/fisheries/quota-management-system/.

5 Status of the stocks

5.1 Northern North Island scallop surveys

57. In 2021, FNZ commissioned the National Institute of Water and Atmospheric Research (NIWA) to conduct comprehensive surveys of all major commercial and recreational non-commercial scallop beds. The surveys included the major beds within SCA 1 and SCA CS outlined in Table 2. Maps displaying these survey areas are available in the Appendix (Figures A1 and A2).

58. The survey sites are consistent with those from previous surveys, allowing comparison with historical results.

59. While the sites do not cover all areas in SCA 1 and SCA CS where scallops are present, the sample sites are designed to give an overall estimate of abundance at a stock level.

60. The objectives of the surveys in SCA 1 and SCA CS were to determine the distribution, abundance, and biomass of scallops and the dredge efficiency of commercial scallop harvesting.

61. The results of the surveys were reviewed by the FNZ Shellfish Working Group in July. Additional time series and updated dredge efficiency data were presented in October. SCA 1 and SCA CS survey time series for individual scallop beds can be found in the Appendix.

Table 2: 2021 survey sites in the Northland (SCA 1) and Coromandel (SCA CS) scallop fisheries.

Stock	Commercial	Non-commercial
SCA 1	Bream Bay	Bay of Islands – Rawhiti
	Pakiri	Bay of Islands – Urupukapuka
	Rangaunu Bay	Whangarei – Smugglers Bay
	Spirits Bay	Whangarei – Urquharts
SCA CS	Barrier	Kawau – Bostaquet Bay
	Colville	Iris Shoal
	Hauraki Gulf	Mercury – Mercury Cove
	Mercury	Mercury – Opito Bay
	Plenty	
	Waiheke	

5.2 Survey results

62. The survey results show that in many areas the biomass is substantially lower than in the previous surveys (Table 3).

63. Overall, the biomass has declined and remains close to lowest recorded levels. The reasons for the low biomass levels are not currently known and could be a result of both fishing and non-fishing related stressors.

64. The final results of the survey are currently in the process of being published and will be released as a publicly available Fisheries Assessment Report in early 2022.

Table 3: Comparison of 2021 and previous median biomass estimates (meatweight tonnes) in commercially fished scallop beds in Northland (SCA 1) and Coromandel (SCA CS) using historical dredge efficiency.

Stock	Location	Biomass 2007	Biomass 2012	Biomass 2021
Northland (SCA 1)	Bream Bay	69		28
	Pakiri	5		7
	Rangaunu Bay	122		28
	Spirits Bay	41		1
	Total	*237*		*64*
Coromandel (SCA CS)	Barrier		59	31
	Colville		20	9
	Hauraki Gulf		1,005	52
	Mercury		220	96
	Plenty		72	49
	Waiheke		21	9
	Total		*1,397*	*249*

Northland (SCA 1) core commercially fished locations

65. The information provided in this section is only for Spirits-Tom Bowling Bay, Rangaunu Bay and Bream Bay, which are the three core commercially fished locations. Graphs for the other locations are shown in the Appendix (Figures A3 and A4).

66. The time series of absolute and commercially fishable recruited scallop biomass between 1990 and 2021 are shown in Figure 3. Note that the time series differ depending on the critical densities used to estimate the biomass.

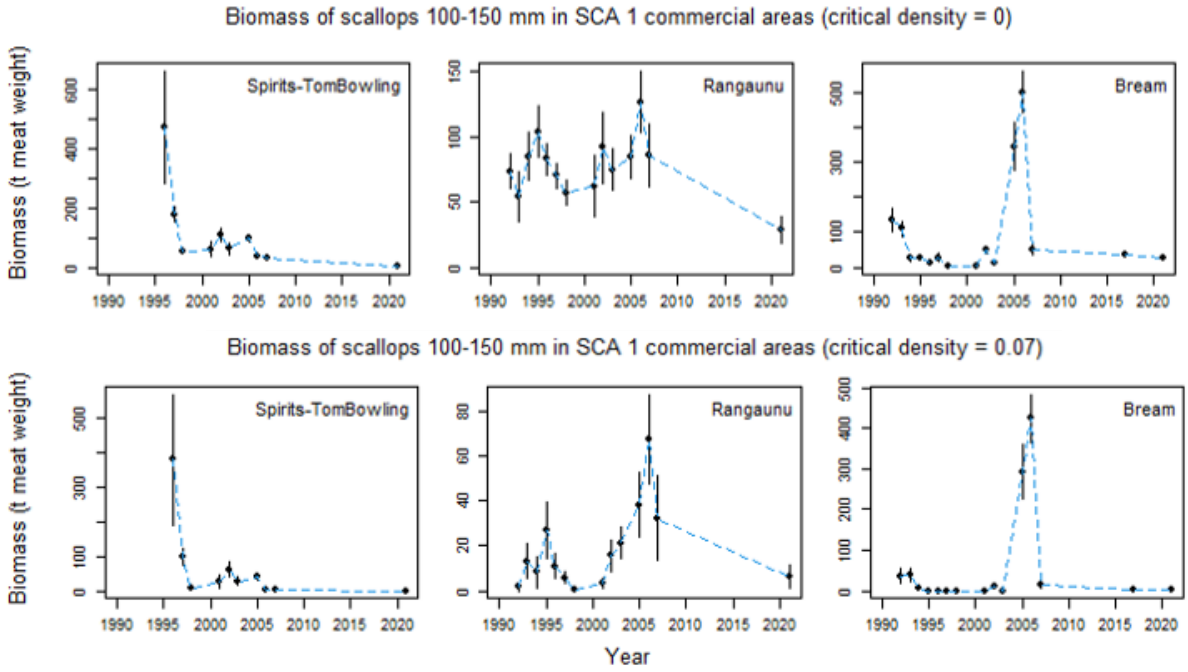

Figure 3: Time series of absolute (top) and commercially fishable (bottom) recruited scallop biomass between 1990 and 2021 in core commercially fished scallop locations.

67. Scallop biomass across the three locations has declined since the last survey and is at levels that are either similar to, or lower than, historical lows.

68. SCA 1 trends in recruitment (juvenile and pre-recruit densities) by location in commercial areas are shown in Figure 4. Note that the time series differ depending on the scallop sizes. Recruitment gives an indication of the number of small scallops entering the fishery over the next few years.

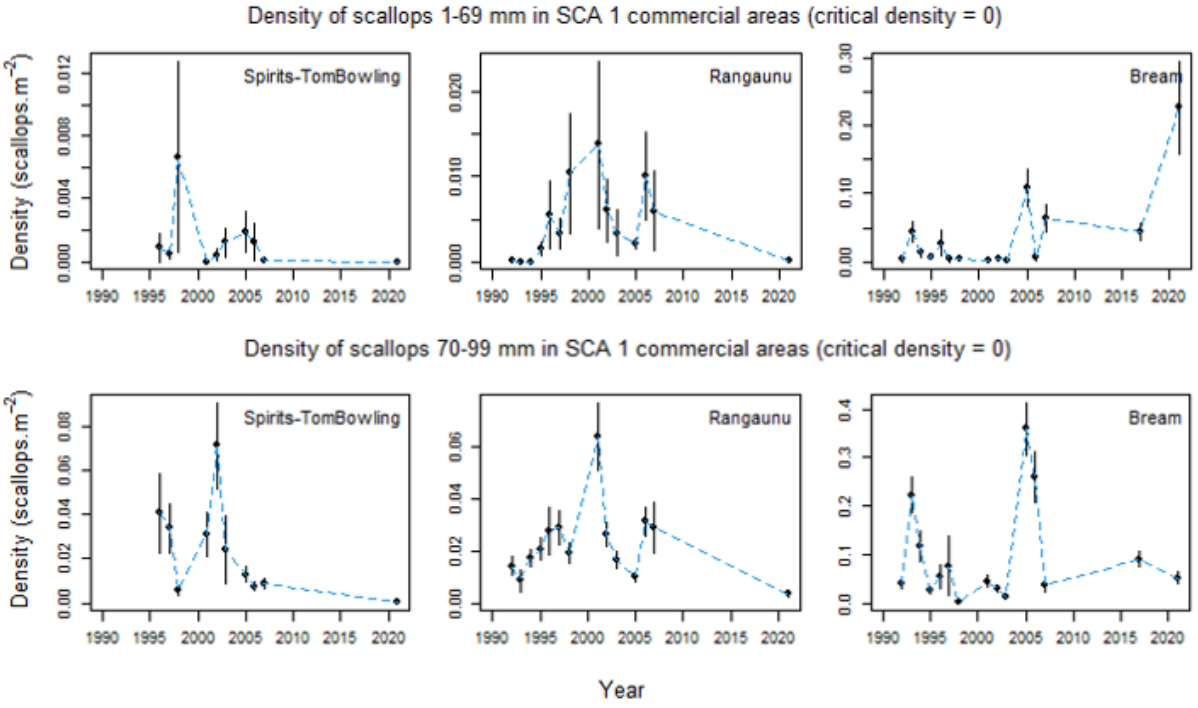

Figure 4: Time series of juvenile (top) and pre-recruit (bottom) scallop density between 1990 and 2021 in core commercially fished scallop locations.

69. Juvenile recruitment in 2021 is notably high at Bream Bay. Pre-recruit density in Bream Bay in 2021 is very low compared to the mid-2000s peak but remains higher than most other years. Recruitment for both juvenile and pre-recruits is very low at Rangaunu and Spirits–Tom Bowling bays.

Coromandel (SCA CS) core commercially fished locations

70. The information provided in this section is only for Mercury, Little Barrier, Colville, and Waiheke, which are the four core commercially fished locations. Graphs for the other locations are shown in the Appendix (Figures A5 and A6).

71. The time series of absolute and commercially fishable recruited scallop biomass between 1990 and 2021 are shown in Figure 5. Note that the time series differ depending on the critical densities used to estimate the biomass.

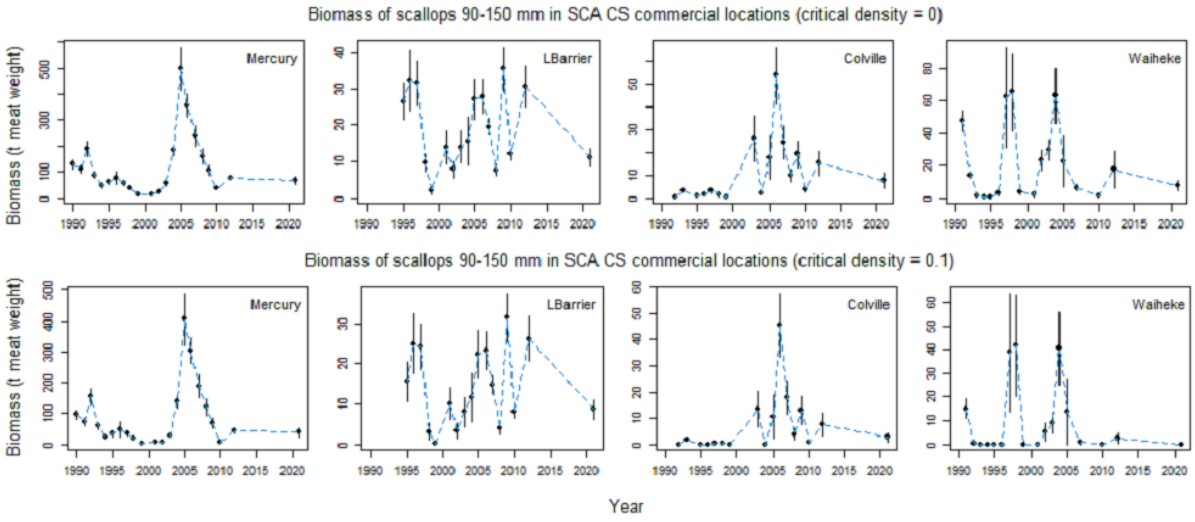

Figure 5: Time series of absolute (top) and commercially fishable (bottom) recruited scallop biomass between 1990 and 2021 in core commercially fished scallop locations.

72. Scallop biomass across the four locations has declined since the last survey and is at levels that are either similar to, or lower than, historical lows.

73. SCA CS trends in recruitment (juvenile and pre-recruit densities) by location in commercial areas are shown in Figure 6. Note that the time series differ depending on the scallop sizes. Recruitment gives an indication of the number of small scallops entering the fishery over the next few years.

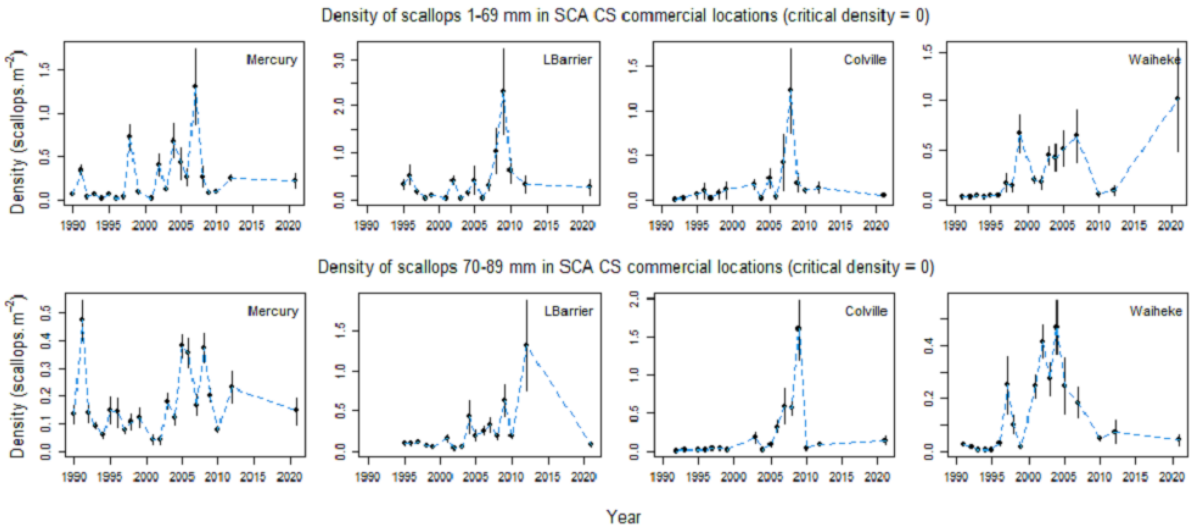

Figure 6: Time series of juvenile (top) and pre-recruit (bottom) scallop density between 1990 and 2021 in core commercially fished scallop locations.

74. Juvenile recruitment in 2021 is notably high at Waiheke. Pre-recruit density in Waiheke in 2021 is very low compared to the mid-2000s peak. Recruitment for both juvenile and pre-recruits has decreased since the last survey at Mercury and Little Barrier. In Colville, juvenile recruitment has decreased too, but has increased in pre-recruits.

Northland (SCA 1) core non-commercially fished locations

75. The information provided in this section is only for the Bay of Islands and Whangarei, which are the two core non-commercially fished locations in SCA 1. Graphs for the other locations are shown in the Appendix (Figure A7).

76. The time series of juvenile, pre-recruit and recruited scallop biomass between 1990 and 2021 can be found in Figure 7. Note that the time series differ depending on the scallop sizes.

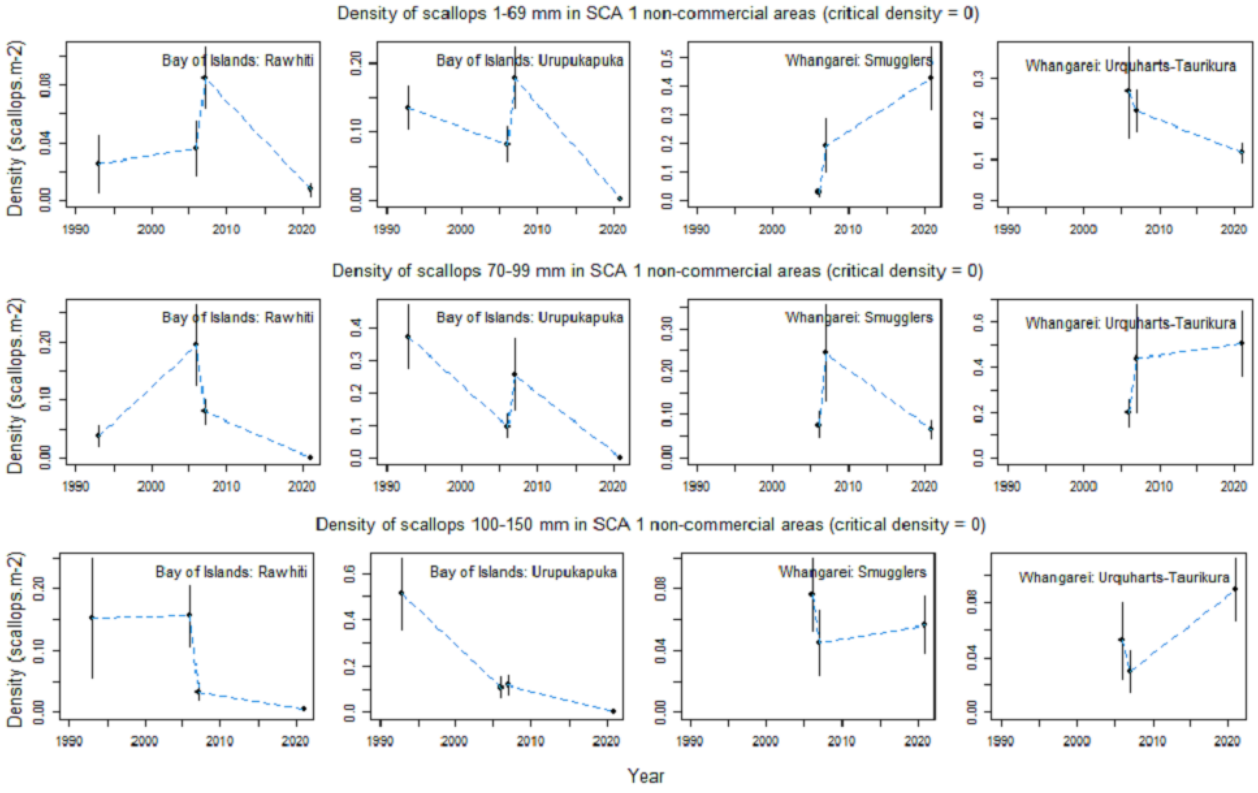

Figure 7: Time series of juvenile (top), pre-recruit (centre), and recruited (bottom) scallop density between 1990 and 2021 in core non-commercially fished scallop locations.

77. Juvenile, pre-recruit, and recruited scallop densities across the 2 beds in the Bay of Islands have declined since the last survey and are at levels that are below historical lows.

78. Smugglers in Whangarei has displayed an increase in juvenile and recruited scallop densities but a decline in pre-recruits. The juvenile scallop density in Urquharts-Taurikura has displayed a decline while pre-recruit and recruited scallop densities in this bed has increased.

Coromandel (SCA CS) core non-commercially fished locations

79. The information provided in this section is only for Kawau and Mercury, which are the 2 core non-commercially fished locations in SCA CS. Graphs for the other locations are shown in the Appendix (Figure A8).

80. The time series of juvenile, pre-recruit and recruited scallop biomass between 1990 and 2021 can be found in Figure 8. Note that the time series differ depending on the scallop sizes.

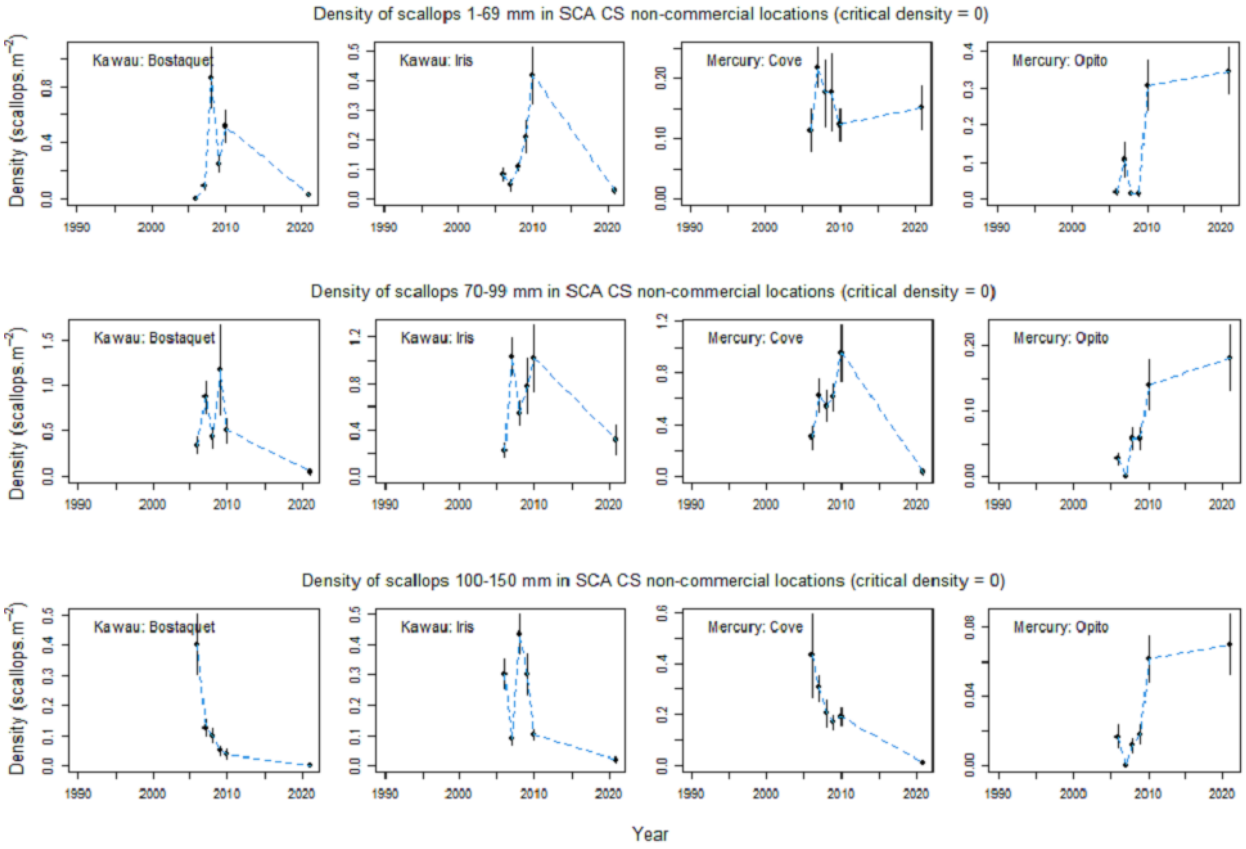

Figure 8: Time series of juvenile (top), pre-recruit (centre), and recruited (bottom) scallop density between 1990 and 2021 in core non-commercially fished scallop locations.

81. Juvenile, pre-recruit, and recruited scallop densities across the 2 beds in Kawau have declined since the last survey and are at levels that are similar to, or lower than, historical lows.

82. Juvenile scallop densities in the beds in Mercury have both increased since the last survey. While pre-recruit and recruited densities have increased in Opito, they have declined in Mercury Cove to a new low.

6 Catch information and current settings within the TAC

6.1 Commercial

Northland (SCA 1)

83. SCA 1 has historically supported a regionally important commercial fishery. There is a commercial fishing season in SCA 1, with fishing restricted to the period 15 July to 14 February each year. The regulated minimum legal size (MLS) for commercial scallops in SCA 1 is 100 millimetres in shell length. Harvested scallops must remain unshelled until they are delivered either to the first point of sale or a processing factory.

84. Landings have varied between 200 tonnes to 10 tonnes (meatweight) between 1980–81 and 2009–10. There was a gradual decline in landings, from 68 tonnes (meatweight) in 2005–06 to only 1 and 2 tonnes in 2010–11 and 2011–12, respectively. In 2012–13, harvesting had virtually

ceased and 86 kilograms and 2 tonnes of meatweight were landed in 2013–14 and 2014–15, respectively. Significant fishing occurred again in Bream Bay in 2015-16, with 16 tonnes (meatweight) landed. Since 2016-17, landings have fluctuated between 5 and 8 tonnes (meatweight).

85. Figure 9 displays the historical commercial landings and catch limits for the SCA 1 fishery.

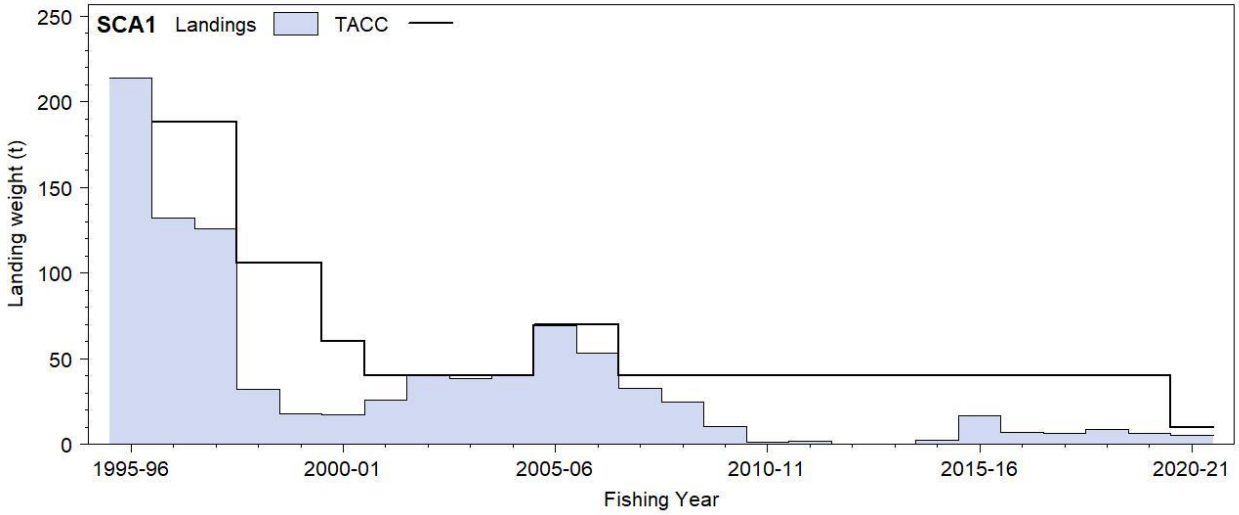

Figure 9: Landings and catch limits for SCA 1 (Northland) since 1995–96. TACC refers to the base TACC and any in season increase in Annual Catch Entitlement (ACE) and 'Weight' refers to meatweight.

Coromandel (SCA CS)

86. Commercial fishing in SCA CS also operates to a restricted season, which runs from 15 July to 21 December each year with commercial fishers operating five days a week during the season. A lower MLS of 90 millimetres in shell length applies in SCA CS[3]. Further to the legislated requirements, commercial fishers in SCA CS operate as a collective and employ additional voluntary measures around scallop harvesting.

87. From 1992, up to and including the 2012 fishing year, the base SCA CS TACC was set at 22 tonnes, before being increased to 100 tonnes in 2013. Information that formed the basis for the TACC decision included the discovery of a significant bed of scallops in 2011 (Hauraki bed), which was surveyed as part of the SCA CS biomass survey in 2012. In 2016, the TACC was reduced to 50 tonnes. Commercial fishers had not fished the new scallop bed since 2013 and reported that it was no longer there (this was supported by fine-scale fishing data).

88. The causes that contributed to the disappearance of the Hauraki bed are not known. The bed contributed to the fishery in 2011-12 and 2012-13. The 2012 survey of the Hauraki bed estimated that it contained 984 tonnes (meatweight), with large numbers of scallops greater than 90mm. Commercial landings for 2011-12 and 2012-13 were 50 tonnes and 73 tonnes respectively. It is likely that the bed contained large numbers of older scallops in a few year classes. Beds with few year classes are known to be highly variable and there are international examples of such beds experiencing natural die off events. It is likely that the fishing activity in

[3] In 1995 the MLS for SCA CS was changed from 100mm to 90mm as part of a management plan comprising a wide variety of effort controls including dredge size, fishing hours, or non-fishing days). The smaller MLS is intended to reduce the dredge tows required to catch the TACC and thereby reduce incidental mortality.

2011-12 and 2012-13 would have had some impact on this bed, however, given the low level of catch relative to the estimated overall abundance, the extent of these impacts is not well understood.

89. From 2017 onwards, landings have decreased with an estimated 13 tonnes (meatweight) landed in 2019-2020. Most landings in this fishery are reported to be from beds around Little Barrier and Mercury Islands. Figure 10 displays the historical commercial landings and catch limits for the SCA CS fishery.

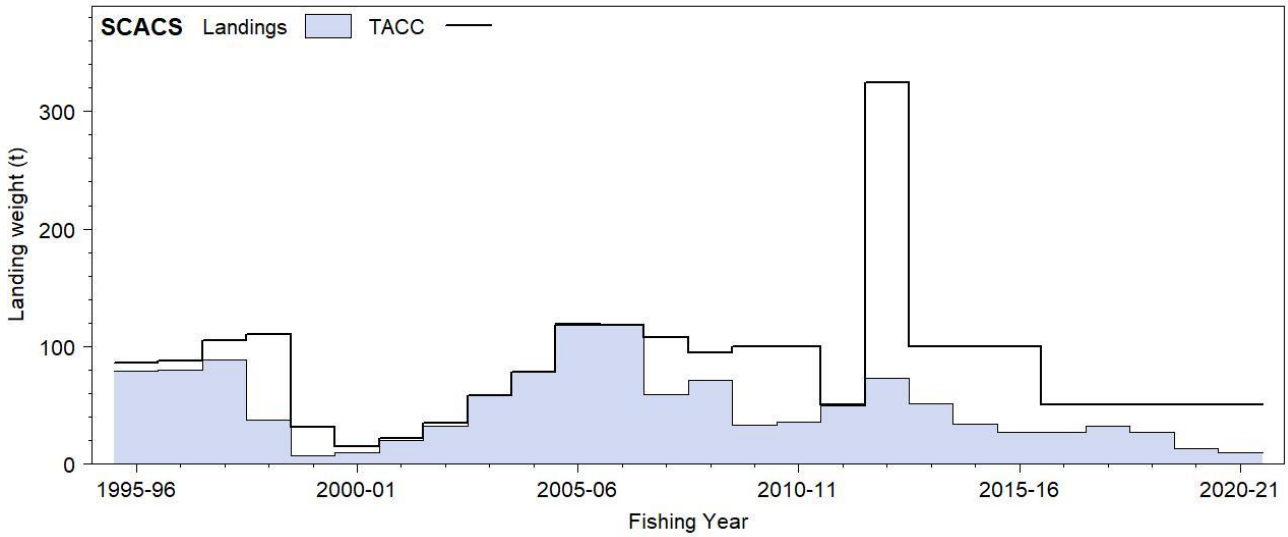

Figure 10: Landings and catch limits for SCA CS (Coromandel) from 1995–98 to 2020–21. TACC refers to catch limit, and weight refers to meatweight.

6.2 Customary Māori

90. Scallops are an important traditional food for Māori and continue to be gathered under provisions for customary fishing.

91. While scallops are a common species for which customary authorisations are issued, there is limited quantitative information available on the level of customary take of scallops from both SCA 1 and SCA CS. It is likely that Māori customary fishers also utilise the provisions under recreational fishing regulations.

92. FNZ has been informed by tangata whenua throughout the SCA 1 and SCA CS QMAs that in order to protect local scallop populations, the issuing of customary authorisations has declined or in some cases ceased as the abundance of scallops has declined.

93. Significant parts of the SCA 1 and SCA CS QMAs are not currently covered under the Fisheries (Kaimoana Customary Fishing) Regulations 1998. Customary fishing authorisations in some parts of the SCA 1 and SCA CS, if issued, would be under the Fisheries (Amateur Fishing) Regulations 2013, where there is no requirement to report on catch. As such customary harvest records held by FNZ are likely to be incomplete.

6.3 Recreational

94. There is significant recreational interest in scallops in suitable areas throughout SCA 1 and SCA CS. These areas are mostly in enclosed bays and harbours. Many of these areas are set aside as non-commercial areas.

95. Harvesting of scallops was reported from larger boats/launches, off land and, most commonly, by trailer boats, from which an estimated 66% of scallops were taken nationally in 2017/18.

96. The best available information on current recreational catch is from the 2017/18 National Panel Survey of Marine Recreational Fishers (NPS), which provides a snapshot of the level of recreational take in that fishing year. Scallops were reported to be harvested using dredging and/or by hand gathering from either the shore or while diving. The 2017/18 NPS estimated 468,843 scallops were harvested for that year across all scallop areas in New Zealand by hand gathering while diving, the popular method of choice.

97. A total estimated weight of 62 tonnes (green weight) of scallops was harvested for the 2017-2018 fishing year. Of the overall national scallop take, 93% came from within Fisheries Management Area 1 (FMA 1), which includes the main scallop beds in SCA 1 and SCA CS. Within FMA 1 approximately 60% of recreational scallop catch is taken from SCA CS with the remaining catch coming from SCA 1. In both areas the predominant fishing method is hand-gathering. The NPS reported 20 and 37 tonnes from SCA 1 and SCA CS, respectively.

6.4 Fishing restrictions

98. Over and above the catch limits and allowances set under the TAC, there are several management controls currently in place for both SCA 1 and SCA CS. These include fishing seasons (for both commercial and recreational fishers), an MLS in place for commercial and recreational fishers and a maximum daily bag limit for recreational take (Table 4). There are also spatial restrictions that prevent commercial fishing in certain recreational and customary areas - these are shown in the Appendix (Figures A9 and A10).

Table 4: Recreational and commercial restrictions for Northland and Coromandel scallop (SCA 1 & SCA CS) fisheries.

Recreational	
SCA 1 & SCA CS	• The recreational fishing season runs from 1 September – 31 March. • MLS of 100 millimetres in shell length. • Daily bag limit is 20 scallops per person. • Divers operating from a vessel can take scallops for up to two nominated safety people on board the vessel, in addition to daily catch limits for the divers. • Scallops must be brought ashore in a measurable state (i.e., not shucked). An exception applies for scallops consumed immediately on board a vessel.
Commercial	
SCA 1	• The commercial fishing season in SCA 1 runs from 15 July to 14 February each year. • There are significant spatial restrictions for commercial scallop fishers in SCA 1, with some areas that are closed to all forms of fishing. • The regulated MLS for commercial scallops in SCA 1 is 100 millimetres in shell length. • No commercial fisher fishing for scallops is permitted to use more than 1 dredge with a bar or bit that is more than 2.5 m long *or* more than 2 dredges, either of which has a bar or bit that is more than 1.4 m long. • No commercial fisher may take scallops from SCA 1 unless the fisher holds, at the time of the taking, a minimum 3 tonnes of annual catch entitlement.
SCA CS	• The commercial fishing season in SCA CS runs from 15 July – 21 December with commercial fishers operating on weekdays only during the season. • There are significant spatial restrictions for commercial scallop fishers. • No commercial fisher is permitted to dredge for scallops from the SCA CS fishery between sunset and sunrise. • The regulated commercial MLS of scallops in SCA CS is 90 millimetres in shell length. Scallops must remain unshelled until they are delivered either to the first point of sale after being taken or to a processing factory. • No commercial fisher fishing for scallops is permitted to use more than 1 dredge with a bar or bit that is more than 2.5 m long *or* more than 2 dredges, either of which has a bar or bit that is more than 1.4 m long.

6.5 Other sources of mortality caused by fishing

99. The Minister must set an allowance within the TAC for all other mortality caused by fishing. This allowance is intended to provide for unrecorded mortality of fish associated with fishing activity, including incidental mortality from fishing methods, or illegal fishing.

100. Incidental damage to uncaught or undersize scallops can occur during commercial dredging.

101. The box dredges used in the SCA 1 and SCA CS commercial fisheries have been found to be more efficient in the sandy conditions prevalent in the northern region than the ring-bag dredges used elsewhere in New Zealand. However, scallops encountered by box dredges have shown modest reductions in growth rate, compared with scallops collected by divers, and quite high mortality at about 20–30% mortality, this could potentially be as high as 50%, for scallops that are returned to the water. Experiments and modelling suggest that dredging also reduces habitat diversity and increases juvenile mortality.

102. Other sources of fishing-related mortality are also likely to occur from recreational dredging and the illegal take or 'poaching' of scallops. FNZ does not have reliable estimates of these other sources of fishing related mortality.

103. All proposed options in this document will lead to reduction in commercial effort, harvest, and associated mortality.

7 Treaty of Waitangi obligations

104. Input and participation into the sustainability decision-making process is provided through Iwi Fisheries Forums, which have been established for that purpose. Each Iwi Fisheries Forum can develop an Iwi Fisheries Forum Plan that describes how the iwi in the Forum exercise kaitiakitanga over the fisheries of importance to them, and their objectives for the management of their interest in fisheries. Particular regard must be given to kaitiakitanga when making sustainability decisions.

105. To facilitate input and participation, Fisheries NZ engaged with tangata whenua at Iwi Fisheries Forums on preliminary survey results and the proposed options. The results of the scallop surveys and the proposed management options, including the potential for a full closure of SCA 1 and SCA CS, has been discussed with the Te Hiku o te Ika, Mid-North and Mai i ngā Kuri a Whārei ki Tihirau forums.

106. Members of the Te Hiku o te Ika, Mid-North and Mai i ngā Kuri a Whārei ki Tihirau forums acknowledged the poor state of Northern scallop fisheries and expressed support for changes to management measures in SCA 1 and SCA CS. Some forum members are considering traditional rāhui as an interim measure before any sustainability decisions are made.

7.1 Kaitiakitanga

107. SCA 1 and SCA CS cover the rohe of Te Hiku o Te Ika, Mid-North, and Mai i Ngā Kuri a Wharei ki Tihirau Iwi Fisheries Forums, all of which identify scallops as a taonga species in their respective Iwi Forum Fisheries Plans.

108. FNZ considers that the proposed management options are in keeping with the objectives of the Iwi Fisheries Forum Plans which generally relate to active engagement with iwi and the maintenance of healthy and sustainable fisheries but seeks further input from iwi to help inform final advice on this review of the Northland and Coromandel stocks.

109. There are ten customary fisheries management areas within SCA 1 and SCA CS. These include two mātaitai reserves, two taiāpure and five temporary closures implemented under section 186A of the Act (Table 5). While many of the customary fisheries management areas may contain scallops in low abundance and density, only the Eastern Coromandel s186A closure area is known to support scallops in abundance high enough to support any level of sustained utilisation.

110. Tangata kaitiaki of the Te Renga Paraoa (Whangarei Harbour) Rohe Moana have indicated concerns regarding the state of scallop beds within the Whangarei Harbour area and have requested FNZ implement a closure to allow recovery of the stocks. The use of customary fisheries management tools has also been considered for scallop beds within their rohe. There are concerns that the abundance of scallops has declined in traditional fishing areas, which is supported by reports from MPI Compliance Officers who have interacted with scallop gatherers in the area.

Table 5: Customary fisheries management areas in SCA 1 and SCA CS.

QMA	Customary Area	Management Type
SCA 1	Waikare Inlet Taiāpure	**Taiāpure** All types of fishing are permitted within a Taiāpure. The management committee can recommend regulations for commercial, recreational, and customary fishing
SCA CS	Maketu Taiāpure	
SCA 1	Maunganui Bay Temporary Closure	**S186A Temporary Closures** Section 186A temporary closures are used to restrict or prohibit fishing of any species of fish, aquatic life or seaweed or the use of any fishing method
	Marsden Bank and Mair Bank Temporary Closure	
SCA CS	Umupuia Beach Temporary Closure	
	Te Mata and Waipatukahu Temporary Closure	
	East Coromandel Temporary Closure	
	Waiheke Island	
SCA 1	Te Puna Mātaitai	**Mātaitai Reserve** Commercial fishing is not permitted within mātaitai reserves unless regulations state otherwise.
SCA CS	Te Maunga o Mauoa Mātaitai	

7.2 s186A Closure of eastern Coromandel coast

111. In February 2021, the Ngāti Hei Trust requested a 2-year temporary closure of the scallop fishery over waters of the east Coromandel coast. This request followed a customary rāhui placed over Opito Bay area in September 2021. This application extended to the waters of the east Coromandel from Anarake Point to Ruahiwihiwi Point, as well as encompassing offshore waters around the Cuvier, Great Mercury, and Aldermen Islands.

112. Public consultation on the application for the temporary closure occurred between April and May 2021 with input sought from tangata whenua, commercial and recreational fishers, and other interested parties. A total of 2,381 submissions were received, the majority of which were in favour of the closure.

113. The closure to scallop harvesting was approved by the Minister for Oceans and Fisheries for a period of two years, pursuant to section 186A of the Act. This closure came into effect on 11 September 2021 and is being monitored by FNZ and MPI Fisheries compliance.

114. This closure restricts access to the Mercury Island and surrounding scallop beds. This area has historically contributed approximately 50 percent of the SCA CS commercial fishery. As a result, there is likely to be some displacement of commercial and recreational scallop fishing activity.

7.3 s186A Closure Waiheke

115. In January 2021, Ngāti Pāoa requested a temporary closure to the harvest of scallops, mussels, rock lobster, and pāua from Waiheke Island. This request preceded a customary rāhui placed over Oneroa Beach area in the same month. The 186A application included the area from the foreshore to 1 nautical mile offshore.

116. Public consultation on the application for the temporary closure occurred between April and May 2021 with input sought from tangata whenua, commercial and recreational fishers, and other interested parties.

117. Commercial scallop fishing is prohibited in most areas around Waiheke Island (see Figure A10 in the Appendix).The closure is unlikely to have a displacement effect on commercial fishing.

8 Current and proposed settings within the TAC and proposed management measures

8.1 Current settings

Table 6. Current settings for the Northland (SCA 1) and Coromandel (SCA CS) scallop fisheries.

Northland Scallops (SCA 1)				
TAC: 30 (t)	**TACC:** 10 (t)	**Customary**: 7.5	**Recreational**: 7.5	**Other mortality**: 5
Coromandel Scallops (SCA CS)				
TAC: 81 (t)	**TACC:** 50 (t)	**Customary**: 10	**Recreational**: 10	**Other mortality**: 11

118. Given the information available on the state of the fisheries, FNZ is not proposing the status quo (Table 6) as an option for the management review of SCA 1 and SCA CS stocks.

119. All options proposed in this paper respond to the reduction in biomass and abundance compared to previous surveys and historical biomass levels in SCA 1 and SCA CS.

120. A range of responses are proposed as a short-medium term solution while an improved long-term management approach is developed. FNZ recognises that some limited harvest of scallops is likely to be sustainable (Options 2 and 3), however, also acknowledges that a full closure (Option 1) would provide the maximum opportunity for recovery to a level where utilisation could again be sustained.

121. Options 2 and 3 provide scenarios where some level of ongoing harvest would be permitted and uses differing mechanisms to achieve the sustainability outcome of rebuilding the SCA CS and SCA 1 stocks. A combination of spatial and method restrictions under section 11 of the Act and changes to management settings under section 13 of the Act are proposed. FNZ seeks views on, if some level ongoing access is provided for, what approach, or combination of approaches best achieves this, while ensuring a rebuild of the stocks.

8.2 Option 1

122. Option 1 proposes a full closure to the commercial and recreational harvest of scallops in the SCA 1 and SCA CS fisheries as a sustainability measure under section 11 of the Act. This will protect scallop beds from the direct and indirect impacts of fishing activity.

123. It is proposed the closure is implemented for an indefinite time period; however, it is anticipated that FNZ will seek new information on the abundance and biomass of scallops in SCA 1 and SCA CS within 3 years. If new information indicates that the stocks have recovered, FNZ will review whether the closure is still required. The future management approach to the utilisation of scallops within SCA 1 and SCA CS will also be considered during the closure period to

ensure any reopening of the fishery could occur in a manner that will ensure the ongoing sustainability of the stocks.

124. This option carries the least sustainability risk and is the most cautious response. It addresses the impacts of fishing affecting the scallop fisheries and will allow for scallop populations and their environments to remain undisturbed for the closure period.

125. It is acknowledged that Option 1 will impact all fishers in SCA 1 and SCA CS significantly. The most significant impact will be the complete exclusion of the commercial fishing and associated industries, which are currently built around the SCA 1 and SCA CS fisheries. However, based on the best available information from the recent survey results, FNZ considers that this option would provide the maximum opportunity for recovery of the fishery.

126. A closure under section 11 of the Act would not extend to customary fishing authorised under section 50 of the Fisheries (Amateur Fishing) Regulations 2013 (fish, aquatic life, or seaweed taken under authorisation for hui or tangi). It would also still allow for tangata kaitiaki/tiaki to authorise the taking of fisheries resources under regulation 11 of the Fisheries (Kaimoana Customary Fishing) Regulations 1998 (power to authorise the taking of fisheries resources for customary food gathering).

127. Under Option 1 it is proposed no change is made to the TAC, TACC, and allowances as access to the fishery will be prohibited through the s11 closure. FNZ will continue to monitor the fishery and, if new information indicates fishing can occur sustainably, the management measures and TAC settings will be reviewed prior to re-opening the fishery.

8.3 Option 2

128. Option 2 seeks to deliver a recovery of the overall SCA 1 and SCA CS stocks while recognising that in certain areas within the QMAs, there are beds with the potential to sustain some level of ongoing utilisation. These areas have been identified based on results of the recent surveys.

129. Under Option 2, in SCA 1 and SCA CS, the TAC, allowances and TACC would be reduced to reflect the status of the stocks and the reduction in available fishing areas. Spatial closures under s11 of the Act would be applied to the majority of SCA 1 and SCA CS to restrict commercial and recreational harvesting, except for within the defined open areas. These are discussed below. Like Option 1, the closures are proposed to be for an indefinite period, with further information sought within 3 years.

Northland (SCA 1)

130. Under Option 2, SCA 1 will be closed to scallop fishing in all areas except for recreational take, by hand gathering/diving, at Smugglers Bay and Urquharts Bay at the entrance of Whangarei Harbour. Commercial fishing is already prohibited in these areas. The proposed permitted fishing areas are shown in Figure 11. The areas include the survey sites from the 2021 NIWA scallop survey. The survey showed that scallop abundance in these areas is at levels that could sustain some ongoing harvest.

131. Under Option 2 recreational dredging will be prohibited in SCA 1 under a s11 sustainability measure. This will protect juvenile scallops from the impacts of dredging in the areas where scallop harvest can continue.

132. The TAC for SCA 1 would be reduced from 30 tonnes to 9.5 tonnes. Within the TAC, the recreational allowance would be reduced from 7.5 tonnes to 1 tonne to reflect the reduced available fishing area. As with Option 1, the closures under s11 would not restrict fishing under

customary authorisation, and as such the current customary allowance would remain unchanged. The allowance for all other sources of mortality caused by fishing would be reduced from 5 to 1 tonne. FNZ considers the levels of harvest provided for under this option are sustainable, while still supporting a recovery of the overall stocks.

133. FNZ recognises that this option may result in a concentration of recreational fishing effort at Smugglers Bay and Urquharts Bay. Both scallop beds are within the Te Renga Paraoa (Whangarei Harbour) Rohe Moana. FNZ is aware that tangata whenua have concerns that fishing on these beds in their current state is unsustainable. Tangata whenua have also considered a s186A temporary closure on the taking of scallops from their rohe. This option will not address the concerns of tangata whenua entirely, however several scallop beds within the harbour will be closed, including Takahiwai, Marsden Bay, and Snake Bank.

134. FNZ will monitor the beds as part of future management. The beds have been persistent over several years and are well known to recreational fishers. The proposed ban on recreational dredging will reduce impacts on scallop habitat in this area and better protect juvenile scallops recruiting into the beds. The removal of commercial take and the associated lack of dredging activity in surrounding areas is also expected to provide increased resilience and sustainability of these areas. Existing recreational controls including the size limit, bag limit and closed season will continue to constrain overall level of recreational harvest.

135. The TACC under Option 2 would be changed from 10 tonnes to 0 tonnes. This reflects the information that the biomass of scallops in commercial beds is at levels that will not support sustainable harvest. This option will protect the fishery so it can rebuild to levels that support future commercial fishing. The absence of commercial take and associated lack of dredging impacts on the core beds is expected to increase the speed of both localised and overall recovery.

136. This option will prevent commercial fishers from utilising the fishery and will prevent their ability to continue to operate while the proposed measures are in place. FNZ considers that these measures will help achieve a return to a long-term sustainable fishery that can support ongoing commercial scallop harvest in the future. As with Option 1, any reopening of the SCA 1 commercial fishery would be considered alongside improvements that may need to be made in terms of the management approach to future harvest.

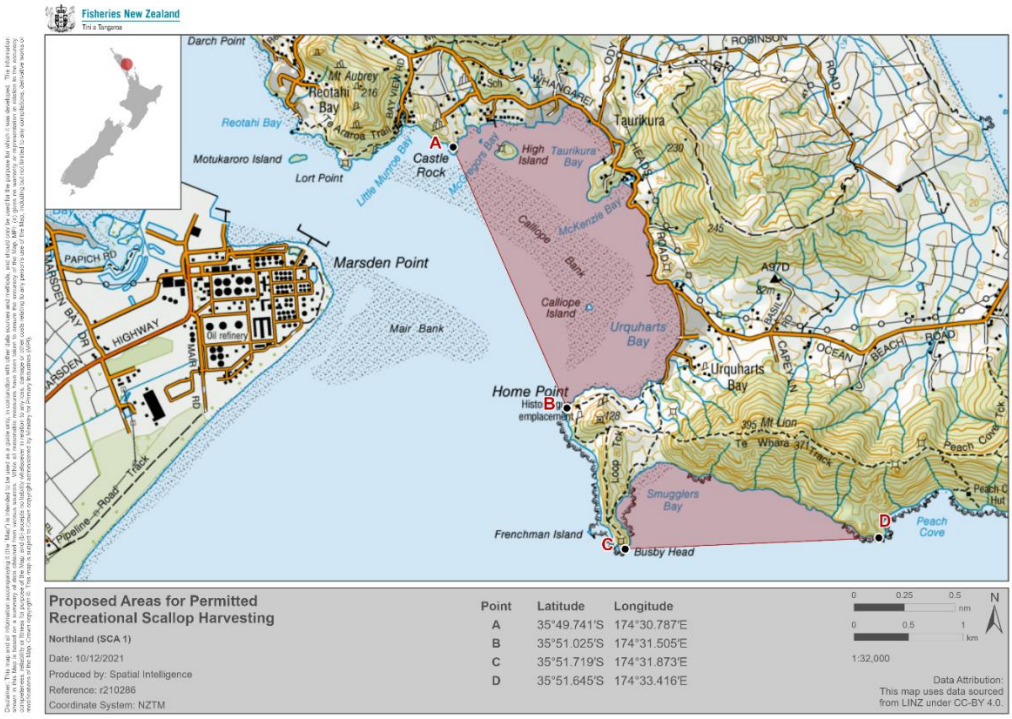

Figure 11: Areas outlining Smugglers Bay and Urquharts Bay in the Northland (SCA 1) fishery where recreational scallop fishing will be permitted under a partial closure. Note: Commercial scallop fishing is already prohibited in this area.

Coromandel (SCA CS)

137. Under Option 2, SCA CS will be closed to scallop fishing in all areas except Little Barrier and Colville Channel, where both commercial and recreational take would be permitted. As there is not currently a viable alternative to dredging for commercial scallop fisheries, dredging (both commercial and recreational) would be permitted to continue in these areas.

138. The proposed permitted fishing areas are shown in Figure 12. The areas include the survey sites from the 2021 NIWA scallop survey. The survey showed that scallop abundance in these areas is at levels that could sustain some ongoing harvest.

139. The TAC for SCA CS would be reduced from 81 tonnes to 19 tonnes. This reflects the likely sustainable catch from the overall current biomass in SCA CS at Little Barrier and Colville Channel.

140. Within the TAC, the recreational allowance would be reduced from 10 tonnes to 3 tonnes with no changes made to the current customary allowance. Other sources of fishing mortality would be reduced from 11 to 1 tonne. FNZ considers this level of harvest is sustainable based on the 2021 survey results.

141. The TACC would be changed from 50 tonnes to 5 tonnes. This option recognises the sustainable catch that is likely to be available from beds with scallop densities that are commercially viable. It also considers the temporary closure under section 186A of the Act which is currently in place over the Mercury area scallop beds.

142. As the TACC applies across the entire SCA CS QMA, Fisheries New Zealand will use fine scale electronic reporting and GPR data on fishing activity to monitor how fishing is spread across the open areas and if a concentration of fishing effort is occurring.

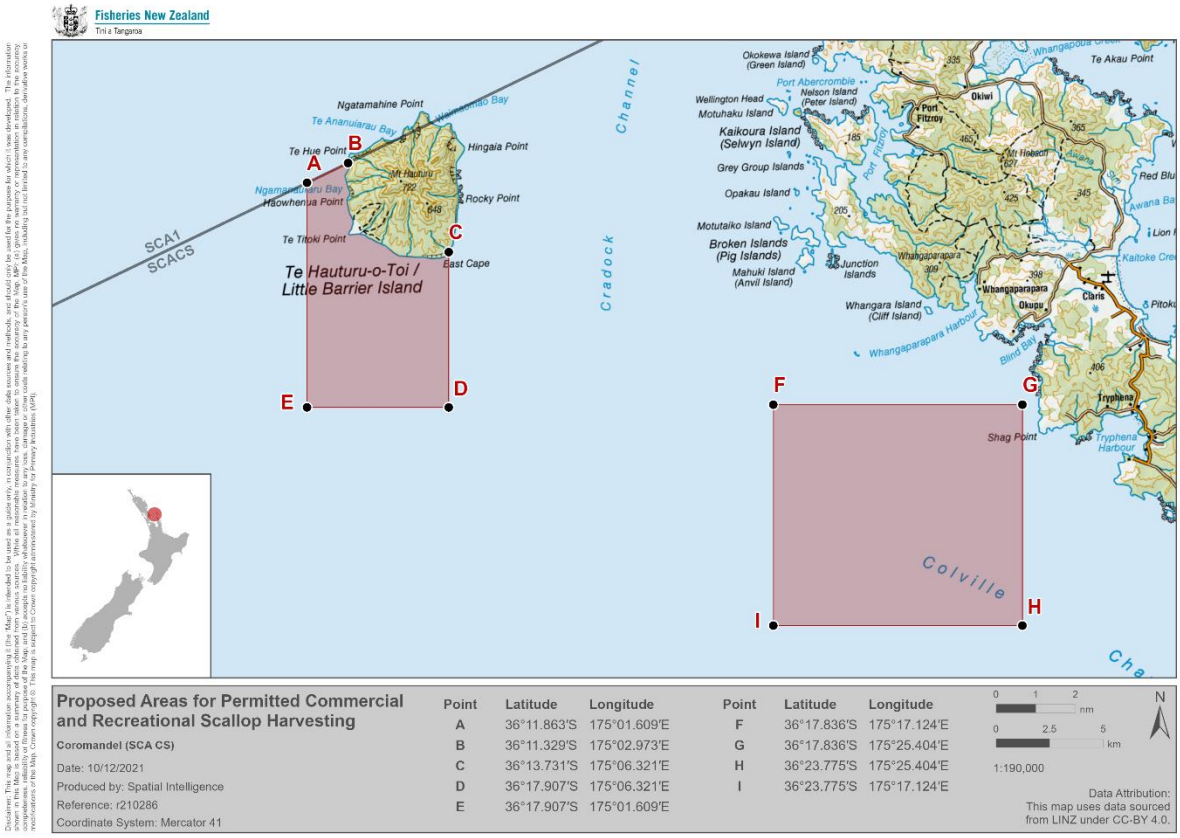

Figure 12: Areas outlining Little Barrier and Colville Channel in the Coromandel (SCA CS) fishery where scallop fishing will be permitted under a partial closure.

8.4 Option 3

143. Option 3 responds to information that the SCA 1 and SCA CS fisheries have experienced long term declines in overall biomass. It recognises that the best available information indicates a risk that the current baseline TACC for SCA 1 and SCA CS are not maintaining the stock at or above a level that can produce the maximum sustainable yield.

144. Option 3 proposes to set the baseline TACC for SCA 1 and SCA CS at 0 tonnes meatweight. This option prevents commercial scallop fishing in SCA 1 and SCA CS without first carrying out an in-season increase. Historically in-season increases have been informed by a pre-season survey and CAY estimate. Commercial fishers will be able to utilise the fishery if information indicates that there is sustainable yield available.

145. The best available information indicates that commercial catch accounts for the majority of scallop take in SCA 1 and SCA CS, and that the fishing method of dredging has a negative impact on the environment, the scallop populations and the habitat that supports them.

146. Option 3 takes the approach of removing commercial fishing impacts through reducing the TACC. Option 3 would allow those beds traditionally harvested by commercial fishers to rebuild to abundance levels that will support the long-term sustainability of the SCA 1 and SCA CS fisheries. Increased abundance in these typically larger, deeper beds is also expected to

provide support to the recovery of other beds through increased supply of spat, however the exact nature and extent of this effect is not fully understood.

147. As SCA 1 and SCA CS are subject to an in season increase provision, if new information suggested that some level of commercial harvest could be carried out sustainably, an in-season increase process could be undertaken to provide for this level of utilisation. An in-season TACC increase requires a public consultation process and Ministerial decision.

148. Currently, a viable alternative harvesting method to dredging does not exist for commercial fisheries and, for that reason, the prohibition of commercial dredging is not proposed. If the TACC were to be increased in the future to provide for commercial utilisation, the method of harvest would be considered in the setting of a sustainable TACC at that time. The operation and management of commercial scallop fisheries, including the ongoing use of dredging, will be part of the longer-term management consideration for the fishery. FNZ considers there are opportunities for innovation and development in this area, to work towards methods that have lower environmental impacts.

149. Recreational and customary fishing activity would be able to continue, however the use of dredging for recreational take would be prohibited to remove any further benthic impacts on recreational beds and promote a recovery of these areas.

150. Recreational fishing also has impacts on scallop beds. While the level of recreational access is in effect unconstrained, typically recreational take is impacted by availability, with less scallops taken when abundance is lower due to the additional effort required. The current recreational controls also manage the overall impacts by limiting the number and size of scallops each person can take, and the season in which they can be taken. The size limit for scallops is set to provide the opportunity for scallops to spawn prior to being eligible for harvest. Option 1 relies on these restrictions to ensure that recreational beds continue to recruit juvenile scallops.

151. Option 3 proposes to ban recreational scallop dredging in SCA 1 and SCA CS. The removal of scallop dredging will reduce benthic impacts to recreational scallop beds and promote increased recovery in these areas. As dredging is estimated to make up only 14% of recreational catch[4], and hand gathering/diving (with extra provision for a skipper and safety person) is a viable alternative, the impact on recreational fishers is considered to be low. It is acknowledged that for a small number of recreational fishers, dredging in the only means by which they can collect scallops.

152. Under Option 3, the TAC for both stocks would be reduced and the allowance for other mortality would be reduced to 1 tonne to reflect the reduction in fishing that would occur and the reduced incidental mortality from removing commercial fishing and recreational dredging. The customary allowances remain unchanged to provide for the exercise of customary harvest activities.

153. Option 3 places weight on the information available that the commercial fishery has the greatest fishing impact on scallop populations. Commercial fishing historically is responsible for most of the scallop harvest in SCA 1 and SCA CS and the method of dredging is known to have negative impacts on scallop populations and the habitats that support them. FNZ considers that Option 3 will protect SCA 1 and SCA CS and allow for the recovery of the stocks to provide for future commercial utilisation.

154. As with all options, FNZ will monitor the fishery to ensure that the management measures put in place are leading to an appropriate level of recovery within the fishery.

[4] National Panel Survey of Marine Recreational Fishers 2017-18: https://fs.fish.govt.nz/Doc/24728/FAR-201924-National-Panel-Survey-Marine-Recreational-Fishers.pdf

Northland (SCA 1)

155. Under Option 3, the SCA 1 TAC would be reduced from 30 tonnes to 16 tonnes meatweight.

156. Within the TAC, the allowances for customary and recreational fishing will remain at 7.5 tonnes each. The allowance for other sources of fishing mortality will be reduced from 5 tonnes to 1 tonne.

157. The TACC will be reduced from 10 tonnes to 0 tonnes meatweight.

158. Option 3 will impact commercial fishers in SCA 1 significantly and will prevent individuals and businesses in the commercial fishery from utilising the fishery.

Coromandel (SCA CS)

159. Under Option 3, the SCA CS TAC would be reduced from 81 tonnes to 14 tonnes meat weight – a 67-tonne reduction.

160. Option 3 would provide an allowance of 3 tonnes to recreational fishers and no changes would be made to the customary allowance. Under Option 3, no spatial controls are proposed. FNZ would develop measures to constrain the recreational allowance after engagement with stakeholders as part of the long-term management of SCA CS.

161. Under Option 3, the TACC would be reduced to 0 tonnes. Commercial fishers will not be able to utilise the fishery without incurring the cost of a biomass survey or an equivalent method of assessing the stock. This will add uncertainty and cost to the commercial fishery.

9 Environmental interactions

162. The key environmental interactions with this fishery, which must be considered when considering sustainability measures, concern marine mammals, seabirds, fish and invertebrate bycatch, benthic impacts, and habitats of particular significance for fisheries management.

9.1 Benthic impacts

163. There is widespread concern around the impacts of dredging on the seabed and wider marine environment. New Zealand Sports Fishing Council and LegaSea have put forward campaigns to ban both recreational and commercial scallop dredging. Removing scallop dredging was a feature of the Sea Change Hauraki Gulf Marine Spatial plan and the recently released Government Response strategy to Sea Change, through the draft Fisheries Plan. This committed to removing recreational dredging from the marine park and freezing commercial dredge fishing to within the current footprint, while implementing improved monitoring and management approaches.

164. FNZ notes that while environmental factors, such as sedimentation and water quality, may also affect scallop growth and mortality rates, it does not have a direct role in managing such environmental impacts. However, it will monitor existing work being done in this field and continue to engage with relevant local authorities in this regard.

9.2 Habitats of particular significance for fisheries management

165. Information on habitats of particular significance for fisheries management for SCA 1 and SCA CS is given in Table 7.

Table 7. Summary of information on habitats of particular significance for fisheries management for stock.

Fish Stock	SCA 1 and SCA CS
Habitat of particular significance	Specific habitats of particular significance for scallops in SCA 1 and SCA CS have not been identified at this time. However, certain features of the habitats with which scallops are associated are known to influence scallop productivity by affecting the recruitment, growth, and mortality of scallops, and therefore may in the future be useful in terms of identifying habitats of significance. Figure A11 (in the Appendix) shows the main scallop beds that have been surveyed from 1990 – 2021.
Attributes of habitat	• Scallops are found in a variety of coastal habitats, but particularly in semi-enclosed areas where circulating currents are thought to retain larvae. • Scallops inhabit waters of up to about 60 m deep) but are more common in depths of 10 to 50 m on substrates of shell gravel, sand or, in some cases, silt. • Scallops are typically patchily distributed at a range of spatial scales. Some scallop beds are persistent, and others are short lived. The extent to which the various beds or populations are reproductively or functionally separate is not known. • Scallop larvae spend about three weeks in the plankton. They then attach to algae or some other filamentous material with fine byssus threads. This indicates that an important attribute of habitat is the presence of suitable settlement surfaces for larvae. When the spat reach about 5 mm they detach and take up the free-living habit of adults, usually lying-in depressions on the seabed and often covered by a layer of silt.
Reasons for particular significance	• Scallops grow relatively fast, have high mortality, and variable recruitment. The rates of these processes probably vary in relation to environmental conditions (e.g., temperature, water flow, turbidity, and salinity), ecological resources (e.g., food, oxygen, and habitat), and with intra- and inter-specific interactions (e.g., competition, predation, parasitism, and mutualism), and the combination of these factors determines the species distribution and abundance (Begon et al. 1990). • Scallops are a key component of the inshore coastal ecosystem, acting both as consumers of primary producers and as prey for many predators. Scallops themselves can also provide structural habitat for other epifauna (e.g., sponges, ascidians, and algae).
Risks/Threats	• It is well known that fishing with mobile bottom contact gears such as dredges has impacts on benthic populations, communities, and their habitats (e.g., Kaiser et al. 2006, Rice 2006). The effects are not uniform but depend on at least: 'the specific features of the seafloor habitats, including the natural disturbance regime, the species present, the type of gear used, the methods and timing of deployment of the gear and the frequency with which a site is impacted by specific gears; and the history of human activities, especially past fishing, in the area of concern' (Department of Fisheries and Oceans 2006). • The effects of scallop dredging on the benthos are relatively well studied and include several New Zealand studies carried out in areas of the northern fisheries (SCA 1 and SCA CS) (Thrush et al. 1995, Thrush et al. 1998, Cryer et al. 2000, Tuck et al. 2009, Tuck & Hewitt 2012) and the Golden/Tasman Bays region of the southern fishery (SCA 7) (Tuck et al. 2017). The results of these studies are that, generally, with increasing fishing intensity there are decreases in the density and

	diversity of benthic communities and, especially, the density of emergent epifauna that provide structured habitat for other fauna. • It is also likely that fine sediments introduced from runoff from land can have adverse effects on filter-feeding bivalves, including scallops.
Existing protection measures	• While specific habitats of significance have not been identified, there are scallop populations in many estuaries and harbours in SCA 1 and SCA CS, and these are protected from benthic effects of commercial dredging, trawling and Danish seining.

10 Relevant plans, strategies, statements, and context

10.1 Harvest Strategy Standard

166. The Harvest Strategy Standard for New Zealand Fisheries (HSS) is a policy statement of best practice in relation to the setting of fishery and stock targets and limits for fish stocks in New Zealand's QMS. It is intended to provide guidance on how fisheries law will be applied in practice, by establishing a consistent and transparent framework for decision-making to achieve the objective of providing for utilisation of New Zealand's QMS species while ensuring sustainability.

167. The HSS outlines the Ministry's approach to relevant sections of the Act and forms a core input to the Ministry's advice to the Minister on the management of fisheries. The HSS defines a hard limit as a biomass limit below which fisheries should be considered for closure and a soft limit as a biomass limit below which the requirement for a formal time-constrained rebuilding plan is triggered.

10.2 Hauraki Gulf Marine Park Act 2000

168. SCA 1 and SCA CS boundaries overlap within the Hauraki Gulf Marine Park. Therefore, sections 7 (recognition of national significance of Hauraki Gulf) and 8 (management of Hauraki Gulf) of the Hauraki Gulf Marine Park Act 2000 (HGMPA) apply to the management of these fisheries.

169. As this review aims to address a potential sustainability risk with the SCA1 and SCA CS management settings, FNZ considers that the proposed options are consistent with obligations under sections 7 and 8 of the HGMPA.

170. In addition to the HGMPA, the recently released Revitalising the Gulf: Government action on the Sea Change Plan may affect future management and monitoring of scallops within the HGMP. Actions proposed under that plan include the development of a section 11A fisheries plan and new marine protection for the HGMP.

11 Economic considerations

171. The northern scallop fisheries support a number people and business associated with the commercial fishery. This includes but is not limited to:

- Quota holders.
- Commercial fishers.
- Seafood processing facilities and licensed fish receivers.
- Suppliers of fishing equipment and others in the marine industry.
- Dive shops

11.1 Northland (SCA 1)

172. Under Option 1, the TACC would not be reduced, however, the fishery would be closed under s11 of the Act. This would prohibit any commercial harvest thus reducing the landed catch to 0 tonnes – a 100% reduction. Under Options 2 and 3, the TACC would also decrease by 100% from 10 tonnes to 0 tonnes.

173. Based on the 2020/21 port price of $15.90/kg this would result in an approximate potential decrease in revenue of $159,000.00 (Table 8).

11.2 Coromandel (SCA CS)

174. Under Option 1, the TACC would not be reduced, however, the fishery would be closed under s11 of the Act. This would prohibit any commercial harvest thus reducing the landed catch to 0 tonnes – a 100% reduction. This would also be the case under Option 3 Based on the 2020/21 port price $15.90/kg, this would result in an approximate potential decrease in revenue of $795,000 (Table 8).

175. Under Option 2, the TACC would decrease by 90% from 50 tonnes to 5 tonnes. Based on the 2020/21 port price of $15.90, this would result in an approximate potential decrease in revenue of $715,500 (Table 8).

Table 8. Predicted changes to commercial revenue for the proposed options, based on estimated average export price in 2020/21 of $15.9/kg for Northland (SCA 1) and Coromandel (SCA CS) scallops.

Stock	Option	Change from current TACC (tonnes)	Predicted export revenue changes ($p.a.)
SCA 1	Option 1	10 ↓ (s11 full closure)	$159,000
	Options 2 & 3	10 ↓	$159,000
SCA CS	Options 1 & 3	50 ↓ (s11 full closure)	$795,000.
	Option 2	45 ↓	$715,500

12 Deemed values

176. Deemed values are the price paid by fishers for each kilogram of unprocessed fish landed in excess of a fisher's ACE holdings. The purpose of the deemed values regime is to provide incentives for individual fishers to acquire or maintain sufficient ACE to cover catch taken over the course of the year, while allowing flexibility in the timing of balancing, promoting efficiency, and encouraging accurate catch reporting.

177. The Deemed Value Guidelines set out the operational policy FNZ uses to inform the development of advice to the Minister on the setting of deemed values.

178. The deemed value rates for SCA 1 and SCA CS are shown in Table 9.

Table 9: Deemed value rates for SCA 1 and SCA CS.

Stock	Interim Rate ($/kg)	Annual Differential Rates ($/kg) for excess catch (% of ACE)					
		100-120%	120-140%	140-160%	160-180%	180-200%	200%+
SCA 1	25.20	28.00	33.60	39.20	44.80	50.40	56.00
SCA CS	33.30	37.00	44.40	51.80	59.20	66.60	74.00

179. FNZ is not proposing to adjust the deemed value rate for SCA 1 and SCA CS as part of this sustainability review.

13 Future management

180. The options in this paper are expected to protect and rebuild the SCA 1 and SCA CS stocks. FNZ will continue to monitor SCA 1 and SCA CS to ensure that the stocks respond to the management option adopted.

181. When the stocks have recovered, FNZ will review the management measures to provide for sustainable utilisation. Conversely, if the fisheries are not responding to the management strategy, FNZ will consider additional management measures as are appropriate.

182. FNZ considers that further changes to the management and monitoring of these stocks could be considered to deliver improved economic, social, and environmental benefits. Key management measures that have been raised by tangata whenua and stakeholders during engagement and previous reviews of scallop stocks include the adoption of underwater breathing apparatus in the commercial fishery, rotational fishing and enhancement, and habitat restoration. In addition to these management frameworks, it is likely that new approaches to harvesting scallops will be possible in the future such as NIWA recently receiving funding for research into "Non-destructive surveying and harvesting for economic acceleration and kaitiakitanga" which leverages advances in artificial intelligence.

13.1 Underwater Breathing Apparatus

183. Currently the use of underwater breathing apparatus is prohibited for commercial taking of scallops under the Fisheries (Commercial Fishing) Regulations 2001. During the 2020 review of the TAC/TACC for the SCA 1 fishery, several submissions suggested consideration should be given to allowing diving, including the use of UBA, in all commercial fisheries, not just SCA 1. In his decision letter to stakeholders, the then Minister of fisheries acknowledged these suggestions and noted he had instructed FNZ to review the restriction on the use of UBA.

184. FNZ is seeking to embrace an ecosystem approach to fisheries management within the regulatory framework and to support and develop alternative fishing methods that are more selective and reduce adverse effects on the marine environment[5]. In line with this, FNZ is proposing to enable the use of UBA for fishers to commercially harvest scallops and this is being consulted on separately as part of a package of fisheries regulatory changes. This consultation will occur in the new year.

185. The selectivity and reduced benthic impacts of diving for scallops may mean it is a suitable alternative for dredging in certain areas. Typically, the predominantly commercial scallop beds are in deeper waters, beyond the depth that would be viable for diving operations. However, there are some parts of both SCA 1 and SCA CS where commercial scallop diving may be a suitable option. If the decision is made to progress the regulatory change to remove the prohibition on the use of UBA, FNZ will work to incorporate this as part of the future management approach for scallop fisheries.

186. The introduction of commercial scallop diving, and the associated rules and requirements to manage it, would need to be carefully considered to ensure unintended consequences such as serial depletion of localized areas and spatial overlap across sectors are appropriately managed.

187. FNZ is aware there are currently several parties interested in exploring the viability of commercial scallop diving.

13.2 Rotational fishing and enhancement.

188. Whilst globally scallop fisheries are known for their 'boom and bust' behaviour there are management approaches which have been demonstrated to reduce the fluctuations. Rotational or 'paddock' harvesting, where fishing grounds are alternately closed for one or more years and then opened for one year, have been demonstrated to reduce fluctuations in abundance in Victorian scallop fisheries (Australia) and have prevented growth overfishing[6] and increase larval production in Atlantic scallop populations.

189. Enhancement of scallop fisheries occur where spat is reseeded into scallop habitat. This was carried out in the scallop fishery at the top of the South Island (SCA 7) and proved successful for a time when it was combined with rotational management. Industry in SCA 1 and SCA CS have investigated enhancement in the past but did not proceed. More research is needed to determine if enhancement is viable or required for SCA 1 and SCA CS.

[5] Note this was one of the recommendations from the 2021 Prime Minister's Chief Science Advisor report (*The Future of Commercial Fishing in Aotearoa New Zealand*).
[6] Growth overfishing occurs when fish or shellfish are harvested at an average size that is smaller than the size that would produce maximum number of recruits into a fishery.

13.3 Habitat restoration

190. Habitat restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

191. Shell material provides either directly or indirectly important habitat for settling spat and post-settlement juveniles in many scallop species and related shellfish. Commercial fishers are required to land scallops with the shell attached under food safety legislation[7]. In areas of SCA 1 and SCA CS where bottom contact fishing has been present for several years the habitat that supports scallops may have been degraded. Habitat restoration initiatives are a further avenue that could be explored as part of the longer-term management approach to improving the SCA 1 and SCA CS fisheries.

192. A habitat restoration guidance framework is in the process of being finalised as part of *Revitalising the Gulf: Government Action on the Sea Change Plan* the Government's Response Strategy to the Sea Change – Tai Timu Tai Pari Hauraki Gulf Marine Spatial Plan. This work will help inform possible approaches to habitat restoration and may provide insights into how scallop habitat restoration could be approached in the future.

193. FNZ will continue to engage with tangata whenua and stakeholders to ensure their expectations and aspirations for the fisheries are understood and considered in any future management changes.

14 Uncertainties and risks

194. Under all options, FNZ will continue to monitor the fishery for any signals of future sustainability risks and utilisation opportunities and look for opportunities to gather better information on these stocks.

195. The 2021 commercial survey was designed to estimate stock-wide abundance. This means that some of the areas surveyed do not align with where commercial fishers are currently fishing. Reports from commercial fishers from this season have indicated that they have fished in areas that are not represented by the survey.

196. Uncertainties identified in the assessment of SCA 1 and SCA CS include:

- Consistency of survey spatial coverage.
- Dredge efficiency during the survey.
- Dredge efficiency variability between substrates and between different environmental conditions.
- Growth rates and natural mortality between the survey and the start of the season.
- Predicting the average recovery of meatweight from greenweight.
- The extent to which dredging causes incidental mortality and affects recruitment.

[7] Animal Products (Regulated Control Scheme—Bivalve Molluscan Shellfish) Regulations 2006: https://www.legislation.govt.nz/regulation/public/2006/0038/latest/whole.html

15 Questions for submitters

- Which option do you support for revising the TAC, allowances and/or closures? Why?
- If you do not support any of the options listed, what alternative(s) should be considered? Why?
- Are the allowances for customary Māori, recreational and other sources of mortality appropriate? Why?
- Do you think these options adequately provide for social, economic, and cultural wellbeing?
- Do you have any concerns about potential impacts of the proposed options on the aquatic environment?
- Should other areas within SCA 1 and/or SCA CS be include in or excluded from the closure proposed under Option 3? Should the area be larger or smaller?

197. We welcome your views on these proposals. Please provide detailed information and sources to support your views, where possible.

16 How to get more information and have your say

198. Fisheries New Zealand invites you to make a submission on the proposals set out in this discussion document. Consultation closes at 5pm on 8 February 2022.

199. Please see the Fisheries New Zealand sustainability consultation webpage (https://www.mpi.govt.nz/consultations/review-of-sustainability-measures-2022-april-round) for related information, an optional submissions template, and information on how to submit your feedback. If you cannot access the webpage or require hard copies of documents or any other information, please email FMSubmissions@mpi.govt.nz.

17 Legal basis for managing fisheries in New Zealand

200. The Fisheries Act 1996 provides the legal basis for managing fisheries in New Zealand, including the Minister's responsibilities for setting and varying sustainability measures. See the separate document Overview of legislative requirements and other considerations at https://www.mpi.govt.nz/dmsdocument/48880 for more information.

16 Referenced reports

Fisheries New Zealand (2011). Operational Guidelines for New Zealand's Harvest Strategy Standard. Accessible at: https://www.mpi.govt.nz/dmsdocument/19706-operational-guidelines-for-new-zealands-harvest-strategy-standard

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New Zealand Legislation. (2000). Hauraki Gulf Marine Park Act 2000. Accessible at https://www.legislation.govt.nz/act/public/2000/0001/latest/DLM52558.html#DLM53130

New Zealand Legislation. (2001). Fisheries (Commercial Fishing) Regulations 2001. Accessible at https://www.legislation.govt.nz/regulation/public/2001/0253/latest/DLM76407.html?search=sw_096be8ed81a205f3_dredge_25_se&p=1

New Zealand Legislation. (2013). Fisheries (Amateur Fishing) Regulations 2013. Accessible at https://www.legislation.govt.nz/regulation/public/2013/0482/latest/DLM3629901.html?src=qs

18 Appendix

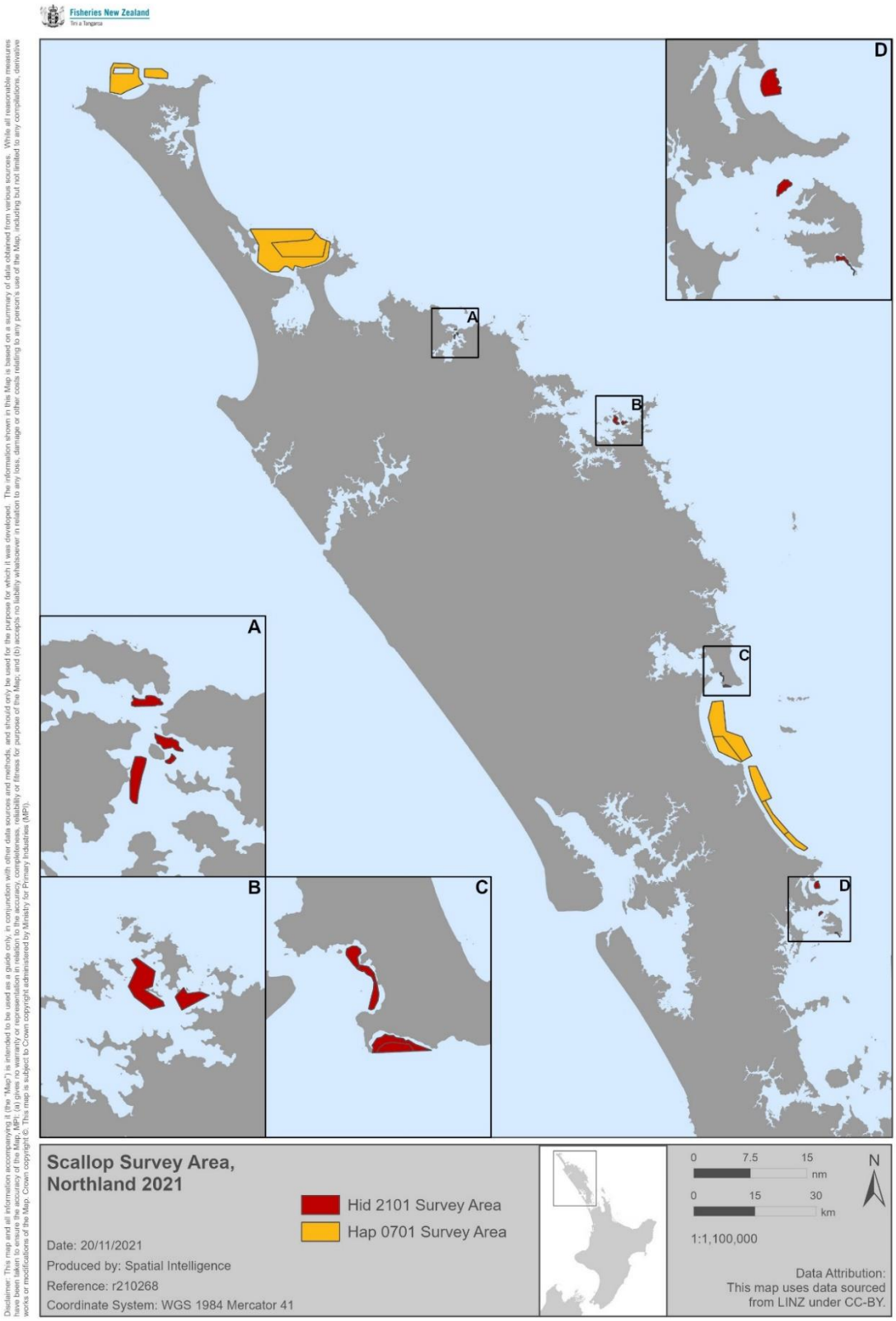

Figure A1. 2021 scallop survey areas in the Northland (SCA 1) scallop fishery.

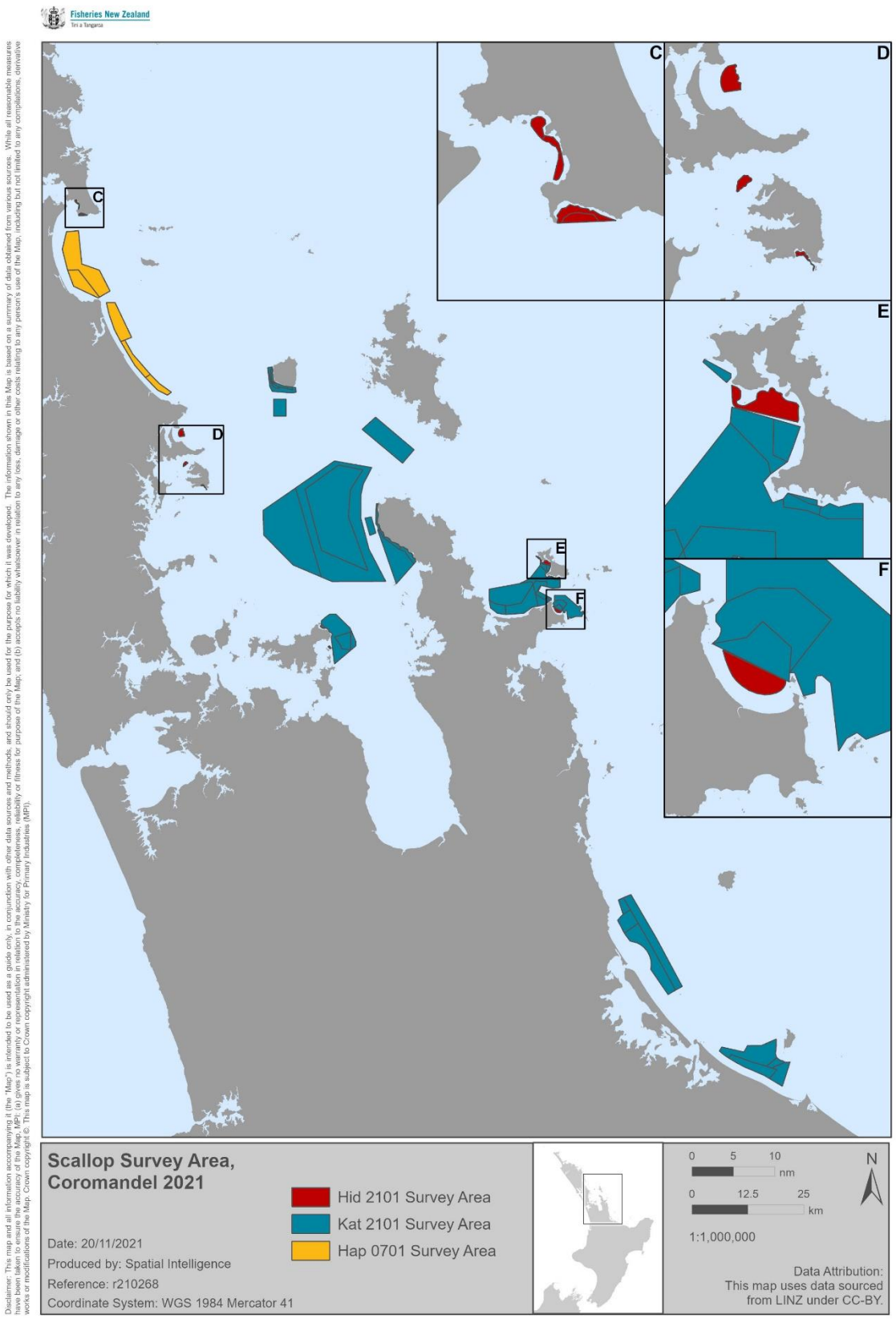

Figure A2. 2021 scallop survey areas in the Coromandel (SCA CS) scallop fishery.

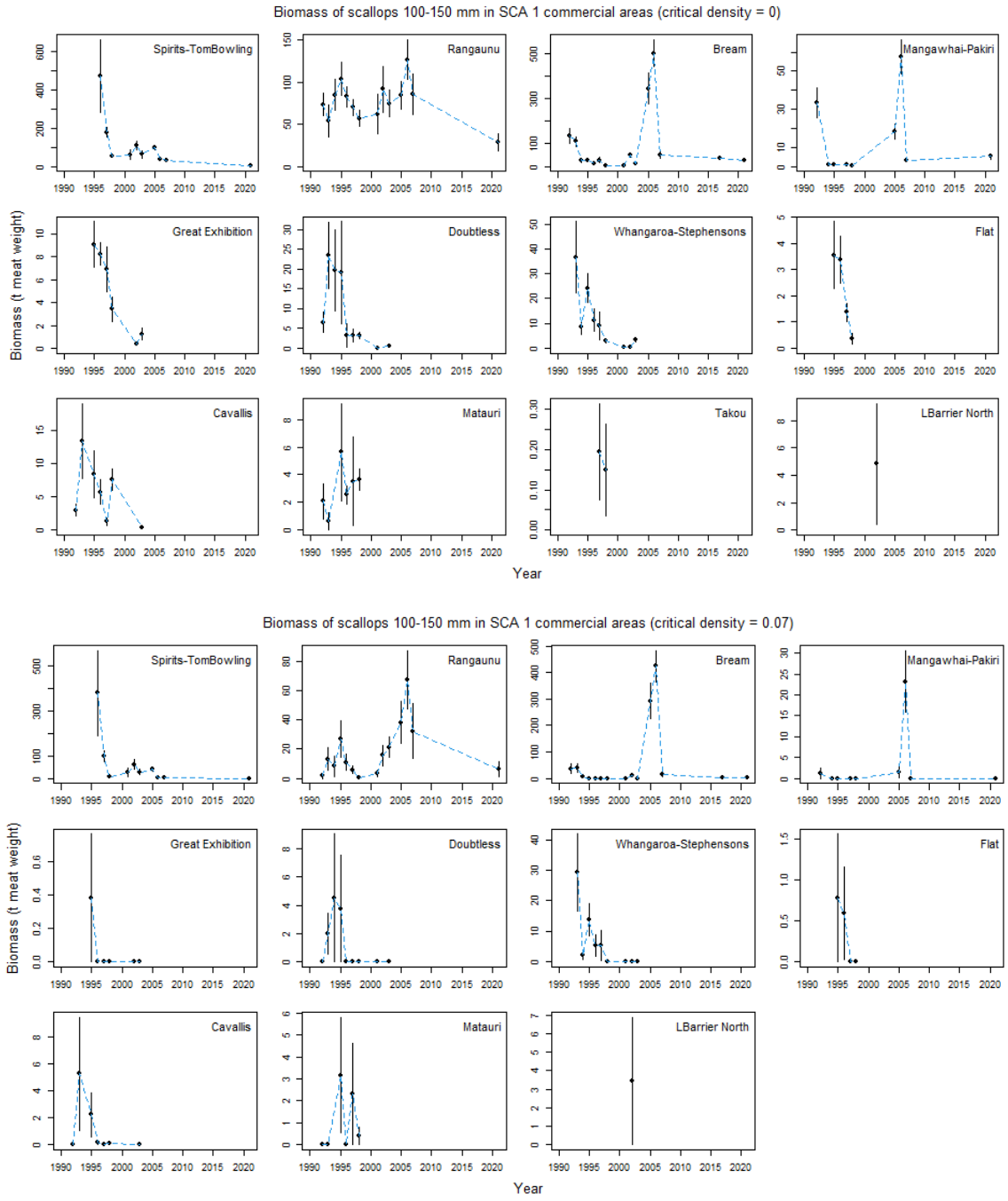

Figure A3. Time series of absolute (top) and commercially fishable (bottom) recruited scallop biomass (t meat weight of scallops 100 mm or larger) between 1990 and 2021 in Northland (SCA 1) commercial scallop locations. Estimates were generated by reanalysing the raw survey data and dredge efficiency estimated from paired dive-dredge sampling in 2021. Commercially fishable biomass (bottom) is the biomass that occurs in areas of scallop density greater than or equal to a critical density threshold of 0.07 recruited scallops.m-2, which calculations suggest equates to a fishery CPUE of 50 kg.h-1 (green weight of scallops 100 mm or larger per hour of dredging).

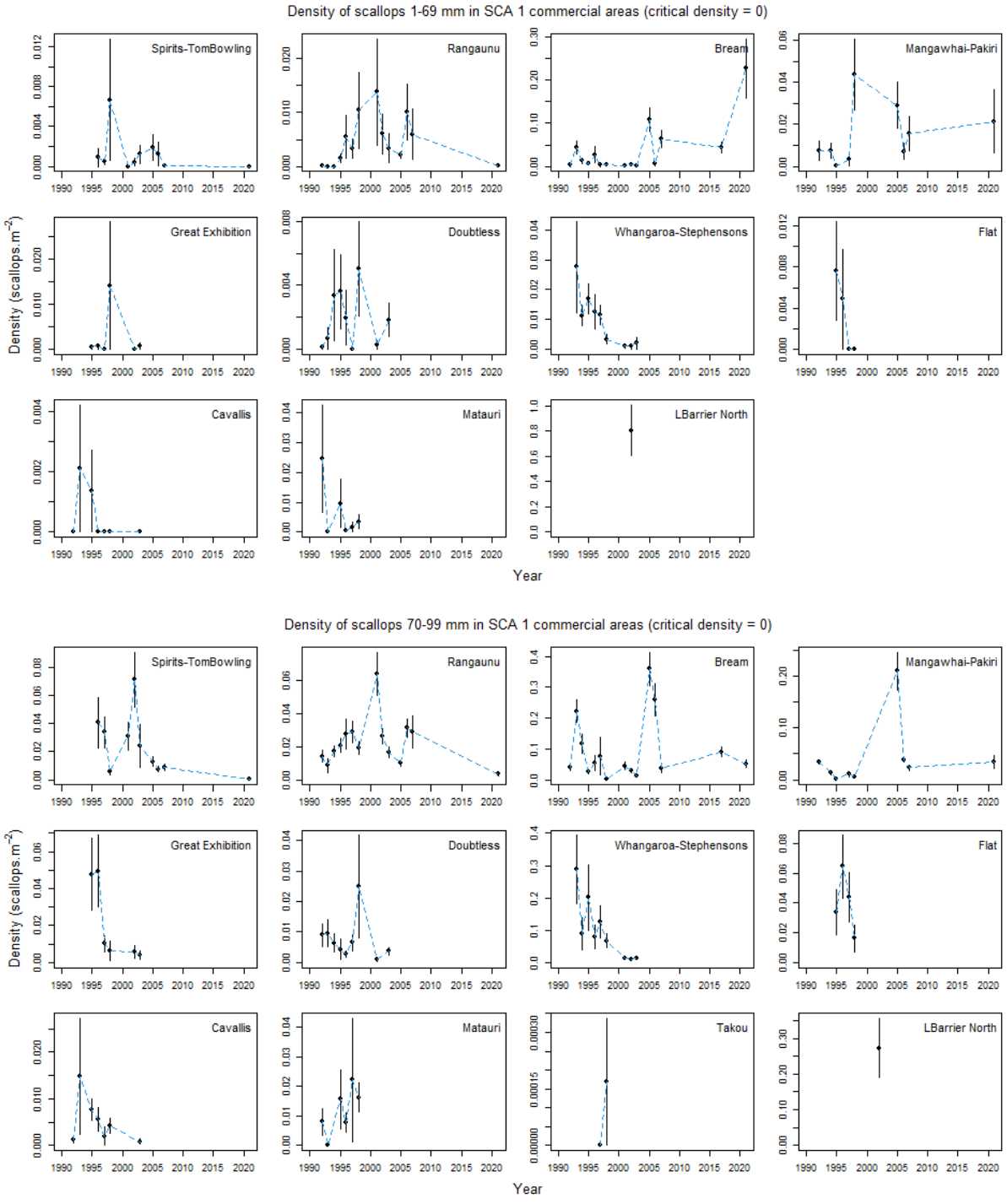

Figure A4. Time series of pre-recruit scallop density between 1990 and 2021 in Northland (SCA 1) commercial scallop locations. Top: pre-recruit scallops 1–69 mm shell length. Bottom: pre-recruit scallops 70–99 mm. Estimates were generated by reanalysing the raw survey data and dredge efficiency estimated from paired dive-dredge sampling in 2021.

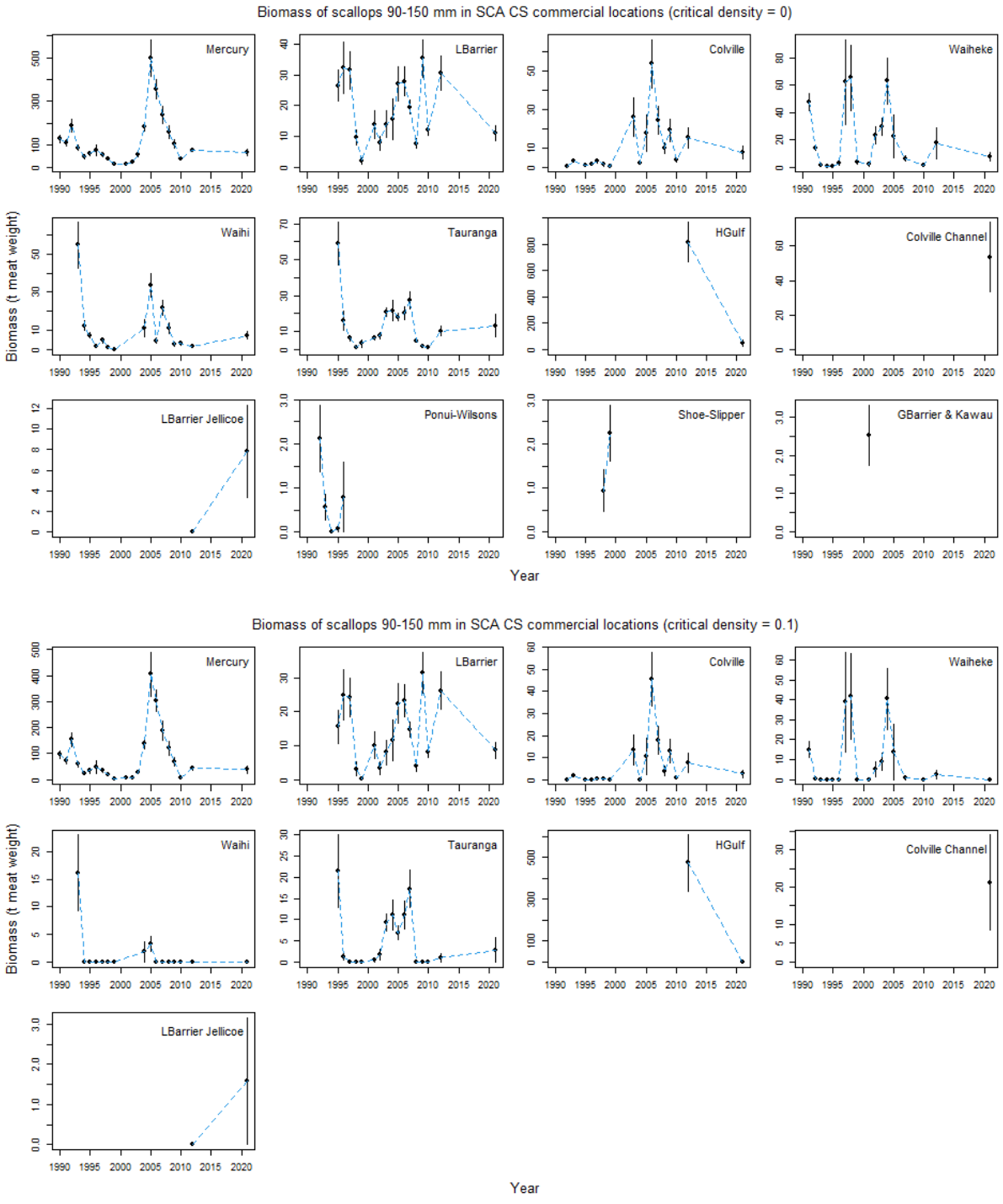

Figure A5. Time series of absolute (top) and commercially fishable (bottom) recruited biomass (t meat weight of scallops 90 mm or larger) between 1990 and 2021 in Coromandel (SCA CS) commercial scallop locations. Estimates were generated by reanalysing the raw survey data, using the subset of strata and dredge efficiency estimated from paired dive-dredge sampling in 2021. Commercially fishable biomass (bottom) is the biomass that occurs in areas of scallop density greater than or equal to a critical density of 0.1 recruited scallops.m-2, which calculations suggest equates to the SCA CS fishery CPUE soft limit of 70 kg.h-1 (green weight of scallops 90 mm or larger per hour of dredging).

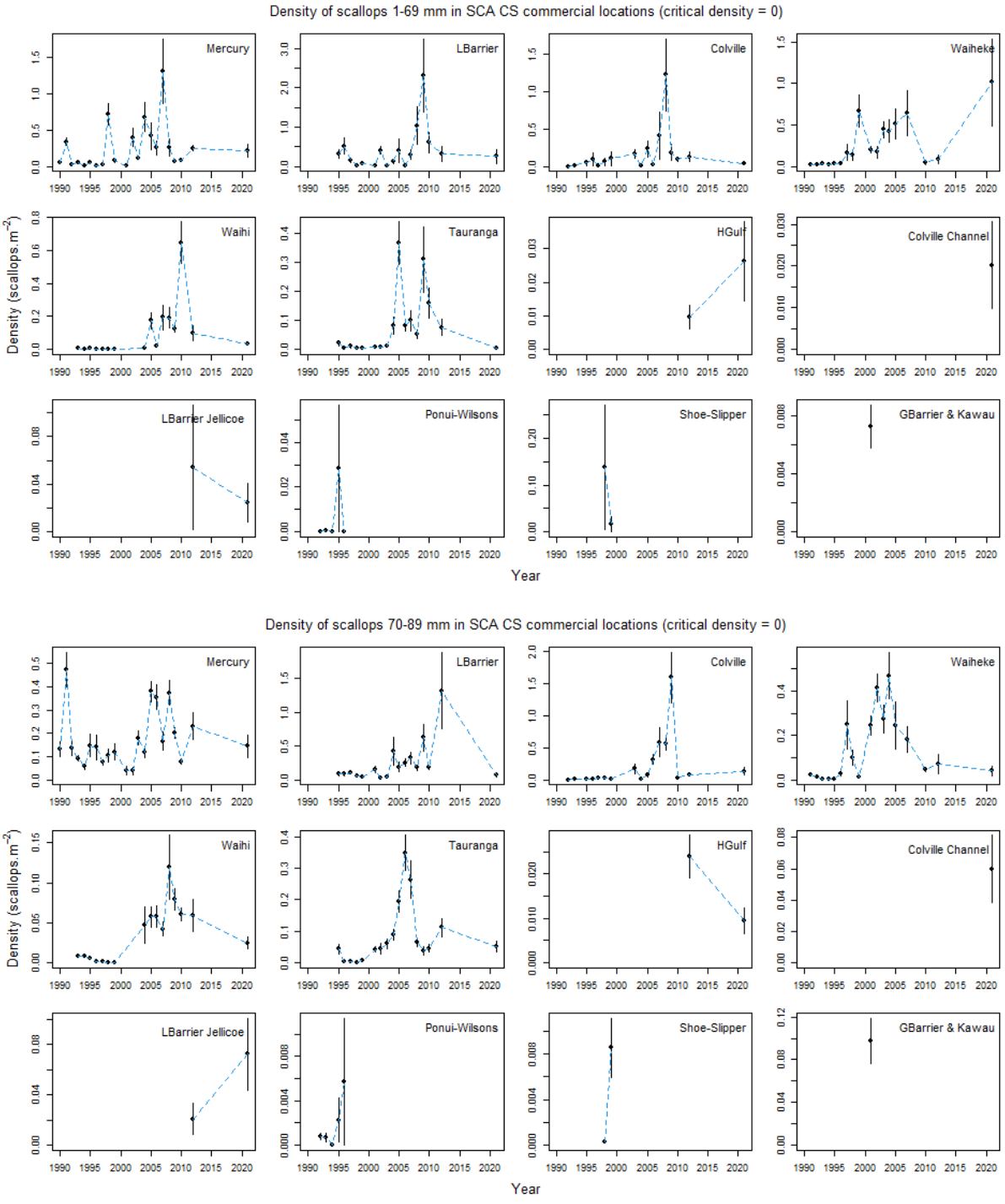

Figure A6. Time series of pre-recruit scallop density between 1990 and 2021 in Coromandel (SCA CS) commercial scallop locations. Top: pre-recruit scallops 1–69 mm shell length. Bottom: pre-recruit scallops 70–89 mm. Estimates were generated by reanalysing the raw survey data and dredge efficiency estimated from paired dive-dredge sampling in 2021.

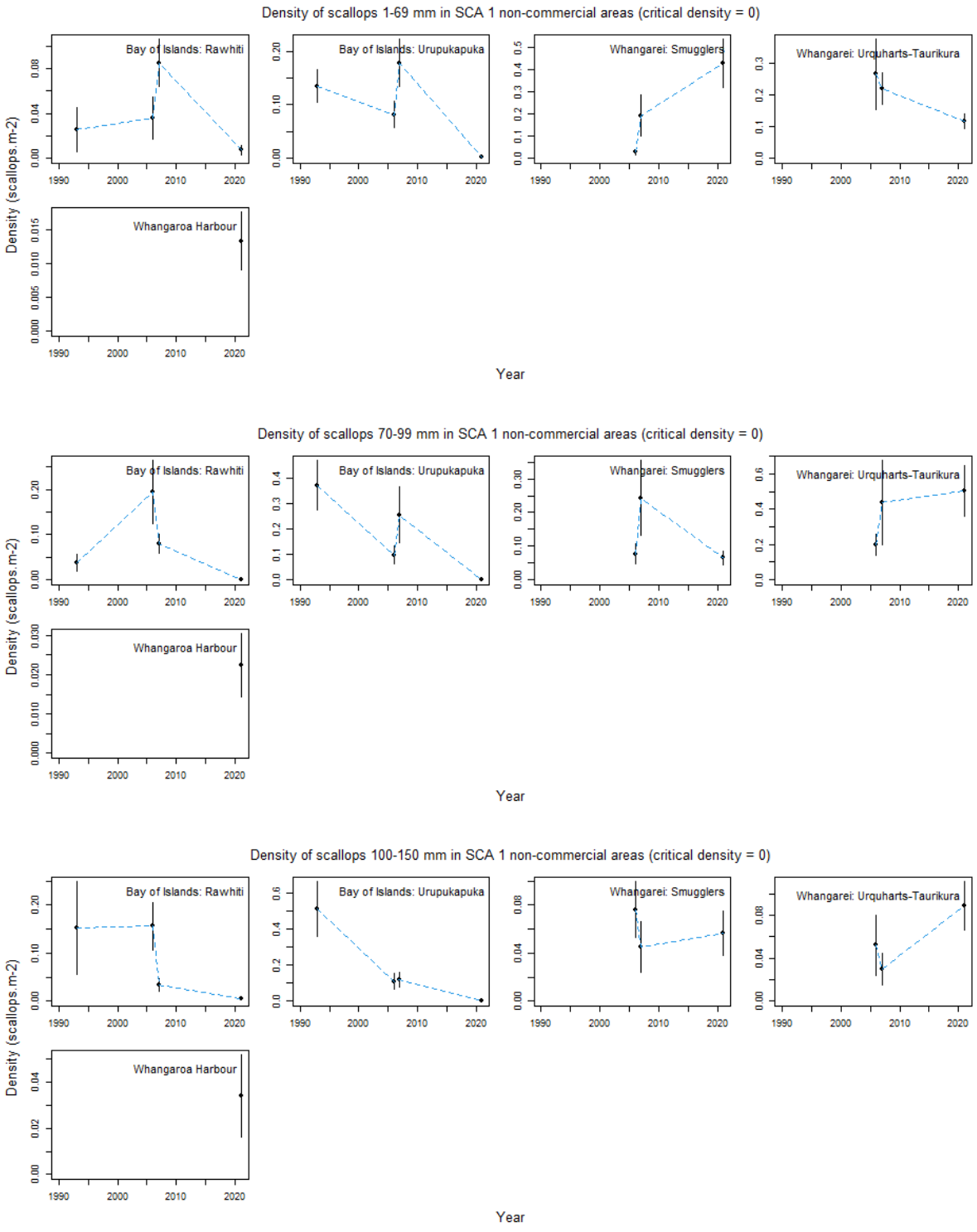

Figure A7. Time series of scallop density between 1990 and 2021 in Northland (SCA 1) non-commercial scallop locations. Top: Juvenile scallops (1–69 mm). Centre: pre-recruit scallops (70–99 mm). Bottom: Recruited scallops (100–150 mm). Estimates were generated by reanalysing the raw survey data, using a subset of strata

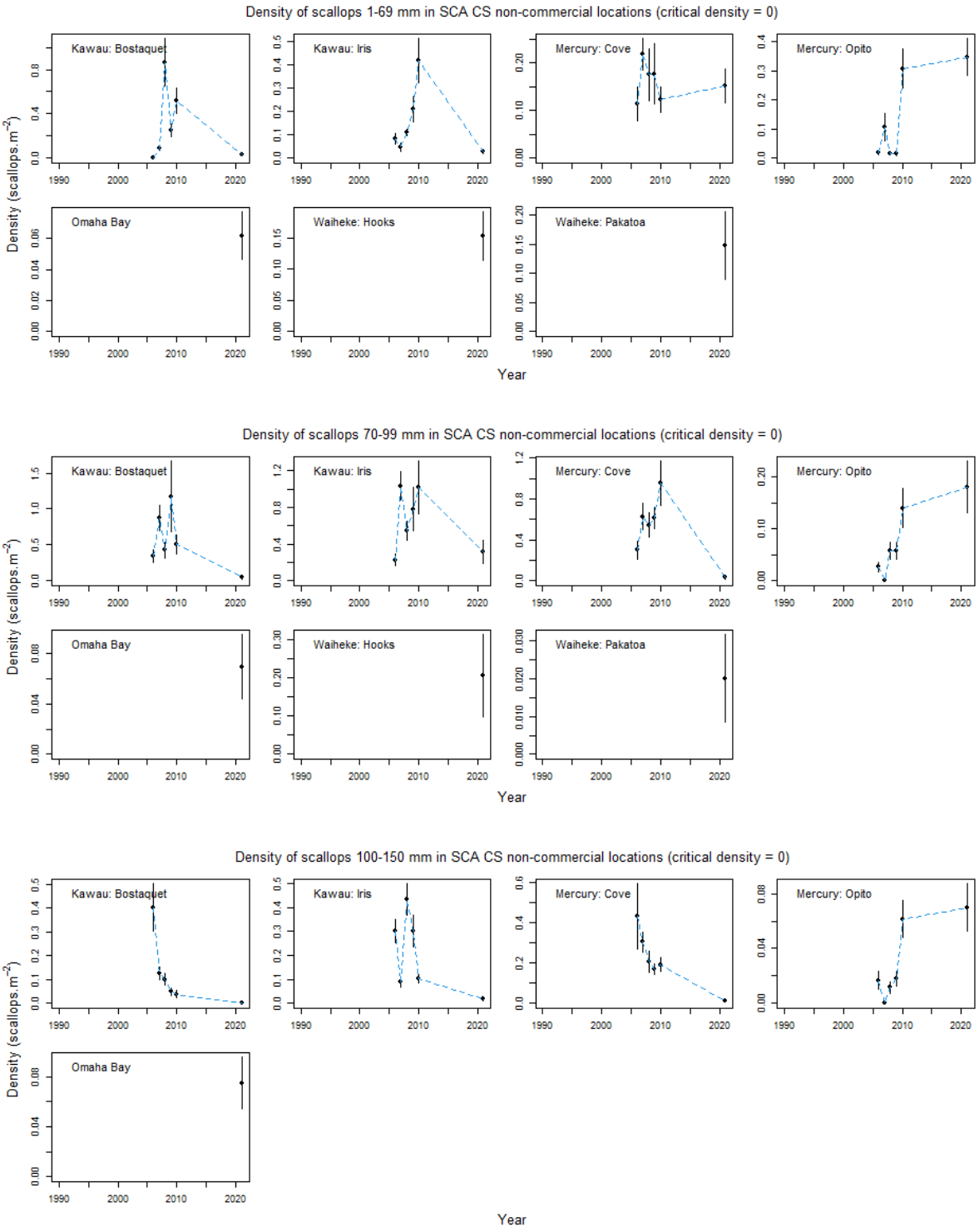

Figure A8. Time series of scallop density between 1990 and 2021 in Coromandel (SCA CS) non-commercial scallop locations. Top: Juvenile scallops (1–69 mm). Centre: pre-recruit scallops (70–99 mm). Bottom: Recruited scallops (100–150 mm). Estimates were generated by reanalysing the raw survey data using a subset of strata.

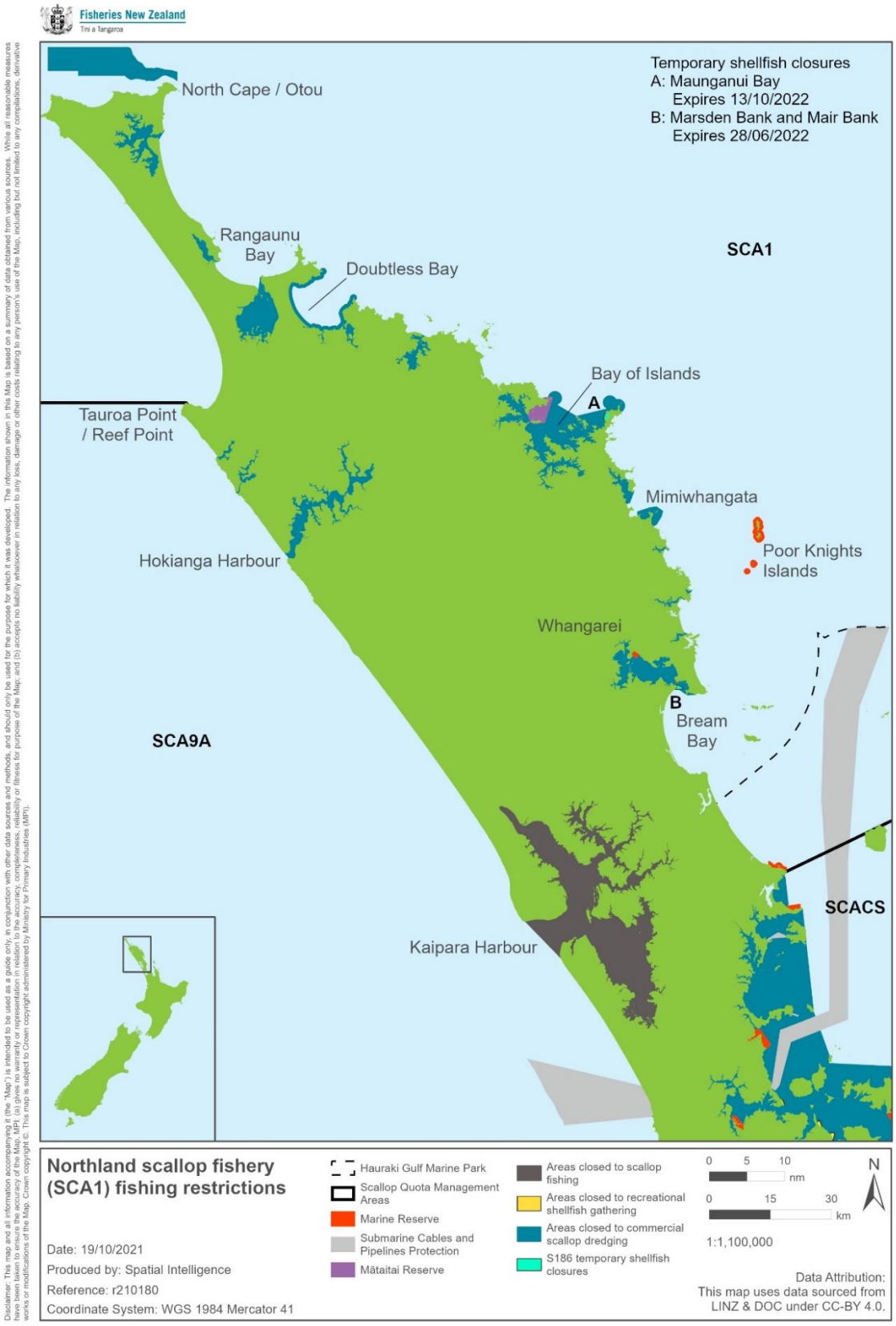

Figure A9. Fishing restrictions in the Northland (SCA 1) scallop fishery.

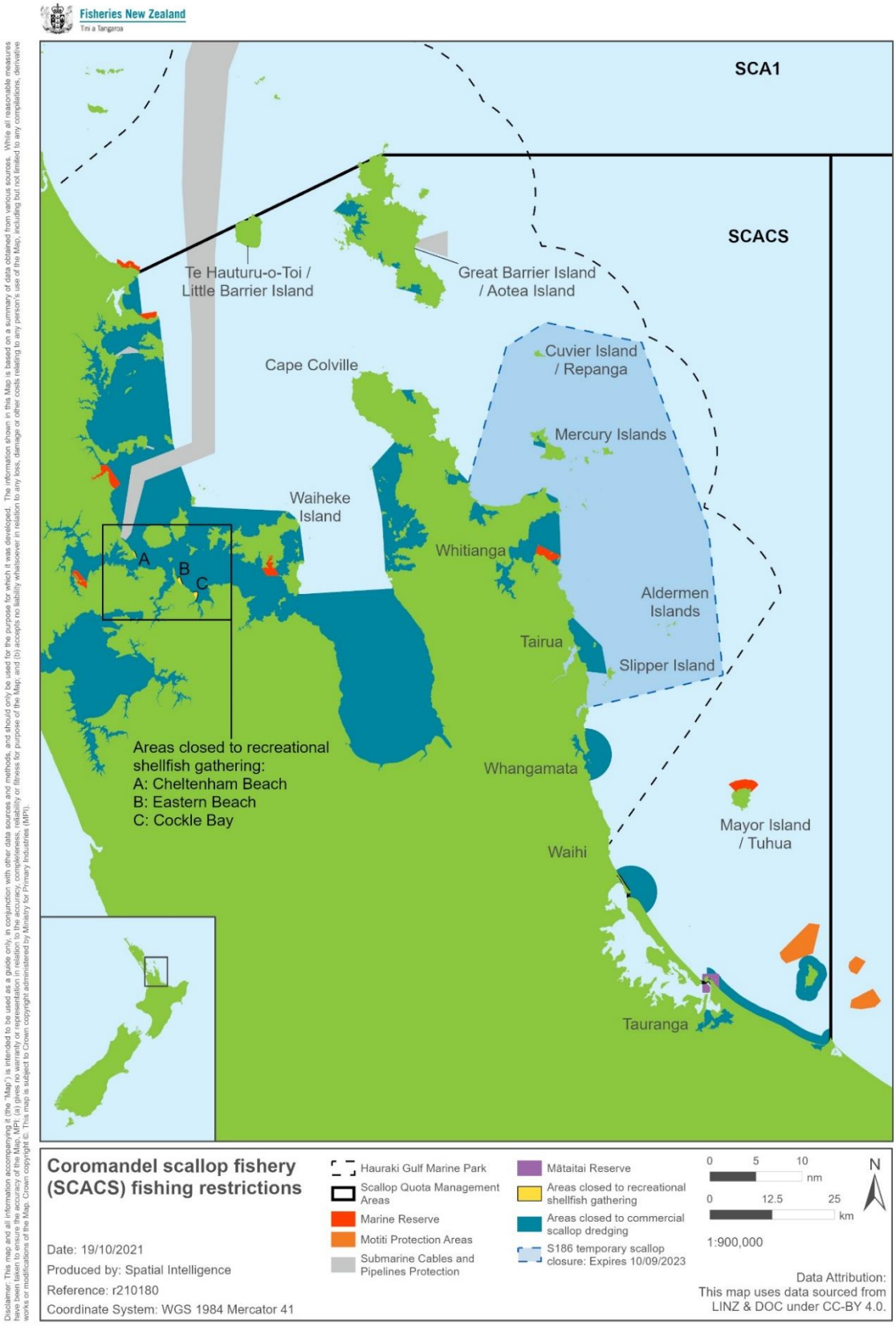

Figure A10. Fishing restrictions in the Coromandel (SCA CS) scallop fishery.

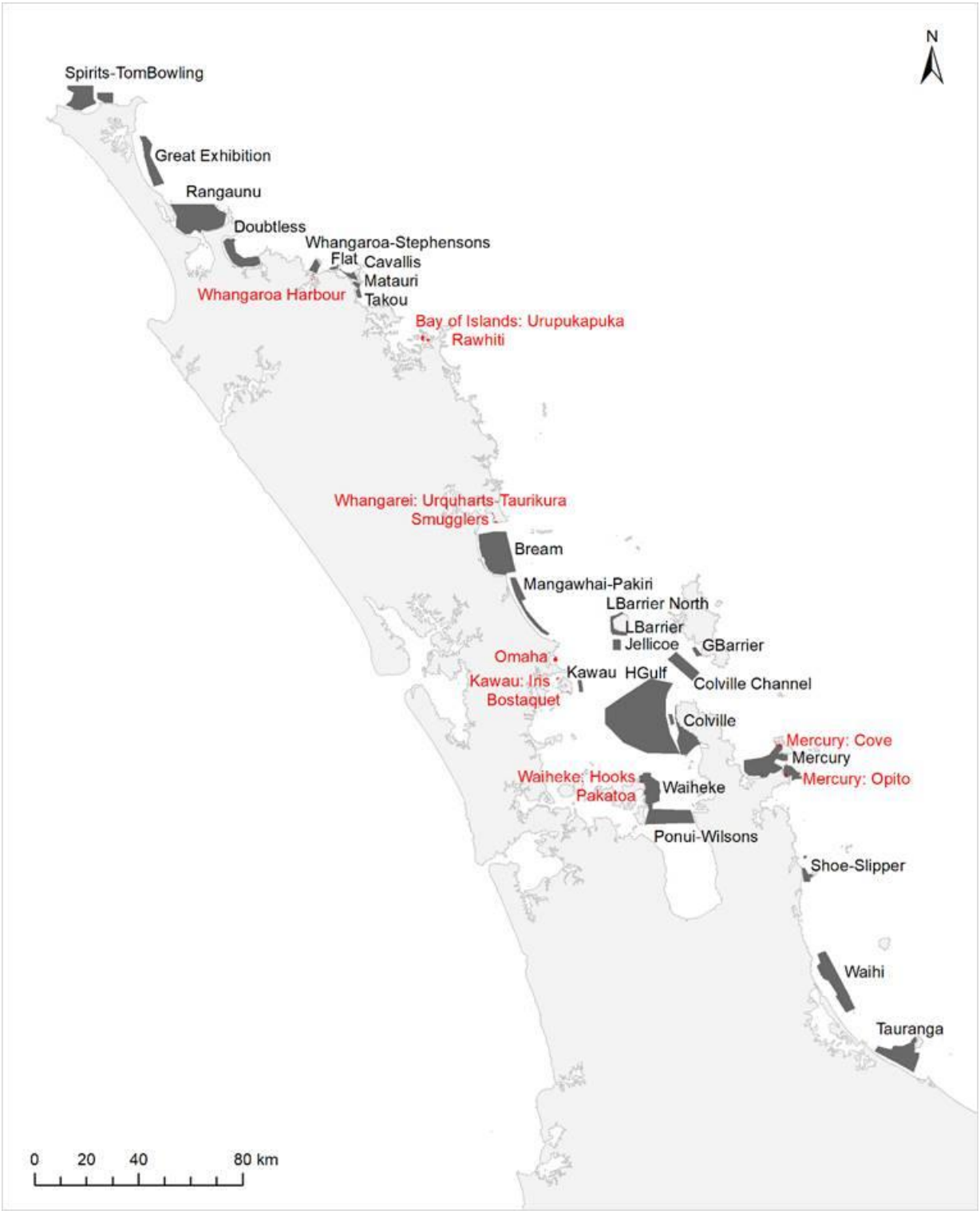

Figure A11. Historical commercial (black) and non-commercial (red) sites from scallop surveys conducted between 1990 and 2021.