Fisheries New Zealand
Tini a Tangaroa

Review of sustainability measures for kina (SUR 1A & SUR 1B) for 2023/24

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Stocks being reviewed

Kina (SUR 1A, SUR 1B) – East Northland & Hauraki Gulf and Bay of Plenty

New Zealand Sea Urchin – *Evechinus chloroticus, kina*

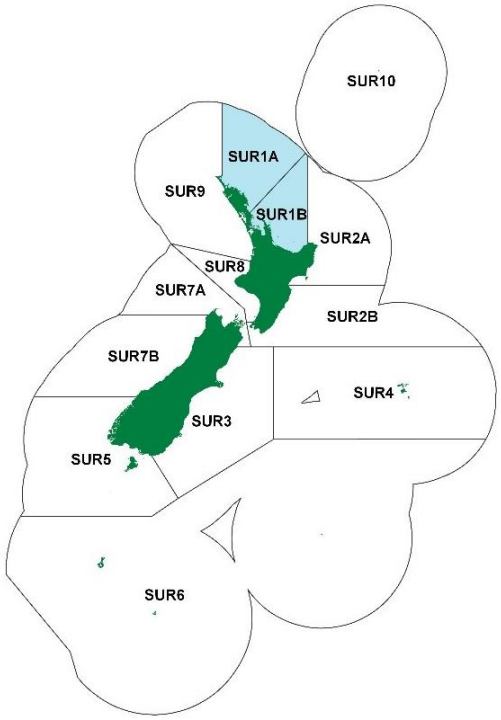

Figure 1: Quota Management Areas (QMAs) for kina, with SUR 1A and SUR 1B highlighted.

1 Why are we proposing a review?

1. Fisheries New Zealand (**FNZ**) is reviewing the sustainability measures for kina in Quota Management Areas SUR 1A and SUR 1B for the 1 October 2023 fishing year (Figure 1). These stocks were last reviewed in 2019. At that time the decision was made by the Minister for Oceans and Fisheries to retain the settings at the *status quo.* This decision recognised concerns raised by iwi that further information was needed before increases to catch limits would be appropriate.

2. Commercial catch limits for kina within these stocks have been fully or over-caught under the current settings. Information from fishers, scientists, and other stakeholders (including through local area surveys) suggests kina abundance is high in many areas to the point where kina are having an impact on other species and the wider marine ecosystem (for example, through creating '*urchin* or *kina barrens'*[1]). Kina abundance is thought to have increased significantly since the mid-1900s. High densities of kina and associated urchin barrens were first recorded in scientific literature in 1964.[2]

3. In 2019, new digital technologies for electronic reporting **(ER)** and Geospatial Position Reporting **(GPR),** or GPS tracking, on all commercial fishing vessels were rolled out. The use of ER and GPR has resulted in timely fine scale information being provided on commercial kina catch and fishing effort. Based on these significant improvements to monitoring and reporting, as well as a further understanding of kina abundance, overall biomass, FNZ considers there may now be an opportunity to provide for increased utilisation.

4. While a formal assessment of stock status is not available for SUR 1A or SUR 1B and there is no indication of the overall biomass of the SUR 1A and SUR 1B fisheries, valuable information can be derived from data collected through ER and GPR. This fine scale monitoring of

[1] *Kina barrens* refer to areas in the marine ecosystems where sea urchin populations have dramatically increased. In these areas, kina graze on kelp and other macroalgae, preventing their growth and causing a shift to barren rocky or sandy habitats. Barrens are characterized by the absence or depletion of kelp forests and the proliferation of kina, resulting in reduced biodiversity and ecological imbalance.

[2] Dromgoole (1964) & Shears and Babcock (2007)

commercial kina fishers' activities can indirectly provide an indication of locations of commercially viable abundance of good quality kina.

5. Despite not having a stock status, the available information on catch trends and reported commercial landings suggest that overall biomass of kina in both stocks is very high, and stable, if not increasing, at current management settings.

6. The current Total Allowable Catch (**TAC**) for SUR 1A is 172 tonnes. This is made up of allowances for customary Māori and recreational fishing of 65 tonnes each, an allowance for all other mortality caused by fishing of two tonnes, and a Total Allowable Commercial Catch (**TACC**) of 40 tonnes.

7. The current TAC for SUR 1B is 324 tonnes. This is made up of an allowance for customary Māori and recreational fishing of 90 tonnes each, and an allowance for all other mortality caused by fishing of four tonnes and a TACC of 140 tonnes.

8. These management settings remain unchanged from when both stocks were introduced into the quota management system (**QMS**) in 2003. These introductory settings are known to have been based off relatively low historical catch records and were set conservatively at the time due to limited available information about the status of the stocks.

9. While recognising there is likely high abundance to support increases at the levels proposed, FNZ has proposed a cautious approach to increasing the catch limits under section 13(2A) because the size of the absolute increase in kina biomass, as well as the overall status of the stock, are unknown. FNZ also notes the importance of kina as a taonga species, and the concerns raised by tangata whenua around overlap of commercial and customary harvest as well as the potential for increased catch to result in localised depletion. FNZ recognises the importance of kina resources for customary harvest and how the species supports iwi and local communities.

10. In recent years the emergence of kina barrens as an ecosystem consequence of fishing has gained considerable attention, and discussions regarding their management are currently underway. It is important to note that the proposed increases to catch limits are not intended as a measure to use in isolation to address kina barrens. A comprehensive set of measures will be developed to address the ecosystem effects of fishing through future engagement over the next year.

11. Measures are likely to include management of critical predator stocks and the implementation of strategies such as spatial management and localised removal initiatives (including the potential for targeted harvesting operations and/or translocation). An integrated management approach will be developed in close collaboration with tangata whenua and other stakeholder groups, including commercial kina fishers.

2 Summary of proposed options

12. Three options are proposed for each of the SUR 1A and SUR 1B stocks, as outlined in Table 1 below. Options 2 and 3 for SUR 1A and SUR 1B provide for a modest increase to the TAC and are considered to be a cautious approach when considering the likely overall biomass of kina within the QMAs.

Table 1: Proposed management options (in tonnes) for SUR 1A and SUR 1B from 1 October 2023.

Stock	Option	TAC	TACC	Allowances		
				Customary Māori	Recreational	All other mortality caused by fishing
SUR 1A	**Option 1** *(Status quo)*	172	40	65	65	2
	Option 2	247 (↑ 75 t)	80 (↑ 40 t)	100 (↑ 35 t)	65	2
	Option 3	267 (↑ 95 t)	100 (↑ 60 t)	100 (↑ 35 t)	65	2
SUR 1B	**Option 1** *(Status quo)*	324	140	90	90	4
	Option 2	439 (↑ 115 t)	210 (↑ 70 t)	135 (↑ 45 t)	90	4
	Option 3	509 (↑ 185 t)	280 (↑ 140 t)	135 (↑ 45 t)	90	4

13. FNZ welcomes feedback and submissions on the options proposed, or any alternatives.

3 About the stocks

3.1 Fishery characteristics

14. Kina are a 'shared' species that is highly valued by tangata whenua, recreational, and commercial fishers. They are also an important part of the coastal marine ecosystem.

15. Kina in SUR 1A and SUR 1B are harvested by customary, recreational, and commercial fishers and are targeted by hand-gathering across these fisheries. The use of underwater breathing apparatus is prohibited when commercially harvesting kina, so gathering is conducted by freediving. Kina are commercially harvested for their roe (eggs) which are removed from the shell and sold, typically in punnets or pottles. Commercially harvested kina roe is almost exclusively consumed by the domestic market.[3]

16. The kina fishery in New Zealand relies on obtaining good roe recovery. Research in New Zealand focused on improving roe recovery in the kina fishery has occurred through translocation trials. Kina were moved from areas with historically low gonad index (**GI**)[4] values to areas with abundant food supply and high GI values[5]. After seven months, the GI of kina at receiver sites significantly increased compared to their initial values. Surprisingly, the increase in GI was even greater at the initial sites, which the researchers attributed to reduced kina density and the regrowth of algal species. The economic significance of these findings was notable, as the increased GI could boost kina roe yield by 50 to 100%. These results align with the suggestion made by McShane & Naylor (1991) that kina remaining in lower densities after fishing would experience higher growth rates due to increased seaweed availability as a food source.

17. Reports from commercial fishers indicate that fishing typically occurs in a rotational manner in which areas are 'groomed' to manage kina populations at sufficiently low levels. Fishers have observed that this practice allows for some algal regrowth which provides food for remaining kina, thereby improving their condition (GI) and, consequently yields from the kina fishery.

18. Commercial fishers have reported that they avoid harvesting in areas across the SUR 1A and SUR 1B QMAs known to be of importance for customary or recreational kina gathering.

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

[3] Fisheries New Zealand (2023) – May 2023 Fisheries Assessment Plenary.

[4] The gonad index (GI) is a ratio between the gonad and body size that is used widely for describing and analysing the reproductive cycle of marine species.

[5] James & Herbert (2009).

whose rohe moana overlap with SUR 1A and SUR 1B. Kina are often part of the pataka kai (food basket) for coastal marae and they play an important role as kai for Māori.

20. Kina are amongst the top six shellfish species harvested by recreational fishers and are harvested by hand gathering while wading, freediving or scuba diving, either from shore or from a boat. Recreational fishing occurs across most of the area where rocky reefs exist, with much of the coastline of north-eastern New Zealand (SUR 1A and 1B) offering many accessible areas of rocky intertidal and subtidal reefs where kina are found.

3.2 Biology

21. Kina are found throughout New Zealand and the sub-Antarctic Islands in coastal habitats, generally in waters from the shallow subtidal to depths of at least 60 metres.[6]

22. Kina have an annual reproductive cycle which culminates in multiple spawning events across mid- and late summer.[7] Size at maturity appears to vary between locations and may be as small as 30 mm test diameter (**TD**) and as large as 75 mm TD.[8] The rate of settlement is likely to vary between years and appears to differ among locations and habitats. Laboratory work has shown that the settlement of urchin larvae is inhibited, and the survival of recruits (2 to 5 mm TD) and juveniles (10 to 30 mm TD) is reduced by sediment concentrations less than that found on wave sheltered reefs within the Hauraki Gulf.[9] Larval abnormalities have also been correlated with increasing suspended sediment concentration in laboratory experiments.[10] This signals a link between environmental factors associated with terrestrial runoff and kina abundance.

23. Feeding experiments have indicated that kina possess a selective mode of feeding, being able to distinguish between algal species but with a preference for the kelp *Ecklonia radiata*[11] and to a lesser extent *Sargassum sinclarii*, *Landsburgia quercifolia* and *Carpophylum maschalocarpum.*[12] However, kina can also feed on encrusting organisms, such as sponges, when algal food is scarce.[13]

24. Interactions between kina, their predators, and the algal species they graze on, is a highly studied aspect of New Zealand's marine ecology. Research conducted utilising marine protected areas which are situated in the SUR1A and 1B areas, where predators such as snapper and crayfish are abundant, indicates that these predators can both control the abundance of kina, and influence their foraging behaviour.[14] These studies have drawn a direct link between increases in the abundance of snapper and crayfish inside Leigh Marine Reserve and other marine protected areas, the long-term declines in kina abundance, and reforestation of areas of bare reef known as kina barrens.

25. Other factors, for example wave exposure, climate, disease, and toxic microalgae[15], are also known to influence the abundance and distribution of kina and kina barrens.

26. There is little genetic difference between kina that have been analysed in different parts of New Zealand, and the boundaries of the biological stock are unknown.

27. In general, coastal shellfish resources fluctuate naturally and are susceptible to environmental degradation. Potential stressors, other than human harvesting include:

    - anthropogenic contaminants
    - changes in the marine environment associated with human activity, such as increased sediment loading, nutrient enrichment, and climate change; and

[6] Miller & Abraham (2011)
[7] Walker (1982)
[8] Miller & Abraham (2011)
[9] Walker (2007)
[10] Shima & Phillips (2006)
[11] Cole et al., 2000; Don, 1975; Schiel, 1982
[12] Schiel 1982
[13] Ayling, 1978
[14] Spyksma et al. (2017)
[15] Shears et al. (2008), Shears & Ross (2010)

- natural phenomena, such as heat stress, and diseases/parasite events.

3.3 Management background

28. Kina in East Northland (SUR 1A) and Hauraki Gulf/Bay of Plenty (SUR 1B) were introduced to the QMS[16] in 2003. At this time, it was acknowledged that there would be benefits in managing kina catches at a finer scale than the standard Fisheries Management Areas (**FMA**s) used for the majority of QMS stocks. The division between SUR 1A and SUR 1B provided a degree of finer scale management while still giving fishers flexibility to gather kina from a variety of locations. Initial catch limits were set cautiously, below the maximum historical recorded catches.

29. SUR 1A and SUR 1B were last reviewed in 2019. The Minister at the time decided not to change the management settings for either stock, noting that there was limited information available at the time, including a lack of historical fine scale records of fishing effort and catch. There were also widespread concerns from Iwi Fisheries Forums that this taonga species may be over-exploited, particularly in areas significant to customary harvest, if an increase to commercial catch limits was implemented. The Minister at the time instructed officials to support further work to develop a collaborative management plan that clearly identifies all aspirations and considers ways to gather further information if there was an interest from parties to do so. Following the development of a plan and at a time when sufficient information has been collected, these stocks could be reviewed and to work with Iwi to develop an appropriate management approach.[17]

30. The development of a plan required finer scale information and a collaborative approach. Since the introduction of ER and GPR in 2019, FNZ has been able to gather better information on catch levels to inform a sustainability review and management report. The development of this management plan has been delayed by the impact of the COVID-19 pandemic. However, FNZ intends to actively engage in the management process over the next year.

31. In March 2023, a National Workshop on kina barrens was held to prioritise scientific research to inform management of kina barrens. There was widespread concern expressed in the workshop regarding the state of the environment with respect to kina barrens and it was acknowledged an integrated management approach was required. Results from this workshop will be published as part of a publicly available report later this year.

32. It was noted, by the workshop attendees, that while kina removal can support kelp regrowth of macroalgae, it does not address the underlying causes of elevated sea urchin populations and is not a long-term solution for ecosystem recovery. Thus, any kelp recovery would be temporary unless broader ecosystem issues are addressed concurrently.

4 Status of the stocks

33. There are no established reference points to use for estimating the maximum sustainable yield of kina, no recognised approach for assessing the status of the stock and there is insufficient information to estimate current stock status.[18]

34. In the absence of an estimate of current stock status, the monitoring of fine scale catch per unit effort of kina is recommended as the most effective and practical monitoring approach for New Zealand kina fisheries[19],[20]. The implementation of electronic catch and position monitoring in 2019 allowed for this level of monitoring to begin and provides the best available information on the kina fisheries.

[16] For more information about the QMS go to https://www.mpi.govt.nz/law-and-policy/legal-overviews/fisheries/quota-management-system/.
[17] The Minister's Decision Letter for October 2019 is available at https://www.mpi.govt.nz/dmsdocument/37203-Ministers-decision-letter-on-the-review-of-sustainability-measures-for-1-October-2019.
[18] Fisheries New Zealand (2023) – May 2023 Fisheries Assessment Plenary.
[19] Andrew et al. (2002).
[20] Miller & Abraham (2011).

35. For stocks in which the Maximum Sustainable Yield (**MSY**) is not able to be reliably estimated using the best available information, section 13(2A) of the Act specifies that decisions to set or vary the TAC must not be inconsistent with the objective of maintaining the stock at or above or moving the stock towards or above a level that can produce the MSY. As the MSY is unknown for SUR 1A and SUR 1B, a precautionary approach is proposed in setting the TAC.

36. While there is no formally assessed estimate of kina biomass for the SUR 1A and SUR 1B stocks, kina do exist at extremely high densities (greater than 20 per m^2) in areas known as kina barrens (the ecology of kina barrens is covered below in section 7). Information from fishers, scientists, and other stakeholders suggests kina abundance is high in many areas to the point where kina are having an impact on other species and the wider marine ecosystem. Kina abundance is thought to have increased significantly since the mid-1900s[21].

37. As an indication of the biomass present in some areas within SUR 1A and 1B, University of Auckland researchers, operating under a FNZ special permit, recently removed an estimated[22] 65 t of kina (~403,000 individual kina) from just 7.1 ha of shallow subtidal reef at sites at Hauturu-o-Toi / Little Barrier Island, Leigh, and Ōtata (Noises)[23]. FNZ recognises that kina are not uniformly distributed and do not occur at such high densities at all locations. However, there is suitable reef habitat for kina all along much of the QMA coastline and it is anticipated that the overall kina biomass for both stocks is very high relative to the current and proposed total allowable catch settings. FNZ also notes that there is uncertainty in the roe quality and commercial viability of these increased stocks of kina.

5 Catch information and current settings within the TAC

5.1 Commercial

38. The best available information on the SUR 1A and SUR 1B stocks is from the Fisheries Assessment Plenary which provides information on commercial reporting; however, this information is limited. This is because, until the implementation of ER and GPR in 2019, information was provided at a general fisheries statistical area scale, which was large and not reported consistently or completely (Figure 2). However, by December 2019, all commercial operators were required to report and submit electronic fishing reports on a daily basis and carry GPR devices on their vessels. This has since provided precise information about the location and extent of fishing. The finer scale information has provided an opportunity to improve monitoring and our understanding of kina stocks.

39. Commercial fishers have continued to report consistent catches and put forward views that substantially more kina could be harvested sustainably. Since the implementation of ER and GPR, commercial landings have been consistently maintained at between 35 and 42 tonnes in SUR 1A and between 130 and 150 tonnes in SUR 1B. Similar figures were recorded prior to 2019.

40. Commercial fishing activity occurs throughout SUR 1A and SUR 1B (Figure 2), but certain areas are specifically targeted for repeated (rotational) harvesting of kina throughout the fishing year.

[21] Dromgoole (1964); Shears and Babcock (2007)
[22] Miller & Shears, (unpublished data)
[23] Miller & Shears, (2022)

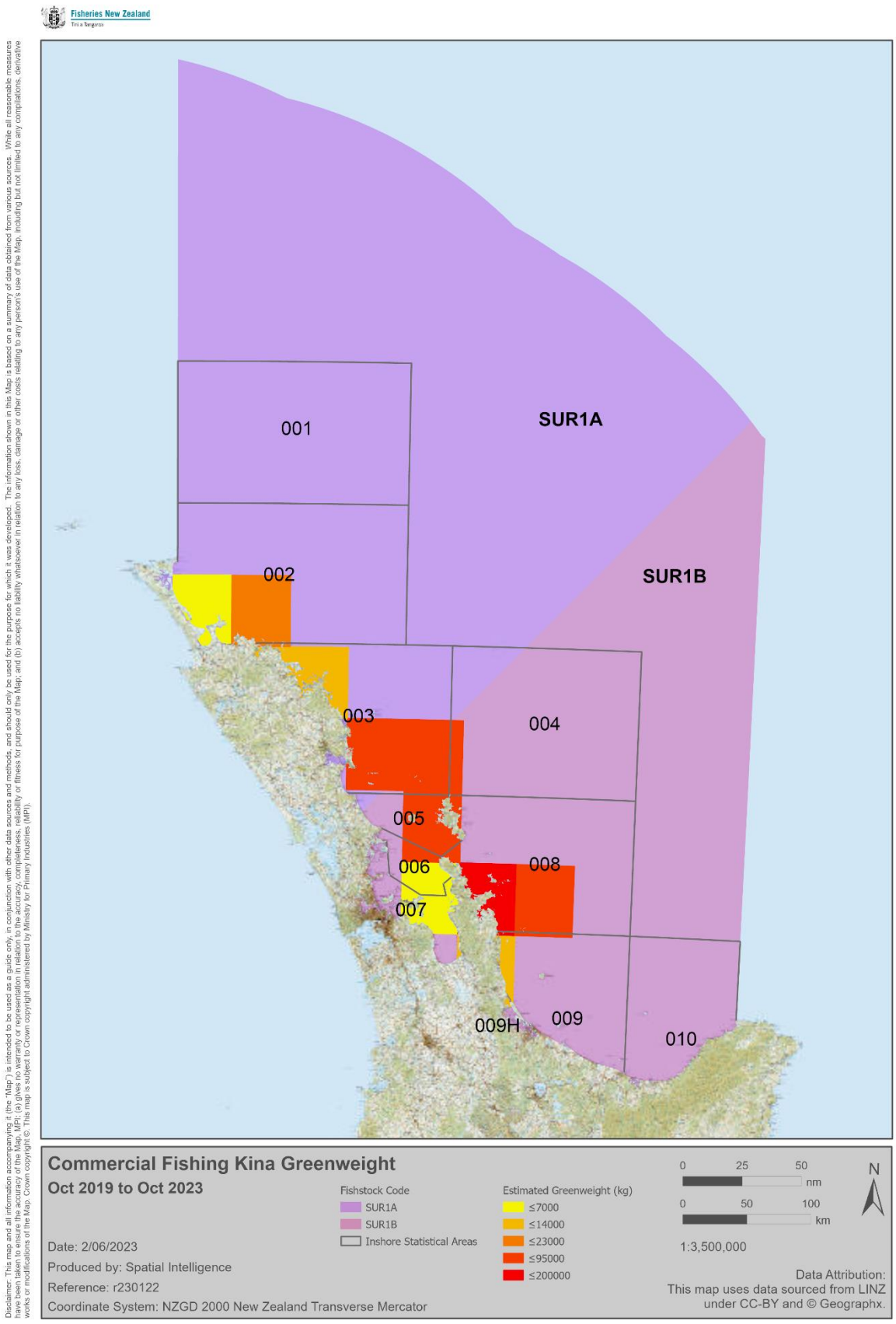

Figure 2: Commercial landings for SUR 1A and SUR 1B in greenweight from 2019 to 2023, since the introduction of electronic reporting and geospatial position reporting[24]. Statistical areas, at which commercial catch was reported by prior to 2019, is shown as well.

[24] Note the resolution used in Figure 2 is in line with the Ministry for Primary Industries data release guidelines and as such does not show fishing activity at a fine scale.

41. Figures 3 and 4 below show that catches in SUR 1A and SUR 1B have remained at a relatively consistent level, with the respective TACCs constraining the total commercial harvest at or near 40 tonnes in SUR 1A and 140 tonnes in SUR 1B.

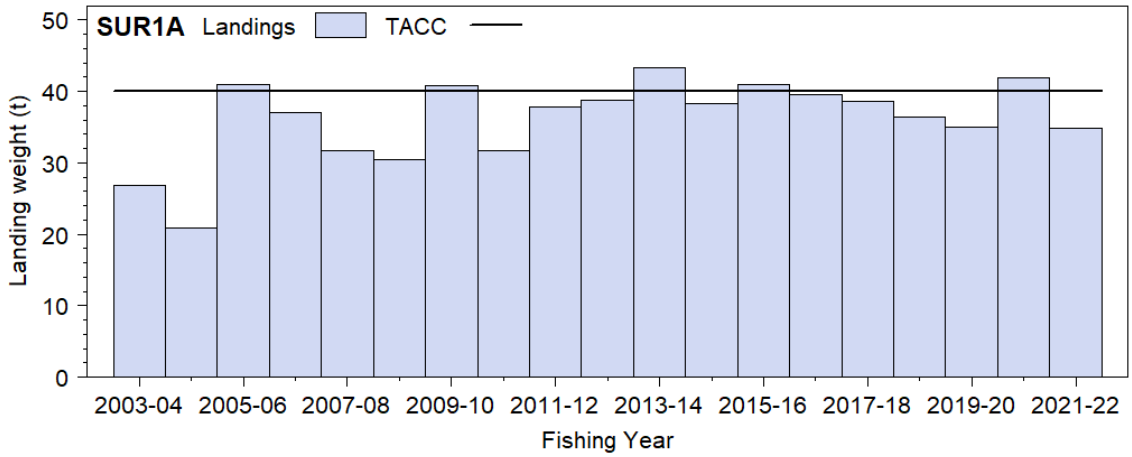

Figure 3: Landings and catch limits for SUR 1A (East Northland) from 2003–04 to 2021–22. TACC refers to catch limit, and weight refers to greenweight.

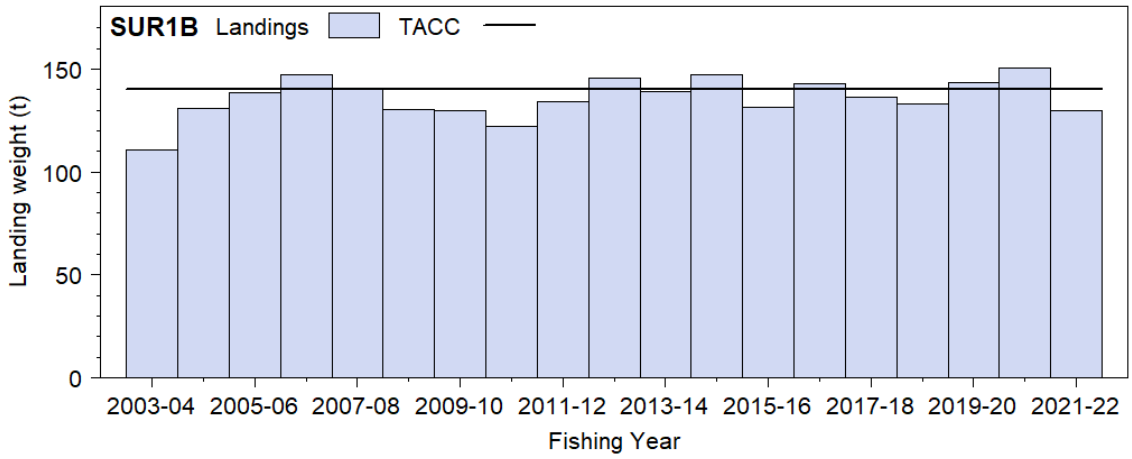

Figure 4: Landings and catch limits for SUR 1B (Hauraki Gulf and Bay of Plenty) from 2003–04 to 2021–22. TACC refers to catch limit, and weight refers to greenweight.

5.2 Customary Māori

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

43. While kina is a common species for which customary authorisations are issued, there is limited quantitative information available on the level of customary take of kina from both SUR 1A and SUR 1B. It is likely that Māori customary fishers also utilise the provisions under recreational fishing regulations (recreational fishers can take up to 50 kina per day).

44. Parts of the SUR 1A and SUR 1B QMAs are not currently covered under the *Fisheries (Kaimoana Customary Fishing) Regulations 1998.*[25] Customary fishing authorisations in some parts of SUR 1A and SUR 1B, if issued, would be under the *Fisheries (Amateur Fishing)*

[25] Fisheries (Kaimoana Customary Fishing) Regulations 1998 are further discussed under Option 2.

Regulations 2013, where there is no requirement to report on catch. As such, customary harvest records held by FNZ are likely to be incomplete.

45. FNZ welcomes input from tangata whenua to inform advice on the setting of an appropriate allowance for customary kina harvest.

5.3 Recreational

46. Kina is a popular recreational species that is exclusively harvested through hand gathering while wading, freediving or scuba diving, either from shore or from a boat. The use of underwater breathing apparatus is permitted in the recreational fishery.

47. The best available information on the 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.[26] The 2017/18 NPS estimated 539,808 kina were harvested across all kina areas in New Zealand, with approximately 55% (296,104) of the national harvest of kina taken in SUR 1A and SUR 1B combined.

48. Estimates of mean kina weight are not available to allow recreational catch estimates reported in the NPS to be converted into harvested weight (catches in the NPS are reported as numbers of individual kina). However, by using a conversion factor of 161 g per individual (used recently be researchers studying kina barrens in SUR 1B[27]), the recreational catch from SUR 1A and SUR 1B can be estimated at approximately 48 tonnes.

5.4 Other sources of mortality caused by fishing

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

50. Another source of kina mortality in SUR 1A and SUR 1B results from the use of kina as ground-bait to attract fish. Ground-baiting is a common practice among spearfishers that involves collecting kina, placing them in a pile in the middle of an open area, and then breaking them open using a knife, rock, or the butt of a speargun.

51. Illegal harvest or poaching of kina is also a potential source of mortality caused by fishing for SUR 1A and SUR 1B. There is qualitative data to suggest significant illegal, unreported, unregulated activity in these fisheries.

52. FNZ have also issued a number of permits, some of which are ongoing, in the SUR 1A and SUR 1B area to allow for the harvesting of kina under investigative research. These permits have seen a substantial amount of kina being extracted from the ocean and so it is expected that a significant mortality to kina occurs under special permits. Currently the take from special permits are not considered under the other sources of mortality allowance and an assessment of the sustainability impact of special permits is undertaken on a case-by-case basis.

6 Treaty of Waitangi obligations

53. Section 5(b) of the *Fisheries Act 1996* requires that the Act be interpreted and people making decisions under the Act to do so in a manner that is consistent with the *Treaty of Waitangi (Fisheries Claims) Settlement Act 1992* (**the Settlement Act**). The Settlement Act provides that non-commercial customary fishing rights continue to be subject to the Principles of the Treaty of Waitangi and give rise to Treaty obligations on the Crown.

54. Section 10 of the Settlement Act requires the Minister to develop policies and programmes to give effect to the use and management practices of tangata whenua. Consistent with this

[26] Wynne-Jones et al. (2019) – NPS 2017-18
[27] Kelsey Millar *pers comm*.

section, the Ministry has worked with iwi to develop engagement processes that enable iwi to work together to reach a consensus where possible and to inform the Ministry on how tāngata whenua wish to exercise kaitiakitanga in respect of fish stocks in which they share rights and interests and how those rights and interests may be affected by sustainability measures proposed by the Ministry.

6.1 Input and participation of tangata whenua

55. Section 12 (1)(b) of the *Fisheries Act 1996* requires that before undertaking any sustainability process the Minister shall provide for the input and participation of tangata whenua who have a non-commercial interest in the stock or an interest in the effects of fishing on the aquatic environment in the area concerned. In considering the views of tangata whenua, the Minister is required to have particular regard to kaitiakitanga[28].

56. Input and participation of tangata whenua into the sustainability decision-making process is provided mainly 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. Iwi Fisheries Forums may also be used as entities to consult iwi with an interest in fisheries.[29]

57. The proposal to review SUR 1A and SUR 1B has been discussed with the Mid-North Iwi Fisheries Forum. Information has also been sent to the Mai I Nga Kuri A Wharei Ki Tihirau Fisheries Forum in the Bay of Plenty and the Te Hiku o te Ika Iwi Fisheries Forum in the far North, will be discussed at the Forum huis in June.

58. Tangata whenua with interests in SUR 1A and SUR 1B have expressed interest in developing a planned approach to address kina barrens using a multitude of options and guided by mātauranga Māori. There was also an expectation expressed that iwi are involved in developing options, as opposed to just providing feedback. Further details received by each Iwi Fisheries Forum is summarised in Table 2 below.

59. FNZ will undertake further engagement with Iwi Fisheries Forums during consultation to seek input on the options outlined in this proposal and FNZ welcomes any input and submissions from tangata whenua on these options.

Table 2: Summary of engagement with Iwi Fisheries Forums.

Iwi Fisheries Forum	Engagement on SUR 1A & SUR 1B
Te Hiku o te Ika	To be discussed at hui in June.
Mai I Nga Kuri A Wharei Ki Tihirau	To be discussed at hui in June.
Mid-North	Indicated strong concerns around providing for any further commercial fishing of kina. Members communicated their preference for Government to consult hapu and iwi on establishing an appropriate kina management plan and then provide for hapu to develop and deliver the plan, rather than FNZ.

6.2 Kaitiakitanga

60. Information provided by forums, and iwi views on the management of fisheries resources and fish stocks, as set out in Iwi Fisheries Plans, are ways that tangata whenua can exercise kaitiakitanga in respect of fish stocks.

[28] The Fisheries Act defines Kaitiakitanga to mean "the exercise of guardianship; and, in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori", where tikanga Māori refers to Māori customary values and practices.

[29] However, Fisheries New Zealand also engages directly with Iwi (outside of Forums) on matters that affect their fisheries interests in their takiwā and consults with any affected Mandated Iwi Organisations and Iwi Governance Entities where needed.

61. Kina is identified in the Te Hiku O Te Ika Iwi Fisheries Forum Fisheries Plan, the Nga Hapu o Te Uru Tainui Iwi Fisheries Forum Fisheries Plan, and in the Mai I Nga Kuri A Wharei Ki Tihirau Iwi Forum Fisheries Plan, as a taonga species.[30]

62. FNZ considers that the management options presented in this consultation paper are in keeping with the objectives of these plans, which generally relate to the maintenance of healthy and sustainable fisheries but notes initial feedback from iwi has been mixed and seeks further input from iwi to help inform final advice on this review.

63. FNZ is seeking input from tangata whenua on how the proposed options for SUR 1A and SUR 1B may or may not provide for kaitiakitanga as exercised by tangata whenua, and how tangata whenua consider the proposal may affect their rights and interests in this stock.

6.3 Mātaitai reserves and other customary management tools

64. When setting or varying any TACC under section 21(4) of the Act and allowing for Māori customary non-commercial interests, the Minister must take into account any gazetted mātaitai reserves and fishing method restrictions or prohibitions in the relevant quota management area.

65. There are 13 customary fisheries management areas within SUR 1A and SUR 1B. These include two taiāpure, six temporary closures, and five mātaitai reserves implemented under section 186A of the Act (Table 3).

Table 3: Customary fisheries management areas in SUR 1A and SUR 1B.

Stock	Customary Area	Management Type
SUR 1A	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.
SUR 1B	Maketu Taiāpure	
SUR 1A	Marsden Bank and Mair Bank Temporary Closure	**Section 186A 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.
	Maunganui Bay Temporary Closure	
SUR 1B	East Coromandel Temporary Closure	
	Te Mata and Waipatukahu Temporary Closure	
	Umupuia Beach Temporary Closure	
	Waiheke Island Temporary Closure	
SUR 1A	Te Puna Mātaitai	**Mātaitai reserve** Commercial fishing is not permitted within mātaitai reserves unless regulations state otherwise.
SUR 1B	Raukokere Mātaitai	
	Te Kopa o Rongokānapa Mātaitai	
	Te Maunga o Mauoa Mātaitai	
	Te Rae o Kohi Mātaitai	

66. Commercial fishing is not permitted within mātaitai reserves (unless regulations state otherwise), but recreational and customary fishing is allowed (subject to any bylaws). The section 186A temporary closures above prevent recreational and commercial fishing for the species to which they apply. The Maunganui Bay section 186A temporary closure is an exception as it prohibits all take other than recreational and customary harvest of kina. At this time no taiāpure within SUR 1A and SUR 1B have introduced regulations that prohibit the harvest of kina.

67. Analysis of fine scale catch and fishing effort data suggests the majority of commercial fishing occurs at offshore islands and isolated coastal regions, and generally does not overlap with the customary management areas in Table 3.

[30] Taonga is defined as a treasure or anything prized and considered to be of value.

68. FNZ believes that the remoteness of the majority of commercial fishing activity limits the likelihood of significant overlap with areas of customary and recreational harvest.

69. While FNZ does not anticipate that an increase in TACC will result in increased harvesting near customary management areas, FNZ will continue to monitor commercial harvest and should any concerns arise, will review the management settings accordingly.

7 Environmental principles – section 9 of the Act

70. The environmental principles that must be taken into account when considering sustainability measures for SUR 1A and SUR 1B, are as follows:

- Associated or dependent species should be maintained above a level that ensures their long-term viability.
- Biological diversity of the aquatic environment should be maintained; and
- Habitats of particular significance for fisheries management should be protected.

7.1 Associated or dependent species – section 9(a) of the Act

7.1.1 Protected species interactions

71. Harvesting of kina is considered to pose little to no risk to seabirds.[31] However, harvesting involves the use of boats or vessels and there is a risk of direct collisions between seabirds and the vessels, leading to injury or mortality.

72. There are no known captures of marine mammals, seabirds, or protected fish species in New Zealand kina fisheries.

7.1.2 Fish and invertebrate bycatch

73. Kina are harvested by hand-gathering while freediving in SUR 1A and SUR 1B. The method of hand-gathering is a highly selective one and there is no bycatch of any fish and invertebrate species.

7.2 Biological diversity of the aquatic environment – section 9(b) of the Act

74. SUR 1A and SUR 1B are recognized as target fisheries where commercial harvesting is conducted through hand gathering while freediving. The selective nature of this method of harvesting ensures that there is no bycatch or incidental mortality of kina or non-target organisms.

75. Harvesting of kina may lead to a reduction in herbivory on a reef resulting in an increase in the abundance of macroalgal and invertebrate species and a corresponding increase in associated biodiversity.

76. The removal of predators (particularly large predators) through fishing, and the occurrence of kina barrens as a result, will have an impact on associated biodiversity.[32] The full extent of this impact is unknown (including on associated and dependent species), but it is likely that a shift from productive kelp forests to kina barrens will result in reduced primary production and biodiversity. It is acknowledged that kelp habitats are likely to be important for a range of harvested and non-harvested species, and any reduction in such habitats is therefore likely to be adverse to species that rely on kelp[33].

[31] Ministry for Primary Industries (2021) Aquatic Environment and Biodiversity Annual Review (AEBAR): A summary of environmental interactions between the seafood sector and the aquatic environment.
[32] MacDiarmid et al. (2013)
[33] Dayton (1985)

77. FNZ notes that environmental factors, such as sedimentation and water quality, also affect the distribution and abundance of biological diversity on rocky reefs but are not directly managed by FNZ. FNZ will continue to monitor research done in this field and will engage with relevant local authorities in this regard.

7.3 Habitats of particular significance for fisheries management – section 9(c) of the Act

78. Habitats of particular significance for fisheries management are not defined in the Act. FNZ recently consulted on draft guidelines for identification of habitats of particular significance for fisheries management and the operational proposals to support its application. In this context, protect means taking measures that would avoid, remedy, or mitigate the adverse effect of a decision that could undermine the function the habitat provides for the fisheries resource and ecosystem.

79. There are no specific habitats of particular significance identified for SUR 1A or SUR 1B at this time in the draft guidelines. What is known is outlined in Table 4. Irrespective of whether a habitat of particular significance for kina has yet been identified, FNZ considers that an increase to catch limits would not increase adverse effects from fishing on any significant kina habitats in SUR 1A or SUR 1B.

Table 4: Summary of information on potential habitats of particular significance for fisheries management for SUR 1A and SUR 1B.

Fish stocks	Kina – SUR 1A and SUR 1B
Habitat of particular significance	Rocky intertidal and subtidal reefs
Attributes of habitat	Kina are found along most coastal habitats, particularly in rocky intertidal and subtidal reefs dominated by encrusting algae. They inhabit shallow subtidal waters to depths of about 60 metres. Kina populations are not uniformly distributed across all rocky reef habitats. Abundance is primarily determined by depth and wave exposure[34]. On the north-eastern coastline of the North Island, dense aggregations of kina can form at depths between 3-20 metres. These areas are characterised by low algal abundance and are known as kina barrens.
Reasons for particular significance	Kina larvae spend between 20 to 40 days in the water column before settling on rocky substrate indicating the importance of the presence of suitable settlement surfaces. Rocky intertidal and subtidal reefs are also characterised by the growth of seaweed species and algae. Rocky shores provide stable platforms for seaweeds to anchor themselves to and create forests. These kelp forests provide shelter and nursery grounds for many fish species such as kina, snapper, and crayfish. They also provide food for grazing species such as kina, crabs and snails which serve as prey for large predatory fish species. Rocky shores in areas of wave exposure are important, as species that attach themselves to substrate permanently, such as barnacles and sea squirts, cannot forage for food, and therefore rely on waves to transport food to them. Intertidal and subtidal reefs, as a result of the points mentioned above, are typically defined as ecosystems that are high in biodiversity.
Risks/threats	The overfishing of key predator species, such as snapper and crayfish, is considered a key contributor to the formation of kina barrens. Kina barrens are characterised by bare rocky substrate, a complete or significant loss in seaweeds, low biodiversity, and high densities of kina and they ultimately threaten healthy kina habitats. Fine sediments introduced from runoff from the land may have adverse effects on kina and the kina habitat. Layers of fine sediment can reduce light levels for marine plant species which could impact food availability for intertidal and subtidal species[35].

[34] Shears & Babcock (2007)
[35] Nicholls et al. (2003)

	The oceans around the East Coast North Island of New Zealand are warming at a rate well in excess of the global average[36], and moderate to strong heatwaves have been recorded in recent years in the Hauraki Gulf[37]. Changes in the environmental conditions associated with marine heatwaves may have impacts on the survival of larval kina and food availability for kina. However, the extent to which changes in climate and temperature may be affecting kina habitat suitability in SUR 1A and SUR 1B is unknown. The increased presence of the long-spined sea urchin (*Centrostephanus rodgersii*) may also pose a risk to kina habitat. The long-spined sea urchin has been observed to cause barren expansion[38].
Confidence	Body of empirical work exists but it is associated with some uncertainty, or the expert has direct personal research experience.

8 Considerations for setting sustainability measures under section 11 of the Act

80. Section 11 of the Act sets out various matters that the Minister take into account or have regard to when setting or varying sustainability measures (such as the TAC changes proposed as part of this paper). These include:

    a) any effects of fishing on any stock and the aquatic environment; and

    b) any existing controls under the Act that apply to the stock or area concerned; and

    c) the natural variability of the stock concerned; and

    d) any relevant planning instruments, strategies, or services.[39]

8.1 Effects of fishing on any stock and the aquatic environment

81. In setting or varying a sustainability measure the Minister must take into account any effects of fishing on any stock and the aquatic environment. "Effect" is defined widely in the Act.[40]

82. All information regarding the effects of harvesting kina on any stock and the aquatic environment is discussed above under '*Environmental principles*', and below under '*Total Allowable Catch*' and ''*Options and analysis*'.

8.2 Existing controls that apply to the stock or area

83. In setting or varying a sustainability measure the Minister must take into account any existing controls under the *Fisheries Act 1996* (including rules and regulations made under the Act (s 2(1A)) that apply to the stock when setting or varying the TAC.

84. Aside from the catch limits and allowances set under the TAC, there are daily bag limits for recreational take in both SUR 1A and SUR 1B of 50 kina per person per day. A daily bag limit is intended not only to ensure sustainable harvesting levels, but also to share the resource between individual fishers. As there are no constraints on the number of recreational harvesters, overall recreational harvest of intertidal shellfish is unconstrained. The limit addresses the additional harvest pressure that close proximity to a major population centre, such as the Auckland and Coromandel regions, can create.

[36] Sutton & Bowen (2019)
[37] Moana Project (n.d.)
[38] Kerr (2016)
[39] Sections 11 (2) and (2A).
[40] Section 2(1) of the Act defines "effect" to mean the direct or indirect effect of fishing, and includes any positive, adverse, temporary, permanent, past, present, or future effect. It also includes any cumulative effect, regardless of the scale, intensity, duration, or frequency of the effect, and includes potential effects.

8.3 The natural variability of the stock

85. In setting or varying a sustainability measure the Minister must take into account the natural variability of the stock.

86. Settlement of kina larvae within the SUR 1A and SUR 1B fisheries is likely to vary between years and appears to differ among locations and habitats, attributed to the variability in larval mortality.[41]

87. In laboratory and field studies, larval mortality and developmental abnormalities have been observed to increase with increasing concentrations of suspended sediment. The suspended sediment concentrations used in these experiments were equivalent to typical peak sediment loads to the Wellington Harbour System.[42] This suggests that environmental conditions associated with terrestrial runoff are of importance.

88. Population growth of kina and the establishment of kina barrens has been attributed to fishing of large predators, as discussed under section 7 of this paper.

~~89.~~ The proposed increases to the TAC of SUR 1A and SUR 1B provide for additional sustainable utilisation of the kina resource and may also contribute to managing the expansions of kina barrens in the short to medium term. FNZ does not anticipate a sustainability risk with the proposed increases to catch settings as reported landings have remained consistent for the past 19 years and information from fishers, scientists, and other stakeholders (including through local area surveys) suggests kina abundance is high in many areas.

90. FNZ will continue to monitor reported landings in both fisheries, and should new information suggest that kina abundance has changed over time in a way that may signal a sustainability concern, the management settings will be reviewed.

8.4 Relevant statements, plans, strategies, provisions, and documents – section 11(2) of the Act

91. In setting or varying the TAC of this stock, the Minister must have regard to relevant statements, plans, strategies, provisions, and planning documents that apply to the coastal marine area. The following plans and strategies apply to SUR 1A ad SUR 1B.

8.4.1 Regional Plans – section 11(2)(a)

92. Four Regional Councils have coastlines within the boundaries of the SUR 1A and SUR 1B areas: Northland, Auckland, Waikato, and Bay of Plenty. Each region has policy statements and plans to manage the coastal and freshwater environments, including terrestrial and coastal linkages, ecosystems, and habitats.

93. FNZ considers that the proposed management options presented in this document, are in keeping with the objectives of relevant regional plans, which generally relate to the maintenance of healthy and sustainable ecosystems to provide for the needs of current and future generations. The provisions that might be considered relevant can be found in a separate document titled *Regional plan provisions and policy statements*, accessible at https://www.mpi.govt.nz/dmsdocument/57115.

94. In April 2023, the Environment Court released its finalised decision on marine protection measures under the proposed Northland Regional Plan. Of relevance to SUR1A, is the prohibition of all fishing, except for kina harvest, in Maunganui Bay to Oke Bay and Mimiwhangata under the proposed Plan to protect the biodiversity values identified. It is expected that the prohibitions will come into effect later this year. It is uncertain what effect these areas will have but FNZ will take interest in any data and studies produced in the future about the closed areas and aims to work with the council and share information in this regard.

[41] Walker (1984)
[42] Phillips & Shima (2006), Schwarz et al. (2006)

95. The Bay of Plenty Regional Coastal Environment Plan also contains rules since 2021 prohibiting all fishing in the three areas that make up the Motiti protection area. The rules have been introduced to protect indigenous biodiversity and acknowledge the significant marine landscape and cultural values in the area. Those three areas comprise of Ōtaiti (Astrolabe Reef); including Te Papa (Brewis Shoal), Te Porotiti, and Okarapu Reef, Motuhaku Island (Schooner Rocks) and Motunau Island (Plate Island). These areas are located in the SUR 1B QMA.

96. The FNZ Coastal Planning Team engages with the RMA coastal planning processes (including regional authorities) to support marine management decisions to manage not only the fishing effects on the coastal environment but also land-based impacts on fisheries.

8.4.2 Hauraki Gulf Marine Park Act (HGMPA) – section 11(2)(c)

97. SUR 1A and SUR 1B boundaries overlap within the Hauraki Gulf Marine Park (**HGMP**). 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 this fishery.

98. FNZ considers that this review of SUR 1A and SUR 1B and the proposed options are consistent with obligations under sections 7 and 8 of the HGMPA in that the proposed options aim to address a sustainable utilisation opportunity in both fisheries, addressing this should help to:

- support the life-supporting capacity of the environment of the Hauraki Gulf and its islands;
- protect natural and historic resources (i.e., kina and their ecosystems) in the Hauraki Gulf; and
- provide the capacity for future use of these resources by people and communities in the Hauraki Gulf.

8.4.3 Harvest Strategy Standard

99. Section 13 of the Act provides for the setting of a TAC for SUR 1A and SUR 1B, and guidance is provided by the Harvest Strategy Standard for New Zealand Fisheries (**HSS**). The High Court has held that the HSS is a mandatory relevant consideration that the Minister must have regard to when setting a TAC under section 13 of the Act.

100. The 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[43]. 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.

101. 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.

102. In the case of kina in SUR 1A and SUR 1B, there are no established reference points or available estimates of B_{MSY} (the biomass that enables a fish stock to deliver *MSY*), and as such there is uncertainty as to where the current biomass sits in relation to the default targets (including the soft or hard limit) set out by the HSS. Reported commercial landings represent the best available information for monitoring stock health.

[43] For more information on the HSS go to https://www.mpi.govt.nz/dmsdocument/728-Harvest-Strategy-Standard-for-New-Zealand-Fisheries.

8.5 Relevant services or fisheries plans – section 11(2A) of the Act

103. Before setting or varying any sustainability measure (such as the TAC), the Minister must take into account any conservation or fisheries services, and any relevant fisheries plans approved under section 11(2A) of the Act.

104. There are no fisheries plans approved under section 11(2A) specific to SUR 1A or SUR 1B, or of specific relevance to this review of measures for the fishery.

105. Fisheries services of relevance to the options in this paper include the research used to monitor the fisheries, such as electronic reporting of landings, and the tools used to enforce compliance of management controls in the fishery.

106. FNZ notes that the SUR 1A and SUR 1B fisheries do not have observer or on-board camera coverage, but Fisheries Compliance regularly monitors the SUR 1A and SUR 1B areas to ensure that management controls are being adhered to.

8.6 Other plans and strategies

107. The following plans and strategies are not mandatory considerations under section 11 of the Act, but they may be considered relevant to this review.

8.6.1 Te Mana o te Taiao (Aotearoa New Zealand Biodiversity Strategy)

108. Te Mana o te Taiao – the Aotearoa New Zealand Biodiversity Strategy sets a strategic direction for the protection, restoration and sustainable use of biodiversity, particularly indigenous biodiversity, in Aotearoa New Zealand[44]. The Strategy sets a number of objectives across three timeframes. The most relevant to setting sustainability measures for SUR 1A and SUR 1B are objectives 10 and 12:

Objective 10: Ecosystems and species are protected, restored, resilient and connected from mountain tops to ocean depths.

Objective 12: Natural resources are managed sustainably.

109. FNZ is working with the Department of Conservation and other agencies on implementation of the strategy. As part of that work, we are progressing to a more integrated ecosystem-based approach to managing oceans and fisheries. In that context, this review contains information on biodiversity impacts, ecosystem function and habitat protection associated with adjustments to sustainability measures (see environmental principles section above, and Total Allowable Catch section below).

8.6.2 Draft Hauraki Gulf Fisheries Plan

110. In addition to the HGMPA, the Revitalising the Gulf: Government action on the Sea Change Plan is relevant to the future management of the portion of SUR 1A and SUR 1B that lies within the HGMP. A key fisheries output from Revitalising the Gulf is the development of an area specific fisheries plan[45] under section 11A of the *Fisheries Act 1996*. There are also new marine protection proposals for the HGMP which would overlap SUR 1A and SUR 1B.

111. The draft Hauraki Gulf Fisheries Plan proposes specific management measures to support the sustainability and improved future management of kina within the HGMP. The draft plan was recently consulted on[46] and FNZ will be providing final advice and seeking Ministerial approval of the plan in mid-2023. FNZ considers that the proposed changes to the SUR 1A and SUR 1B catch limits would be consistent with the actions in draft Hauraki Gulf Fisheries Plan.

[44] Accessible at: https://www.doc.govt.nz/nature/biodiversity/aotearoa-new-zealand-biodiversity-strategy/.
[45] The Hauraki Gulf Fisheries Plan is still in draft and not yet approved under section 11A of the Fisheries Act, which means the Minister is not required to take it into account.
[46] Accessible at: https://www.mpi.govt.nz/consultations/draft-hauraki-gulf-fisheries-plan/

8.7 Section 13 – Total Allowable Catch

112. For the purposes of setting a total allowable catch under this section, if the Minister considers that the current level of the stock or the level of the stock that can produce the maximum sustainable yield is not able to be estimated reliably using the best available information, the Minister must—

(a) not use the absence of, or any uncertainty in, that information as a reason for postponing or failing to set a total allowable catch for the stock; and
(b) have regard to the interdependence of stocks, the biological characteristics of the stock, and any environmental conditions affecting the stock; and

(c) set a total allowable catch —

(i) using the best available information; and

(ii) 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 the maximum sustainable yield.

8.7.1 Interdependence of stocks

113. When setting the TAC for SUR 1A and SUR 1B under section 13, the Minister must have regard to the interdependence of stocks. The interdependence of stocks involves the consideration of the effects of fishing on associated stocks affected by fishing for the target stock.

Relevant predators of kina in SUR 1A and SUR 1B

114. Kina are an important prey species on rocky reefs across New Zealand. Within SUR1A and 1B, their main predators considered to be rock lobsters and snapper (although numerous other fish and echinoderm species also prey on them to a lesser extent).

115. In describing predators of urchins there is an important relationship between the size classes of both predator and prey. A wide variety of species predate kina, with the range of predators narrowing as kina increase in size. Large predators are generally required to successfully manipulate and kill a large sea urchin whereas smaller urchins are easier to both pry off rocks and consume whole. Predatory consumption by fish has been linked directly to gape size (mouth size) in New Zealand.[47] While they have a similar relationship between predator and prey size, lobsters are more unique in their ability to pry sea urchins from rocks and consume the animal via the unprotected mouthparts.[48] Thus, the largest size classes of kina (>15 cm) 'might be immune to predation by all but the largest of lobster'.[49]

Kina or urchin barrens

116. There is a trend occurring in parts of New Zealand (and in other places globally), where sections of rocky reef previously covered in kelp forest, have been, or are being, converted to homogenous sea urchin dominated barrens, largely devoid of kelp and other benthic biodiversity.

117. The hypothesized driver for this pattern of increased barrens in New Zealand is through a trophic cascade, where an ecosystem is controlled from the top-down.[50] There is evidence to suggest that urchin predators, including snapper and spiny rock lobsters, when at sufficient abundance, can prevent kina attaining a density where they graze a kelp forest to the point of complete algal removal.[51] However, when predator abundance is reduced (by fishing or other factors), sea urchin populations are released from top-down control, and eventually reach an abundance where their grazing results in kelp deforestation and the formation of kina barrens. These barrens are less biologically diverse and less productive environments than the kelp forest habitats they replace. In SUR 1A and SUR 1B, evidence indicates that snapper and spiny

[47] Marinovich (2022)
[48] Flood (2021)
[49] Andrew & MacDiarmid (1991)
[50] Paine (1980)
[51] Shears & Babcock (2003)

rock lobster are not present at an abundance that enables them to meaningfully contribute to controlling kina populations, whether alone or in combination with other factors.[52]

118. The increase in kina abundance and subsequent loss of kelp forests is considered a problem because it is indicative of a significant adverse effect of fishing on aquatic ecosystems[53], and because kelp forests provide a wide and diverse range of ecosystem services. These include:

- Providing important settlement, nursery, shelter, and refuge habitats for a wide range of coastal and inshore shellfish and finfish species, including kina.
- Providing food for invertebrates, shellfish, finfish, and seabird species, which in turn supports a variety of important commercial and non-commercial fisheries resources.
- Modifying wave and tidal action and influencing coastal and physical processes such as, erosion, sedimentation, and turbidity.
- Driving primary production and energy and nutrient recycling that contribute to other near-shore systems including sandy beaches and deepwater ecosystems.

119. Once a reef is converted from kelp forest to urchin barren, these ecosystem services are lost.

120. Kina barrens are not ubiquitous across rocky reefs and tend to be restricted to different depth zones determined by environmental conditions. On moderately exposed coasts the shallow reef (0–3 m) is characterized by stands of fucalean algae, intermediate depths (3–8 m) are maintained as kina barrens, and deeper reef (>8 m) is dominated by kelp forests.[54] On more exposed reefs, barrens form on deeper sections of reef (12–20 m), while in more sheltered conditions barrens are restricted to shallower depths.[55] Kina barrens tend to not form in very sheltered areas that experience high sediment loads.

121. The primary evidence that fishing of urchin predators in north-eastern New Zealand has caused kina to become more abundant and kina barrens more prevalent comes from studies comparing protected and unprotected areas[56], along with the observation of trends in protected areas.

122. Kina barrens in north-eastern New Zealand are also caused by the long-spined sea urchin (*Centrostephanus rodgersii*). Centrostephanus has been present in New Zealand since at least 1897, but recently due to climate change, warming waters and shifting ocean currents, the species has both extended its range southwards and increased in abundance throughout New Zealand and Australia.[57] Centrostephanus has few predators due to its long spines and is known to either create barrens in areas where kina would not or join existing barrens alongside kina.

123. The long-spined sea urchin is not encompassed within the QMS framework and, therefore, does not have an allocated TAC or specific restrictions. However, fishers are required to possess a registered commercial license to commercially fish them and there is a requirement to report their catch of this species.

9 Options and analysis

124. Under section 13(2A) of the Act, if the Minister is satisfied that the maximum sustainable yield (**MSY**) cannot be reliably estimated, the Minister must set the TAC using the best available information and in a way 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.

125. Three options are proposed for the TAC, TACC and allowances (customary, recreational, and other sources of mortality caused by fishing) for each stock. The options represent the general

[52] Shears et al. (2008)
[53] Ministry for Primary Industries (2021) Aquatic Environment and Biodiversity Annual Review (AEBAR): A summary of environmental interactions between the seafood sector and the aquatic environment.
[54] Choat & Schiel (1982), Shears & Babcock (2004)
[55] Shears et al. (2004)
[56] Shears & Babcock (2002), Shears & Babcock (2003), Shears & Babcock (2004), Shears et al. (2008), Allard et al. (2022)
[57] Sweatmann (2021)

range of increases to catch settings being considered. Feedback is sought on these options, or alternatives within this range.

126. Commercial landings are considered the best available information and have been consistent for the past 19 years. Reports of kina abundance suggest that there is an opportunity for increased utilisation.

127. FNZ recognizes that if commercial catch limits were increased, it is unlikely the additional harvest would be taken from kina barren areas. However, in areas that are currently fished, and new areas that may be fished, harvest would likely be sustainable and may also help prevent the formation of additional barrens. The manner in which commercial harvesting takes place, such as grooming or rotational fishing of areas, is also not seen as a resolution to the issue of kina barren areas, but it could offer a mechanism that may assist in managing expansion in fished areas through the reduction of kina density. Effective monitoring using ER and GPR will provide the ability to closely monitor fishing activity and catch for any signs of localised depletion or overfishing.

128. Moreover, it is possible these harvesting practices may enhance the potential utilization for other sectors by improving the quality of kina left between harvests through reduced competition. Therefore, while concerns exist regarding local depletion affecting Iwi and other sectors' local kina gathering areas, there may also be overlapping benefits. Should concerns arise regarding concentrated fishing efforts, particularly in areas of significance to other sectors, FNZ is prepared to engage with all parties and review management settings accordingly.

129. Although not a statutory consideration, FNZ envisions the development of a kina management plan and other initiatives like crayfish and snapper management, special permits, increased research efforts, and more, working in tandem with any increases in catch limits to provide an integrated solution to kina barrens. An integrated management approach will be developed in collaboration with tangata whenua, commercial and recreational fishers, and local communities to address more localized concerns.

9.1 Option 1 – *status quo*

East Northland Kina (SUR 1A)				
TAC: 172 t	TACC: 40 t	Customary: 65 t	Recreational: 65 t	Other mortality: 2 t
Hauraki Gulf and Bay of Plenty (SUR 1B)				
TAC: 324 t	TACC: 140 t	Customary: 90 t	Recreational: 90 t	Other mortality: 4 t

130. Option 1 is the *status quo* for both SUR 1A and SUR 1B and proposes no changes to the current management settings.

131. Option 1 does not provide for further utilisation despite the high likelihood that further kina harvest in both quota management areas would be sustainable. It also does not account for the improved information gathering and monitoring capability since the introduction of ER and GPR in commercial fisheries.

132. This option reflects a cautious approach to management and puts the most weight on the uncertainty in information regarding the stock status of SUR 1A and SUR 1B. This option carries the least sustainability risk to these overall kina stocks.

133. Option 1 also acknowledges and places weight on the concern expressed by tangata whenua that increases to commercial catch may negatively impact on local customary fisheries.

134. Feedback from Iwi fisheries forums supported retaining the *status quo* and favoured a broader, Iwi lead management approach, using special permit processes to undertake targeted management interventions such as removals and/or translocation.

135. Section 13(3) requires the Minister to have regard to social, cultural and economic factors in "considering the way and rate at which stock is moved towards or above a level that can produce MSY." While there are no estimates of what the MSY may be, the best available

information suggests the abundance of kina is high relative to current catch settings. Retaining the *status quo* would be at the expense of social, cultural, and economic benefit by not providing for increased utilisation.

9.1.1 TAC

136. Under Option 1, the TAC is proposed to be retained at 172 tonnes for SUR 1A and 324 tonnes for SUR 1B.

9.1.2 Allowances

137. In SUR 1A, the customary and recreational allowances would be retained at 65 tonnes, and the allowance for all other mortality cause by fishing would be retained at 2 tonnes.

138. In SUR 1B, the customary and recreational allowances would be retained at 90 tonnes, and the allowance for all other mortality caused by fishing would be retained at 4 tonnes.

9.1.3 TACC

139. Under Option 1, the TACC would be retained at the current settings of 40 tonnes for SUR 1A and 140 tonnes for SUR 1B.

9.2 Option 2

140. Option 2 proposes a moderate increase to the TAC for both SUR 1A and SUR 1B stocks. It proposes an increase to the TACC and to the allowance for customary harvest.

141. The proposed moderate increase in the TAC may result in a lower abundance of kina in some areas which may reduce herbivory and result in increased abundance of macroalgae and the associated species as noted above when discussing the interdependence of stocks in section 8.7 of this paper.

142. While it is acknowledged that increasing the TAC may reduce the number of kina available as food for predatory species like snapper and crayfish, there is no evidence to suggest these species are currently food limited. Kina are unlikely to be harvested from depths greater than 10-12 m (due to harvesting methods) and so it is anticipated that they will continue to be available as a food source on most reefs where harvesting occurs. Therefore, FNZ does not anticipate that the proposed increase in TAC would pose a significant risk to the sustainability of the SUR 1A and SUR 1B stocks.

143. There is currently no evidence to indicate that an increase in TAC would pose a sustainability risk due to environmental factors which are discussed under section 7 of this paper. However, ongoing monitoring of the ecosystem is crucial to ensure that any potential impacts are carefully managed.

144. The increases proposed in Option 2 take into account that commercial landings for kina in both stocks have remained consistent for the last 19 years and appear to be constrained even with some fluctuations. Information from fishers, scientists, and other stakeholders (including through local area surveys) indicates a high abundance of kina, specifically in fished areas, suggesting that there is significant potential for the expansion of the fishery.

145. This option also considers social, cultural, and economic benefit by providing for increased utilisation through the increased allowance for customary harvest. The proposal to increase the customary allowance for kina harvest is driven by the anticipation of closer collaboration with iwi in implementing initiatives for kina management. While the *Fisheries (Amateur Fishing) Regulations 2013* have limited applications of kina harvest, primarily related to hui and tangi purposes, the *Fisheries (Kaimoana Customary Fishing) Regulations 1998* provide a broader scope for customary practices. In areas where the *Fisheries (Kaimoana Customary Fishing) Regulations 1998* are applicable, there is potential in exploring iwi-led approaches to kina management under customary permits. These approaches will recognise and integrate Mātauranga Māori and traditional practices in managing fisheries resources.

9.2.1 East Northland (SUR 1A)

TAC: 247 t (↑ 75 t)	**TACC**: 80 t (↑ 40 t)	**Customary**: 100 t (↑ 35 t)	**Recreational**: 65 t	**Other mortality**: 2 t

TAC

146. Under Option 2, the TAC for SUR 1A would increase by 75 tonnes from 172 tonnes to 247 tonnes.

Allowances

147. Under Option 2, the allowance for customary harvest would increase by 35 tonnes from 65 tonnes to 100 tonnes.

148. The allowances for recreational harvest and all other mortality caused by fishing would be retained at 65 tonnes and 2 tonnes, respectively, under Option 2.

TACC

149. Under Option 2, the TACC would be increased by 40 tonnes from 40 tonnes to 80 tonnes.

150. Available information from research and anecdotal reports suggests that the current TACC of 40 tonnes in the SUR 1A fishery is relatively small in comparison to the vast area in which the fishery operates. These sources indicate a high abundance of kina, specifically in fished areas, suggesting that there is significant potential for the expansion of the fishery.

9.2.2 Hauraki Gulf and Bay of Plenty (SUR 1B)

TAC: 439 t (↑ 115 t)	**TACC**: 210 t (↑ 70 t)	**Customary**: 135 t (↑ 45 t)	**Recreational**: 90 t	**Other mortality**: 4 t

TAC

151. Under Option 2, the TAC for SUR 1B would increase by 115 tonnes from 324 tonnes to 439 tonnes.

Allowances

152. Under Option 2, the allowance for customary harvest would increase by 45 tonnes from 90 tonnes to 135 tonnes.

153. The allowances for recreational harvest and all other mortality caused by fishing would be retained at 90 tonnes and 4 tonnes, respectively, under Option 2.

TACC

154. Under Option 2, the TACC would be increased by 70 tonnes from 140 tonnes to 210 tonnes.

155. SUR 1B encompasses the Hauraki Gulf, a region characterised by the presence of numerous kina barrens, which has raised widespread concern among stakeholders and the wider community. Recognising the ecological importance of addressing this issue, active exploratory research has been conducted to study the impacts of kina removals within the area. Initial results from this research indicate positive outcomes from a restoration perspective.

156. FNZ notes, however, that while commercial harvest of kina may potentially contribute to reducing the expansion of barrens, this approach is not a solution for effective kina barren management. Further strategies and considerations are required to ensure the sustainable management and conservation of important coastal marine ecosystems.

9.3 Option 3

157. Option 3 is the least conservative option and proposes a higher increase to the TAC for both SUR 1A and SUR 1B stocks. It proposes an increase to the TACC and to the allowance for customary harvest as Option 2 does.

158. The increases proposed in Option 3, also considers the factors discussed under Option 2. While being the least conservative option, FNZ does not consider that Option 3 carries a sustainability risk given the reports of widespread of kina barrens.

159. This option also considers social, cultural, and economic benefit by providing for increased utilisation and it is likely that the increased harvest of kina in both SUR 1A and SUR 1B will increase the overall quality of kina in many areas within the QMAs.

9.3.1 East Northland (SUR 1A)

TAC: 267 t (↑ 95 t)	**TACC**: 100 t (↑ 60 t)	**Customary:** 100 t (↑ 35 t)	**Recreational**: 65 t	**Other mortality**: 2 t

TAC

160. Under Option 3, the TAC for SUR 1A would increase by 95 tonnes from 172 tonnes to 267 tonnes.

Allowances

161. Under Option 3, the allowance for customary harvest would increase by 35 tonnes from 65 tonnes to 100 tonnes.

162. The allowances for recreational harvest and all other mortality caused by fishing would be retained at 65 tonnes and 2 tonnes, respectively, under Option 3.

TACC

163. Under Option 3, the TACC would be increased by 60 tonnes from 40 tonnes to 100 tonnes.

9.3.2 Hauraki Gulf and Bay of Plenty (SUR 1B)

TAC: 509 t (↑ 185 t)	**TACC:** 280 t (↑ 140 t)	**Customary:** 135 t (↑ 45 t)	**Recreational**: 90 t	**Other mortality**: 4 t

TAC

164. Under Option 3, the TAC for SUR 1B would increase by 185 tonnes from 324 tonnes to 509 tonnes.

Allowances

165. Under Option 3, the allowance for customary harvest would increase by 45 tonnes from 90 tonnes to 135 tonnes.

166. The allowances for recreational harvest and all other mortality caused by fishing would be retained at 90 tonnes and 4 tonnes, respectively, under Option 3.

TACC

167. Under Option 3, the TACC would be increased by 140 tonnes from 140 tonnes to 280 tonnes.

10 Economic considerations

168. The SUR 1A and SUR 1B kina fisheries support many associated people, including:

- Quota holders[58]
- Commercial fishers
- Seafood processing facilities and licensed fish receivers.

169. To give a sense of scale and distribution, based on the 2021/22 fishing year, in SUR 1A, 90% of quota was owned by 4 entities, and the remaining 10% of quota was owned by 7 entities. In SUR 1B, 95% of quota was owned by four entities, and the remaining 5% of quota was owned by 10 entities. As at the end of the 2021/22 fishing year, there were 6 commercial entities holding ACE in SUR 1A, and five commercial entities holding ACE in SUR 1B.

10.1 SUR 1A

170. Under Option 1, the current management settings would be retained at *status quo*. This would not result in any increase in commercial harvest of kina thus not resulting in any increase in annual revenue.

171. Under Option 2, the TACC would increase from 40 tonnes to 80 tonnes. This would allow for increased commercial harvest, potentially increasing the maximum landed catch by 40,000 kg – a 100% increase. Based on the 2023/24 port price of $0.78/kg, this would result in an approximate increase of approximately $31,000 in annual revenue potential.

172. Under Option 3, the TACC would increase from 40 tonnes to 100 tonnes. This would allow for increased commercial harvest, thus potentially increasing the maximum landed catch by 60,000 kg – a 150% increase. Based on the 2023/24 port price of $0.78/kg, this would result in an approximate increase of approximately $47,000 in annual revenue potential.

10.2 SUR 1B

173. Under Option 1, the current management settings would be retained at *status quo*. This would not result in any increase in commercial harvest of kina, so would not result in any increase in annual revenue.

174. Under Option 2, the TACC would be increased from 140 tonnes to 210 tonnes. This would allow for increased commercial harvest, thus potentially increasing the maximum landed catch by 70,000 kgs – a 50% increase. Based on the 2023/24 port price of $0.98/kg, this would result in an approximate increase of approximately $69,000 in annual revenue potential.

175. Under Option 3, the TACC would be increased from 140 tonnes to 280 tonnes. This would allow for increased commercial harvest, thus potentially increasing the maximum landed catch by 140,000 kgs – a 100% increase. Based on the 2023/24 port price of $0.98/kg, this would result in an approximate increase of approximately $137,000 in annual revenue potential.

11 Deemed value rates

176. Deemed values are the price paid by fishers for each kilogram of unprocessed fish landed in excess of a fisher's Annual Catch Entitlement (**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.

[58] This includes Māori who own Fisheries Settlement quota shares – Some iwi and mandated iwi organisations are therefore likely to be impacted by a closure of commercial take. However, Fisheries New Zealand does not have information to accurately quantify the potential loss in quota value or flow on impacts of this for iwi and their associated communities.

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 SUR 1A and SUR 1B are shown in Table 5 below.

Table 5. Current deemed value rates ($/kg) for SUR 1A and SUR 1B.

Stocks	Interim Rate ($/kg)	Annual Differential Rates ($/kg) for excess catch (% of ACE)					
		100-120%	120-140%	140-160%	160-180%	180-200%	200%+
SUR 1A & SUR 1B	1.53	1.70	2.04	2.38	2.72	3.06	3.40

179. Figures 5 and 6 below show trends in the port prices, average annual ACE transfer prices, and annual deemed value rates since 2011/12 for SUR 1A and SUR 1B, respectively.

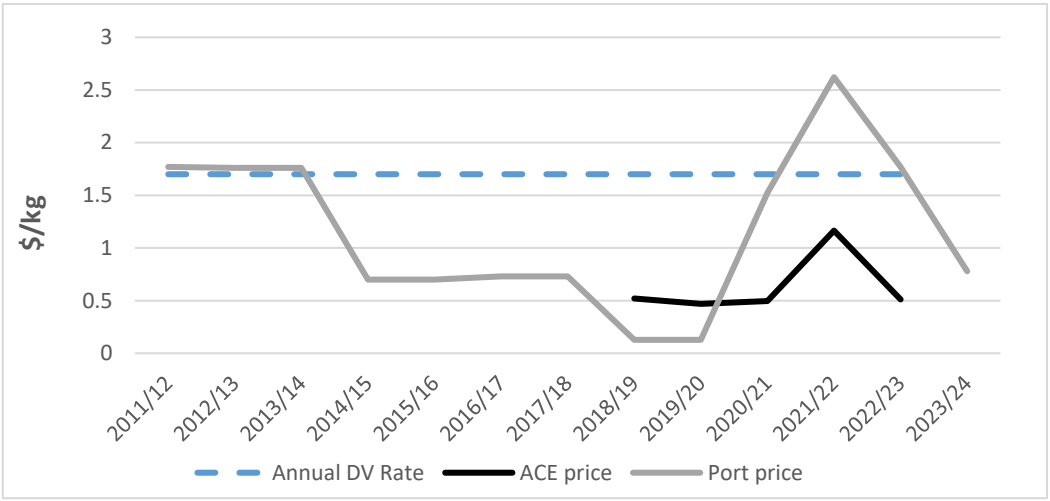

Figure 5: Summary of port price, average annual ACE transfer price, and annual deemed value rate information for SUR 1A since 2011/12. Note that the average ACE transfer price for 2022/23 is based on a smaller sample size given that the fishing year is not yet complete.

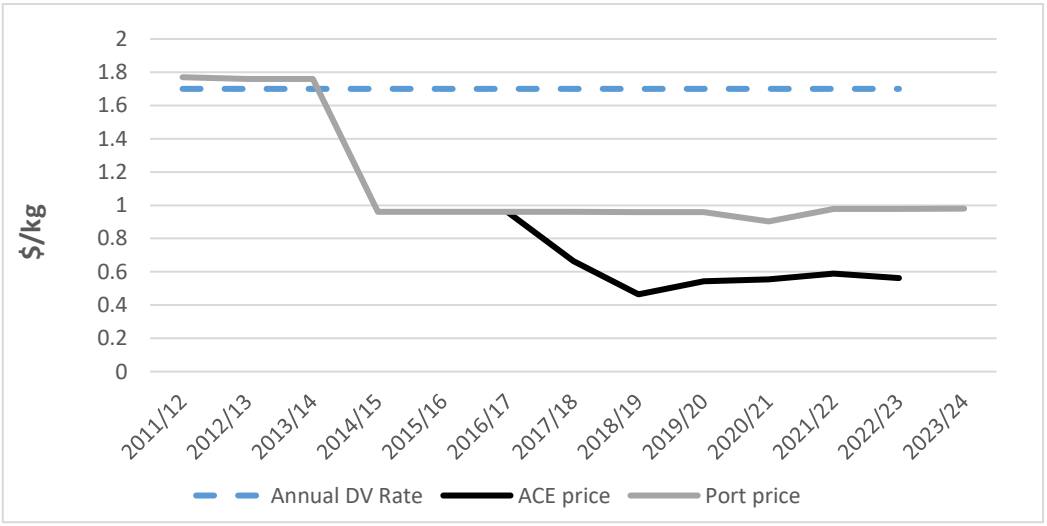

Figure 6: Summary of port price, average annual ACE transfer price, and annual deemed value rate information for SUR 1B since 2011/12. Note that the average ACE transfer price for 2022/23 is based on a smaller sample size given that the fishing year is not yet complete.

180. The average price paid by fishers during the 2021/22 fishing year was $0.51/kg for SUR 1A ACE and $0.56/kg for SUR 1B ACE. Port price information is uncertain and can vary, but most recently in 2023/24 the port price was estimated to be $0.78/kg for SUR 1A and $0.98/kg for SUR 1B.

181. The basic annual deemed value rate for both SUR 1A and SUR 1B is $1.70/kg, which is higher than the ACE and port prices for both stocks (Table 5, Figures 6 & 7).

182. This is considered appropriate for these stocks given that they are taken selectively as single species fisheries. Kina can only be taken commercially using hand gathering in these QMAs and can be returned to the sea under the Schedule 6 of the Act, so it is appropriate to have a deemed value rate setting that provides a strong incentive not to harvest in excess of ACE.

183. FNZ is satisfied that the current deemed value rates are consistent with section 75(2)(a) of the Fisheries Act in that they provide sufficient incentive for fishers to balance their catch with ACE. FNZ is therefore not recommending any changes to deemed value rates for SUR 1A and SUR 1B at this time but welcomes feedback on these settings.

12 Questions for submitters

- Which option do you support for revising the TAC and allowances? 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?

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

13 How to get more information and have your say

185. FNZ invites you to make a submission on the proposals set out in this discussion document. Consultation closes at 5pm on 17 July 2023.

186. Please see FNZ's sustainability consultation webpage (https://www.mpi.govt.nz/consultations/review-of-sustainability-measures-for-fisheries-october-2023-round) for related information, a helpful submissions template, and information on how to submit your feedback. If you cannot access to the webpage or require hard copies of documents or any other information, please email FMSubmissions@mpi.govt.nz.

14 Legal basis for managing fisheries in New Zealand

187. 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/57112 for more information.

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