

## SUBMISSION ON FISHERIES MANAGEMENT CHANGES FOR THE 2016/17 FISHING YEAR

### Introduction

1. Thank you for the opportunity to comment on the consultation papers on fisheries management decisions for the 2016/17 fishing year.
2. Fisheries Inshore New Zealand Ltd (*Fisheries Inshore*) is the Sector Representative Entity for inshore finfish, pelagic and tuna fisheries in New Zealand. Its role is to deal with national issues on behalf of the sector and to work directly with, and behalf of, its quota owners, fishers and affiliated sector representative organisations. Its key outputs are:
  - developing appropriate policy frameworks, processes and tools to assist the sector to manage inshore, pelagic and tuna fishstocks more effectively
  - minimising fishing interactions with protected species and the associated ecosystems
  - working positively with other fishers and users of marine space where we carry out our harvesting activities
3. Collectively, Fisheries Inshore shareholders own more than 51% of the quota in 187 (of 239) inshore, pelagic and tuna stocks and have shareholdings in the remaining inshore stocks. This equates to approximately 80% of the inshore finfish sector by value and volume.
4. The focus of this submission is primarily the paper titled “*Review of Management Controls for the Bluenose Fishery (BNS 1, 2, 3, 7 & 8) in 2016*” (MPI Discussion Paper No: 2016/16). We also make comment on deemed value rates in the final section of this paper.
5. Members of Fisheries Inshore hold the majority of quota shares in the five BNS stocks in question (Table 1). Furthermore, Fisheries Inshore has contracted scientific analyses in the last three years that has contributed to the management of these BNS fisheries. That research has been funded by both Fisheries Inshore members and quota owners currently outside Fisheries Inshore.

**Table 1:** BNS quota held by members of Fisheries Inshore and non-members contributing to BNS research

	<b>BNS 1</b>	<b>BNS 2</b>	<b>BNS 3</b>	<b>BNS 7</b>	<b>BNS 8</b>
<b>Fisheries Inshore members</b>	76%	80%	82%	63%	97%
<b>Contributing non-members</b>	19%	17%	12%	13%	2%
<b>Total</b>	95%	97%	94%	76%	99%

6. Fisheries Inshore endorses the submissions made by Southern Inshore Fisheries Management Company on SNA7 and JDO7 as they have the mandate to represent the views of those quota owners.

### The big picture

7. The primary matters addressed in the consultation paper are TACs and allowances for five BNS stocks. To a great extent those management settings are peripheral to a more important issue: how to manage inshore fishstocks.
8. In Fisheries Inshore’s submission on the Operational Review of the Fisheries Act, we set out our view of the shortcomings in the current management approach and suggested ways to improve fisheries management.
9. In short, implementation of the existing management framework has not kept pace with the demands for fisheries management, for example:
  - 28% of landings come from stocks that have no assessed status

- No inshore stocks have documented, stock-specific management criteria that direct fisheries research<sup>1</sup>
  - TACCs of most stocks have never been reviewed since entering the QMS
  - On average, the TACCs of only six of c. 200 inshore fishstocks are reviewed each year<sup>2</sup>
10. As a consequence of not putting in place well-specified, bespoke yet appropriately-pragmatic management plans, the management system is slow to respond (or not responsive at all). This may result in foregone value, may risk the sustainability of stocks and does not result in optimal service provision. This neither grows, nor protects, New Zealand fisheries.
  11. To improve the performance of our fisheries—for customary, commercial and recreational fishers—we need better-defined management objectives, and pragmatic harvest strategies that result in more appropriate and cost-effective fisheries monitoring. Fisheries Inshore has developed the concept of Management and Monitoring Plans (see BNS Plan in Annex One) to allow for better-specified management objectives, more responsive management and more effective and efficient fisheries services.
  12. MPI has acknowledged some of the shortcomings mentioned above and has expressed some support for the concept of Management and Monitoring Plans. That being the case, quota owners were dismayed that despite acknowledging issues and seemingly endorsing the concept of Management and Monitoring Plans, MPI did not opt to support and refine the BNS Management and Monitoring Plan.
  13. In the consultation paper, MPI make reference to this work as follows:
 

*“Given the value of the bluenose fishery, MPI considers that there would be benefits in doing further work to determine the best way to manage and monitor bluenose over the longer term to achieve the rebuild objectives. For example, in recent years the industry has led investigation into the potential application of a management procedure (MP) to provide decision rules and greater certainty. MPI would like to continue work in this area and considers that an MP could be available to inform a review in 2017.” (Emphasis added)*
  14. Bluenose quota owners have invested in precisely the work MPI reference in the excerpt above: a programme of CPUE analyses, catch sampling to improve vital information gaps, management procedure evaluation, commitment to annual updates and five-yearly reviews of that management procedure. Rather endorse and refine that work, MPI has retreated to the very system of management that has demonstrably failed to deliver both government objectives and those desired by the industry.
  15. The apparent reason for MPI’s position is that MPI has unilaterally determined what the rebuild target and rate will be (see emphasis in excerpt above). This is based on default policy settings that are simply guidance, the adherence to which undermines both better future management for inshore fisheries and their economic prosperity.
  16. Fisheries Inshore considers that adopting the BNS Management and Monitoring Plan is simply an objectively better way to manage these fisheries. Justification for this comment follows, along with the rationale for the Minister adopting this approach.

## Better management

17. MPI’s support for the BNS work conducted by industry is appreciated and significant progress has been made in recent years. The fishery is rebuilding. There is a significant alignment of views.
18. To illustrate the point we highlight the following statement from page 11 of consultation paper:
 

*“Industry and MPI are interested in the application of MPs as they have specific advantages. MPs provide a greater degree of management responsiveness through the use of decision rules, which in turn can provide greater certainty that management objectives are met.”*

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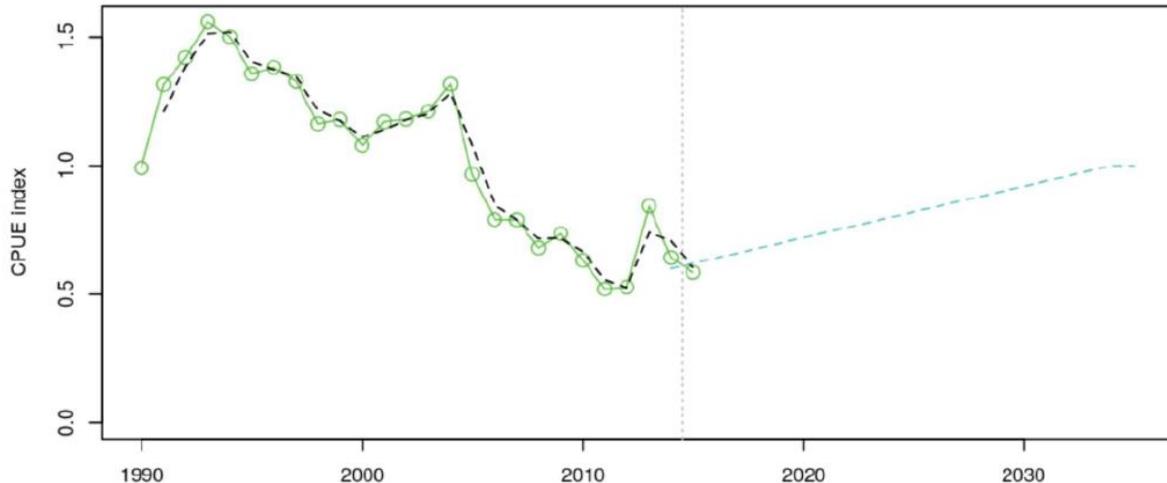
<sup>1</sup> Although we acknowledge the progress made on the SNA1 Plan.

<sup>2</sup> While we acknowledge that capacity issues will limit the number of changes that can be advanced in any year, pragmatic changes to the decision-making processes and more specific management will assist.

19. We support that statement but encourage MPI to go further and explicitly endorse and implement the existing MP. It is unfortunate that MPI's support has recently faltered rather than strengthened to result in implementing better management.

*FINZ Management and Monitoring Plan*

20. The MP is the core of the Management and Monitoring Plan; in summary:
- The MP is designed to maintain the rebuilding trajectory to target biomass
  - The TACC would be reduced if the rebuild is not maintained
  - The rebuild in the MP uses a target of 35%  $B_0$  in 30 years
21. Running the MP consists of the following processes:
- Every January the fishery overview is updated
  - Every year until 2018/19 the MP is run and TACCs adjusted accordingly
  - Every year the until 2017/18 the catch sampling of BLL fisheries is conducted
  - In 2016/17 the patterns in catch at length for 2014/15 and 2015/16 are examined and a decision made about whether to age otoliths as an input into the next iteration of the MP
  - During February–May 2019 the MP is updated using the latest information and implemented from 2019/20
22. As can be seen in Figure 1, the MP will ensure that the index remains on the dashed blue line that represents the rebuild trajectory. This will result in stock rebuild and provides the ability to continually monitor progress and to adjust TACCs accordingly. As the process matures, the additional information collected as part of the Management and Monitoring Plan will provide increased precision and increased certainty that the rebuild is progressing as planned.
23. This represents a comprehensive management regime for these BNS fisheries and is perhaps the most sophisticated approach currently in place for any inshore finfish stock.



**Figure 1:** CPUE index as an output of the BNS management procedure and the rebuilding trajectory that will result as part of implementation.

24. This is contrasted with the assessment approach relied upon by MPI since 2011. That used a relatively rudimentary stock assessment, including a deterministic recruitment assumption, and proposed to simply reduce the TACCs to 620 tonnes and collect little or no further information. This is akin to “laissez faire management” and sits in stark contrast to the approach preferred by industry to invest in better information and take an active role in rebuilding the stock in a manner that allows for economic opportunity and the associated benefits for New Zealand.
25. MPI's reluctance to endorse the Management and Monitoring Plan appears to rest on one small difference of view; the rebuild target and timeframe. MPI has adopted a default rebuild to 40%  $B_0$  in 26 years, whereas quota owners support 35%  $B_0$  in 30 years.

26. One could argue that these differences are somewhat immaterial given the decadal timeframes involved and inherent uncertainty in the science. Acting upon assumed precision in current biomass estimates and projections results in significant costs for quota owners and fishers simply for the purpose of meeting theoretical targets. The industry will accept the impact of TACC reductions; that is part of operating in the seafood industry. However, it is vital that those reductions are made pursuant to a Management and Monitoring Plan that allows industry to understand and support the necessary changes. Providing certainty is paramount and MPI's relatively sudden decision to conduct further analysis and rush into TACC changes has not engendered confidence.
27. We suggest that there are significant benefits in adopting the established Management and Monitoring Plan in preference to the Options set out in the consultation paper.

### *Benefits of Management and Monitoring Plan*

28. Fisheries Inshore appreciates that what is proposed in the Management and Monitoring Plan is different to management and monitoring approaches that have historically been used for inshore fisheries. As such, clear rationale is useful to allow consideration of this new initiative.
29. First, the MP will rebuild the fishery. The stock is thought to be around the default soft limit of 20%  $B_0$  (the mid-point of model estimates being 22%  $B_0$ ) and the MP is specifically designed to ensure that the biomass rebuilds to a target level (Figure 1).
30. Second, the MP is more responsive to change. Rather than setting a TACC relatively infrequently, the MP allows for annual analysis of information, application of the MP and the potential to adjust TACCs up or down annually.
31. Third, the MP increases certainty. Annual review of the MP allows managers to remain certain that the fishery is continuing to rebuild, and also allows for more informed decisions to be made about whether to vary the speed of the rebuild by adjusting the TAC. If such an MP had been available a decade ago, it is very unlikely the stock would have reached the recent nadir that we are rebuilding from. In a related point we also note that MPI has considered the use of interim targets in more popular finfish species as a way of rebuilding and reassessing progress toward long-term objectives.
32. Fourth, it grows the information base. As part of implementing the Management and Monitoring Plan and the associated MP, representative catch sampling has been, and continues to be, undertaken to collect length frequency data and otoliths. This will allow for better estimates of recruitment and other important parameters and thereby provide greater precision about the status of the stock. This is consistent with desire of MPI and Industry to move more inshore fisheries from low information stocks to higher information stocks.
33. A related point is that re-running the 2011 model at short notice this year without those additional data meant that the benefit of that work was not available, incorporating that information may help to resolve one of the major sources of uncertainty that MPI identified in the current model as stated on page 214 of the 2016 Plenary (i.e. "Deterministic recruitment is assumed; variations in year class strengths are not estimated"). It is irrational to identify that major source of uncertainty, choose not to use the information that is being collected to resolve that uncertainty, and instead propose management action that may result in fewer or less comprehensive data being collected thereby perpetuating the uncertainty identified.
34. While this additional data collection can be conducted without adopting an MP, the work done to date has been funded directly by industry and demonstrates that when certainty of management exists and fisheries remain economically productive, there is more likely to be investment in data acquisition to the benefit of the fishery. This represents the fifth advantage to the approach proposed.

### *Minister's considerations*

35. We submit that the advantages set out above of adopting industry's preferred option outweigh the costs that would be imposed by Options 2 or 3 in MPI's consultation paper. Further, nothing in industry's response prevents MPI from increasing the speed of stock rebuild in the future, that option becomes more tenable once an MP has been accepted and adopted and is reviewed periodically as proposed by quota owners (currently planned for review and implementation from 2019/20).

36. As set out above, the rebuild trajectory is designed to rebuild the stock to 35%  $B_0$  within 30 years. This departs from the default target of 40%  $B_0$  in 26 years that is a guideline expressed in the Harvest Strategy Standard Operational Guidelines for a low productivity stock.<sup>3</sup>
37. While the Harvest Strategy Standard sets out a valuable framework for this type of consideration, the touchstone is always the Fisheries Act. Without taking an overly legalistic approach, or diminishing the value of the Harvest Strategy Standard, it is important to consider the Act to provide the wider context.
38. Section 13 of the Act states that the Minister shall set a TAC that enables the biomass of any stock that is below  $B_{MSY}$  to be altered in a way and at a rate that will result in the stock being restored to or above  $B_{MSY}$  (having regard to the interdependence of stocks; and within a period appropriate to the stock, having regard to the biological characteristics of the stock and any environmental conditions affecting the stock).
39. Further, section 13(3) states that when considering the way and rate of rebuild, the Minister shall have regard to such social, cultural, and economic factors as he considers relevant. Clearly this provides some flexibility for the Minister and he is not constrained by a formulaic application of policy guidelines.
40. The flexibility in the Act allows the Minister to select the MP that is set out in the Management and Monitoring Plan after having regard to social, cultural, and economic factors. This may include the desire to ensure the fishery remains economically viable and to provide for continued revenue, employment and investment in better information that will generally improve the performance of the fishery (as expressed in paragraphs 28–34 above).
41. Ultimately the target and rebuild rate are decisions for the Minister. However, we consider there is a compelling argument to be made for adopting the MP when the factors set out above are considered.
42. Adopting this approach is particularly persuasive when there is no countervailing sustainability risk against which to balance these utilisation opportunities. Industry's view is that applying the attached Management and Monitoring Plan will result in a better managed fishery and will set a valuable example that will lead to improvements in other inshore fish stocks. It is rare that a management decision can simultaneously meet both purposes of the Fisheries Act: to provide for utilisation of fisheries resources while ensuring sustainability. This is such a case and that opportunity should not be missed in favour of rigid application of policy guidelines.

### *Social, cultural and economic factors*

43. Social, cultural and economic factors are difficult to estimate and the consultation paper provides some suggested impacts by computing the value of catch based on port price and export price. Actual impacts are of course more difficult to quantify as they vary depending on the specific nature of fishing operations.
44. In discussions within the commercial sector as part of preparing this submission, one major quota owner noted that in FMAs 1 and 2, BNS vessels are usually a combination of bottom and surface longline or solely bottom longline. As in most fisheries, vessels target fish seasonally and are therefore a viable economic unit as long as they can continue to access an appropriate ACE package of various species all year round. Some vessels use BNS as a valuable bycatch, or a stop gap that allows that vessel to remain viable. A reduction in BNS ACE provides the real possibility that gaps appear in the annual catch plan of vessels and thereby undermines the economic viability of that vessel for all fisheries in which it engages.
45. The impact is more straightforward for those vessels that target a significant quantum of BNS. TACC reductions as proposed will have a direct impact. The same quota owner identified four vessels that have caught 100%, 84%, 68% and 46% BNS respectively in the current fishing year. These vessels will either sell up or have to change to another type of fishing.
46. While it may sound simple to change to other species, there are inherent difficulties that mean this may not be practically or economically viable. These include lack of ACE, geographic limitations or lack of specific expertise in a new fishery.
47. A second major quota owner noted that a 20% TACC reduction would probably result in loss of one of their current three full-time fishermen with \$250–500k capital invested in vessel as well as job losses for

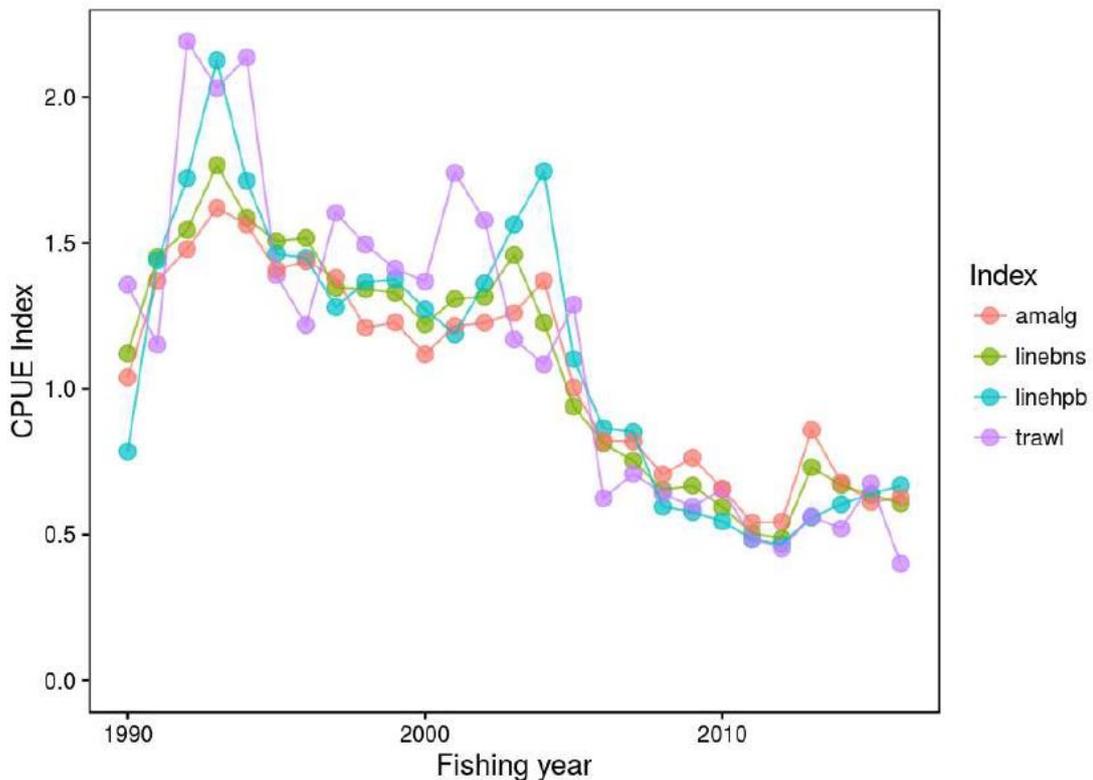
<sup>3</sup> It is notable that the 2015 Plenary records that there is no formally-established target for BNS and deterministic  $B_{MSY}$  is estimated to be 15-25%  $B_0$  (p 200). Also notable is that the estimate of  $B_{MSY}$  has been deleted from the 2016 Plenary (p 212).

the skipper and two deck hands. In terms of lost revenue, this was estimated to equate to a minimum of \$360 k per annum.

- 48. Other fishing entities will suffer similar losses depending on the size and nature of their operations.
- 49. As identified in paragraph 42 above, while such economic losses may be a necessary part of commercial fishing, there is no sustainability imperative that requires these losses to be incurred. The opposite is true, there exists a better management regime that ensures sustainability and provides for utilisation. This accords with MPI's stated objective of *Growing and Protecting New Zealand*.

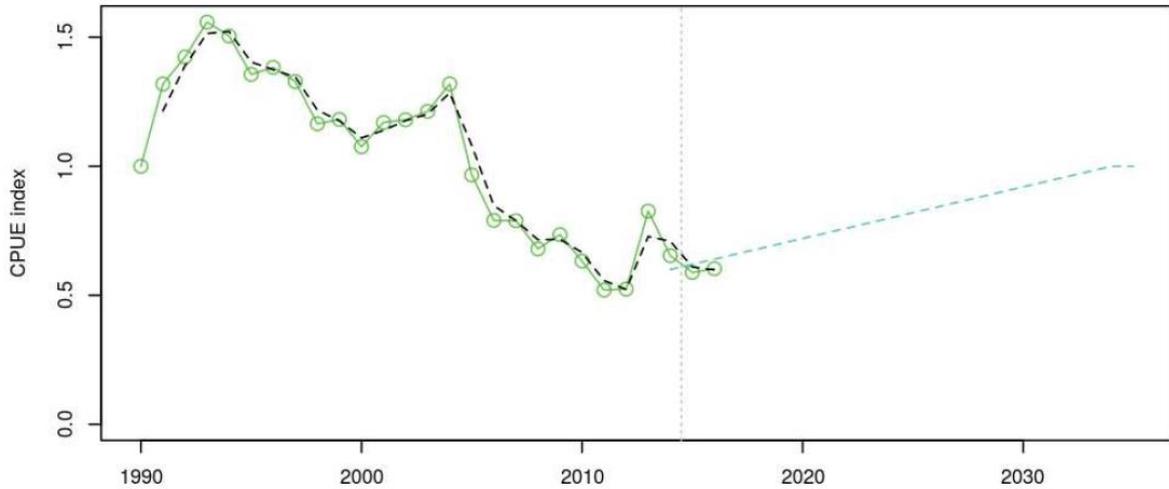
### Specific views

- 50. As is apparent from this submission, the benefits associated with the Management and Monitoring Plan are the primary concern of quota owners. TACC reductions are not currently necessary to deliver those outcomes—although it is accepted they may be in the future pursuant to that Plan. Fisheries Inshore canvassed the views of all BNS quota owners and there was a strong and unanimous view that neither Option 2 nor Option 3 could be supported.
- 51. However, quota owners were not in universal agreement about how to proceed. There was support from some for Option 1, while the vast majority voiced support for an interim Option 1a (discussed below). Such a difference of views is to be expected given the large variety of operators across these five stocks, the scale of those operations and relative importance of BNS to them (Table 2). This difference of views should therefore not be interpreted as displaying disunity in industry; it is simply a commercial reality. Where quota owners are united is in their willingness to invest in science and management as is demonstrated by the commitment to this work illustrated in Table 1.
- 52. As a sign of our commitment to sustainability and the Management and Monitoring Plan, BNS quota owners funded further work to update the MP based on data up until 30 April 2016. This analysis would ordinarily be conducted after the 2015/16 fishing year had finished and so include all data from that year and the results implemented from 1 October 2017.
- 53. That partial analysis included about 75% of the expected data so it a reasonable approximation of the full fishing year. The CPUE amalgamated index has increased very slightly since last year but is essentially flat (see the red line in Figure 2).



**Figure 2:** Interim CPUE indices including the analysis of partial data from 1 October 2015 to 30 April 2016

54. The MP was then run incorporating this information and the TACC estimated (that would apply from 1 October 2017 and assuming the CPUE for the partial analysis was similar at the end of the fishing year). This analysis showed that the CPUE index had dipped slightly below the rebuild trajectory and as a result a reduction in the TACCs would be warranted (from 1 October 2017 and assuming the CPUE index for the partial analysis was similar at the end of the fishing year) (Figure 3).



**Figure 3:** CPUE index and rebuild trajectory based on partial data from 1 October 2015 to 30 April 2016

55. The outcome of operating the MP would be a combined TACC reduction of 62 tonnes to 1,038 tonnes. As mentioned, quota owners are committed to sustainable fishing and committed to the Management and Monitoring Plan. To demonstrate that commitment an intermediate Option is proposed which is to reduce BNS TACCs in line with the MP.
56. In doing so BNS quota owners seek a commitment from MPI to support the continued implementation of the Management and Monitoring Plan including the ongoing catch sampling. The MP would then run for two further fishing years and TACCs adjusted as necessary. In early 2019, the additional information from the catch sampling programme would be used to re-evaluate the MP which could include reconsideration of the biomass target and rebuilding timeframe, but based on a more precise MP.
57. Option 1a has much to recommend it in that it delivers certainty of rebuild, the opportunity for a more precise MP and management in the future, and does nothing to foreclose the possibility of altering the rebuild trajectory in 2019 based on that improved information.

**Table 2:** Preference of quota holders for Option 1 and Option 1a

	<b>BNS 1</b>	<b>BNS 2</b>	<b>BNS 3</b>	<b>BNS 7</b>	<b>BNS 8</b>
<b>Total quota shares voted</b>	84,502,243	89,140,173	79,197,048	68,903,712	94,337,886
<b>Shares voted for Option 1</b>	10,900,100	14,406,088	446,531	0	0
<b>Shares voted for Option 1a</b>	73,602,143	74,734,085	78,750,517	68,903,712	94,337,962
<b>% vote for Option 1</b>	12.9%	16.2%	0.6%	0.0%	0.0%
<b>% vote for Option 1a</b>	87.1%	83.8%	99.4%	100.0%	100.0%

## Allowances

58. Fisheries Inshore notes that MPI is not considering any adjustment to the allowances for recreational or customary fishers. MPI notes that the best estimate of recreational harvest is 46 tonnes against an allowance of 63 tonnes and then goes on to state that “MPI considers that at this time there is no new information to suggest recreational allowances should be changed” (page 7). It is unclear what new information would be necessary to implement any change in the recreational allowance. The statement implies some underlying policy position that is not made apparent in this, or any other, consultation paper. On the basis on the BNS consultation paper it would appear that MPI hold the view that it is appropriate not only to provide in full for recreational demand, but to provide more than that demand.
59. A similar flavour can be seen in the other consultation papers released as part of this sustainability round. In PAU7, all Options propose that 100% of the TAC reduction be applied to the TACC; the recreational allowance is unaffected. In SNA7, MPI propose a 50 tonne TACC increase and a 160 tonne increase in the recreational allowance. Whilst we accept that the Minister has some discretion to allocate the TAC among sectors, this is not unfettered and MPI’s approach to this important consideration is somewhat opaque.
60. Further, by not even consulting on any changes to allowances, MPI is tying the Minister’s hands. Section 21(2) requires the Minister to consult on TACC changes which inevitably also include the possibility of changes to the other allowances. By not considering or consulting on changes to allowances, MPI could be seen as making those allocation decisions on the Minister’s behalf. That is not the function of the executive, the Fisheries Act makes is plain that such decisions are for the Minister.

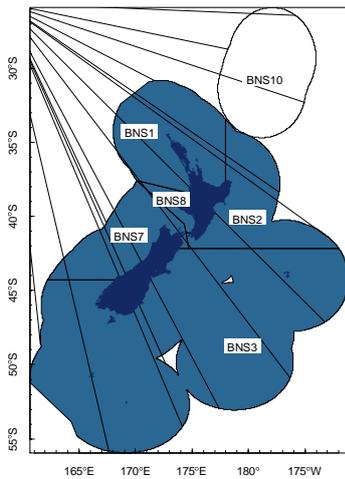
## Deemed value rates

61. MPI proposes to review the deemed value rates of 18 finfish stocks (excluding the new LFE and SFE eel stocks). The RBY3, LFE and SFE reviews are considered appropriate as a consequence of TAC decisions and the remaining 17 stocks as a consequence of over-catch in 2014/15.
62. Of the other 17 stocks, only four—BCO3, LIN7, SWA3 and TAR2—have a history of regular over-catch. Other than for the 2014/15 year, catches for the other stocks have been within the available ACE. There is no need for MPI to review the deemed value rates for these stocks from a fisheries management perspective. The reviews consist of movements in the interim deemed values from generally 50% of the annual deemed value rate to 90% of the rate. There are no fisheries management issues giving rise to these adjustments. The adjustments are unnecessary tinkering with the only beneficiary being the Crown through the receipt of higher interim deemed values, should they be necessary.
63. At a time when MPI is only reviewing two other inshore stocks in addition to BNS, the diversion of resources to amend unnecessarily the interim deemed values is inappropriate.

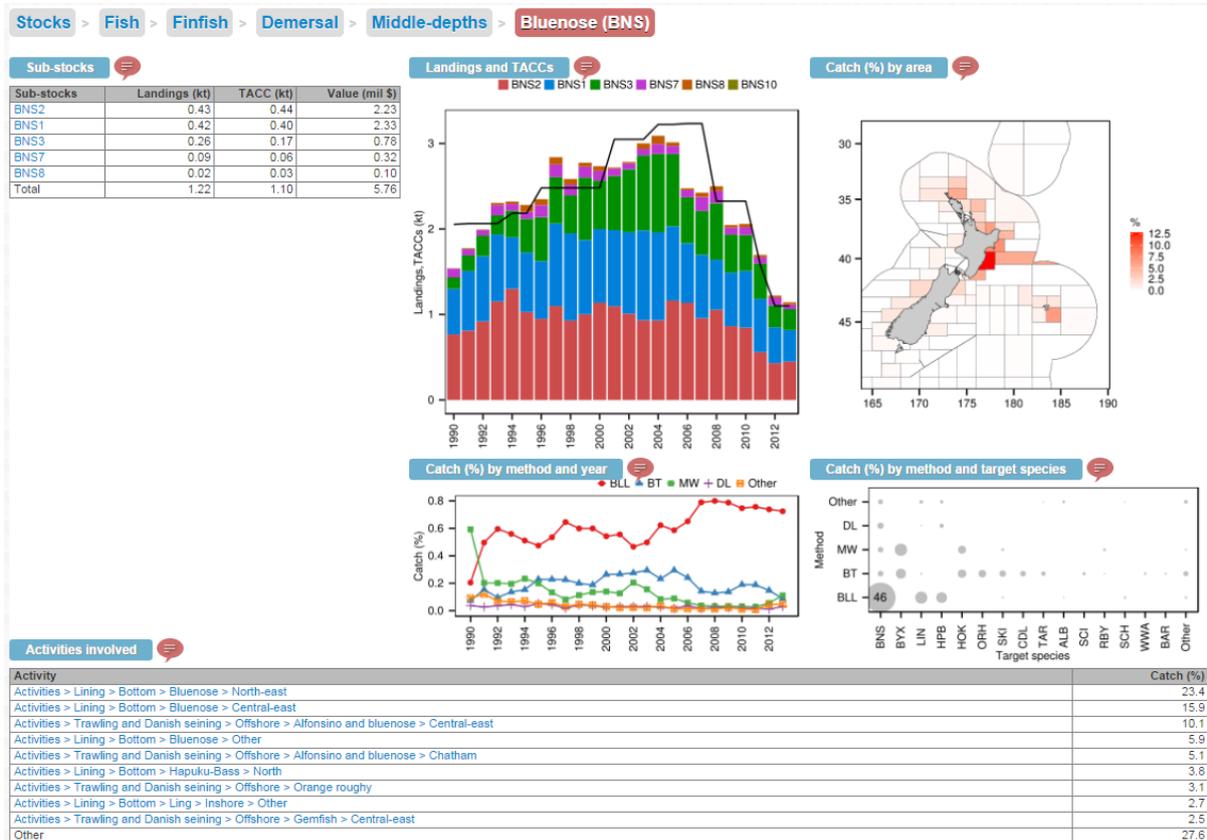
# BNS 1, 2, 3, 7, 8

## FISHERY MANAGEMENT AND MONITORING PLAN

### FISHERY OVERVIEW

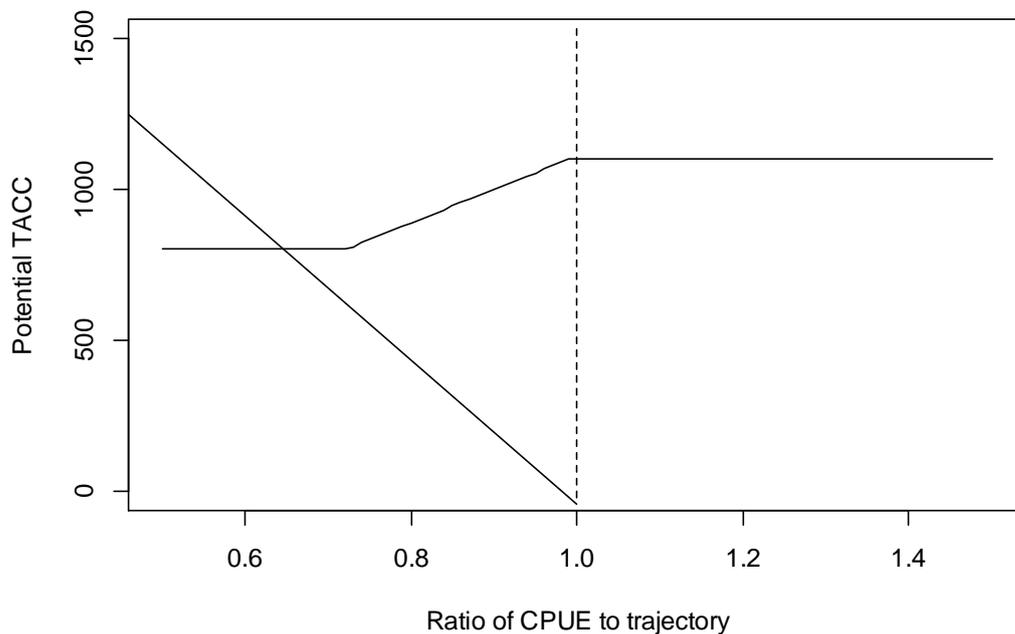


- BNS is managed as six QMS stocks, which are assessed as a single biological stock. For management purposes this biological stock is considered to include BNS 1, 2, 3, 7 and 8.
- BNS are taken primarily in target bottom longline fisheries. They are also commonly taken in LIN and HPB line fisheries, and in the BYX (BNS 2, 3) and HOK (BNS 7) trawl fisheries.



## MANAGEMENT PROCEDURE

- The overall TACC for BNS 1, 2, 3, 7, and 8 is set using a Trajectory Status Adjustment Restricted (TSAR) management procedure (see Appendix) which defines a rebuild trajectory for CPUE, as a proxy for abundance. The rebuild trajectory was defined to be consistent with rebuild to 35% B0 within 30 years, or better.
- The value of an annual, smoothed, CPUE index is assessed annually in relation to the rebuild trajectory, and the overall TACC varied (if required) in order to maintain the required rebuild.
- The overall potential TACC is set as illustrated below:



- The actual overall TACC is not varied if the potential TACC is within 5% of the current TACC, and changes are limited to a maximum of 50% of the current TACC.
- The TACCs for BNS 1, 2, 3, 7 and 8 are set by maintaining proportionality within the overall TACC.

## ANNUAL MANAGEMENT CYCLE

- 15 Oct – Catch-effort data submitted to FishServe for fishing year ending 30 Sept
- 30 Mar – Updated MP index (rapid CPUE update) and diagnostics calculated, and proposed TACC for next fishing year calculated
- 15 Apr – 30 Jun – consultation on any proposed TACC change
- 1 Sep – Minister’s decision announced
- 1 Oct – updated TACC gazetted

## LATEST ANALYSES AND INFORMATION

- In 2013/14 the CPUE index,  $\lambda_t$ , was 0.726.
- The TACC for 2015/16 is 1,110 t.

## FOR FURTHER INFORMATION

- 2014: Assessment and management procedure evaluation (**Bentley and Middleton, 2015**)
- 2014: Management procedure implementation report (**link**)
- 2014: MPI stock assessment plenary (**link**)

## FUTURE MONITORING AND RESEARCH

- Annually: fishery overview updated in January
- Annually until 2018/19: management procedure implementation
- Annually 2014/15 to 2017/18: catch sampling of BLL fisheries.
- Feb – May 2016: examine patterns in catch @ length in 2014/15, 2015/16. Consider value of ageing for upcoming management procedure evaluation.
- Feb - May 2019: updated management procedure evaluation, for implementation from 2019/20.

## OTHER MANAGEMENT INFORMATION NEEDS

- When updating the management procedure for 2015/16 onwards, the level of the deemed value should be reviewed.
- Updated recreational harvest estimates, including charter vessels.

## APPENDIX – DETAILED MANAGEMENT PROCEDURE SPECIFICATION

- The required rebuild trajectory ( $\bar{i}_t$ ) is defined by three control parameters, *Initial (I)*, *Slope (S)* and *Target (T)*, with  $\bar{i}_t = \min(I + St, T)$ . For BNS,  $I = 0.6$ ,  $S = 0.02$ ,  $T = 1$ , and  $t$  is years since 2013/14.
- The TSAR management procedure is based on a smoothed CPUE index  $\hat{i}_t$ , calculated as  $\hat{i}_t = i_t R + \hat{i}_{t-1}(1 - R)$ , with responsiveness parameter  $R = 0.675$ .
- Current status relative to the trajectory is the ratio of the smoothed CPUE to the trajectory:  $s_t = \hat{i}_t / \bar{i}_t$
- The potential TACC for the following year is calculated as  $1110 \times s_t$ , subject to a minimum TACC of 800 t, and a maximum of 1100 t. If the potential TACC differs from the current TACC by less than 5% of the current TACC, no change is made. Changes are limited to a maximum of 50% of the current TACC.