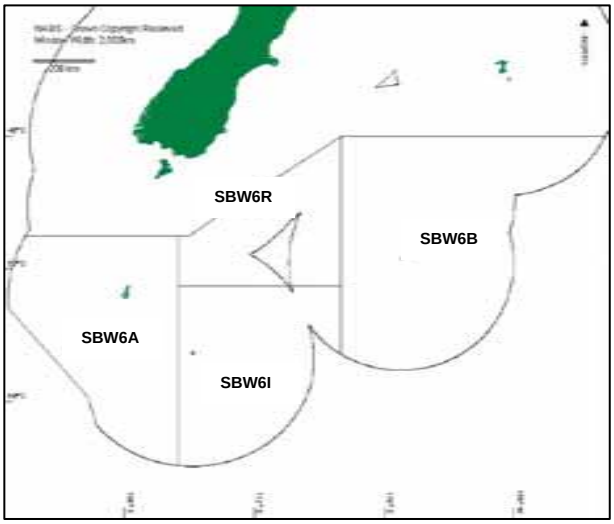
# FINAL ADVICE PAPER: SOUTHERN BLUE WHITING 6B (SBW 6B)




## Executive Summary

1 The Ministry of Fisheries (MFish) proposes that the Total Allowable Catch (TAC) for SBW 6B be increased to 10,000 tonnes for the 2008-09 fishing year, with a Total Allowable Commercial Catch (TACC) of 9,800 tonnes and an allowance of 200 tonnes for other sources of fishing related mortality.

2 The results of the 2007 acoustic survey show a large increase in biomass. Estimates derived directly from the survey data indicate a biomass 10 times higher than that seen in the most recent *Tangaroa* survey in 2001, and 6-7 times higher than the previous Industry survey in 2006. Results were presented to the middle depths fishery assessment working group (FAWG) in late 2007 and it was accepted that the estimated biomass was representative of the stock size. It appears that the increase in stock size is due to a very strong and relatively slow-growing 2002 year class. Stock size in SBW 6B is now considered to be well above conservative estimates of the biomass that can produce the maximum sustainable yield ($B_{MSY}$).

3 Yield estimates in the order of 15,000 – 20,000 tonnes were determined by the FAWG based on applying a fishing mortality rate of 0.2 to conservative estimates of biomass derived directly from the acoustic survey. The fishing mortality rate of 0.2 is equal to the estimated natural mortality rate which is considered to be an analytical proxy for $F_{MSY}$, the fishing mortality limit that if applied constantly would result in the maximum sustainable yield.

4 While Industry are encouraged by the state of the fishery and support an increase in the TAC they also support a measured approach to harvesting the 2002 year class. They support a TACC in the order of 8,000 to 10,000 tonnes, which is lower than the yield estimates, and have agreed to undertake a further acoustic survey in 2008 to inform a revised stock assessment.

## Recommended option

5 MFish recommends that you:

i) Increase the TAC for SBW 6B from 3,500 tonnes to 10,000 tonnes for the 2008-09 fishing year; and

ii) Set a TACC for SBW 6B at 9,800 tonnes; and

iii) Set an allowance for other sources of fishing related mortality of 200 tonnes.

6 Two options were provided in the initial position paper (IPP). IPP option 1 was to maintain the existing TAC and TACC of 3,500 tonnes with no additional allowances. IPP option 2 was the option recommended here.

## Consultation

7 Your decision whether or not to adjust the TAC for SBW 6B is a decision under section 13(2)-(4) of the Fisheries Act 1996 (the Act) and therefore the consultation requirements of section 12 apply. Further, in respect of your decision whether or not to adjust the TACC for SBW 6B, the consultation requirements set out in section 21(2) apply.

8 Consultation on the IPP was undertaken with such persons or organisations representative of those classes of persons having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned, including Mäori, environmental, commercial, and recreational interests.

9 The consultation period for the SBW 6B IPP was necessarily truncated. This is typical for SBW stocks due to the short space of time between the completion of the fishery in September and the start of the next fishing year on 1 April. Recognising that stakeholders would have limited time to comment on the IPP, MFish wrote to stakeholders on 21 December 2007 to inform them of the likely consultation dates. The IPP was made available to stakeholders on 5 February 2008 and submissions closed on 7 March 2008.

## Submissions Received

10 Written submissions regarding this proposal were received from:

- Aurora Fisheries Limited
- Deepwater Group Limited
- New Zealand Seafood Industry Council Limited
- Sanford Limited

11 All of these submissions supported the TAC and TACC proposed by option 2 in the IPP.

12 A verbal submission was also received from Te Ohu Kaimoana Trustee Limited (Te Ohu) which also supported option 2. Te Ohu noted that stability of TACC was important and expressed the view that future increases should only be considered if supported by new information.

13 The Deepwater Group Limited (DWG) submission was made on behalf of the 89% of SBW 6B quota owners who are DWG shareholders. It advises that 85% of SBW 6B quota owners support an increase in SBW 6B TACC to between 8,000 - 10,000 tonnes. On this basis DWG supports option 2.

14 SBW 6B quota owners agree that, through DWG, they will:

- Continue a close working relationship with the Ministry and the Minister on the management of this fishery;
- Plan an acoustic biomass survey of spawning aggregations on the Bounty Platform in 2008, using an industry vessel, to inform a revised stock assessment in 2009;
- Re-evaluate the desirability of a further TACC increase, within the sustainability parameters for the stock, from 1 April 2009.

## Rationale for management options

15 Background on the biological characteristics of southern blue whiting and the history of the SBW 6B fishery is provided in Appendix 2. Details on the stock assessment for this fishery is provided in Appendix 3.

16 A new acoustic survey was undertaken in 2007 and an additional year of catch-at-age data is also available. Analysis of the data indicates a large increase in biomass, likely to have been caused by the maturing of a strong 2002 year class. Biomass estimates derived directly from the 2007 survey indicate that the biomass is 10 times higher than that seen in the most recent research survey in 2001, and 6-7 times higher than the previous industry survey in 2006. The FAWG accepted that the biomass estimated from the acoustic survey was representative of stock size, and is supported by catch-at-age data.

### *Harvest strategy*

17 SBW 6B has been managed under a constant fishing mortality strategy with the TAC based on an estimate of the current annual yield (CAY). CAY is the one-year catch calculated by applying a constant fishing mortality, or exploitation rate, to an estimate of the vulnerable biomass. The maximum average yield (MAY) is the average of the CAYs over time and is used as an analytical proxy for the maximum sustainable yield (MSY) in SBW 6B.

18 The Plenary uses $20\%B_0$ as a limit reference point in SBW 6B. Risk to the sustainability of the stock is considered unacceptable if the probability of the stock dropping below the limit reference point exceeds 10%.

19 Without a recent formal stock assessment, it is not possible to directly quantify the vulnerable biomass of the SBW 6B stock. However the FAWG agreed that a conservative estimate could be derived directly from the 2007 acoustic survey. Such an approach would need to take into account sampling uncertainties in the acoustic estimates[1] and uncertainty in the acoustic target strength of southern blue whiting.[2] A vulnerable biomass estimate based on the lower 10$^{th}$ percentile bound of the survey estimate and using a mean target strength returned a value of 102,000 tonnes. Using the mean acoustic estimate and the lower bound of target strength gave a value of 78,000 tonnes.

20 $F_{MSY}$ is the fishing mortality limit that, if applied constantly, would result in the maximum sustainable yield. A common method of estimating $F_{MSY}$, and the method used in SBW 6B, is to assume it is equal to the natural mortality rate (M). F=M is considered a conservative proxy for $F_{MSY}$. For southern blue whiting M is estimated to be 0.2.

21 CAY estimates based on the estimated vulnerable biomass and $F_{MSY}$ is in the range of 15,000 to 20,000 tonnes. The FAWG agreed that if the TAC was based on these conservative yield estimates, the risk of the biomass dropping below the limit reference point in 2008 would be negligible.

22 Quota owners have indicated a preference for a relatively modest TACC increase to a level in the order of 8,000 to 10,000 tonnes. Part of the reason for Industry not seeking a larger increase at this time is recognition that the large 2002 year class will remain available to fishers over a number of years and there is likely to be an economic benefit in taking a measured approach to harvesting this year class. Specifically, Industry notes that larger fish receive a price premium when landed dressed. As the 2002 year class is slow growing and dominates the catch, greater value may be realised by letting the fish grow, thereby allowing larger fish to be harvested in future years.

# Assessment of Management Options

## *Total Allowable Catch*

### *Setting the TAC (s 13(2))*

23 The TAC is set under section 13(2) of the Act. The status of the stock in relation to MSY determines the appropriate sub-section under which you should alter the TAC.

24 The Plenary states that based on the 2005 stock assessment, the unfished biomass ($B_0$) in SBW 6B is estimated to be 86,000 tonnes. Estimates of $B_{MSY}$ for a medium to high productivity species such as southern blue whiting typically fall in the range of 20-40% of $B_0$. Taking the upper limit of 40% provides a conservative $B_{MSY}$ estimate of 34,000 tonnes based on the most recent stock assessment.

25 Conservative estimates of current biomass put the current stock size at 78,000 to 102,000 tonnes, well above conservative estimates of $B_{MSY}$. MFish therefore

[1] The lower 10 percentile bound of the 2007 acoustic estimate was used
[2] The lower bound of the estimated ± 3 dB uncertainty in target strength was used

recommends setting the TAC for the stock under section 13(2)(c) of the Act to enable the level of the stock to be altered in a way and a rate that will result in the stock moving towards or above the level that can produce MSY, having regard to the independence of stocks.

26 Analysis of the survey data indicates that a TAC of 10,000 tonnes is below the most conservative CAY yield estimates derived by applying an $F_{MSY}$ of 0.2 to the estimated vulnerable biomass.

27 Another acoustic survey in 2008 will allow a better assessment in 2009.

### *Way and rate discussion (s 13(3))*

28 Under s 13(3) of the Act, you must consider relevant social, cultural and economic considerations in determining an appropriate way and rate to move the stock towards or above MSY.

29 As noted, Industry suggests that allowing SBW in the dominant 2002 year class to grow to a larger size prior to harvest is likely to increase the economic return from the fishery, particularly from the higher valued dressed product. The proposed TAC of 10,000 tonnes represents a conservative catch limit, consistent with economic considerations. A further increase to the TAC based on utilisation considerations may be appropriate in 2009.

30 Rather than increasing the TAC to the maximum likely to be sustainable, MFish is proposing a modest increase as an appropriate first step among possible future increases. An increase to a TAC of 10,000 tonnes represents an appropriate way and rate to initiate the movement of the stock towards or above a level that can support MSY.

### *Effects of fishing on any stock and the aquatic environment (s 11(1)(a))*

31 When varying the TAC, s 11(1)(a) of the Act specifies that you may take into account any effects of fishing on any stock and the aquatic environment.

Benthic impact

32 There is currently little direct information on the benthic effects of SBW trawling and it is not possible to quantify an acceptable level of benthic impact at this time. However, SBW 6B is fished using mid-water trawls. Mid-water trawl gear is lighter than bottom trawl gear and, although SBW is fished near or on the bottom, the rocky seabed in SBW 6B means that trawls are not fished hard down. The fishery also occurs over a relatively small area that does not change substantially from year to year.

33 Relative to other fisheries that are trawled on or near the bottom, SBW 6B is likely to have less benthic impact. Due to the restricted area over which the SBW 6B fishery occurs, MFish does not consider that a TAC increase would substantially increase the benthic impact resulting from the fishery. Measures to avoid, remedy or mitigate the benthic impact of trawl fisheries generally will be considered through development of a benthic impact standard.

Fish bycatch

34 While the total fish bycatch for SBW varies widely between years it is small compared to the targeted SBW catch, comprising of about 1% of total greenweight catch based on observed and reported catch. Most of the bycatch that does occur consists of other commercial species, principally ling, and such bycatch is typically retained.[3]

Marine mammals

35 The SBW fisheries are known to make incidental captures of both New Zealand sea lions and fur seals. No sea lion captures have been recorded from SBW 6B although a number have been taken in SBW 6I in recent years.

36 Observed and reported fur seal captures from SBW 6B are shown in Table 1 along with effort and the percentage of that effort that was observed. Of the SBW fisheries, fur seal captures are dominated by SBW 6B, likely due to the proximity of this fishery to the large Bounty Island fur seal colony. Both observer coverage and effort in this fishery has varied considerably over the years with typically greater observer coverage in years where greater effort was expended. While it is difficult to determine a trend in the actual number of fur seal captures, an increase in the TACC in SBW 6B may result in an increased number of fur seal captures.

| Fishing year | Observed and reported fur seal captures | Total number of tows | Percentage of tows observed |
|---|---|---|---|
| 2002-03 | 6 | 96 | 9% |
| 2003-04 | 0 | 26 | 8% |
| 2004-05 | 28 | 31 | 23% |
| 2005-06 | 28 | 96 | 54% |
| 2006-07 | 51 | 94 | 87% |

**Table 1. Observed and reported fur seal captures, effort and percentage of effort observed in SBW 6B**

37 In a joint briefing to Ministers in 2007, MFish and the Department of Conservation (DOC) agreed that vessels operating in the SBW fisheries would be requested to follow the 'Operating Procedure for Mitigating Marine Mammal Incidental Catch' developed by the Deepwater Group Limited (DWG). MFish and DOC also agreed to continue to monitor marine mammal captures in this fishery. MFish considers this to be sufficient to monitor and manage fur seal interactions at this time.

Seabirds

38 The SBW fisheries are known to make incidental captures of various seabirds, although based on observer reports this number is low. Mitigation measures are currently in place across the middle depths fleet and you have recently introduced offal management measures. No additional measures are proposed at this time.

Trophic linkages

39 SBW is prey to a range of seabirds, pinnipeds, and larger demersal finfish species in the area. Juvenile SBW (age 4 to 6 months) are known to form a major part of the diet of seabirds such as penguins and albatross. The nature and extent of any existing

[3] Anderson, O.F. (2004) Fish discards and non-target fish catch in the fisheries for southern blue whiting and oreos. *New Zealand Fisheries Assessment Report 2004.* 40 p.

or future effects of SBW harvesting on the availability of SBW as food for prey species is not known. No action is proposed at this time.

## *TACC and allowances*

### *Customary and recreational allowance*

40 There is no known recreational or customary Mäori take of SBW. MFish considers that you need not provide an allowance for recreational or customary catch within the TAC for SBW 6B.

### *Other sources of fishing related mortality*

41 Science observers have reported discards of small fish and accidental loss from torn or burst codends. NIWA used trawl catch and discard data from the MFish Observer Programme and commercial catch-effort data for the period 1990 to 2002 to estimate discard levels in the SBW target fisheries.[4] For this period total annual discard estimates (including estimates of fish lost from the net at the surface) ranged between 0.4% and 2.0% of the estimated SBW catch for all SBW fisheries.

42 MFish proposes an allowance for other sources of fishing related mortality of 2% of the proposed TAC. This equates to 200 tonnes at a TAC of 10,000 tonnes.

43 There is no allowance for other sources of fishing related mortality in place for other SBW stocks. MFish proposes to review the allowance for other sources of fishing related mortality for the other SBW stocks as and when their sustainability measures are reviewed.

## *Total allowable commercial catch*

44 MFish proposes to set a TACC of 9,800 tonnes.

## *Other Management Controls*

### *Deemed values*

45 The catch has exceeded the TACC in SBW 6B in 4 of the last 5 fishing years. Accordingly the deemed value regime for this fishery is being reviewed for the start of the 2008-09 fishing year.

### *Observer coverage*

46 Observer coverage in SBW 6B has generally been high in recent years. The number of tows targeting SBW in SBW 6B, along with the percentage of these tows observed is shown in table 1.

47 Observer coverage of the SBW fisheries for the 2008-09 fishing year has been set at 254 days. The short time period of the SBW fisheries means that there is little need to increase observer coverage or the collection of catch-at-age data following a TACC

[4] Anderson, O.F. (2004) Fish discards and non-target fish catch in the fisheries for southern blue whiting and oreos. *New Zealand Fisheries Assessment Report 2004.* 40 p.

increase. All vessels participating in the SBW 6B fishery are on the fishing grounds at the same time and are extracting fish from the same aggregations. Consequently, sampling from one or two vessels is typically sufficient.

### *Compliance implications*

48 Offences that have occurred in SBW fisheries include misreporting of QMA and dumping. An increase in SBW 6B ACE will provide an increased opportunity for fishers involved in other SBW fisheries to area misreport catch as coming from SBW 6B. However the large biomass of SBW available in SBW 6B may decrease the incentive to area misreporting – if good catch rates are available in SBW 6B it may reduce the likelihood that fishers will go elsewhere to catch SBW and report it against SBW 6B ACE. An increase in ACE should reduce incentives for high-grading as the incentive to maximise the value of a limited catch entitlement would be reduced.

## Recommendations

49 MFish recommends that you:

a) **Increase** the TAC for SBW 6B from 3,500 tonnes to 10,000 tonnes, effective 1 April 2008, and within that TAC, set the following limits:

i) Allowance for other sources of fishing related mortality of 200 tonnes;

ii) Allowance for recreational and customary fishing of 0 tonnes; and

iii) TACC of 9,800 tonnes.

AGREE / DISAGREE/ AGREE AS AMENDED

Hon Jim Anderton
**Minister of Fisheries**

**/ /** 2008

# APPENDIX 1.

## Statutory Considerations

50 In forming the management options the following statutory considerations under the Act have been taken into account.

a) **Section 8. Purpose:** The purpose of the Act is to provide for the utilisation of fisheries resources while ensuring sustainability. The proposed TAC allows for increased utilisation in response to an increase in biomass due to the strong 2002 year class, whilst ensuring sustainability.

b) **Section 13. Total allowable catch:**

*Section 13(2):* The TAC proposed in option 2 is based on section 13(2)(c) whereby you set a TAC that enables the level of any stock whose current level is above that which can produce the maximum sustainable yield to be altered in a way and at a rate that will result in the stock moving towards or above a level that can produce the maximum sustainable yield, having regard to the independence of stocks

The SBW 6B stock is considered likely to be above $B_{MSY}$ and the proposed TAC is considered likely to move the stock towards or above the biomass that can produce the maximum sustainable yield. While interactions between species have been identified[5] there is no evidence that the interdependence of stocks is of a significant magnitude to impact on the setting of the TAC.

*Section 13(3):* You must also have regard to relevant social, cultural and economic factors when considering the way and rate at which the stock is moved towards or above $B_{MSY}$. This is discussed in the body of the paper under the assessment of management options which concludes that the TAC increase under option 2 is likely to have positive social and economic outcomes.

c) **Section 9. Environmental principles:**

*Section 9(a) and (b):* There is relatively little bycatch in SBW 6B and species that are caught are dominated by QMS species - principally ling. Marine mammal capture in SBW 6B has been discussed under the assessment of management options section in the body of the paper. There is no evidence that interactions are of significant magnitude to impact on associated and dependent species, or on biological diversity.

*Section 9(c):* No habitats of particular significance for fisheries management have been identified in SBW 6B.

d) **Section 5 Application of international obligations and Treaty of Waitangi (Fisheries Claims) Settlement Act 1992:** There is a wide range of international obligations relating to fishing (including sustainability, utilisation of fishstocks and maintaining biodiversity). MFish considers that issues

[5] Anderson, O.F. (2004) Fish discards and non-target fish catch in the fisheries for southern blue whiting and oreos. *New Zealand Fisheries Assessment Report 2004.* 40 p.

arising under international obligations and the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 are adequately addressed in the management options for this stock.

e) **Section 11 Sustainability measures:**

*Section 11(1)(a):* Before varying the TAC for SBW 6B, you may take into account any effects of fishing on any stock and the aquatic environment. This has been discussed under the assessment of management options section in the body of the paper. No information additional to that discussed elsewhere in the paper has been considered about any effects of fishing on any stock or on the aquatic environment.

*Section 11(1)(b):* Before varying the TAC for SBW 6B, you may take into account any existing controls under the Act that apply to the stock. All existing controls under the Act that apply to SBW 6B have been taken into account in considering appropriate sustainability measures for this stock. Such controls include the existing TAC/TACC, the deemed value regime and scientific observer coverage.

*Section 11(1)(c):* Before varying the TAC for SBW 6B, you may take into account the natural variability of the stock. SBW biomass has increased significantly as a result of the strong 2002 year class. The significance of this variability was discussed at length in both the rationale for management options and the assessment of management options sections in the body of the paper.

*Sections 11(2)(a) and (b):* Before varying the TAC for SBW 6B, you may have regard to any provisions of any regional policy statement, regional plan or proposed regional plan under the Resource Management Act 1991 and any management strategy or management plan under the Conservation Act 1987 that apply to the coastal marine area and the that you consider relevant. MFish is not aware of any such provisions that should be taken into account for SBW 6B.

*Section 11(2)(c):* Before varying the TAC for SBW 6B, you shall have regard to sections 7 and 8 of the Hauraki Gulf Marine Park Act 2000 that apply to the coastal marine area and you consider relevant. The distribution of SBW in the SBW 6B QMA does not intersect with the Park boundaries.

*Section 11(2A)(b):* Before varying the TAC for SBW 6B, you must take account of any relevant fisheries plans approved under part III of the Act. A fisheries plan incorporating SBW 6B is proposed for development in 2007-08. However, at present, no such plan has been finalised or approved.

*Sections 11(2A)(a) and (c):* Before varying the TAC for SBW 6B, you must take into account any conservation or fisheries service, and any decisions not to require such services. There are no conservation services in place specific to SBW 6B. Fisheries services, including stock assessment research, research into the effects of fishing on the aquatic environment and enforcement of management measures, have been considered in developing the TAC options for SBW 6B.

f) **Section 21. Matters to be taken into account in setting or varying any TACC:** Before varying the TAC for SBW 6B, you shall have regard to non-

commercial Mäori customary and recreational fishing interests in that stock, and all other sources of fishing-related mortality caused by fishing. There is no known customary Mäori or recreational interest in SBW 6B and an allowance has been proposed under option 2 for other sources of fishing-related mortality.

*Section 21(4):* This section requires that you take into account any mätaitai reserve, or closure/restriction under s 186A to facilitate customary fishing, when allowing for customary Mäori interests. There are no mätaitai reserve in SBW 6B. No area has been closed or fishing method restricted (that affects the fishery within SBW 6B) under the customary fishing provisions of the Act.

*Section 21(5):* This section requires you take into account any regulations that prohibit or restrict fishing made under s 311, when setting allowances for recreational interests. No restrictions under s 311 have been placed on fishing in any area within SBW 6B.

g) **Section 10:** The information principles in section 10 require that decisions be based on the best available information, taking into account any uncertainty in that information, and applying caution when information is uncertain, unreliable, or inadequate. On balance MFish considers that the options provided are derived from the best available information and cover an appropriate range of caution in response to the uncertainty in that information.

# APPENDIX 2.

## SBW background

51 Southern blue whiting (SBW) is a schooling species generally confined to sub-Antarctic waters over depths of 250–600 m. Although dispersed for much of the year, during spawning SBW form aggregations that are the focus of the commercial fishery.

52 Four spawning areas have been identified; Bounty Platform (SBW 6B), Pukaki Rise (SBW 6R), Auckland Islands Shelf (SBW 6A), and Campbell Island Rise (SBW 6I). Spawning on Bounty Platform begins in mid-August and finishes by mid-September. Spawning begins 3–4 weeks later in the other areas, finishing in late September/early October.

53 SBW is a productive species with relatively fast growth, early maturity and can live to a maximum age of 25 years. The age and length of maturity (i.e. when fish are first available to the fishery) varies between areas and between years although typically males and females mature at ages 3 or 4. Recruitment can vary markedly between years and give rise to pronounced changes in stock size. For example the exceptionally strong 1991 year class in SBW 6I increased the biomass of fish aged 4+ from 29,000 t in 1994 to 131,000 t in 1995. Such was the strength of the 1991 year class that, 16 years later, it still provides about eight percent of the catch by number.

54 Catch in SBW 6B has fluctuated widely both prior to and following introduction to the quota management system (QMS) in 2000.

55 The limited duration of the SBW season, coupled with long distances between fishing areas and significant search times to locate fish, works against the ability of the fishing industry to fish effectively in all four SBW 6 Quota Management Areas (QMAs) and may account for some of the annual catch variation. Timing of this fishery may also contribute to the observed catch variation. Vessels engaged in this fishery typically steam to the grounds after the completion of the West Coast South Island (WCSI) hoki fishery. Hoki is a more lucrative fishery than SBW so vessels seek to maximise their hoki catch. Of the SBW 6 fisheries, spawning occurs first in SBW 6B and consequently effort expended in SBW 6B is most affected by the timing of the hoki fishery. In years where the period of the WCSI hoki fishery runs into the spawning period of SBW 6B, vessels may have limited opportunity to participate in that fishery, leading to low catches.

56 In the last five fishing years, SBW 6B catch has remained relatively close to the TACC. Significant reductions in the HOK 1 TACC since 2004-05 may have allowed for a more consistent period of time on the SBW 6B grounds and better integration of this fishery into the catch plans of the middle depths fleet.

57 Up to 2004-05 almost all SBW 6B catch was landed as surimi. In more recent years the amount landed dressed has increased to 20-35% of total landings. Although still a relatively low value fishery, the value has increased in recent years as dressed product typically commands a price premium over surimi.

# APPENDIX 3.

## Stock assessment

58 From 1993 - 2001 the primary input into the stock assessment model was the acoustic surveys undertaken by the *RV Tangaroa.* Surveys of the Bounty Platform stock were undertaken annually from 1993 to 1995, and then biennially until 2001. After the TAC was decreased to 3,500 tonnes in 2003-04, the *Tangaroa* surveys were discontinued as they were no longer cost effective. The Plenary noted that higher yields would only be available in the future when there was good recruitment – which only occurs sporadically in this fishery.

59 A survey undertaken on the Campbell Rise SBW stock in 2003 demonstrated that useful acoustic data could be collected by industry vessels. Acoustic data has subsequently been collected by the industry vessel *FV Tomi Maru* from the SBW 6B stock in 2004, 2006 and 2007.

60 Favourable weather conditions in 2007 resulted in good quality acoustic data from the industry vessel. The quality of the data, in combination with close adherence to survey protocols, resulted in a successful survey of the principal spawning stock aggregations identified by the commercial fleet. Analysis of the survey data and catch-at-age data indicated a large increase in biomass, likely to have been caused by the maturing of a strong 2002 year class. Biomass estimates derived directly from the 2007 survey indicate that the biomass is 10 times higher than that seen in the most recent research survey in 2001, and 6-7 times higher than the most recent 2006 industry survey.

61 The biomass increase identified in the 2007 survey results was accepted by the middle-depths Fisheries Assessment Working Group (FAWG) in late 2007. In January 2008 an attempt was made at a new stock assessment using the survey data and additional years of catch-at-age data, with preliminary results presented to the FAWG in January 2008. The stock assessment proved problematic, primarily due to difficulties modelling the strong 2002 year class. Ultimately the FAWG agreed to not progress the stock assessment at this time but to continue to refine the model during 2008 with the intention of providing an updated stock assessment in January 2009. The FAWG recommended that a further acoustic survey be undertaken in 2008 to confirm the large increase in biomass seen in the 2007 survey.

62 The FAWG did however accept that the biomass estimated from the acoustic survey was representative of stock size. This conclusion was supported by the catch-at-age data which shows that catch is now dominated by the 2002 year class which provided approximately 80% of the catch by number in 2007. The catch-at-age data also indicate that this year class is relatively slow-growing which is consistent with the low growth rate seen in the strong 1991 year class in SBW 6I.

63 The FAWG agreed that additional work should be undertaken in 2008 to better refine the stock assessment model. Another acoustic survey in 2008 was also recommended

to support a new stock assessment in 2009. Industry has indicated a willingness to undertake a further acoustic survey in September 2008.