



Department of Conservation  
*Te Papa Atawhai*



**Fisheries New Zealand**

Tini a Tangaroa



**Te Rūnanga o NGĀI TAHU**

**New Zealand Sea Lion/Rāpoka Conservation Services  
Programme (CSP) and Threat Management Plan (TMP)  
Technical Working Group Meeting report**

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# 1. Introduction

## 1.1 Context

On 26 March 2019, the Department of Conservation (DOC) held a full day workshop (a Technical Working Group) to present preliminary results of the 2018/19 fieldwork seasons and an update of other sea lion projects. This was performed to gather research and action ideas for the upcoming fieldwork seasons. Key recommendations from the meeting were captured and are outlined below for discussing and prioritising in the Forum and Advisory Group.

## 1.2 Workshop participants

Participants in the workshop included Enrique Pardo, Laura Boren, Katie Clemens-Seely, Don Neale, Jim Campbell, Phred Dobbins, Jim Fyfe, Kirsten Rogers, Shannon Weaver (DOC), Greg Lydon (FNZ), Jim Roberts, Kath Large (NIWA), Richard Wells (Deep Water Group), Tom Clark (FINZ), Wendi Roe (Massey University), Jordana Whyte (NZSLT), Katrina Goddard (Forest & Bird), Aditi Sriram, Helena Dodge, Jody Weir, Dahlia Foo, Kelly Buckle (contractors for field work), Odin Neil (Auckland Zoo), Rauhina Scott-Fyfe (Ngāi Tahu), Veronica Frans (Michigan State University), Mary-Anne Lea (University of Tasmania), Sarah Michael (University of Sydney & Massey University) and Simon Childerhouse (Cawthron Institute). Neil Gilbert was contracted by DOC/FNZ as an Independent Chair.

# 2. Material Presented

## 2.1 POP2018-03 New Zealand Sea Lion: Auckland Islands pup counts and updates

Presented by Laura Boren

[Auckland Islands Pup Counts/Updates Presentation Link](#) (Revised Version)

### Summary Points:

The main objectives of the NZSL fieldwork on the Auckland Islands were estimating pup production, daily counts, double flipper tagging/microchipping, resighting of individuals, and assessment of mortality. The total pup count estimates originally presented at the Workshop for the Auckland Islands was 1751 but this estimate was slightly revised to 1678 (awaiting final confirmation on the Figure of Eight count which may increase this number by one pup) based on discussions at and following the workshop (see Appendices III and IV for a description of this).

### Discussion Points:

Comments/Actions: There was discussion regarding the types of counts that would be best used for highest accuracy and consistency in estimating pup production (with a focus on Dundas Island). As a result, LB, SC, and JR arranged time for an additional conversation to decide on the most accurate method for estimating this year's pup production. The updated numbers, along with a description of why that specific counting method was regarded as most accurate/consistent, can be found in the excerpt in Appendix III (that derives from The New Zealand Sea Lion Monitoring and Pup Production at the Auckland Islands 2018/2019 Research Report. Also, SC provided an explanation with additional background/insight which can be found in Appendix IV.

Comments/Actions: There was discussion regarding whether we may be missing some vital information with the later start date and whether this would impact the consistency and effectiveness of the data. A later start date/incomplete field season doesn't allow for a full capture

of mortality and thus pup production. Suggestions were made to potentially shift to earlier start dates.

Comments/Actions: There was discussion regarding the lack of ability to invest time into resighting on Dundas. It was suggested that more time be spent there with additional time allocated to resighting. There was also discussion around the use of microchips on Dundas and whether they should continue to be used as, if there is little or no resighting effort, then there appears to be little benefit in the additional impact on the pups and increased cost to the existing tagging programme. Irrespective of whether the decision is made to continue chipping at Dundas, decisions are still needed on the use of a new microchip brand (as there is a lack of access to reliable readers for the current brand) and whether there is the capacity for a fixed microchip reader to acquire resights more effectively as the work is likely to continue at Sandy Bay. As a result, a tagging workshop will be planned to address these topics regarding microchips, and ongoing issues with tag readability/duration for resights.

Comments/Actions: There was discussion on the collection methods of the shark scar/distinct scar photo ID library. Currently it's used as a basis for starting a photo ID library of animals. Suggestions were made that if it's to be used as an indicator of shark activity, a more formalised system needs to be created which ideally would be consistent with the previous systems to allow comparability. Also, there were some photos taken previously and, if in a compatible format, it was suggested these can be compiled for a larger photo database set.

Comments/Actions: It was discussed and suggested that for the activities with the ramps, it would be useful to have a recorded measure of success of the ramps, i.e. number of animals stuck in ditches prior to ramp placement and after ramp placement. This has been done previously and it would be ideal if a consistent methodology was applied to allow comparability over time.

Comments/Actions: It was suggested that chip retention survey be done on pups every year, some length of time after the initial placement to assess retention rates which vary by year, operator, and experience.

## **2.2 TMP New Zealand Sea Lion: Otago and Southland pup counts and updates**

Presented by Jim Fyfe

[Otago and Southland Pup Counts/Updates Presentation Link](#)

### **Summary points:**

In the Otago region, of the 17 females considered to be sexually mature, only 13 have been recorded with a pup so far. There were a total of 17 pups tagged in the southeast coast of the South Island: 13 pups tagged on the Otago Peninsula (1 currently missing), 1 tagged at Akatore, and 3 in the Catlins. Two juvenile females died during the breeding season. Poor behaviour by people and inappropriate social media postings continues to arise as an issue. A new tracking device app was reported by JW for logging individuals in the field which has been very helpful, and they are trialling the success for further use next year. Also, camera traps are being trialled to determine how useful it could be. They have been getting a lot of tagged pups from Stewart Island resighted around Otago - mostly males but some females as well. Mature females not from local lineage are starting to supplement the Otago breeding population.

### **Discussion points:**

Comments/Actions: The question was raised regarding whether the data acquired this year will be usable/comparable to past years data. There was also discussion around whether there was a plan to redo the population model for the mainland in the near future. This was left unresolved on the day of the meeting and was parked for further discussion. This issue is likely to be discussed at the NZSL Forum meeting where further details around the issue will take place.

Comments/Actions: It was flagged that Nathan Reed, PhD student at Texas A&M (working with Bruce Robertson at Otago Uni), has a permit to satellite tag four females in Catlins, with video camera footage also collected. This will likely be happening in early July.

### **2.3 TMP New Zealand Sea Lion: Stewart Island pup counts and updates**

Presented by Phred Dobbins

Presentation link can be found at <https://www.doc.govt.nz/nature/native-animals/marine-mammals/seals/new-zealand-sea-lion/research-and-fieldwork/>

#### **Summary points:**

At Port Pegasus in early 2019, 51 pups were tagged, and 32 resights of previously tagged NZSL were recorded (all but two from Stewart Island). This area is challenging due to accessibility issues and generally only one trip occurs per year. However, efforts are being made to make the field work as repeatable as possible. Looking towards continuing flipper tagging and possibly adding microchipping in the future. Chipping wasn't performed this year as it was felt to be unsafe and personnel desired additional training. Work is being done to continue to foster collaborations, and potentially to reach out to other groups (such as Titi Island Community, Stewart Island Locals, Ecotourists, etc.).

#### **Discussion points:**

Comments/Actions: The need for a ranger position in this area was highlighted and generally supported. This was raised along with questions of what type of resight effort is put in for this area for population monitoring, resights for other areas, genetic sampling, and more. This was suggested as a topic for further consideration.

### **2.4 TMP New Zealand Sea Lion: Campbell Island pup counts, updates and preliminary results from gross post-mortem investigations**

Presented by Jody Weir

[Campbell Island Pup Counts/Preliminary Gross Post-Mortem Results Presentation Link \(Revised Version\)](#)

#### **Summary points:**

At Campbell Island, the total pup production estimate was 704. The overall mortality rate at Campbell Island up until 26 January 2019 was 54% (i.e. 380 dead pups from a total of ~704 born). At Davis Point, the mortality rate was 77% (i.e. 342 dead pups of ~447 born), and at Shoal point it was 15% (i.e. 38 dead pups of 257 born). The field team suggested that the 2018/19 field season was worse than the previous year with overall lower temperatures and increased wind. Upon gross post-mortem, starvation/exposure was provisionally assigned as the most significant contributor to mortality (with the suspicion of exposure based on circumstantial indicators). Histological analysis will be undertaken on samples collected to provide a final cause of death for autopsied pups.

#### **Discussion points:**

Comments/Actions: There was quite a bit of conversation around the fact that mortality rates at Davis Point are continually high but that this year was the highest ever recorded. It was suggested that the NZSL work programme on Campbell Island should transition to implementing active and adaptive management steps at Campbell to start actually reducing mortality rates which are unsustainable. As a result, it was proposed that a focused workshop be held, specifically to develop potential action plans/management priorities at Campbell Island.

## 2.5 TMP New Zealand Sea Lion: Suitable habitats model – southern South Island project updates

Presented by Veronica Frans

[NZSL Suitable Habitats Model Presentation Link](#)

### Summary Points:

The study presented discussed determining suitable sites on the mainland for NZSL colonies with the use of distribution models. This included features of states of movement, potential human impact, and more.

### Discussion points:

Comments/Actions: Questions were posed to VF regarding what additional factors the model could incorporate/represent and suggestions were given to VF regarding other factors to consider when formulating the models. JR knew someone doing a project on a factor that would directly relate to a variable she could incorporate and offered to put her in touch with who is running that project. Also, EP mentioned he could email participants VF's questions regarding refining the model.

## 2.6 TMP New Zealand Sea Lion: Enderby Island pup mortality and necropsy preliminary results

Presented by Aditi Sriram

[Enderby Island Pup Mortality Presentation Link](#)

### Summary Points:

On Enderby Island, mortality rate up until 5 March 2019 was 14% with 44 pups found dead. However, this is viewed as an underestimate/incomplete season count as some pups would have likely died and have been scavenged/no longer available to count prior to the team's arrival in early January. Of the 35 necropsied, 22 cases contained gross pathology suggestive of *Klebsiella pneumoniae* (still needs to be confirmed through histology). Limitations were noted regarding sampling period, scavenging, and large pup dispersal.

### Discussion points:

Comments/Actions: As also noted in the presentation on pup counts, discussions were had around the recommendation of having a longer season to capture the full picture of mortality. With the current information on *Klebsiella* in relation to mortality, discussion around research priorities for disease research is needed to confirm the next steps for *Klebsiella* research on Enderby Island from now until 2022.

Comments/Actions: A discussion about whether there were any signs of *Klebsiella* present on Campbell was held. Based on recommended actions from last year, a team was present in the later portion of the season at Davis Point. However, at this point the sea lions were highly dispersed around the island, so there was not much success with finding pups or carcasses. Also, a factor could be, due to early season high mortality, less pups were surviving to the point of displaying signs of *Klebsiella*. Possible decisions need to be made regarding reallocation of resources/staffing/field season duration in relation to Campbell and the overall goals.

## 2.7 TMP New Zealand Sea Lion: Campbell Island pup behaviour in relation to terrain traps

Presented by Dahlia Foo

[Campbell Island Pup Behaviour/Terrain Trap Presentation Link](#)

### Summary Points:

Continued trials were performed on terrain traps at Davis Point. Amongst the coir logs, hessian bags (with rocks and sand as fillers), and ladders, it was indicated that they all have potential when used in different types/shapes of hazardous terrain traps. It's possible that, with higher mortality this season, the pups were not exploring the hazardous areas as heavily as seen in 2017/18.

**Discussion points:**

Comments/Actions: Questions were posed regarding what steps are being taken to develop industrial scale habitat modifications with an aim of reducing pup mortality. Aerial photos have been collected and would be a useful source of planning information (e.g. size of area of bogs and holes). This information will be useful to start to develop what could be done short/long term and related costs. These topics are likely to be discussed further in the Campbell Island active management workshop that was planned.

## **2.8 TMP New Zealand Sea Lion: Fisheries New Zealand projects update**

Presented by Greg Lydon

\*\*Verbal overview given, no associated PowerPoint presentation\*\*

**Summary points:**

GL stepped in to give a high-level overview. FNZ will be consulting on a new Southern Ocean Squid Fishery (SQU6T) Operational Plan. It has become more difficult to determine the number of female capture/death estimates, due to the SLEDs which allow most sea lions to escape the net but, there is a possibility of cryptic mortality. This means the Fisheries Related Mortality Limit is highly uncertain and not as useful for management as it was in the past. There are a number of scientific research and modelling projects occurring around this topic this year to be able to move from the FRML to a different measure. NIWA contractors introduced studies on 1) updating the Auckland Islands demographic model in order to estimate a Population Sustainability Threshold (PST) to be used in the fishery moving forward, and 2) work by Proteus (DM) in developing a desktop tool to estimate decay of the PST, and 3) the application of the Spatially Explicit Fisheries Risk Assessment (SEFRA) framework used for Hector's and Maui dolphins, to assess the risk in the overlap between sea lions and fisheries at the Auckland Islands.

**Discussion Points:**

Comments/Actions: Fisheries New Zealand highlighted the timeline for the review of the SQU6T Operational Plan which includes a follow up meeting of the plan's Technical Advisory Group in June to assess the completed science, followed by a public consultation prior to the Minister of Fisheries making a decision on a revised Operational Plan in time for the next fishing year starting in October.

## **2.9 TMP New Zealand Sea Lion: Mātauranga project update**

Presented by Rauhina Scott-Fyfe

[Mātauranga Project Update Presentation Link](#)

**Summary points:**

This project is looking at capturing perspectives and Mātauranga from Ngāi Tahu whānui surrounding the NZSL. The investigation will gather perspectives from historical accounts or oral interviews relating to how Ngāi Tahu whānui describe it's kaitiaki relationship to the NZSL. This is done to ensure the flax-roots knowledge and the Ngāi Tahu voice is heard and to ensure kaitiakitanga responsibilities for rāpoka are met.

**Discussion points:**

Comments/Actions: Discussion was made around the potential ideas of places that maybe further investigation can be had (ex. Rāpoka Point on Enderby Island). The question was posed if there had been any investigation into contacting other iwi around the country, since the NZSL used to range across a wider area? The focus at the moment is with Ngāi Tahu, though it does not preclude it from being expanded in the future.

### 3. Recommendations/priorities for 2019/2020 field season and beyond

<b>Purpose TWG</b>	<p>To present preliminary results of the 2018/19 fieldwork seasons and an update of other sea lion projects. To gather research and action ideas for the next fieldwork season. This information will be processed by DOC and discussed in the NZ sea lion Forum and Advisory Group.</p>			
	<b>Auckland Islands</b>	<b>Campbell Island</b>	<b>Stewart Island</b>	<b>Otago / Southland</b>
<b>2019/20 fieldwork expectations</b>	<ul style="list-style-type: none"> <li>- Pup count, tagging, re-sighting and PIT tagging (when possible) all colonies (CSP)</li> <li>- Necropsies – Finding fresh pup carcasses, that might require an earlier start of the fieldwork season (Dec) and enough team members.</li> <li>- Rolling out <i>Klebsiella</i> treatment trial (PhD results available in winter of 2019). Option: 2019/20 set up as control year prior to full rollout of mitigation in 2020/21</li> <li>- Increase the length of the fieldwork to allow comparability with <i>Klebsiella</i> work to date.</li> <li>- Off season data collection opportunistically</li> <li>- Review Dundas re-sighting effort including consideration of: (i) consider investigate gates for chip reading on Dundas; (ii) update the subants logistics PIT tagging SOP, and (iii) chip retention testing each year.</li> </ul>	<ul style="list-style-type: none"> <li>- Pup counts, tagging, PIT tagging (when possible) and resighting at all colonies</li> <li>- Necropsies (i) develop a research question and design sampling around it</li> <li>- Pilot study: mitigation for pup mortality poor quality habitat</li> <li>- Campbell Island NZSL workshop</li> </ul>	<ul style="list-style-type: none"> <li>- Pup count, tagging, PIT tagging (when possible) and re-sighting</li> <li>- Reinforce positive behaviour</li> </ul>	<ul style="list-style-type: none"> <li>- Pup count, tagging, PIT tagging (when possible) and re-sighting</li> <li>- Collection of toe samples for genetic ID and individual marking</li> <li>- Camera traps</li> <li>- Increased resighting effort</li> <li>- Reinforce positive behaviour</li> </ul>
<b>Next actions and research projects</b>	<ul style="list-style-type: none"> <li>- Diving behaviour?</li> <li>- Female sea lion body condition and age structure?</li> <li>- Klebsiella trial solutions?</li> <li>- Foraging behaviour in Campbell Island</li> <li>- Use of daily count dates</li> <li>- Shark scar project?</li> <li>- Additional research on ramps?</li> <li>- Resighting in Dundas.</li> <li>- Weight study over the years</li> <li>- Stomach content (yellow octopus content)</li> </ul>	<ul style="list-style-type: none"> <li>- Pups mortality from falling into hole solutions?</li> <li>- Foraging behaviour in Campbell Island</li> <li>- Implement solutions for pup mortality (holes, poor habitat quality, etc.)</li> <li>- Weight study over the years</li> <li>- Stomach content (yellow octopus content)</li> <li>- Body condition for adult females</li> </ul>	<ul style="list-style-type: none"> <li>- Additional colony behaviour research?</li> <li>- Off tag season fieldwork?</li> </ul>	<ul style="list-style-type: none"> <li>- Additional habitat modelling (ground-truth)?</li> </ul>

## 4. Tracked TMP Measures of Success

Site	Measures of success-tracking progress of the TMP over years.  = On Track  = Not on Track  = Track Currently Unknown
<u>Auckland Islands:</u> Pup numbers to increase from the 2014 pup count	<ul style="list-style-type: none"> <li>• Adult female survival rate and pup survival rate improve. 2017   2018   2019</li> <li>• Pup numbers are consistently above 1,575 (2014 pup count), and ideally over 1,965 (the 2017 pup count)  2017    2018    2019</li> </ul>
<u>Campbell Island/Motu Ihupuku:</u> Reduce pup mortality and support population growth	<ul style="list-style-type: none"> <li>• Pup counts are consistently at or above 696 (2015 pup count) 2017 (N/A)    2018    2019</li> <li>• Pup mortality rates are consistently lower than 40% per annum 2017 (N/A)    2018    2019</li> <li>• Frequency and consistency of monitoring of sea lions has increased.  2017    2018    2019</li> </ul>
<u>Stewart Island/Rakiura:</u> Support population growth to achieve breeding colony status	<ul style="list-style-type: none"> <li>• Pup counts remain higher than 35 for 5 years in a row, qualifying the site as a new breeding colony.  2017    2018    2019</li> <li>• Pup production continues to increase to allow for colonial breeding.  2017    2018<sup>1</sup>    2019</li> <li>• There are no cases of deliberate human-caused mortality.  2017    2018    2019</li> <li>• Public involvement in the conservation of sea lions increases. 2017   2018   2019<sup>2</sup></li> </ul>
<u>South Island/ Te Waipounamu:</u> Support population growth	<ul style="list-style-type: none"> <li>• Pup counts along this stretch of coastline increase to above 16 per year, eventually reaching 35, on track to achieving breeding colony status.  2017    2018    2019</li> <li>• There are no cases of deliberate human-caused mortality  2017    2018    2019</li> <li>• Public involvement in the conservation of sea lions increases. 2017   2018   2019<sup>1</sup></li> </ul>
<u>Success across the New Zealand sea lion range</u>	<ul style="list-style-type: none"> <li>• Pup mortality from falling into natural holes is reduced.  2017    2018    2019</li> <li>• Disease research yields answers to inform recommendations to reduce pup mortality from <i>Klebsiella pneumoniae</i>.  2017    2018    2019</li> <li>• Estimation of SLED efficacy and cryptic mortality affecting adult survival improves.  2017    2018    2019<sup>3</sup></li> <li>• The effects of climate change and fisheries on sea lion nutritional status are better understood.  2017    2018    2019</li> <li>• Sea lion breeding sites developing and colonies establishing at new locations.  2017    2018    2019</li> <li>• The NZSL threat status improves from Nationally Critical to Not Threatened.  2017    2018    2019<sup>4</sup></li> </ul>

<sup>1</sup> Partially on track as there was as small drop in pup production, but colonies were established at a new location.

<sup>2</sup> Specific indicators haven't been established for assessing this measure, but DOC is continually working towards achieving this.

<sup>3</sup> Squid 6T's Operational Plan creates management framework to estimate SLED efficacy and cryptic mortality.

<sup>4</sup> The NZ Threat Classification for marine mammals is currently under review. Once the review is finalized we will update the status of this item if any changes are necessary.

Note: This table is used as a snapshot to track success. However, some measures which are "on track" still have areas of desired improvement.

## Appendix I: Meeting Agenda

**Meeting:** Conservation Services Programme and New Zealand sea lion Threat Management Plan - Technical Working Group

**Date:** 26 March 2019

**Time:** 9:15 am – 5:30pm

**Place:** G0.3 Toroa Room, Conservation House, 18-32 Manners Street, Wellington.

**Chair:** Neil Gilbert

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<b>Time:</b>	<b>Event:</b>	
9:15 am	Tea / coffee	
9:30 am	Welcome/Apologies and purpose of the TWG	Neil Gilbert
	<b>CSP presentations</b>	
9:45 am	POP2018-03: New Zealand Sea Lion: Auckland Islands pup count	Laura B / Don N.
	<b>TMP presentations</b>	
10:15 pm	Otago / Southland / Stewart Island pup counts and updates	Jim F
10:45 am	Campbell Island pup count and mortality	Jody W
11:15 am	Tea break	
11:30 am	Sea lion suitable habitats model S South Island	Veronica F
12:00 am	Pup mortality and necropsies Enderby	Aditi S
12:30 pm	Lunch	
1:15 pm	Campbell Island: pup behaviour	Dahlia F
1:45 pm	Fisheries NZ projects update	FNZ
2:00 pm	Mātauranga Project update	Rauhina S
2:30 pm	Tea break	
2:45 pm	2019/20 fieldwork expectations	DOC
3:30 pm	Next actions and research	DOC
4:45 pm	<b>AOB</b>	Neil Gilbert
5:00 pm	<b>Close of meeting</b>	Neil Gilbert

## Appendix II: NZSL TMP measures of success



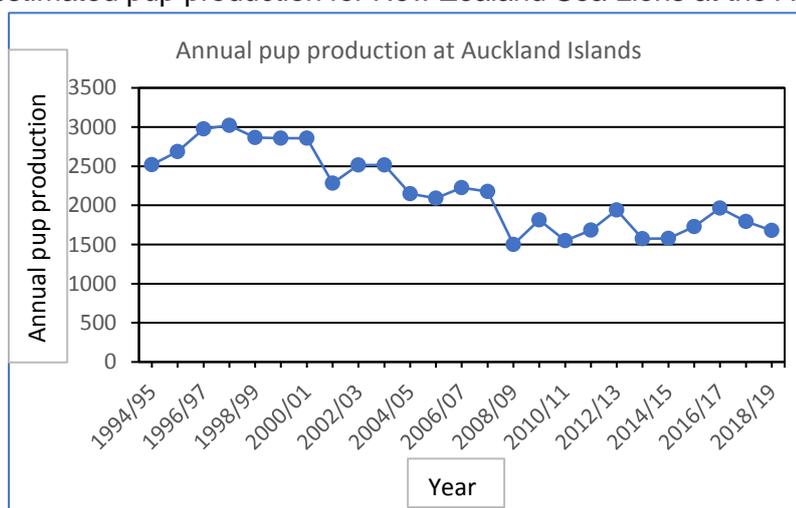
## Appendix III: Excerpt from “NZSL Monitoring and Pup Production at The Auckland Islands 2018/2019 Research Report”

The total pup production for Dundas Island in 2018/2019 is estimated at 1295 (1240 live and 55 dead). This number reflects the mean of the mark-recapture (M-R) estimate. Historically, the mean of the M-R counts has been higher than the mean of the direct live count. However, for the 2018/19 Dundas count, the mean of the direct live count was found to be higher. This could be contributed to the complexity of the Dundas pup counts as they can prove difficult due to dynamics like continual mixing/movement and sheer abundance. This can result in a large range in direct counts, which was seen this season (raw count data can be found in Appendix 3).

In addition to complexities associated with the direct count, the standard error for the M-R count is typically found to be lower than that of the direct counts which remains true for 2018/19 data. For these reasons, the M-R has been continually recognized as the more accurate representation of pup production estimates, and to remain consistent, was used to determine Dundas pup production estimates for 2018/19.

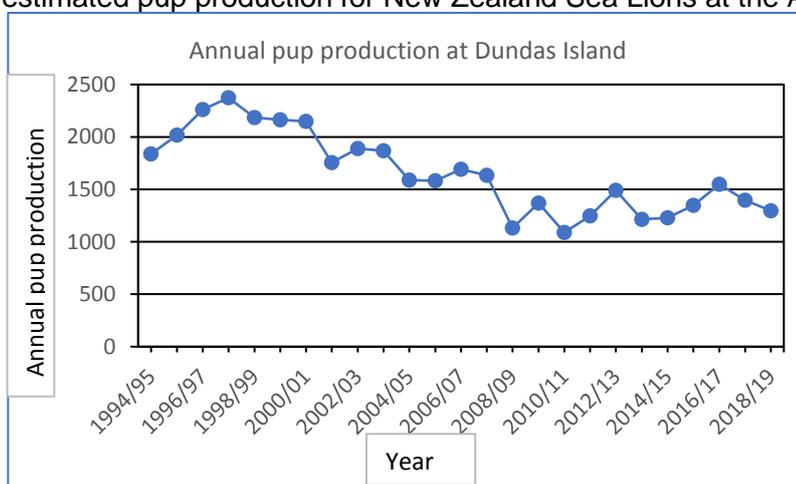
This estimate is 7% lower than in 2017/2018. The number of dead pups found up to January 18<sup>th</sup> is 4% lower than the 2017/2018 season. Figure 1 shows annual estimates of The Auckland Islands and Figure 2 shows the Dundas annual pup estimates. Numbers over time can be found in Appendix 2.

Figure 1. Total estimated pup production for New Zealand Sea Lions at the Auckland Islands 1994/95-2018/19.



(Data prior to 2012/13 from Chilvers (2012), and remaining data prior to 2018/19 from Childerhouse (2018)).

Figure 2. Total estimated pup production for New Zealand Sea Lions at the Auckland Islands 1994/95-2018/19.



(Data prior to 2012/13 from Chilvers (2012), and remaining data prior to 2018/19 from Childerhouse (2018)).

## Appendix IV: 2018/19 Pup Production Estimate Explanation for Dundas Island

Explanation/supplemental information provided by Simon Childerhouse:

The estimate of pup production at Dundas Island has been based on the mark-recapture (MR) estimate annually since 1995/96. In 2018/19, the MR estimate (1240) was considerably lower than that direct count (1310). This is unusual in that the MR has been on average 8% higher than the direct count based on an average over the last six years. Given the lower value of the MR than the direct count, it was originally proposed that the direct count be used as the agreed estimate for Dundas rather than MR estimate although it was noted that this would lead to inconsistencies with previous years. We (Simon, Laura, Jim) reviewed the Dundas Island direct and MR data for 2018/19 and concluded that there was little reason to change the estimate for Dundas from the MR to the direct count and that the MR for 2018/19 should be used as the best estimate of pup production for Dundas Island. This is based on the following observations: (i) there was significant variability between the direct counts leading to potential concerns about the accuracy of these counts; (ii) the raw MR data was reviewed and found to be consistent with data from previous years although the MR counts from one person were excluded from the final estimate as it was agreed that these counts were likely to have been undertaken incorrectly; (iv) the estimation methodology (including analytical methods) were consistent between years; and (v) that the MR methodology is known to be a reliable method for pup census on both Sandy Bay and Dundas Island and that direct counts are known to be less accurate.

The outcome is that the official estimate of pup production for Dundas Island changes from 1365 (direct count) to 1295 (MR) which, while representing a 5% decline at that colony, is still within the normal range of estimates for Dundas Island.