Item 25

Note: the attachments to this email trail have not been included in this document bundle as they are are publicly available at: https://www.doc.govt.nz/get-involved/have-your-say/all-consultations/2020-consultations/consultation-on-south-eastern-south-island-marine-protected-areas/

From: [redacted] 9(2)(a)
To: SEMP
Subject: FW: Otago Rock Lobster Industry Association - Submissions against SEMPA (20-6877)
Date: Monday, 3 August 2020 5:05:39 PM
Attachments: ORLIA submissions on South East Marine Reserve Proposals.pdf
ORLIA economic effects report final 300720.pdf
SEMPA science review, Dr Goldstien Final.pdf

FYI

From: Kate Hesson [mailto:[redacted] 9(2)(a)]
Sent: Monday, 3 August 2020 11:06 AM
To: S Nash (MIN) <s.nash@ministers.govt.nz>
Cc: Kate Hesson <[redacted] 9(2)(a)>
Subject: 20-6877 Otago Rock Lobster Industry Association - Submissions against SEMPA

Dear Mr Nash

As you will be aware submissions on the proposed South East Marine Protection Areas close today.

On behalf of the Otago Rock Lobster Industry Association (otherwise known as CRA7), I attach the following which have been filed against SEMPA:

- ORLIA submissions
- Supporting report - Economic effects review
- Supporting report - Scientific review

These submissions provide more in depth analysis than officials have done to date and highlight areas where further analysis needs to be done. Therefore, we ask that you read them in their entirety (various statutory declarations from affected individual fishers have also been filed but for the sake of brevity they are not attached here).

We also recommend that you pay particular attention to the submissions filed by Fiordland Lobster Company and jointly by SREs, including the New Zealand Rock Lobster Industry Council. The submissions of the Tautuku Fishing Club Dunedin and Haast Incorporated are also important. Such is our level of concern against SEMPA that we have worked closely with these organisations and others across the commercial and recreational fishing sectors. Although at times we have inconsistent views, here we are united in our concern with the process and substance of SEMPA.

If you require any further information, please contact me at the details below . 9(2)(a) [redacted].

Many thanks

Kate Hesson
9(2)(a) [redacted]
Executive Officer
Otago Rock Lobster Industry Association

Item 26

From: SEMP
To: SEMP
Subject: FW: Proposed southeast marine protected areas - further information
Date: Friday, 16 October 2020 7:22:00 am
Attachments: image001.jpg

Tēnā koe

Thank you for your submission on the proposed Southeast Marine Protected Areas. We have read your submission and note that you have identified as tangata whenua or consider that you exercise kaitiakitanga in one or more of the proposed marine reserves.

To ensure we are giving your submission the appropriate consideration under section 47 (1) of the Marine and Coastal Area (Takutai Moana) Act 2011 could you please identify your whānau, hapū or iwi affiliations?

We would be grateful for your response by Friday 23 October 2020.

Should you have any questions or require further information please respond to this email.

Nāku noa, nā

The SEMP Team

www.doc.govt.nz

Item 27

From: Kate Hesson
To: Rebecca Bird
Cc: Kate Hesson
Subject: Re: SEMP submissions now available.
Date: Monday, 14 December 2020 8:28:28 pm

Thanks Rebecca

Kate Hesson
[redacted] 9(2)(a)
9(2)(a)
Executive Officer
Otago Rock Lobster Industry Association

> On 14/12/2020, at 4:06 PM, Rebecca Bird <rbird@doc.govt.nz> wrote:
>
> Kia ora Kate,
> I trust this email finds you well.
> I wanted to let you know the SEMP submissions have to day been released on the DOC website and can be accessed here https://www.doc.govt.nz/get-involved/have-your-say/all-consultations/2020-consultations/consultation-on-south-eastern-south-island-marine-protected-areas/
> Ngā mihi
> **Rebecca Bird**
> **National Marine Protection Programme Team Lead**
>
> Planning Permissions and Land / Wahanga Whakamahere Tutohu
> Nelson / Whakatū
>
> Phone: [redacted] 9(2)(a)
>
> www.doc.govt.nz
> <image003.jpg>
>
>

Item 28

Note: the attachments to this email trail have not been included in this document bundle as they are are publicly available at: https://www.doc.govt.nz/get-involved/have-your-say/all-consultations/2020-consultations/consultation-on-south-eastern-south-island-marine-protected-areas/

From:	Kate Hesson
To:	Lesley Douglas
Cc:	Kate Hesson
Subject:	Full ORLIA submission on SEMPA
Date:	Tuesday, 12 January 2021 2:59:44 pm
Attachments:	ALToituCarbonZero_480px1.png Submission of the Otago Rock Lobster Industry Association on the south-eastern South Island Marine Protected areas Proposal (3_3).eml.msg Submission of the Otago Rock Lobster Industry Association on the south-eastern South Island Marine Protected areas Proposal (2_3).eml.msg Submission of the Otago Rock Lobster Industry Association on the south-eastern South Island Marine Protected areas Proposal (1_3).eml.msg

---

Dear Lesley

Please see my email in reply to yours from late December 2020 for further explanation.

Kate Hesson
[redacted]
Executive Officer
Otago Rock Lobster Industry Association

Begin forwarded message:

From: Shelley Chadwick <[redacted]>
Subject: ORLIA submission
Date: 31 July 2020 at 4:37:05 PM NZST
To: Kate Hesson [redacted]

Kia ora
See attached submission went in across three emails.
Regards,
Shelley

Shelley Chadwick
Associate

[redacted]
Level 10, Otago House, 477 Moray Place, Dunedin 9016
Private Bag 1959, Dunedin 9054, New Zealand
e [redacted] | al.nz

This email is confidential and may be legally privileged. If you have received this email in error then please:
do not disclose the contents to anyone;no ify the sender by return email; and delete this email from your system.
Please consider the environment before printing this e-mail.

From: 9(2)(a) [redacted] on behalf of Shelley Chadwick
To: southeast.marine@publicvoice.co.nz
Subject: Submission of the Otago Rock Lobster Industry Association on the south-eastern South Island Marine Protected areas Proposal (1/3)
Date: Friday, 31 July 2020 4:30:26 pm
Attachments: ORLIA submissions on South East Marine Reserve Proposals.pdf

---

(Email 1 of 3)
Good afternoon,
Please find attached the Otago Rock Lobster Industry Association Incorporated's (ORLIA) submission on the proposed marine protection measures for south-eastern South Island. We enclose the following documents:

1. ORLIA's submission document;
2. Statutory declarations of the CRAMAC7 fishermen;
    - 9(2)(a) [redacted]

    Please note the declarations of 9(2)(a) [redacted] and 9(2)(a) [redacted] are provided subject to the attached request for confidentiality
3. Science Review to the NZ Rock Lobster Industry Council: South East Marine Protection Area prepared by Dr Sharyn Goldstein;
4. The economic effects of the proposal southeast marine protected areas: A report for Otago Rock Lobster Industry Association prepared by NERA Economic Consulting

Please note due to size we will send over three emails.
Kind regards

Level 10
Otago House
477 Moray Place
Dunedin 9016

Private Bag 1959
Dunedin 9054
New Zealand

al.nz

31 July 2020

Proposed south-east marine protection network
Department of Conservation
By Email: southeast.marine@publicvoice.co.nz

Dear Sir/Madam

Request to withhold information for commercial confidentiality reasons

1 We act for the Otago Rock Lobster Industry Association Incorporated (**ORLIA**) in relation to its submission on the proposed marine protected areas for the south east coast of the South Island (the **proposal**).

2 The following statutory declarations are provided in support of the ORLIA submission subject to a request that they are not made publicly available pursuant to section 9(2)(b)(ii) of the Official Information Act 1982:

(a) The statutory declaration of [redacted] 9(2)(a) sworn 7 July 2020; and

(b) The statutory declaration of [redacted] 9(2)(a) sworn 27 July 2020

Section 9(2)(b)(ii) of the Official Information Act

3 The Office of the Ombudsmen indicates that for section 9(2)(b)(ii) of the Act to apply, it must be shown that:

(a) the withholding is necessary to protect information where the making available of that information would be likely to unreasonably prejudice the commercial position of the person who supplied the information; and

(b) the interest in favour of withholding information is not outweighed by other considerations which render it desirable, in the public interest, to make that information available.

Unreasonable prejudice to the commercial position

Statutory declaration of [redacted] 9(2)(a)

4 Disclosure of the statutory declaration is likely to unreasonably prejudice the commercial position of [redacted] 9(2)(a) for the following reasons:

(a) Disclosure of the statutory declaration will allow competitors in the same market to gain an advantage. [redacted] 9(2)(b)(ii) and accordingly has acquired commercial knowledge on the reef structures and migratory patterns of crayfish. To release information on the locations of reef and abundance of crayfish in each location would be providing an advantage to his competitors [redacted] 9(2)(a). His competitors having access to intellectual capital and information [redacted] 9(2)(a) has gained over many years of operations. This would have the potential to adversely affect his fishing operation, tonnage and profitability.

(b) The information in the statutory declarations has been gained at significant cost and effort.

(c) The details of the locations frequented by [redacted] 9(2)(a) are not currently in the public domain and is not widely available to the public or other persons [redacted] 9(2)(b)(ii). [redacted] 9(2)(a) currently has knowledge [redacted] 9(2)(b)(ii) which could be used by competitors to his commercial detriment if the information is disclosed.

[redacted] 9(2)(a)

5 [redacted] 9(2)(b)(ii)

6 [redacted] 9(2)(a) uses the same commercial knowledge gathered by [redacted] 9(2)(a) detailed at paragraphs 4(a) to (c) above.

7 Accordingly, [redacted] 9(2)(a) statutory declaration, which details where he fishes, the grading he carries out and the estimated greenweight catch landed from each location.

Public interest in the exhibit of [redacted] 9(2)(a) and [redacted] 9(2)(a)

8 There is no public interest reason for this information to be publicly available.

9 ORLIA's submissions speak for themselves and provide all the necessary evidence which any member of the public would be interested in. There is no situation where members of the public need to know the locations where the areas of reef fished are. We do not consider there is any public interest in understanding where a fisherman puts his pots in the CRAMAC7 region (particularly given these locations have no practical use for the everyday person.

10 There is no other reason that these statutory declarations should be disclosed that might outweigh the prejudice which [redacted] 9(2)(a) and the fishermen would experience if the statutory declaration were disclosed.

Request

11 Accordingly, we request that the statutory declarations of [redacted] 9(2)(a) and [redacted] 9(2)(a) be withheld permanently and appropriately marked on the Department of Conservation and Ministry of Fisheries file to ensure that they are properly withheld in the case of any future official information required.

12 Please advise if you require anything further to assist with this request.

Yours faithfully
Anderson Lloyd

9(2)(a) [redacted]

9(2)(a) [redacted]

Shelley Chadwick
Associate
d +64 3 471 5436
m +64 27 244 7952
e shelley.chadwick@al.nz

Awhina Clark-Tahana
Solicitor
d +64 3 467 7168
m +64 27 755 0752
e awhina.clark-tahana@al.nz

Item 29

Note: the attachment to this email trail is the Otago Rock Lobster Industry Association's submission, which is publicly available at: https://www.doc.govt.nz/get-involved/have-your-say/all-consultations/2020-consultations/consultation-on-south-eastern-south-island-marine-protected-areas/

From: Kate Hesson
To: Lesley Douglas
Cc: Kate Hesson
Subject: Fwd: Proposed southeast Marine Protection - further information
Date: Tuesday, 12 January 2021 3:01:17 pm
Attachments: image001.jpg
WS-2161327.pdf

Kia ora Lesley

As discussed, [redacted] 9(2)(a), I will send you some information by email which we can chat further about tomorrow at 9am.

The email you attached which I sent to Mr Nash's office contained only the 'highlights' of our submission. I have just sent you the full submission which is supported by statutory declarations from CRA7 fishers. Attached to them are maps with the details you seek, in the best format we could provide.

From the outset of the SEMPA process (i.e. even during the Forum), there was a lack of detailed, accurate mapping of the sea floor which hampered the ability for parties to have meaningful discussions. This is something we can discuss further tomorrow.

Nga mihi

Kate Hesson
[redacted] 9(2)(a)
9(2)(a)
Executive Officer
Otago Rock Lobster Industry Association

Begin forwarded message:

From: Lesley Douglas <ldouglas@doc.govt.nz>
Subject: Proposed southeast Marine Protection - further information
Date: 24 December 2020 at 1:18:40 PM NZDT
To: [redacted] 9(2)(a)

Tena Koe Ms Hesson
My name is Lesley Douglas. I'm a member of the team at the Department of Conservation working on the proposed marine protection along the south-east coast of the South Island.
You made a submission on behalf of the Otago Rock Lobster Industry Association during our public consultation process. Thank you for taking the time to share these views. Currently we are analysing submissions and forming advice for the consideration of the Minister of Conservation. We'd like to better understand aspects of the ORLIA submission, which I have attached as reference.
At several places, the submission refers to the "East-West Ledge" and the "Karitane Ledge", indicating these as important areas for CRA7 rock lobster fishers and rock lobsters. It is stated that both ledges are within the boundaries of the proposed marine reserve Te Umu Koau (site D1).
We would like to understand more clearly the locations of these ledges.

1. Can you please supply a map with the marked locations and extents of the "East-West Ledge" and the "Karitane Ledge"?

The submission also refers to interviews with CRA7 fishers where they have indicated on maps the areas of their fishing activity (for example, where they have caught rock lobsters over the last five years).

2. Would you be able to supply to us the maps from these interviews?

[redacted] 9(2)(a). Most happy to talk further with you if you have any questions once I return.

Best wishes for a relaxing and enjoyable Christmas and New Year. Thanks again for your input into this important discussion.

Naku noa na

Lesley

Lesley Douglas
Project Manager Marine Protection | Kaiwhakamaru Apure Moana
Department of Conservation | Te Papa Atawhai
[redacted] 9(2)(a)
Whakatu Nelson Office
Monro Building, 186 Bridge Street | Private Bag 5, Nelson 7042
T: +64 3 546 9335

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Item 30

From: Lesley Douglas
To: Kate Hesson
Subject: RE: SEMP - ORLIA submission, further details
Date: Monday, 8 March 2021 10:23:00 am

Morena Kate

Thank you for your response regarding the location of the Karitane and East-West Ledges and that fishers are not in a position to supply further maps detailing the exact location(s) of these sites and also the [redacted] 9(2)(b)(ii)

Regarding your view on a face-to-face meeting, we are currently discussing with FNZ their plans for meeting with CRA7 fishers and will respond to you in due course.

Regards

Lesley

From: Kate Hesson [redacted] 9(2)(a)
Sent: Tuesday, 2 March 2021 3:50 PM
To: Lesley Douglas <ldouglas@doc.govt.nz>
Cc: Kate Hesson [redacted] 9(2)(a)
Subject: Re: SEMP - ORLIA submission, further details

Hello Lesley

Thank you for your email.

To assist with your assessment, I can advise that the “Ledges” referred to below are contained within the proposed Site D1.

As for providing further maps, ORLIA members have already submitted mapping to the extent that is readily available to them. In our view it would be more constructive for us to have a face-to-face meeting with DoC personnel for your questions to be answered and for you to gain a full understanding of our submissions. We are clearly a significantly affected stakeholder and therefore believe it is essential we are given that opportunity.

Many thanks

Kate Hesson
[redacted] 9(2)(a)
[redacted] 9(2)(a)
Executive Officer
Otago Rock Lobster Industry Association

> On 25/02/2021, at 1:00 PM, Lesley Douglas <ldouglas@doc.govt.nz> wrote:
>
> Kia ora Kate
>
> Nice to talk with you in January re the ORLIA submission re SEMP.
>
> We continue to develop our advice for the Minister’s consideration.
>
> We have some questions relating to the ORLIA submission and would be grateful for this additional information as it will help in our assessment.
>
> 1. The “East-West Ledge” and/or “Karitane Ledge” were mentioned in the some of the statutory declarations (yours, [redacted] 9(2)(a) Trevor Allison’s, Christopher Cooper’s, Colin Pile’s and Kenneth Harris’). Could you please supply a map with the marked locations and extents of these two areas?
> 2. In their statutory declarations, Colin Pile and Kenneth Charles refer to an area called the [redacted] 9(2)(b)(ii) Could you please supply a map with the marked location and extent of this area?
>
> Many thanks.
>
> Naku noa na

Lesley

Lesley Douglas
Project Manager | Marine Protection
Department of Conservation | Te Papa Atawhai
9(2)(a)

Whakatu Nelson Office
Monro Building, 186 Bridge Street | Private Bag 5, Nelson 7042
T: +64 3 546 9335

Kia piki te oranga o te ao turoa, i roto i te ngatahitanga, ki Aotearoa.
To work with others to increase the value of conservation for New Zealanders.

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Item 31

From: Mark Edwards
To: Lesley Douglas
Cc: [redacted]
Subject: RE: Request for 2020 Breen report - SEMPA
Date: Thursday, 10 March 2022 12:19:54 pm
Attachments: image001.png
image002.jpg

Hi Lesley
Yes, happy to be contacted in first instance.
Regards
Mark

From: Lesley Douglas <ldouglas@doc.govt.nz>
Sent: Thursday, 10 March 2022 12:10 PM
To: Mark Edwards <[redacted]>
Cc: [redacted]
Subject: RE: Request for 2020 Breen report - SEMPA

Hello Mark
Many thanks for forwarding the memorandum authored by Dr Breen.
I have passed it along to our team at DOC and to the Fisheries New Zealand team working on SEMP.
Are you happy for us to contact you should we have any questions?
We are continuing to develop our advice to the Minister of Conservation and will provide it to her once it's finalised.
Regards
Lesley

From: Mark Edwards <[redacted]>
Sent: Monday, 7 March 2022 3:36 pm
To: Lesley Douglas <ldouglas@doc.govt.nz>
Cc: [redacted]
Subject: Request for 2020 Breen report - SEMPA

Note: the attachment mentioned (the Breen report) is included on page 16.

Good afternoon Lesley
Please find attached a copy of the memorandum authored by Dr Breen that was referenced I understand as part of CRA 7 submissions to SEMPA.
Dr Breen's report is based on a surplus production modelling of the CRA 7 fishery at the time. It shows the impacts of an MPA area that removed 25% of the production of CRA 7. In general what it showed was

- Because of the good current stock status, the stock would be OK at the (then) TACC with the implementation of the MPA – but CPUE would decline by [redacted]
- To maintain CPUE with the implementation of the MPA – you would need a 25% TACC reduction
- Importantly – the modelling shows that without the MPA – the TACC could be increased – so the impact of the MPA would have been a substantial opportunity cost for the fishery.

I was interested to receive your request. I would be grateful for an update on the process for consideration of the SEMPA proposals and decisions ?
Best regards
Mark Edwards
CEO
NZ RLIC

From: Lesley Douglas <ldouglas@doc.govt.nz>
Sent: Thursday, 3 March 2022 10:25 AM
To: Mark Edwards <[redacted]>
Subject: RE: Seeking 2020 Breen report

Hi Mark
Just touching base again re my email request below.
Thanks
Lesley

From: Lesley Douglas
Sent: Monday, 28 February 2022 12:08 pm
To: [redacted] 9(2)(a)
Subject: Seeking 2020 Breen report

Hi Mark
Your email address has been provided to me by my colleagues at FNZ in the hope you may be able to provide a copy of a report, which was referred to in the CRA7 submission on the proposed Southeast Marine Protected Area Network.
The report is referred to as 'Breen PA. (2020). CRA 7 surplus-production modelling. *Breen Consulting report'* but it wasn't included along with the CRA7 submission.
Are you able to provide me with a copy of this report please, else forward my request to someone who can help?
Naku noa na

Lesley

Lesley Douglas (Ms/she/her)
Project Manager Marine Protection | Kaiwhakamaru Apure Moana
Whakatu Office | Nelson Office
Phone: [redacted] 9(2)(a)

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bc breen consulting

Paul A. Breen

[redacted] 9(2)(a)

[redacted] 9(2)(a)

13 May 2020

CRA 7 surplus-production modelling

Abstract and non-technical summary

This study explored the effects of creating no-take protected areas in CRA 7. It assumed that the protected areas would not contribute to the production available to the lobster fishery. The study fitted a simple model to catch and CPUE data, then made 20-year forward projections. Individual runs were highly variable. Indicators included statistics for commercial catch, start-of-season biomass and CPUE, the risk of breaching the soft limit of half *Bmsy*, the prevalence of higher than optimum exploitation rate and the prevalence of crashed runs.

The surplus-production model's reconstruction shows the current stock in very good shape, with biomass well above *Bmsy* and fishing intensity well below the optimum.

In 20-year projections:

- leaving the TACC in place without alienation would cause no problems
- if MPAs were to alienate areas such that 25% of production were removed from the fishery, and TACC were left at its current value
    - CPUE would decline on average by [redacted] 9(2)(b)(ii)
    - average catch would decline by only a very small amount
    - there would be no problems with stock indicators
- if there were 25% alienation plus a 25% TACC reduction:
    - CPUE would remain at the same level on average
    - but catch would decline by 25%

If the TACC were **increased** by 25% from its current level of 106.2 t:

- the increased catch would be sustainable without stock indicator problems
    - and CPUE would decline by about [redacted] 9(2)(b)(ii)
- with alienation and the increased TACC:
    - the catch would often not be caught (18% of runs crashed)
    - breaches of the soft limit would rise to [redacted] 9(2)(b)(ii)
    - CPUE would decline by about [redacted] 9(2)(b)(ii) on average

Assumptions are discussed.

Background

The government proposes to alienate substantial areas of the fished CRA 7 rock lobster habitat by making no-take marine protected areas (MPAs). The CRA 7 rock lobster industry have commissioned this analysis to explore the consequences for their fishery.

An economic analyst has used fisher interview data to identify how much catch had been taken from within the proposed MPAs [redacted] unpub. data). The estimate, based on best available information, is [redacted]. The fishers' intuitive estimate is [redacted]), roughly similar, and the DoC and MPI estimate is reported to be 23%, quite similar.

This study explored the effect of the MPAs on commercial catch and CPUE trajectories. Several scenarios were requested:

- with no alienation of productivity, the existing TACC is retained and the fishery finds a new equilibrium
- with 25% alienation, the existing TACC is retained
- with 25% alienation, the existing TACC is reduced by 25%
- with no alienation of productivity, the existing TACC is increased by 25%
- with 25% alienation of productivity, the existing TACC is increased by 25%

The study simulated these five scenarios using an operating model.

Data

This study used catch and CPUE data from 1979 through 2018 from MPI, provided by [redacted] pers. comm.) (Table 1). Commercial catches came from the FSU, QMR and MHR series as described in assessments (for instance, Starr & Webber (2018). Non-commercial catches were those assumed in the most recent stock assessment (Haist et al. 2016). Commercial catch varied from 19 t (1997) to 403 t (1979) and averaged 127 t, but averaged only 84.5 t since 1990. Illegal catch varied up to 58.7 t in 1986, but for recent years was assumed to be 1 t. Customary catch was assumed to have been 1 t for the whole series. Recreational catch (including s.111) was assumed to have been 8.688 t for the whole series. The total and commercial catch series are shown in Figure 1.

The annual standardised CPUE series (see Starr 2019) CPUE has fluctuated greatly over the series: it reached its maximum, near 3 kg/pot, in 2018 (Figure 2).

Operating model

The study used a simple production model based on the catch and CPUE data. Breen & Kendrick (1998) explored this approach with simulated data, with and without errors, and concluded that *Provided that errors in catch and effective effort data are not too severe, and with the caution that appropriate indicators be used, we conclude that surplus-production analysis is a useful tool for this and similar fisheries.* These authors used a version of the Pella-Tomlinson (1969) model. In a small project to explore a management procedure for CRA 5, Breen (2009) used a roughly similar model, and Breen (2018) estimated surplus production in all stocks using similar assumptions as those used previously.

When fitting the model to the data, for year *y*, CPUE was assumed proportional to mid-season stock biomass B_y^{mid}, so:

$$B_y^{mid} = I_y / q$$

where I_y is the standardised annual CPUE in year *y* and *q* is the catchability coefficient. Biomass at the start of a season was calculated by adding back half the catch in year *y*:

$$B_y^{start} = B_y^{mid} + 0.5C_y$$

The annual exploitation rate, U_y, was:

$$U_y = C_y / B_y^{start}$$

The highest value of exploitation rate was 84% in 1988 (Table 1). The rate has been declining (Figure 3) and averaged only 13.5% for the past 10 years.

"Observed" annual production, P_y, was calculated as the change in biomass plus the catch:

$$P_y = B_{y+1}^{start} - B_y^{start} + C_y$$

This is the same method as described by Hilborn (2001) except that, as in the stock assessment, CPUE was assumed related to mid-season biomass. The observed production (Figure 4) varied from minus 185 t in 2016 to 665 t in 2012 and averaged 173 t. Production has not been stable over time: it appears to have been higher in the 1980s, low in the 1990s and high again in recent years. Fluctuations in production appear more volatile in recent years.

The Pella-Tomlinson surplus-production model predicts production from start-of-year biomass:

$$\hat{P}_y = (r/m) B_y^{start} \left(1 - \left(B_y^{start}/K\right)^m\right)$$

where $\hat{P}_y$ is the predicted production in year *y*, *r* is the intrinsic rate of increase, *K* is the carrying capacity and *m* is a shape parameter.

This simple model was implemented in ADModelBuilder (Fournier et al. 2012) and fitted with least squares, comparing the observed and predicted production for each year.

an aside: fitting approach

The study used a process error fit: CPUE was assumed known without error and production could vary from its predicted value. The study attempted an observation-error time series fit, in which the model estimated initial biomass for 1979 as a parameter and then estimated subsequent biomass by adding production and subtracting catch:

$$\hat{B}_{y+1}^{start} = \hat{B}_y^{start} + \hat{P}_y - C_y$$

In this approach, CPUE ($\hat{I}_y$) was predicted from $\hat{B}_y^{mid}$ and q, then compared with I_y. This observation-error estimation was not successful and was abandoned. The problem appeared to be related to the high and low periods of production seen in Figure 4.

This operating model involves a number of assumptions: these are listed and discussed in the Discussion.

results of fitting

The parameters *r*, *K* and *m* were estimated but catchability could not be estimated: when the model tried to estimate *q*, a better fit was obtained but was unrealistic, with unreasonably high values for all parameters. The study used the *q* estimated in the last stock assessment (Haist et al. 2016).

Estimated parameters are shown in Table 2 while biomass and production results are shown in Table 1. The estimated standard deviations (from the ADMB calculation involving the Hessian matrix) were very small - c.v.s less than 1% - and would probably be much greater in an McMC. The fit between observed and predicted production was somewhat messy (Figure 5). The dome-shaped production function (Figure 6) implied an *MSY* of 230 t, obtained at 46% of *K*. Residuals appeared to increase in recent years (Figure 7) and also with increasing predicted production (Figure 8).

Given the wide variation in production vs. biomass seen in Figure 6, one might ask whether the dome-shaped relation is statistically real or just an artefact of fitting a dome-shaped model. Breen (2018) fitted a polynomial to observed production:

$$\hat{P}_y = aB_y^{start} + bB_y^{start} - c\left(B_y^{start}\right)^2$$

The polynomial model could, if the data suggested it, describe a flat line with $c = b = 0$ or even a concave-upwards curve. This study fitted the polynomial and obtained parameters $a = 31.49$, $b = 0.6936$ and $c = 6.0927\text{E-}04$. The sum of squares was slightly smaller than in the surplus-production model fit, but the resulting curves (Figure 9) were surprisingly similar.

snail trail

The deterministic *MSY* and *Bmsy* are not realistic when production varies, as it obviously does, because there is never an equilibrium between catch and biomass. Jumping ahead to results from work described below, the *MSY* obtainable from constant-rate simulations is 209 t total catch, *Bmsy* is 542 t and *Umsy* is 0.386. Using these values, the phase diagram of fishing intensity plotted against biomass is shown in Figure 10.

This suggests that in 1979 the CRA 7 stock was above *Bmsy* but fished at well above the optimum exploitation rate. Although exploitation rate tended to decrease from then, biomass fell and remained well below *Bmsy* for a long time. Biomass above *Bmsy* and exploitation rate less than *Umsy* occurred in 2005-09 and 2013-18.

Projections from the operating model

Projections assumed that lobsters in the alienated habitat will not contribute to the production available to the fishery. This is discussed in the Discussion.

projection model

The projection model was based on the operating model parameters and estimates and was used to make 1000 20-year projections to compare catch and CPUE among each of the five requested scenarios.

For each run, the projected start-of-season biomass for the first projected year, $B_1^{start,proj}$, was made equal to B_{2018}^{start} reduced by the simulated alienation[1]. With no alienation, a term h was equal to 1. With an alienation of 25% of habitat, h was one minus the alienation, or 0.75:

$$B_1^{start,proj} = hB_{2018}^{start}$$

The basic projection model for each run was:

$$B_{y+1}^{start,proj} = B_y^{start,proj} + P_y^{proj} - C_y^{proj}$$

where $B_y^{start,proj}$ is the projected starting biomass in year y, P_y^{proj} is projected production, based on the biomass but with error added (see below), and C_y^{proj} is the projected catch, determined as described below. When projected production was negative, biomass could fall below zero in the equation above, so biomass was truncated at 50 t and a flag was set for the run when this happened.

Projections were made with constant specified TACCs. Each year the model either made the projected commercial catch equal to the TACC or if necessary limited commercial catch to 84% of the start-of-season biomass:

$$C_y^{comm,proj} = \min\left(TACC_y^{proj}, 0.84B_y^{start,proj}\right)$$

Non-commercial catch was assumed in the last assessment to be 8.688. That value was assumed in projections, but was reduced whenever commercial catch was reduced below the TACC:

$$C_y^{proj} = C_y^{comm,proj} + 8.688\left(C_y^{comm,proj} / TACC_y^{proj}\right)$$

[1] projection years were numbered 1 through 20 for simplicity and 2018 was chosen because it was the last year with known catch and CPUE

projection CPUE

The model calculated CPUE, I_y^{proj} from mid-season biomass, in turn calculated from start-of-season biomass:

$$B_y^{mid,proj} = B_y^{start,proj} - C_y^{proj}/2$$

When habitat is alienated by creating an MPA, the vulnerable biomass is decreased but CPUE in the remaining fished area can remain the same until biomass changes, because CPUE depends on density rather than absolute abundance. Thus:

$$I_y^{proj} = qB_y^{mid,proj}/h$$

projected production

Projected production for each year was based on the estimated *r*, *K* and *m*, taking alienation into account, $B_y^{start,proj}$ and stochastic production deviations:

$$P_y^{proj} = (r/m)\,B_y^{start,proj}\left(1-\left(B_y^{start,proj}/hK\right)^m\right) + \varepsilon_y$$

The deviations, ε_y, were based on the pattern seen in the residuals (Figure 7 and Figure 8). The 39 residuals appeared to be normally distributed (Figure 11). There was a trend, with larger absolute residuals seen for recent years and for larger predicted production. The absolute residuals also appeared to increase with increasing biomass (Figure 12). A fitted regression had intercept of 68 t, which seemed high, so the intercept was set arbitrarily at 20 t and the slope was fitted (0.2004).

$$\varepsilon_y = \xi_y\left(20 + B_y^{start,proj}\right) \qquad \text{where } \xi_y \text{ is N(0,1).}$$

The residuals did not appear autocorrelated (r = -0.056). The same seed for the random normal deviates was used for every set of runs.

production curves

One would expect that a 25% reduction of the productive stock would result, in the long term, in a 25% reduction in sustainable catch. This was tested by making 50-year runs with a range of constant catches between 5 and 350 t, with either no alienation or 25% alienation. Results were not filtered by rejecting those that reduced the stock below some level, but the procedure kept track of the proportion of runs in which biomass was truncated at 50 t.

This procedure was repeated with a series of constant rate rules:

$$TACC_y^{proj} = \varpi I_{k-1}^{proj}$$

where ϖ is a simple multiplier on the previous year's CPUE. In these projections the previous CPUE for projection year 1 was set to the observed CPUE for 2017.

The relation between average stock biomass and average catch from 1000 runs are shown for constant catch (Figure 13) and constant rate (Figure 14). Alienation reduced the maximum catch in these sets. When average catch was plotted against the TACC, in the constant catch sets there was little difference until TACC reached about 100 t (Figure 15). In constant-rate runs the difference began at low multipliers (Figure 16). The proportion of runs that crashed (i.e. when biomass fell below 50 t) was always higher when some area was alienated and was higher for constant catch sets (Figure 17 and Figure 18).

For each set of runs there was a maximum total catch averaged across the 1000 runs, *MSY*, and an average biomass associated with this, *Bmsy*. These are shown in Table 3, along with the ratio of *Bmsy* to the effective *K*, which is *K*/*h*, the average CPUE associated with *MSY*, the average exploitation rate associated with *MSY* and the proportion of runs that crashed.

With no alienation, *MSY* was about 30% higher for constant-rate sets of runs (Table 3). *Bmsy* and *Imsy* were about 15% lower in constant-rate runs; exploitation rate *Umsy* was 53% higher and the proportion of crashed runs was much lower (11% vs 34%). Constant-rate rules deliver a higher *MSY* and do it more safely; a well-known result.

MSY in both sets of runs was about 23% less when alienation was 25%.

With 25% alienation in the constant-rate runs, the proportion of crashed runs was 24% compared with 11% with no alienation. The final column of Table 3 shows the *MSY* and other quantities that would be associated with the 11% risk of crashed runs, as in h = 1.

Requested scenarios

The scenarios are summarised as follows:

set	alienation	TACC	TACC value
1.a	none	current	106.20
1.b	25%	current	106.20
2.b	25%	reduced 25%	79.65
3.a	none	increased 25%	132.75
3.b	25%	increased 25%	132.75

Comparing 1.b with 1.a shows the effect of alienation if the TACC is unchanged. Comparing 2.b with 1.b shows the effect of changing the TACC after alienation.

Comparing 3.a with 1.a shows the effect of increasing the TACC by 25% with no alienation. Comparing 3.b with 3.a shows the effect of alienation if the TACC had been increased.

indicators

For each set of runs, the study collated:

- for each year of the run, the average across the 1000 runs of start-of-season biomass, commercial catch and CPUE, and their 5th and 95th quantiles
- across all runs and all years, the average start-of-season biomass, commercial catch and CPUE
- across all runs, the average start-f-season biomass, catch and CPUE in the 20th projection year, and their 5th and 95th quantiles
- the average number of years in which biomass was less than *Bmsy*/2 (low B)
- the average number of years in which exploitation rate was greater than *Umsy* (high U)
- the number of runs in which start-of-season biomass fell below 50 t at any stage

Based on the explorations described above (Table 3), and given that the study is addressing constant-TACC scenarios, *Bmsy* was considered to be 639.4 t when h = 1 and 428.2 t when h = 0.75; *Umsy* was considered to be 0.28 in both scenarios.

results: runs 1.a, 1.b and 2.b

Selected examples of the same run from each set are compared in Figure 19. Two of these were chosen to show crashed runs and the rest were randomly selected. These show the high variability among runs. In all years, start-of-season biomass was always highest in set 1.a and lowest in set 1.b. In all sets, TACC was caught in most years. CPUE was always least in set 1.b and was similar in sets 1.a and 2.b.

The mean trajectories across the whole of the three sets are compared in Figure 20. Start-of-season biomass was least in set 1.b. CPUE was least in set 1.b, and the difference tended to increase over time. Average commercial catch was always less under alienation, but the difference between 1.a and 1.b was very small. CPUE declined by about 14% between sets 1.a and 1.b, but 2.b and 1.a were very similar.

Summaries of the statistics from these sets across all years and runs are shown in Table 4. The major difference between 1.a and 1.b was in CPUE, where 1.b had 14% less CPUE on average. Commercial catches were about the same in 1.a and 1.b. Between 1.a and 2.b, the CPUE was nearly the same on average but the catch was 25% less.

Results from the last year of projections (Table 5) show that average biomass and CPUE declined, so was lower than average in the last year. The 5th and 95th quantiles reflect the wide variability in individual runs. But the conclusions above are maintained: the main difference between 1.a and 1.b is smaller CPUE (by 18%), while catch is not much different. CPUE is similar between 1.a and 2.b but average catch is 25% smaller in 2.b.

The soft limit (Table 6) was reached in only 1% of runs in 1.a and 2.b, and reached only 3.5% in 1.b. The exploitation rate exceeded *Umsy* in 2-5 of runs in 1.a and 2.b, but increased to 15.6% in 1.b.

results: runs 1.a, 3.a and 3.b

The average trajectories from these runs are shown in Figure 21. Sets 1.a and 3.a show only slightly lower biomass and CPUE despite the higher TACC in 3.a. Set 3.b shows large decreases in biomass and CPUE over the 20-year period of the run, and by the end of the run average catch has fallen below the TACC.

These average trajectories suggest that the increased TACC is sustainable if there is no alienation, but is not sustainable with 25% alienation. The indicators (Table 4, Table 5, Table 6) bear this out: between 1.a and 3.a there was some decrease in start-of-season biomass (6%) and CPUE 14%, but the soft limit was breached in only 3.5% of years. By contrast, set 3.b breached the soft limit 13% of the time, exceeded *Umsy* in 43% of years and had crashed runs 18% of the time.

Discussion

Percentage changes in biomass, catch and CPUE are summarised in Table 7.

The main conclusions from modelling these scenarios are:

- the current stock is very healthy and likely to remain healthy in the next 20 years
- if 25% of production were alienated, then the current TACC would remain sustainable
    - with a [redacted] decrease in average CPUE
- if the TACC were reduced to accommodate the alienation, the new TACC would also be sustainable and average CPUE would remain near current levels
    - but of course the catch would be 25% less
- without alienation, the current TACC could be sustainably increased by 25%
    - there would be an [redacted] decrease in CPUE
- if 25% of production were alienated, then a 25% increase from the current TACC could not be sustained

The high variability in individual runs must be considered: no TACC can be guaranteed to be sustainable if left constant for any length of time.

operating model assumptions

- total catches are known

This assumption is also made by the stock assessment and is almost certainly violated. Commercial catch before 1990 may have been under-reported, or wrongly attributed to CRA 7, but is likely to be reasonably accurate after introduction of the QMS. Customary catch and recreational catches are unknown but thought to be relatively small. Illegal catch has never been estimated coherently. Total catch may be over-estimated to some extent: it seems unlikely that illegal catch could have been 58 t in 1986 but is 1 t now. Over-estimated non-commercial catch would imply over-estimated production.

- CPUE is proportional to mid-year biomass

This assumption is also made by the stock assessment and may also be violated. The relation may not be directly proportional over the range of biomass, with either hyperstability or hyperdepletion. It is likely that catchability has increased over time, as is addressed by the very recent stock assessments, but for simplicity that possibility was not incorporated. A related assumption, because *q* could not be estimated, is that *q* was correctly estimated by the 2015 stock assessment.

Alienation of some habitat could change catchability: this could occur because of small-scale variation in CPUE among habitats. If, for instance, the higher-CPUE areas were alienated, then average CPUE would decrease even if abundance within the fished area did not change. This effect cannot be addressed without small-scale data.

- production in the alienated areas is proportional to recent catches from those areas

There is no way to evaluate this.

- the production vs. biomass relation is stable over time

Breen (2018) showed that average production has been decreasing over time in all rock lobster stocks, and that only part of this is explicable by changing biomass. For CRA 7, the estimated annual change was on the order of 1% but was sensitive to the alternative specific assumptions used. For simplicity in this study, stability was assumed.

- lobsters in the alienated habitat will not contribute to the production available to the fishery

This is an assumption used in the length-based stock assessments, which reduce recruitment in proportion to the reduction in productive area. The assumption is based on the results of tag-recapture data, which show little movement by lobsters away from where they were tagged (e.g. Kendrick & Bentley 2003 and many early studies), except of course in CRA 7 and CRA 8. This idea is supported by work in the CRA 3 marine reserve (Freeman et al. 2009). Some authors (e.g. Kelly et al. 2002) suggest that reserves have a "spillover" effect, where lobsters move out into the commercial catching areas. However, the spillover reported by these authors is part of the seasonal onshore and offshore movement patterns, and would be absent if the seaward boundary of the Leigh marine reserve were further offshore.

Movements from CRA 7 to CRA 8 are well documented (e.g. Street 1969). Movements involve immature animals going from CRA 7 to the south, also from Stewart Island to the northwest, and north within Fiordland. Not much is known about CRA 7 movements at fine spatial scales. The most recent assessment (Haist et al. 2016) estimated the annual proportions of fish that moved to CRA 8: these varied from zero to just over 40%, with an average on the order of perhaps 20% (see Figure 41 in their report).

The effect of movements on productivity to the fishery in CRA 7 would depend on the spatial relation of the fished areas and MPAs: for instance, if the MPAs were upstream of the remaining habitat, the loss of productivity might be mitigated somewhat when lobsters migrated from the MPA and became vulnerable to the fishery. Such effects cannot be modelled without more information.

If this issue proceeds further, then a proper and comprehensive literature review should be commissioned. This study assumed that alienated habitat does not contribute to production available to the fishery.

The model is a simplistic one when compared with the Bayesian length-based model:

- it does not use tag-recapture data nor LF data
- it does consider minimum legal size nor berried female protection

- it assumes a single season within each year
- it assumes spatial homogeneity
- the assumed effect of alienation is simplistic
    - but is the same as in the Bayesian model)
- there is no incorporation of declining productivity
- the model assumes constant catchability

Some of the first-listed simplicities have led authors to suggest that *surplus production models should not be used for routine stock assessments, particularly outside the realm of full management strategy evaluation* (e.g. Wang et al. 2014). Punt & Szuwalski (2012) found that *Bmsy* and *Fmsy* were poorly estimated by surplus-production models (but see Zhang 2013), although stock status and *MSY* were estimated well. Despite that, surplus-production continues to be used by well-respected agencies and scientists (e.g. Fogarty et al. 2012), especially for multiple-stock and ecosystem assessments. Breen & Kendrick (1998) and Breen (2009; 2018) worked with such models on New Zealand rock lobster data and obtained promising results.

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Table 1: Data used in model fitting, and model results. Abbrevs: comm: commercial, *Bmid*: mid-season biomass, *Bstart*: start of season biomass, *U*: exploitation rate, *Pobs*: observed production, *Ppred*: predicted production, resid: residual.

fishing year	comm catch	total catch	CPUE	*Bmid*	*Bstart*	*U*	*Pobs*	*Ppred*	resid
1979	403.4	446.1	0.958	422.9	646.0	0.691	341.7	224.8	117.0
1980	297.8	339.4	0.843	371.9	541.6	0.627	275.5	229.9	45.6
1981	267.0	322.6	0.717	316.4	477.7	0.675	129.1	226.2	-97.2
1982	129.4	160.4	0.462	204.0	284.2	0.564	120.9	181.0	-60.0
1983	109.1	136.4	0.400	176.6	244.8	0.557	244.9	165.0	79.9
1984	191.7	233.7	0.536	236.4	353.3	0.662	388.1	203.3	184.8
1985	319.9	385.0	0.714	315.2	507.7	0.758	434.2	228.6	205.6
1986	327.1	393.5	0.816	360.2	556.9	0.707	318.9	230.0	88.9
1987	295.8	356.6	0.689	304.0	482.3	0.739	182.7	226.7	-43.9
1988	213.9	259.9	0.404	178.5	308.5	0.843	161.2	189.6	-28.5
1989	101.4	127.3	0.331	146.1	209.7	0.607	177.9	148.6	29.3
1990	98.5	149.7	0.420	185.5	260.4	0.575	415.3	171.6	243.7
1991	144.6	193.6	0.972	429.1	525.9	0.368	-86.3	229.5	-315.7
1992	100.4	147.0	0.391	172.5	246.1	0.598	249.3	165.5	83.8
1993	112.4	152.1	0.617	272.3	348.3	0.437	70.3	201.9	-131.6
1994	100.3	133.0	0.453	200.0	266.5	0.499	40.1	174.1	-134.0
1995	69.3	92.0	0.289	127.7	173.6	0.530	63.5	129.5	-66.0
1996	46.9	74.6	0.244	107.9	145.2	0.514	31.1	112.9	-81.8
1997	19.1	47.9	0.176	77.8	101.8	0.471	94.1	84.4	9.7
1998	40.8	70.7	0.255	112.6	147.9	0.478	55.9	114.5	-58.7
1999	37.7	68.8	0.223	98.6	133.1	0.517	134.7	105.3	29.4
2000	74.4	98.1	0.340	149.9	198.9	0.493	161.6	143.1	18.5
2001	70.1	86.3	0.497	219.3	262.4	0.329	136.9	172.4	-35.6
2002	87.8	96.4	0.600	264.8	313.0	0.308	89.9	191.2	-101.2
2003	80.6	89.3	0.593	261.9	306.5	0.291	221.6	189.0	32.6
2004	93.4	102.1	0.878	387.8	438.8	0.233	277.8	221.3	56.5
2005	94.2	102.9	1.276	563.1	614.6	0.167	324.8	227.7	97.1
2006	119.4	128.1	1.750	772.5	836.5	0.153	38.8	181.9	-143.2
2007	119.3	128.0	1.548	683.2	747.2	0.171	230.9	207.2	23.7
2008	119.5	128.2	1.781	786.1	850.2	0.151	-172.7	177.3	-350.0
2009	135.7	144.4	1.081	477.1	549.3	0.263	-10.1	230.0	-240.1
2010	74.0	82.7	0.801	353.5	394.8	0.209	17.1	213.3	-196.2
2011	44.9	53.5	0.685	302.5	329.3	0.163	54.7	196.4	-141.7
2012	53.8	62.5	0.678	299.2	330.4	0.189	664.9	196.7	468.1
2013	44.0	52.7	2.053	906.4	932.8	0.056	78.7	144.7	-66.0
2014	66.0	74.7	2.088	921.5	958.8	0.078	74.8	132.9	-58.1
2015	97.6	106.3	2.052	905.8	959.0	0.111	425.0	132.9	292.1
2016	97.6	106.3	2.774	1224.5	1277.7	0.083	-184.9	-68.5	-116.4
2017	112.7	121.4	2.097	925.8	986.5	0.123	493.3	119.6	373.7
2018	97.0	105.7	2.958	1305.6	1358.4	0.078			

Table 2: Model parameters, their specified lower and upper bounds, their estimated values and estimated standard deviations; *the ln(q) was fixed at the value shown.

parameter	lower bound	upper bound	initial value	estimate	standard deviation
r	0.1	1.5	0.5	0.7013	0.00166
K	100	100000	2000	1185.92	0.657
m	0.1	2	1	0.691	0.00443
ln(q)	-10	-2	-6.09	-6.09	n.a.
sum of squares				1.091E+06	

Table 3: Summary of sets of 1000 50-year runs, with constant TACC (left group) or constant multiplier on the previous year's CPUE, and with no alienation (h= 1) or 25% alienation (h = 0.75). The first line shows the maximum average total catch seen in the set of runs. The second line shows the constant specified TACC, for constant-catch sets, or the multiplier on previous year's CPUE for constant rate rules. *Bmsy* is the average biomass associated with *MSY*. The following line shows *Bmsy/(h*K)*. *Imsy* is the average CPUE associated with *MSY*. The last line shows the proportion of runs in which biomass fell below 50 t at any stage in the run. The final column shows, for constant-rate rules with h = 0.75, the values at the point where the risk of a crash is the same as under h = 1.

	constant	catch		constant	rate
	h = 1	h = 0.75	h = 1	h = 0.75	h = 0.75
MSY	161.2	120.2	209.4	154.9	151.8
TACC or multiplier	170	130	200	150	120
Bmsy	639.4	428.2	541.9	396.1	466.2
Bmsy/K	0.539	0.481	0.457	0.445	0.524
Imsy	1.27	1.11	0.99	0.96	1.18
Umsy	0.252	0.281	0.386	0.391	0.326
p(crash)	0.338	0.541	0.109	0.243	0.107

Table 4: Results from 20-year projections for each of five scenarios (see text). These are the statistics (mean and 5th and 95th quantiles) from the distributions of results from all years and all runs. Bstart is start-of-season biomass t), Comm is commercial catch (t) and CPUE is in kg/potlift. Means are shown in bold for easier comparison among sets.

		Bstart			Comm			CPUE	
set	5%	mean	95%	5%	mean	95%	5%	mean	95%
1.a	525.6	**951.9**	1382.9	106.2	**105.9**	106.2	1.06	**2.04**	3.00
1.b	267.2	**636.9**	1018.8	106.2	**105.2**	106.2	0.63	**1.76**	2.90
2.b	371.3	**705.5**	1039.4	79.7	**79.4**	79.7	0.99	**2.01**	3.01
3.a	447.6	**891.3**	1358.4	132.8	**132.1**	132.8	0.85	**1.87**	2.92
3.b	76.6	**537.0**	1018.8	64.3	**126.3**	132.8	0.13	**1.43**	2.86

Table 5: Results from 20-year projections for each of five scenarios (see text). These are the statistics (mean and 5th and 95th quantiles) from the 20th year of each set. Bstart is start-of-season biomass t), Comm is commercial catch (t) and CPUE is in kg/potlift. Means are shown in bold for easier comparison among sets.

		Bstart			Comm			CPUE	
set	5%	mean	95%	5%	mean	95%	5%	mean	95%
1.a	513.2	**909.9**	1357.8	106.2	**105.6**	106.2	1.03	**1.95**	2.95
1.b	122.5	**579.9**	951.6	102.9	**103.8**	106.2	0.20	**1.60**	2.70
2.b	363.9	**671.9**	1021.0	79.7	**79.2**	79.7	0.97	**1.92**	2.95
3.a	420.5	**834.8**	1292.8	132.8	**131.3**	132.8	0.79	**1.75**	2.77
3.b	50.0	**411.5**	842.0	42.0	**116.4**	132.8	0.08	**1.08**	2.33

Table 6: Indicators compared among the five scenarios: low B is the soft limit and is the percentage of years with start-of-season biomass less than *Bmsy* / 2; high *U* is the percentage of years with exploitation rate greater than *Umsy* and ncrash is the number of the 1000 runs in which start-of-season biomass fell below 50 t.

set	low B	high *U*	ncrash
1.a	1.0%	2.0%	9
1.b	3.5%	15.6%	37
2.b	1.1%	2.8%	12
3.a	1.9%	7.5%	14
3.b	13.3%	45.3%	180

Table 7: For the comparisons listed, percentage change in average start-of-season biomass, commercial catch and CPUE.

comparing	with	mean biomass	mean catch	mean CPUE
1.b	1.a	-33%	-1%	-13%
2.b	1.a	-26%	-25%	-1%
3.a	1.a	-6%	25%	-8%
3.b	3.a	-40%	-4%	-24%

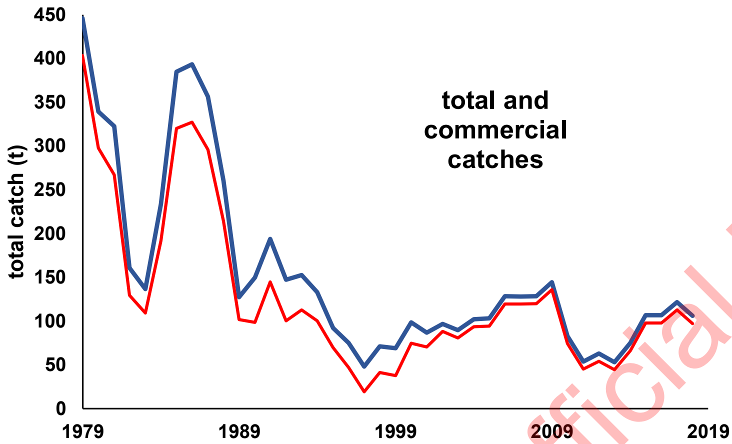

Figure 1: CRA 7 total catch (blue line) and commercial catch (lower red line) from 1979-2018.

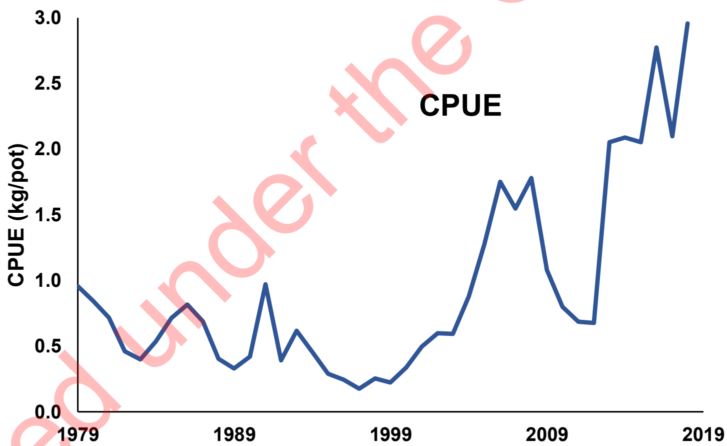

Figure 2: CRA 7 CPUE.

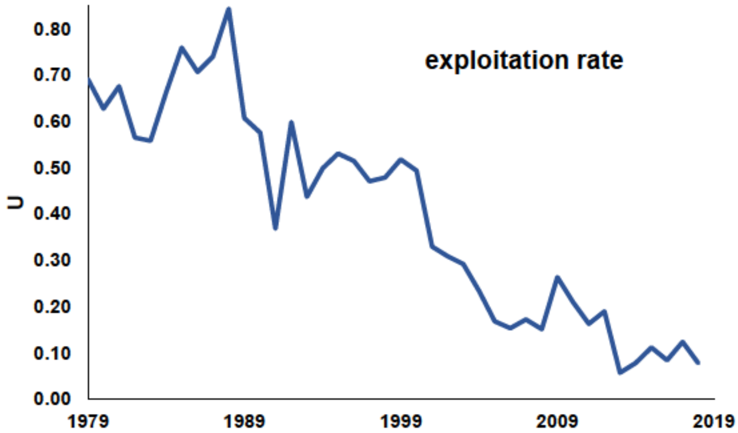

Figure 3: Exploitation rate in CRA 7.

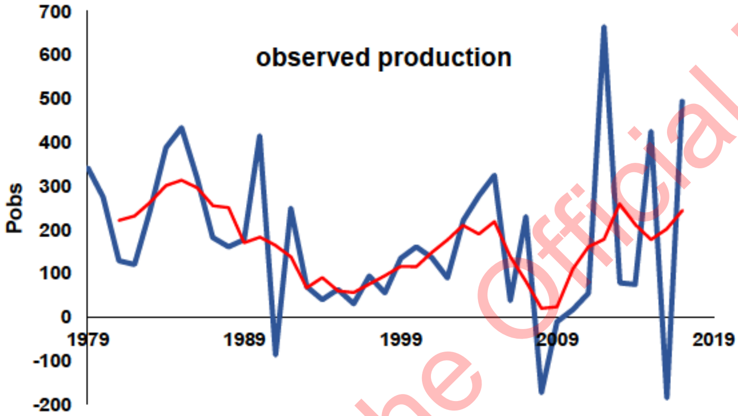

Figure 4: Observed production in CRA 7 (heavier blue line), with a 5-year running mean (lighter red line).

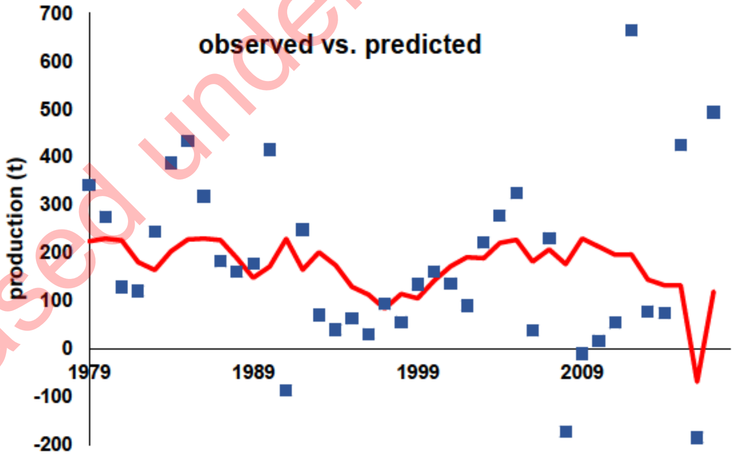

Figure 5: Observed (blue squares) vs. predicted (red line) production in CRA 7.

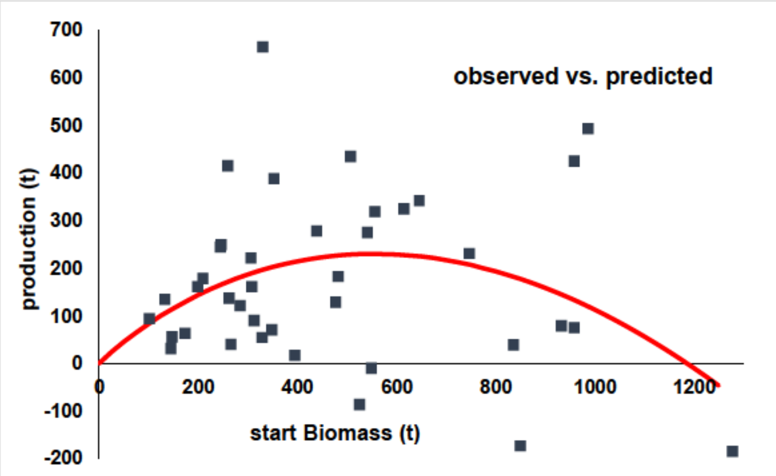

Figure 6: Observed (blue squares) vs. predicted (red line) production in CRA 7 plotted against starting biomass.

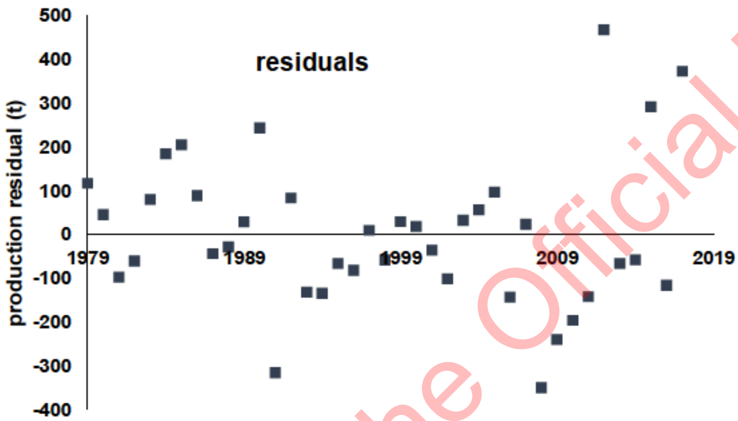

Figure 7: Residuals from the fit in Figure 6 vs. year.

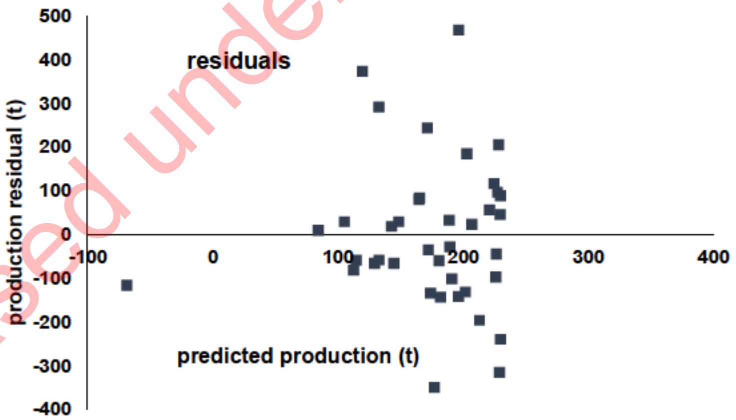

Figure 8: Residuals from the fit in Figure 6 vs. predicted production.

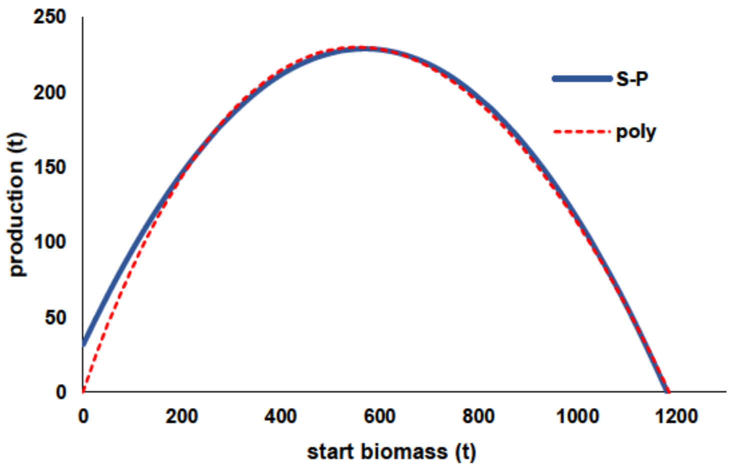

Figure 9: Comparison of the fitted surplus production model reported above (blue line) and a polynomial (dashed red line).

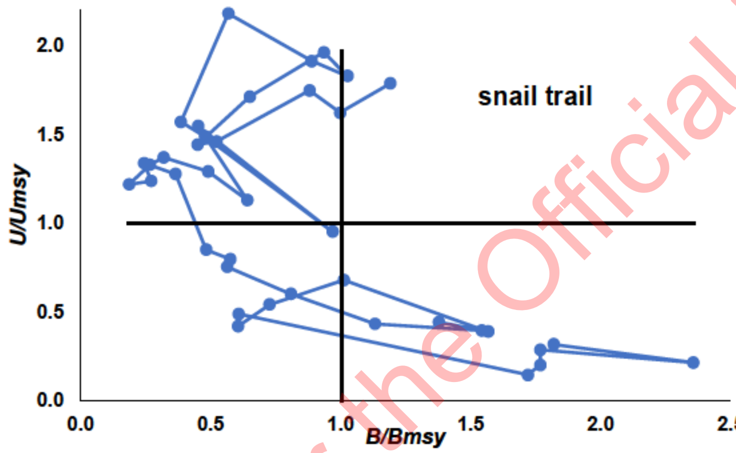

Figure 10: Phase diagram of fishing intensity on the y-axis, as *U/Umsy*, vs biomass on the x-axis, plotted as annual start-of-season biomass / *Bmsy*. The series starts (1979) with the point in the top right quadrant and ends (2018) in the centre of the bottom right quadrant.

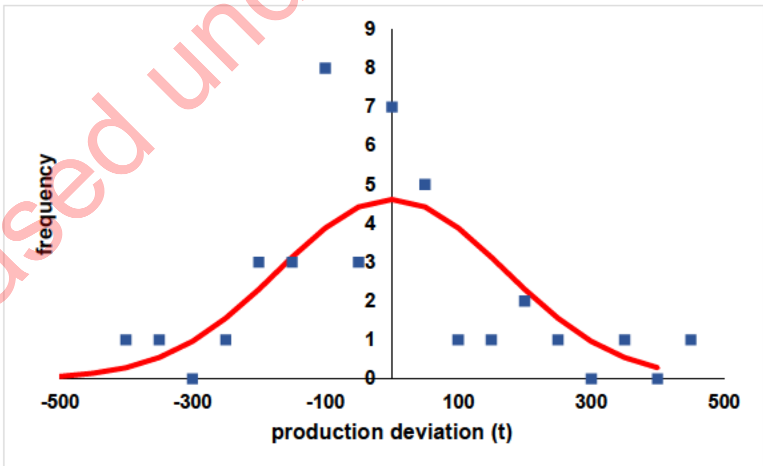

Figure 11: Distribution of the residuals in Figure 7 (blue squares) compared with the a normal distribution with the same standard deviation (red line).

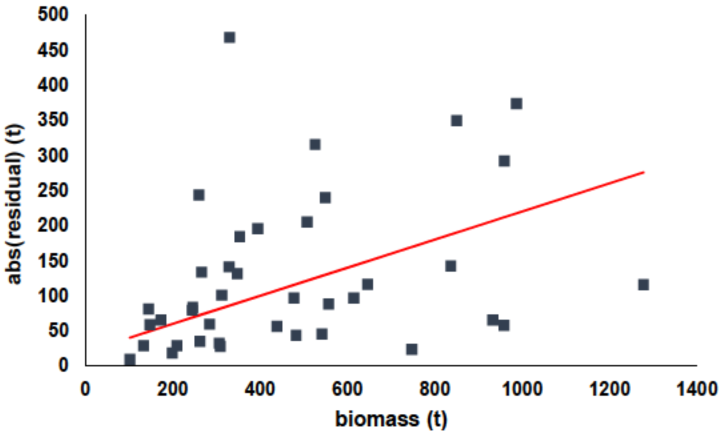

Figure 12: From the fit shown in Figure 6, the absolute residuals vs. starting biomass (squares), and a fitted regression (red line) with arbitrary intercept of 20 and estimated slope of 0.208.

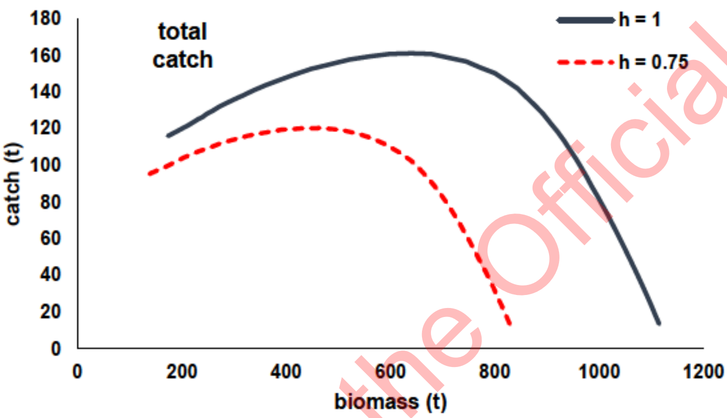

Figure 13: From 1000 50-year constant-catch runs, the average total catch vs. average starting biomass with no alienation (blue line) and 25% alienation (dashed red line).

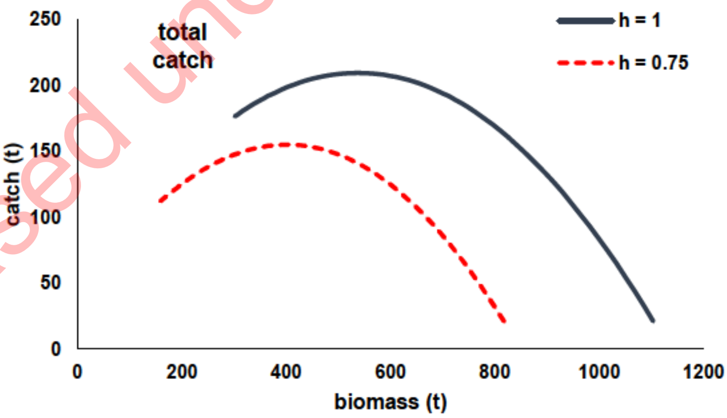

Figure 14: From 1000 50-year constant-rate runs, the average total catch vs. average starting biomass with no alienation (blue line) and 25% alienation (dashed red line).

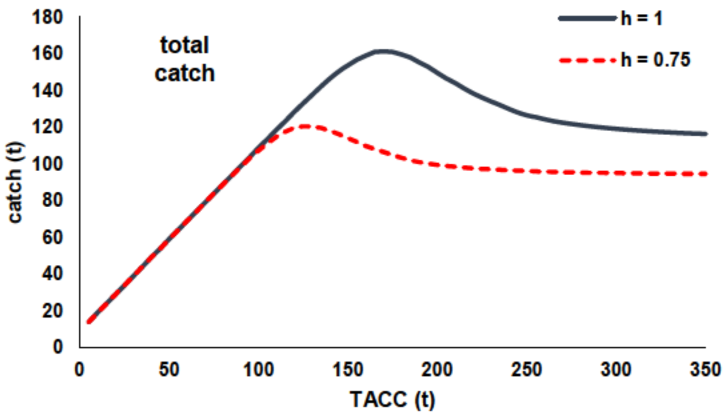

Figure 15: From 1000 50-year constant-catch runs, the average commercial catch vs. the specified constant TACC with no alienation (blue line) and 25% alienation (dashed red line).

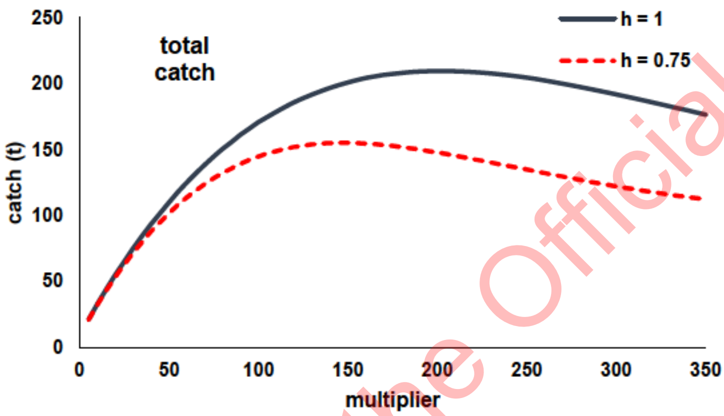

Figure 16: From 1000 50-year constant-rate runs, the average commercial catch vs. the specified multiplier with no alienation (blue line) and 25% alienation (dashed red line).

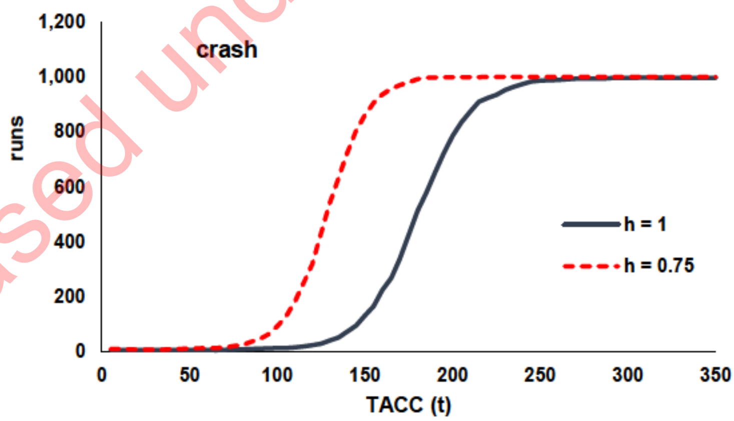

Figure 17: From 1000 50-year constant-catch runs, the proportion of runs that "crashed" vs. the specified constant TACC with no alienation (blue line) and 25% alienation (dashed red line).

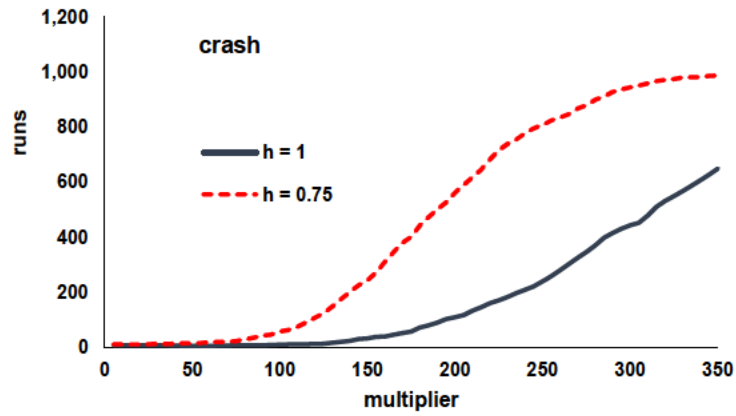

Figure 18: From 1000 50-year constant-rate runs, the proportion of runs that "crashed" vs. the specified multiplier with no alienation (blue line) and 25% alienation (dashed red line).

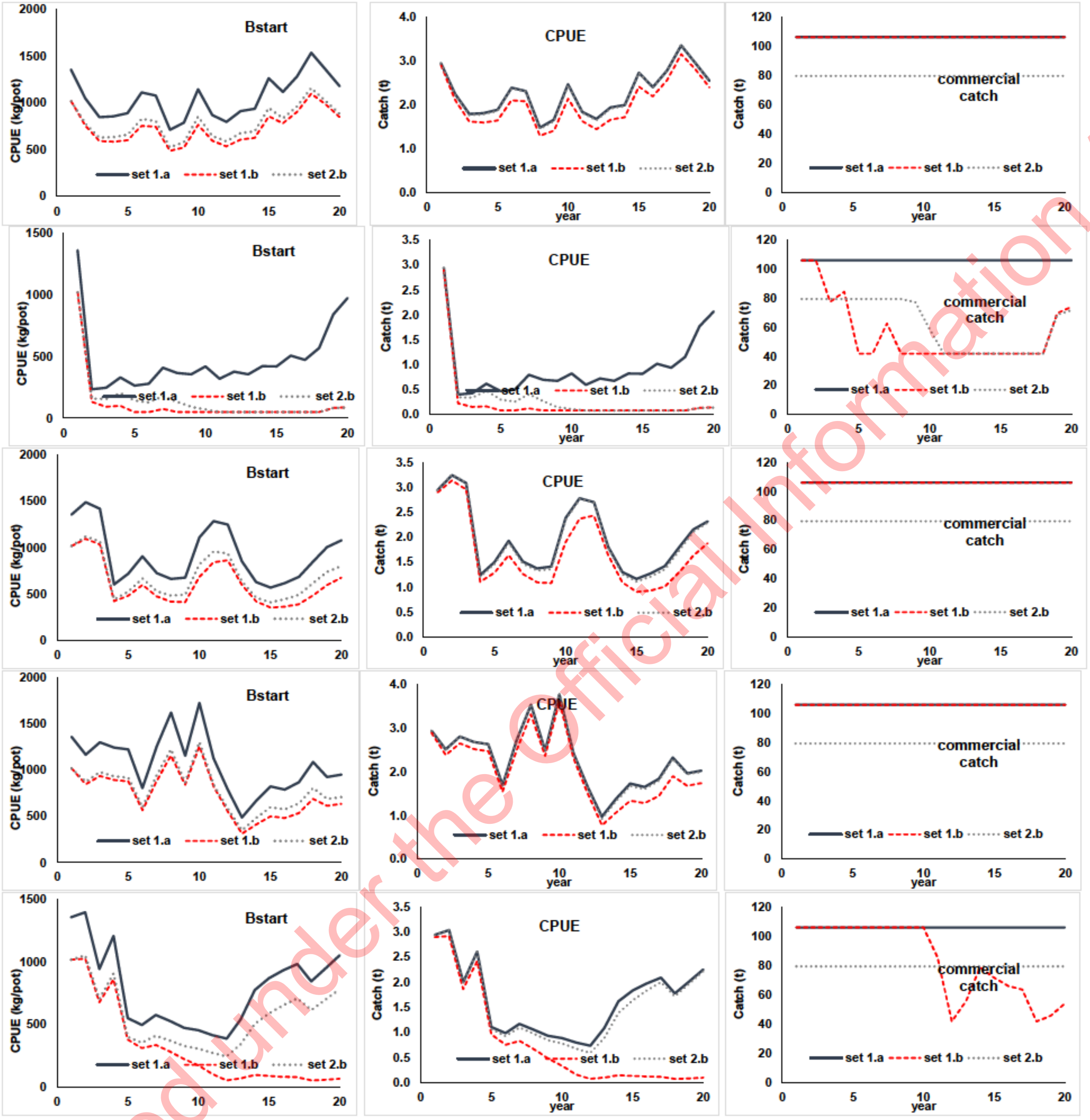

Figure 19: Comparisons of CPUE (left) and commercial catch trajectories in five runs from the three sets: the third and fifth show crashed runs while the others were chosen randomly.

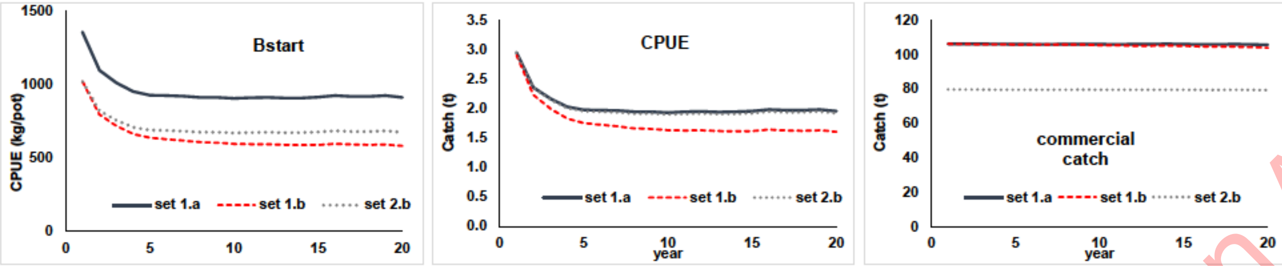

Figure 20: The average start biomass, CPUE and commercial catch trajectories compared between the three sets of runs 1.a (blue line), 1.b (dashed red line) and 2.b (dotted grey line).

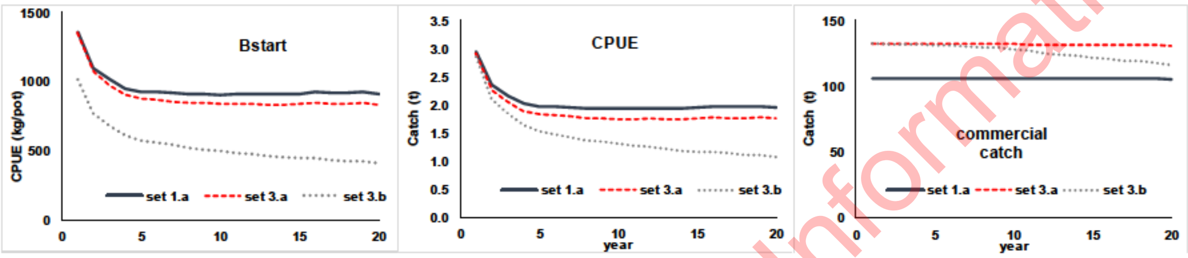

Figure 21: The average start biomass, CPUE and commercial catch trajectories compared between the three sets of runs 1.a (blue line), 3.a (dashed red line) and 3.b (dotted grey line).

Item 32

From: Chanel Gardner
To: Lesley Douglas
Subject: Re Official Information Act response - includes your name/organisation name
Date: Monday, 3 October 2022 12:07:32 pm

Hi Lesley,

Are you able to tell me what was requested? I am not entirely sure how this works as I am new to the Executive Officer role for CRA7.

Best,
Chanel Gardner

---------- Forwarded message ---------
From: **Kate** [redacted] 9(2)(a)
Date: Wed, 28 Sep 2022 at 6:03 PM
Subject: Re: FOR YOUR INFORMATION - Official Information Act response - includes your name/organisation name
To: Lesley Douglas <ldouglas@doc.govt.nz>
Cc: <[redacted] 9(2)(a)>

Kiaora Lesley

I am no longer working for ORLIA. Please direct your emails to Chanel Gardner whose address is copied in this email.

Kate

Sent from my iPhone

> On 28/09/2022, at 8:57 AM, Lesley Douglas <ldouglas@doc.govt.nz> wrote:
>
> Kia ora Ms Hesson
>
> Yesterday DOC responded to an Official Information Act 1982 request regarding southeast marine protection (SEMP). A number of documents were released as part of the request.
>
> Before releasing the documents we reviewed the content and have withheld some.
>
> Among information to be released are the names of some individuals and/or organisations.
>
> Your name and the name of the Otago Rock Lobster Industry Association appear in the documents for release.
>
> This relates to your 2020 Official Information Act request for SEMP submissions and DOC's subsequent decline of the request pending proactive

release of the documents.

To reach decisions regarding release of this information, we considered a number of factors, including the public interest considerations in section 9(1) of the Official Information Act. With respect to your name/organisation's name we determined the public interests outweigh the grounds for withholding.

Happy to talk directly if you have questions/concerns.

Please note that I cannot discuss the identity of the requester.

Naku noa na

Lesley

Lesley Douglas (Ms/she/her)
National Marine Protection Advisor | Kaiwhakamaru Apure Moana
Whakatu Office | Nelson Office
Phone: [redacted] 9(2)(a)

www.doc.govt.nz

Item 33

From: Rebecca Bird
To: "Maree Baker-Galloway"; "Gail Thompson (Runaka Mgr"; [redacted] 9(2)(a); "Ate Heineman"; "John Henry"; "Sue Maturin"; "Neville Peat"; "Tim Ritchie"; "Fergus Sutherland"; "Carol Scott"; "Philippa Agnew"; "Simon Gilmour"; "Chris Hepburn"; "Edward Ellison"; "Stephanie Blair"; "Khyla Russell"; "Gail Thompson (Runaka Mgr)"
Bcc: Anna Cameron; Sarah Owen; Kathryn Blakemore; Sanjay Thakur; Aaron Fleming; Gabriel Davies; Fiona Oliphant
Subject: Invitation to Ministerial announcement event in Dunedin, Thurs 5th Oct
Date: Tuesday, 26 September 2023 6:14:00 pm
Attachments: image001.png

Save the date: Ministerial announcement event – Thursday 5th October, Dunedin.

Kia ora former SEMP Forum members

It has been a very long time since I have been in touch with you, I trust you are all well.

I am reaching out to inform you of an event being planned for next week in Dunedin.

I hope you can save the date for the event as we would very much appreciate your attendance.

You will receive a formal invitation in the next day or so and please appreciate, at this stage I cannot share any more details.

Ngā mihi
Rebecca Bird
National Marine Protection Team Lead/ **Poutiaki Matua Ahumoana ā Motu**
Office of Regulatory Services
Department of Conservation / **Te Papa Atawhai**
Phone: [redacted] 9(2)(a)

Note I am based in Whakatū | Nelson
www.doc.govt.nz

Toitū te marae a Tāne-Mahuta, Toitū te marae a Tangaroa, Toitū te tangata.
If the land is well, and the sea is well, the people will thrive.

Item 34

From: Simon Gilmour
To: Rebecca Bird
Cc: Maree Baker-Galloway; Gail Thompson (Runaka Mgr); Steve Bennett; Ate Heineman; John Henry; Sue Maturin; Neville Peat; Tim Ritchie; Fergus Sutherland; cscott; Philippa Agnew; Chris Hepburn; Edward Ellison; Stephanie Blair contractor; Khyla Russell
Subject: Re: Invitation to Ministerial announcement event in Dunedin, Thurs 5th Oct
Date: Wednesday, 27 September 2023 10:35:41 am
Attachments: image001.png
image001.png

Hi Rebecca,
Looking forward to catching up with everyone and seeing the completion of the first faze of the reserves.
Simon

On Tue, 26 Sep 2023, 6:15 PM Rebecca Bird, <rbird@doc.govt.nz> wrote:

> **Save the date: Ministerial announcement event – Thursday 5th October, Dunedin.**
>
> Kia ora former SEMP Forum members
>
> It has been a very long time since I have been in touch with you, I trust you are all well.
>
> I am reaching out to inform you of an event being planned for next week in Dunedin.
>
> I hope you can save the date for the event as we would very much appreciate your attendance.
>
> You will receive a formal invitation in the next day or so and please appreciate, at this stage I cannot share any more details.
>
> Ngā mihi
>
> Rebecca Bird
>
> National Marine Protection Team Lead/ **Poutiaki Matua Ahumoana ā Motu**
>
> Office of Regulatory Services
>
> Department of Conservation / **Te Papa Atawhai**
>
> Phone: [redacted] 9(2)(a)
>
> Note I am based in Whakatū | Nelson

www.doc.govt.nz

Toitū te marae a Tāne-Mahuta, Toitū te marae a Tangaroa, Toitū te tangata.

If the land is well, and the sea is well, the people will thrive.

Caution - This message and accompanying data may contain information that is confidential or subject to legal privilege. If you are not the intended recipient you are notified that any use, dissemination, distribution or copying of this message or data is prohibited. If you received this email in error, please notify us immediately and erase all copies of the message and attachments. We apologise for the inconvenience. Thank you.

Item 35

From: Deanna Randell
To: [redacted] 9(2)(a)
Subject: Invitation to a Ministerial Announcement Thursday 5th October
Date: Thursday, 28 September 2023 12:53:00 pm
Attachments: Ministerial invitation - announcement event - Carol Scott.pdf
image001.png

Tēnā koe Carol,

Please see the attached invitation to a Ministerial announcement.

Please let me know by 9am on Monday 2nd October if you will be able to attend.

Ngā mihi,

Deanna

Deanna Randell
Statutory Support Officer
Christchurch | Ōtautahi
Phone: [redacted] 9(2)(a)

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Department of Conservation
Te Papa Atawhai

Hon Willow-Jean Prime
Minister of Conservation

Hon Rachel Brooking
Minister for Oceans and Fisheries

In partnership with

Kāi Tahu

invite you Carol Scott

to an announcement

on Thursday, 5 October 2023, 11am – 1pm
Please arrive from 10.45am onwards.

at St Clair, Dunedin
South Coast Board Riders Association, 1 Esplanade
Please note there is limited parking near the venue.

Light refreshments will be served.
This invitation is not transferable.

RSVP: by 9am 2 October 2023 to drandell@doc.govt.nz
Contact for queries: Deanna Randell, 9(2)(a)

Item 36

From:	Deanna Randell
To:	[redacted] 9(2)(a)
Subject:	Invitation to a Ministerial Announcement Thursday 5th October
Date:	Thursday, 28 September 2023 12:55:00 pm
Attachments:	Ministerial invitation - announcement event - Simon Gilmour.pdf image001.png

Tēnā koe Simon,

Please see the attached invitation to a Ministerial announcement.

Please let me know by 9am on Monday 2nd October if you will be able to attend.

Ngā mihi,

Deanna

Deanna Randell
Statutory Support Officer
Christchurch | Ōtautahi
Phone: [redacted] 9(2)(a)

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Department of Conservation
Te Papa Atawhai

Hon Willow-Jean Prime

Minister of Conservation

Hon Rachel Brooking

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Please note there is limited parking near the venue.

Light refreshments will be served.
This invitation is not transferable.

RSVP: by 9am 2 October 2023 to drandell@doc.govt.nz
Contact for queries: Deanna Randell, [redacted] 9(2)(a)

From: Rebecca Bird
To: Carol Scott
Bcc: Anna Cameron
Subject: RE: Invitation to Ministerial announcement event in Dunedin, Thurs 5th Oct
Date: Thursday, 28 September 2023 5:41:00 pm
Attachments: image001.png

Kia ora Carol

[redacted] 9(2)(a) apologies for the late response.

We acknowledge the short notice and do apologise for this but unfortunately we have not been able to advise Forum members any earlier than this.

[redacted] 9(2)(a)

Kind regards

Rebecca

From: Carol Scott <[redacted] 9(2)(a)>
Sent: Tuesday, September 26, 2023 6:45 PM
To: Rebecca Bird <rbird@doc.govt.nz>
Subject: Re: Invitation to Ministerial announcement event in Dunedin, Thurs 5th Oct

Hi Rebecca

This is so last minute, how long have you known this was being announced. Are DoC paying for forum members to attend?

Rgds

Carol

On 26/09/2023, at 6:15 PM, Rebecca Bird <rbird@doc.govt.nz> wrote:

Save the date: Ministerial announcement event – Thursday 5th October, Dunedin.

Kia ora former SEMP Forum members

It has been a very long time since I have been in touch with you, I trust you are all well.

I am reaching out to inform you of an event being planned for next week in Dunedin.

I hope you can save the date for the event as we would very much appreciate your attendance.

You will receive a formal invitation in the next day or so and please appreciate, at this stage I cannot share any more details.

Ngā mihi

Rebecca Bird
National Marine Protection Team Lead/ **Poutiaki Matua Ahumoana ā Motu**
Office of Regulatory Services
Department of Conservation / **Te Papa Atawhai**
Phone: [redacted] 9(2)(a)
Note I am based in Whakatū | Nelson
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image001.png

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If the land is well, and the sea is well, the people will thrive.

Item 38

Note: the attachment to this email thread is included on page 45.

From: [redacted]
To: [redacted]
Cc: [redacted]; Deanna Randell; [redacted]; david.seymour@parliament.govt.nz; [redacted]
Subject: Re: Invitation to a Ministerial Announcement Thursday 5th October
Date: Thursday, 28 September 2023 8:29:12 pm
Attachments: image001.png
Ministerial invitation - announcement event - Carol Scott.pdf

---

Hi [redacted],

This Ministerial announcement is about the South East Marine Protection Area (SEMPA)

Thanks [redacted] & I will be there.

Why are the kelp quota owners not being invited to this announcement?

I can only assume that the secrecy around this is that DOC & MPI are going to announce that they are going to prohibit KBB3G kelp quota owners harvesting from Timaru to North of Dunedin & that they don't want Kelp quota owners spoiling their deliberately deceptive plans.
This represents 80% of the kelp beds in KBB3G (East coast of the South Island from Clarence river to South of Dunedin)

Imagine if Ngai Tahu were to lose 80% of an asset that they had legally obtained through the legal system & through purchase & were not invited to the announcement of that loss.

This process that DOC & MPI are spearheading is racist thievery.

Stealing peoples property rights is against the law.

[redacted] he crown then tendered off 40%, 20% went to Ngai Tahu.

Nationalising 80% of an industry is the stuff third world countries do.

There is no scientific, legal, moral or ethical reason for taking away 80% of our legal property rights without fair compensation.

I value our long term kelp quota in area KBB3G as being worth $40-100 million.

Not only are MPI & DOC disregarding the 'best available scientific advice' but they are acting with 'reckless disregard' towards kelp quota owners.

If DOC & MPI announces that they are going to take away our rights to 80% of our kelp quota area then they will face a legal battle including Misfeasance in public office. If they think that is an impossible hurdle then they need to read why the Crown settled with me in the first place- Misfeasance.

This time round I won't settle, as the crown has shown it is not to be trusted.
It is indeed a high hurdle to get over to prove Misfeasance in public office but if I lose then who cares but if DOC & MPI lose then the consequences will be catastrophic.

DOC & MPI need to think on this.

Cheers

[redacted] 9(2)(a)

On 28/09/2023, at 6:12 PM, [redacted] 9(2)(a) wrote:

Hi [redacted] 9(2)(a)

Im overseas at moment, just got copied this.

I understand it is to announce the establishment of the reserves along the Otago coast, SEMPA.

Likely including the giant kelp harvest ban

Any chance you can make the public meeting and announcement ?.

Might be worth asking the two ministers some pointed questions ?

cheers

[redacted] 9(2)(a)

-------- Forwarded Message --------
Subject:FW: Invitation to a Ministerial Announcement Thursday 5th October
Date: Thu, 28 Sep 2023 00:41:56 +0000
From: Carol Scott [redacted] 9(2)(a)
To: [redacted] 9(2)(a)

FYI – I have asked Chanel Gardner (SIF Director) to attend in my place

---

From: Deanna Randell <drandell@doc.govt.nz>
Sent: Thursday, 28 September 2023 12:53 p.m.
To: Carol Scott [redacted] 9(2)(a)
Subject: Invitation to a Ministerial Announcement Thursday 5th October

Tēnā koe Carol,

Please see the attached invitation to a Ministerial announcement.

Please let me know by 9am on Monday 2nd October if you will be able to attend.

Ngā mihi,

Deanna

Deanna Randell
Statutory Support Officer
Christchurch | Ōtautahi
Phone: [redacted] 9(2)(a)

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Department of Conservation
Te Papa Atawhai