

*learning/*Akoranga from research consultation with Māori on sequencing the genome of a taonga species

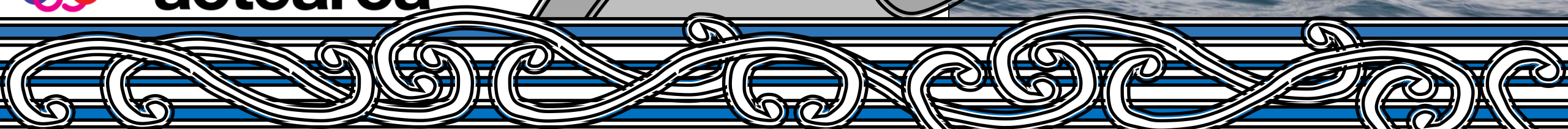
Alana Alexander  @laninsky



RUTHERFORD
FOUNDATION TRUST



Ben Te Aika



Pepeha *Māori GPS*



Ko Te Ramaroa te maunga
Te Ramaroa is the mountain

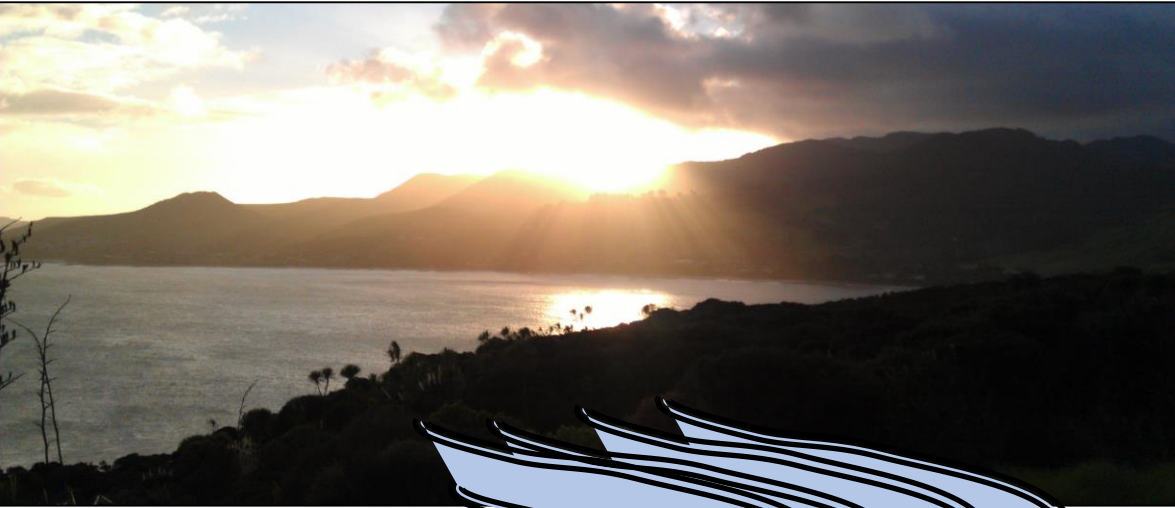
background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Pepeha *Māori GPS*



Ko Te Ramaroa te maunga
Te Ramaroa is the mountain

Ko Tuwhatero te
wairere
*Tuwhatero is the
waterfall*



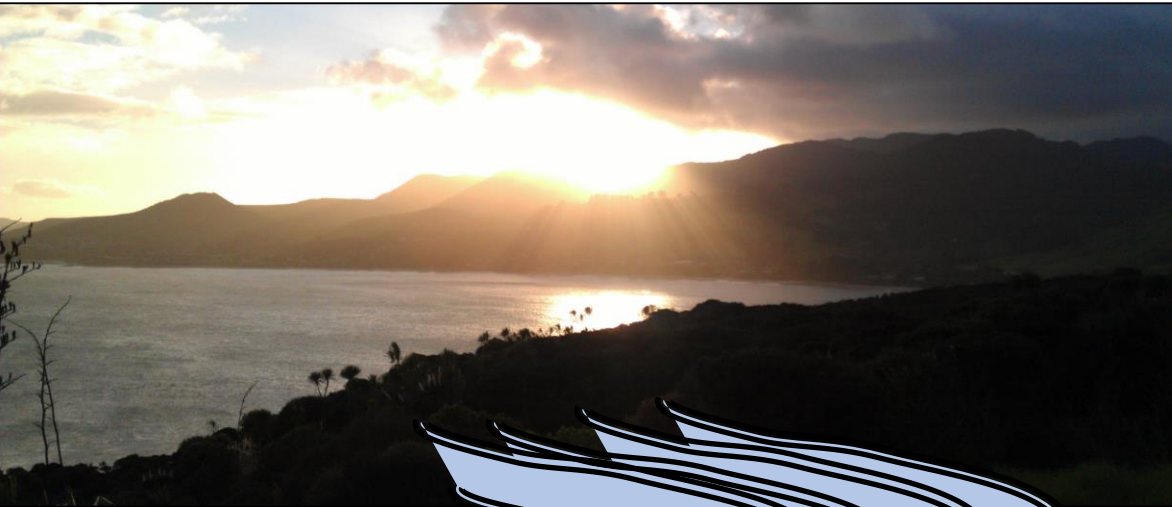
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why consultation?

*what did
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improved?*

Pepeha *Māori GPS*



Ko Te Ramaroa te maunga
Te Ramaroa is the mountain

Ko Tuwhatero te
wairere
*Tuwhatero is the
waterfall*



Ko Whirinaki te
awa me te
whenua
*Whirinaki is the
river & the land*

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*



Pepeha *Māori GPS*

Ko Matai Aranui
rātou ko Moria,
ko Pa Te Aroha
ngā marae

*Matai Aranui,
Moria, and
Pa Te Aroha
are the
marae*

background

why consultation?

*what did
consultation look
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*what could be
improved?*



Pepeha *Māori GPS*

Ko Matai Aranui
rātou ko Moria,
ko Pa Te Aroha
ngā marae

*Matai Aranui,
Moria, and
Pa Te Aroha
are the
marae*



Ko Te Hikutu
te hapū

*Te Hikutu
is the
hapū*

background

why consultation?

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consultation look
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*what could be
improved?*

Pepeha *Māori GPS*

Ko Matai Aranui
rātou ko Moria,
ko Pa Te Aroha
ngā marae

*Matai Aranui,
Moria, and
Pa Te Aroha
are the
marae*

Ko Te Hikutu
te hapū
*Te Hikutu
is the
hapū*



Ko Ngāpuhi
te iwi
*Ngāpuhi is
the iwi*

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*



Pepeha *Māori GPS*

Ko Kupe te
rangatira
*Kupe is the
rangatira*

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Pepeha *Māori GPS*



Ko Kupe te
rangatira
*Kupe is the
rangatira*



Ko Matawhao te
waka
*Matawhao
is the waka*

background

why consultation?

*what did
consultation look
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*what could be
improved?*

Pepeha *Māori GPS*



Ko Kupe te
rangatira
***Kupe is the
rangatira***



Ko Matawhao te
waka
***Matawhao
is the waka***



Ko Hokianga nui a
Kupe te moana
***Hokianga-nui-a-
Kupe is the ocean***

background

why consultation?

***what did
consultation look
like?***

***what could be
improved?***



Pepeha *Māori GPS*

Ka tipu ahau i raro i te maunga o Te Rangi-i-tōtōngia-ai-te ihu-o Tamatekapua

I grew up under the mountain of Rangitoto

background

why consultation?

*what did
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Pepeha *Māori GPS*

Ka tipu ahau i raro i te maunga o Te Rangi-i-
tōtōngia-ai-te ihu-o Tamatekapua

I grew up under the mountain of Rangitoto

Ko Alana ahau. Nō Tāmaki
Makaurau ahau, engari kei
Ōtepoti ahau e noho ana.

*I'm Alana. I'm
from Auckland,
but now I live in
Dunedin*

background

why consultation?

*what did
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*what could be
improved?*



Pepeha *Māori GPS*

Ka tipu ahau i raro i te maunga o Te Rangi-i-
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I grew up under the mountain of Rangitoto

Ko Alana ahau. Nō Tāmaki
Makaurau ahau, engari kei
Ōtepoti ahau e noho ana.

*I'm Alana. I'm
from Auckland,
but now I live in
Dunedin*

E mihi ana ki ngā tohu o nehe, o Ōtepoti e noho nei au
*I recognise the ancestral and spiritual landmarks of Dunedin
where I live*

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Hua *outline*

Background on 'Hologenomics for Hector's'

Why consultation?

What did consultation look like for this project? What went well?

What could have been done better?



background

why consultation?

*what did
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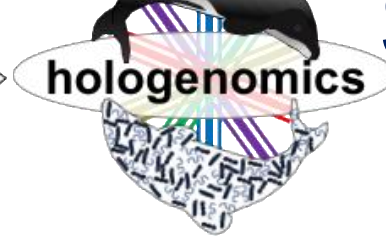
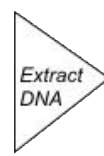
Does



+

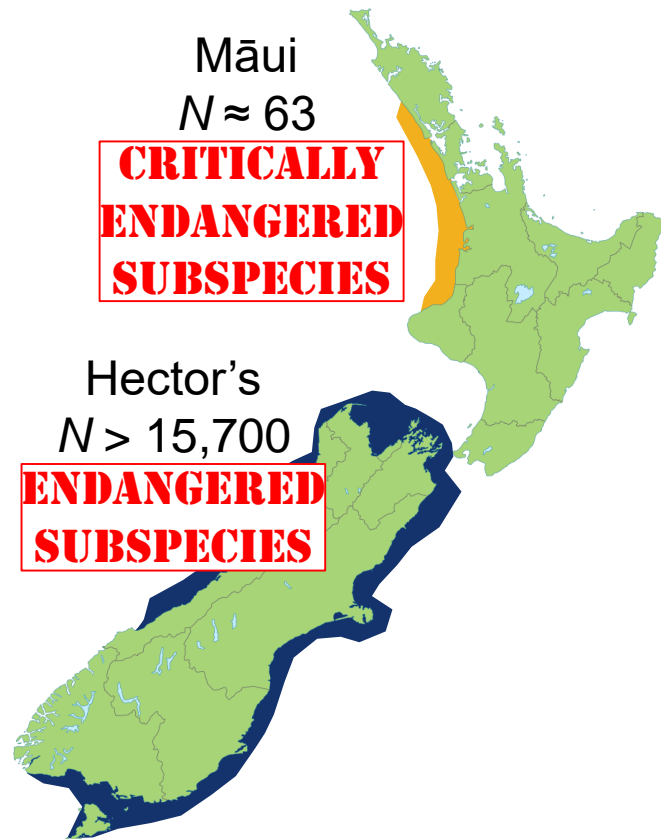


=



show utility for conservation?

Hector's
and Māui
dolphins as
a test case



background

why consultation?

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improved?*

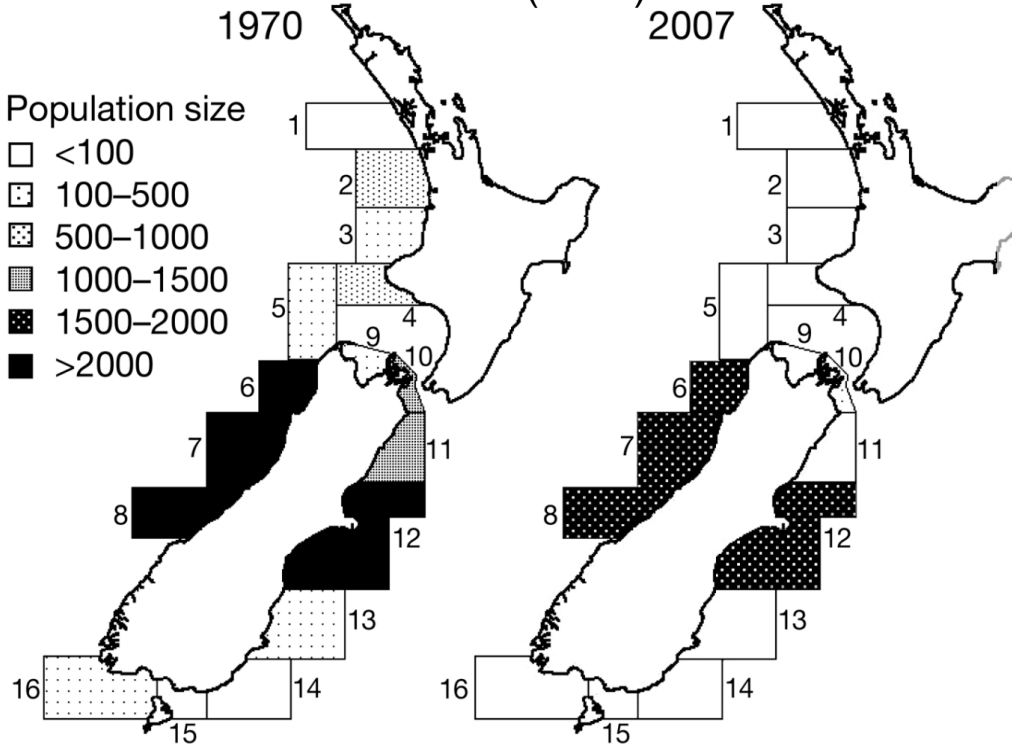
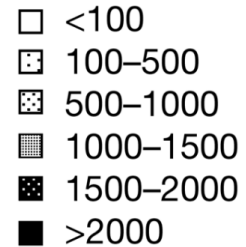
Biggest threat historically: fisheries

Slooten (2007)

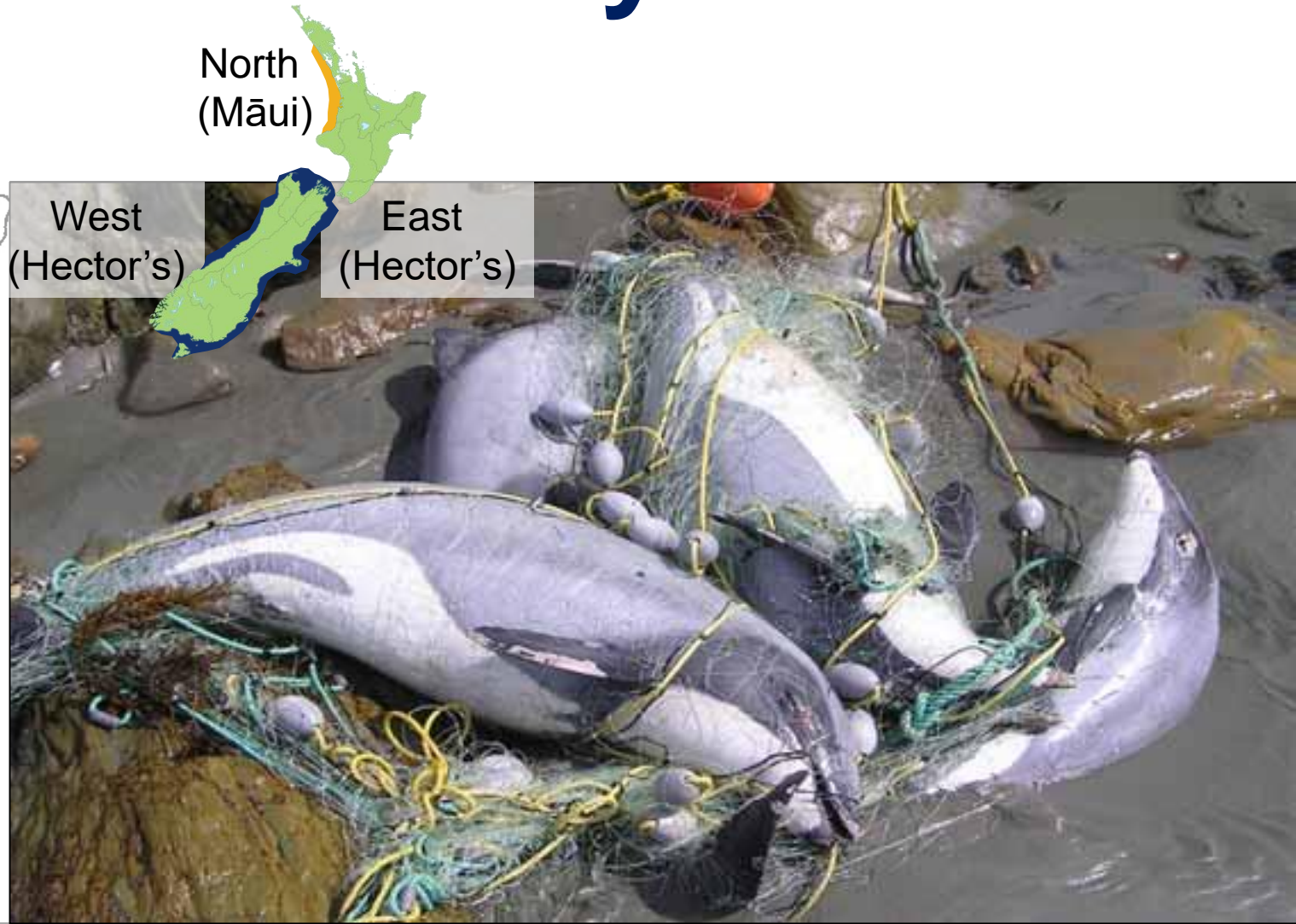
1970

2007

Population size



1970 population estimate
based on extrapolation
from fisheries deaths



background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Infectious diseases: an emerging threat

NEW ZEALAND

Unborn calf likely to be behind Maui dolphin's death

7:18 pm on 5 October 2018

Share this



The Maui dolphin that washed up on a beach north of Raglan earlier this week probably died from blood poisoning.

Department of Conservation said veterinary pathologists at Massey University established the dolphin had been pregnant, and that the death of the unborn calf several days before had caused the poisoning.

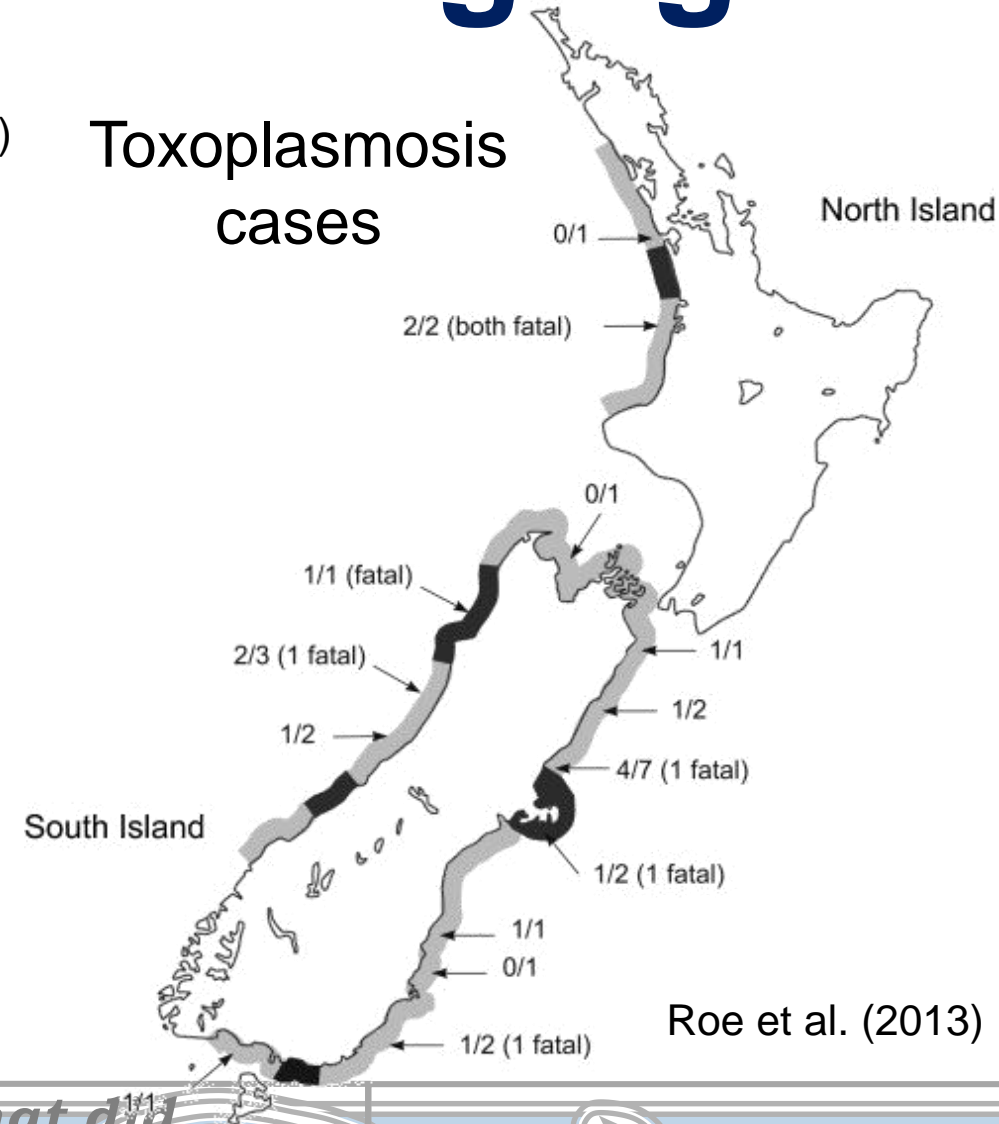
A marine adviser Kristina Hillock said the pathologists could not tell from a necropsy exactly why the fetus died, but the mother had been unable to give birth to it.



Brucellosis cases

Buckle et al. (2017)

Toxoplasmosis cases



Roe et al. (2013)

background

why consultation?

**what did
consultation look
like?**

**what could be
improved?**

Why do they make a good test case?

Uncertainty remains about:

- (i) the potential for genetic interchange between these two subspecies
- (ii) changes in their population sizes through time
- (iii) the risks of inbreeding within each subspecies
- (iv) individual susceptibility to pathogens e.g. toxoplasmosis



background

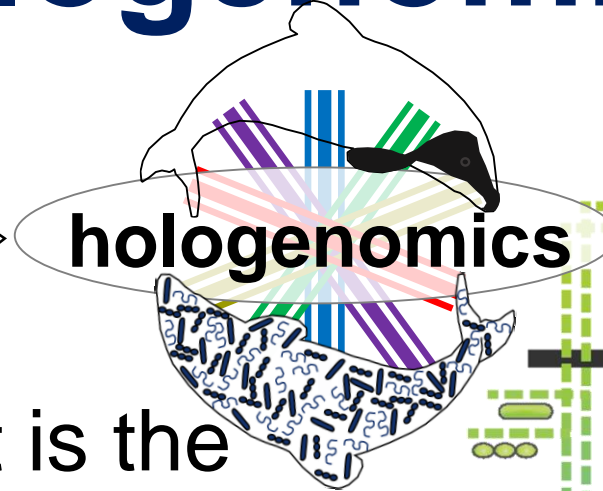
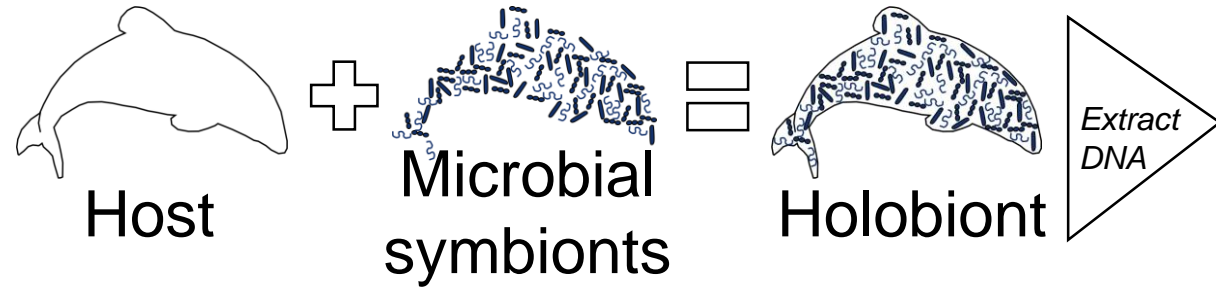
why consultation?

***what did
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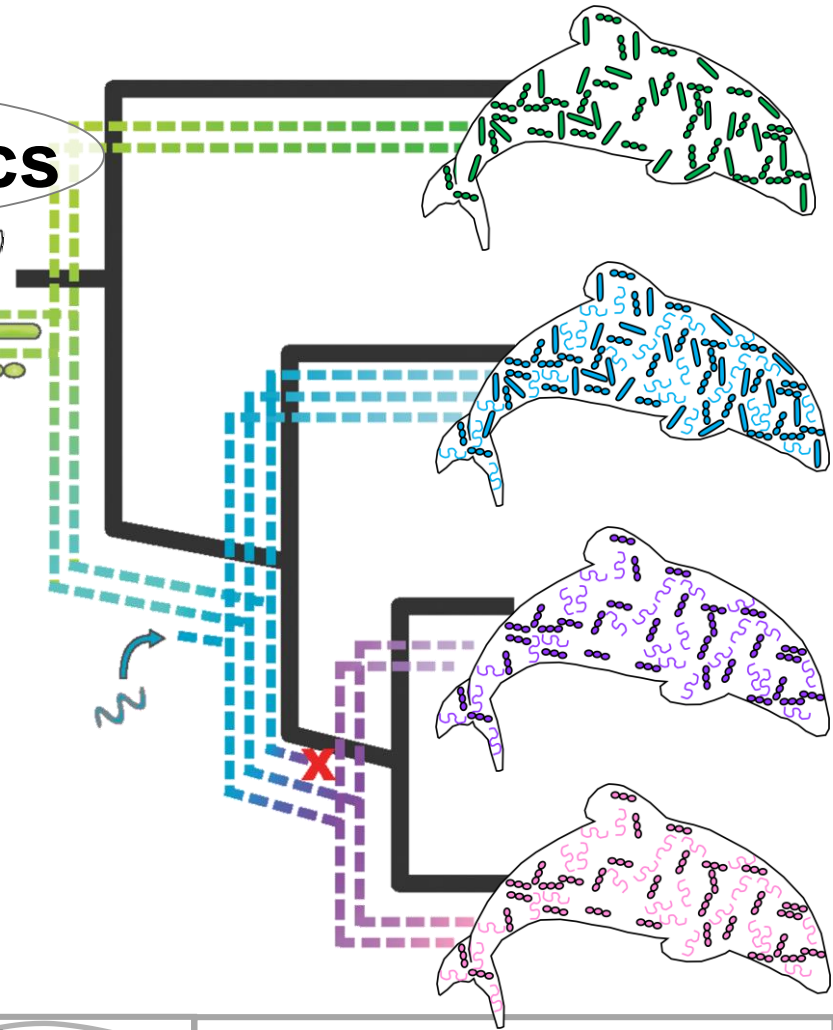
***what could be
improved?***

What is “hologenomics”?

“Dolphinified” Moran and Sloan (2015)



- The phenotype of a holobiont is the result of the host and all of its microbiome inhabitants



background

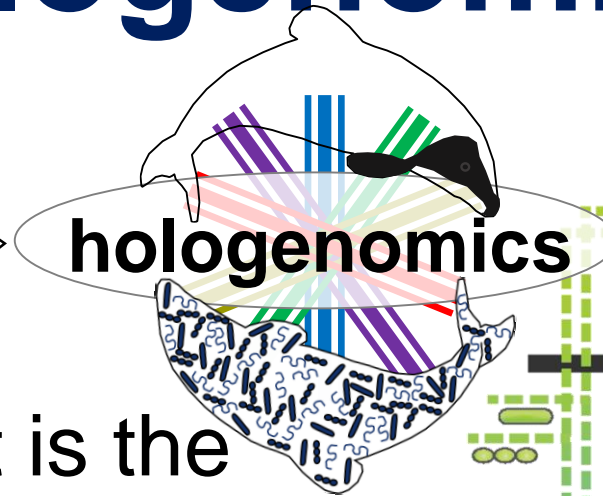
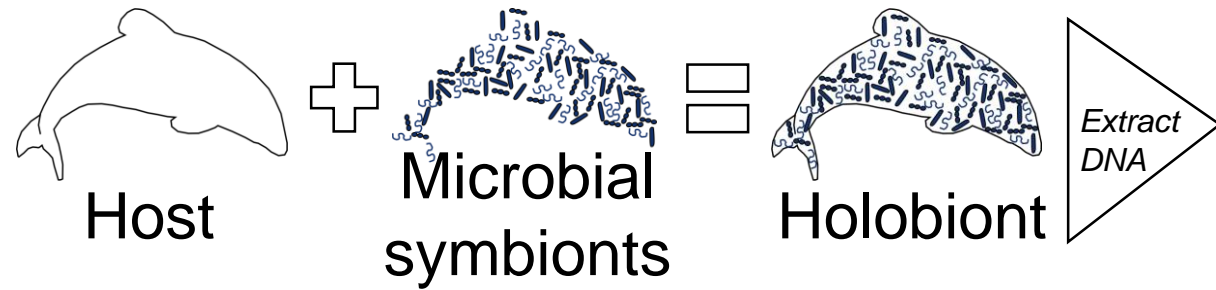
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*what did
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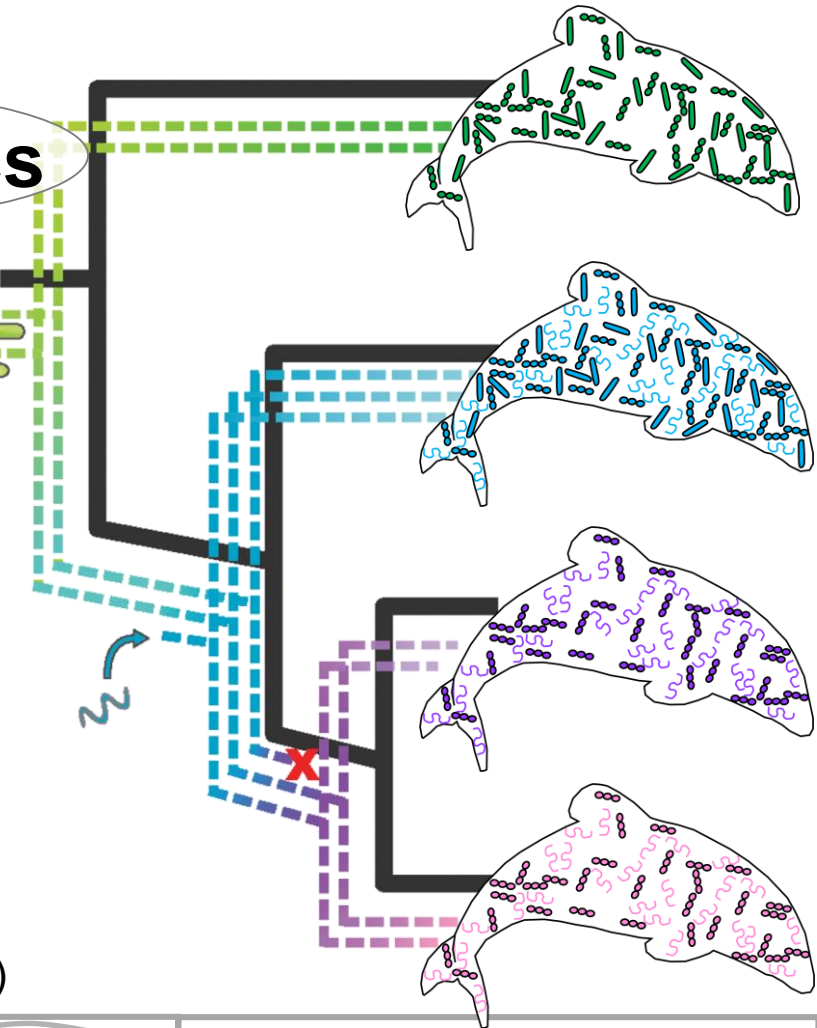
What is “hologenomics”?

“Dolphinified” Moran and Sloan (2015)



- The phenotype of a holobiont is the result of the host and all of its microbiome inhabitants
- Evolution acts at the level of the holobiont and causes changes in the “hologenome”, or the collective genomic content of all the individual bionts within the holobiont

Morris (2018)



background

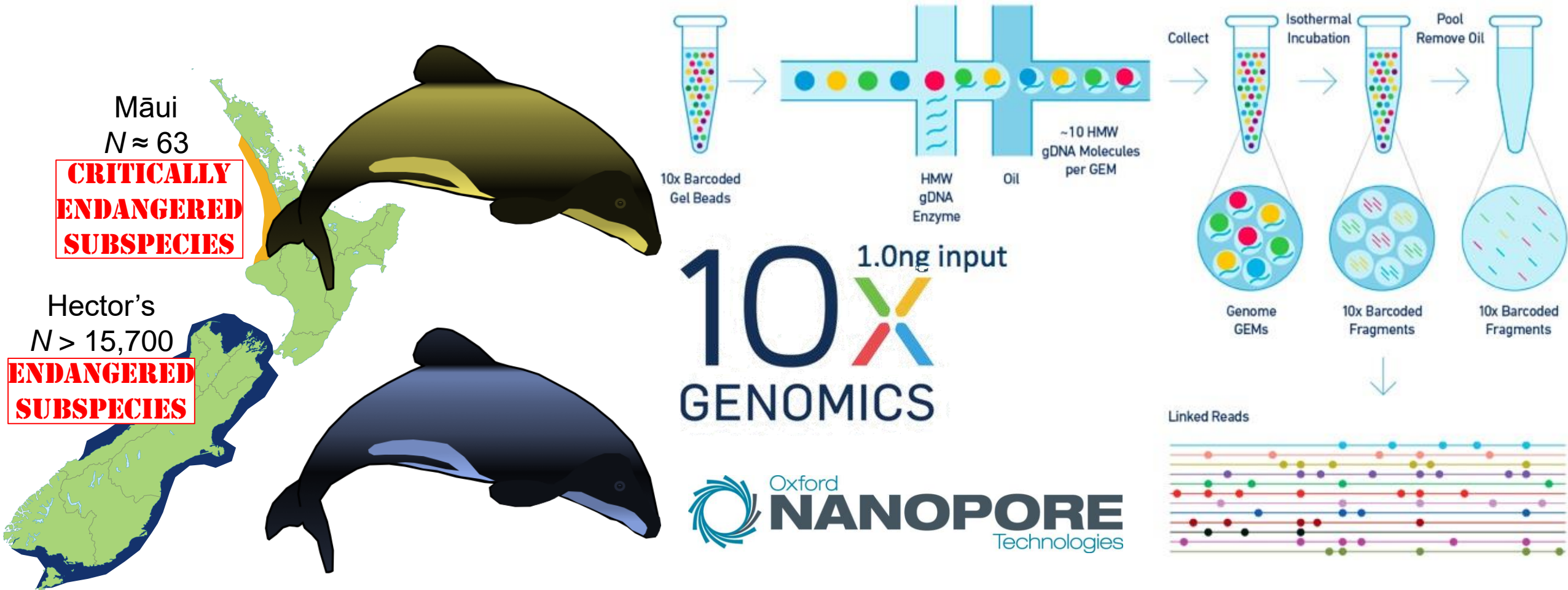
why consultation?

*what did
consultation look
like?*

*what could be
improved?*

How are we planning on doing this?

Generate two high-quality genomes: one for the Māui and one for the Hector's dolphin



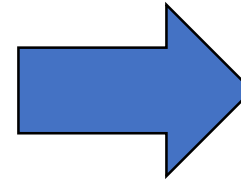
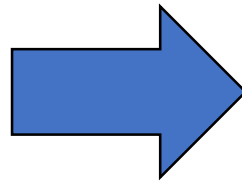
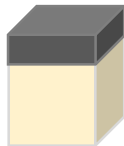
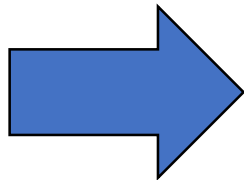
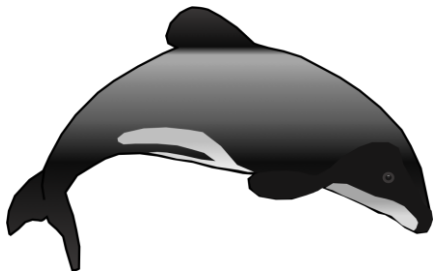
background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Why consultation?



CCCCCGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG
@SN7001438:202:C9CJPANXX:3:1101:1
CATTGATCATCGACACTTGAACGCACATTGCGG
+
CCCCCGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG
@SN7001438:202:C9CJPANXX:3:1101:1
GT TTGTGATGACTTACATGGAATTCTGTTCCGG
+
BCCCCGEGDGGGGGGGGG<>DEGGGGGGGGG<G
@SN7001438:202:C9CJPANXX:3:1101:1
CTTCGTGATCGATGTGGTGACGTCTGCTCTCC
+
CCCCCGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG

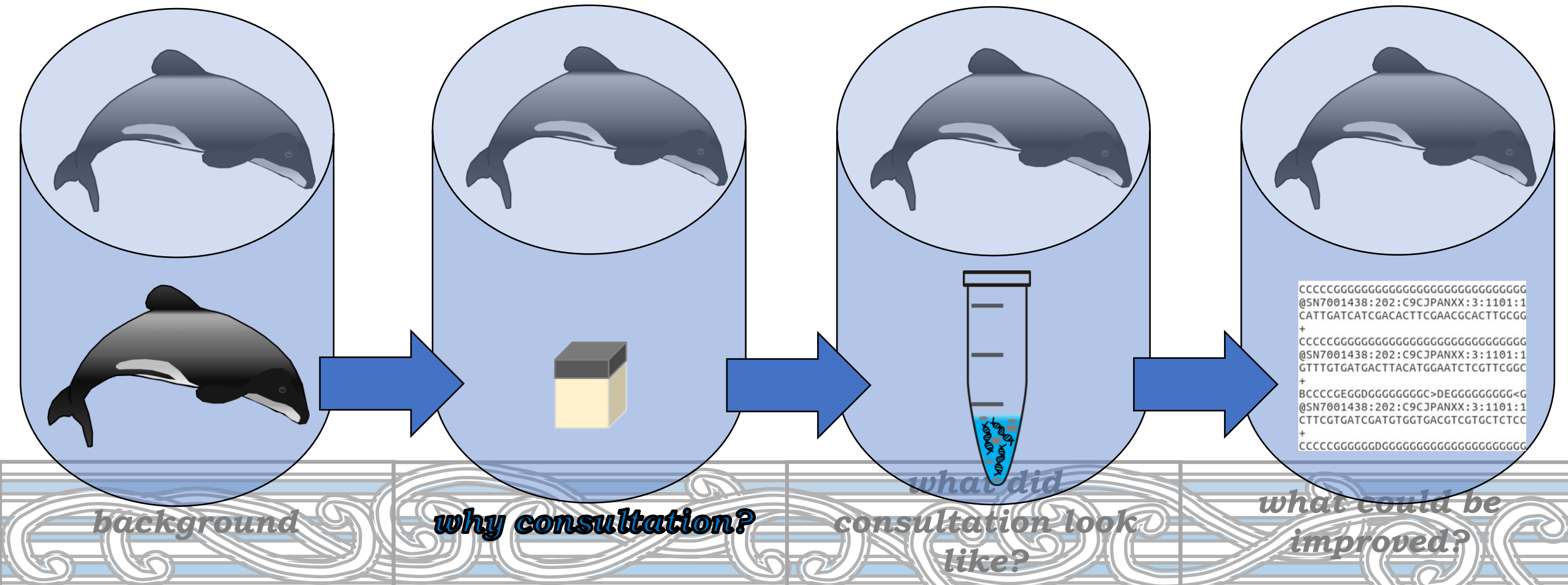
background

why consultation?

*what did
consultation look
like?*

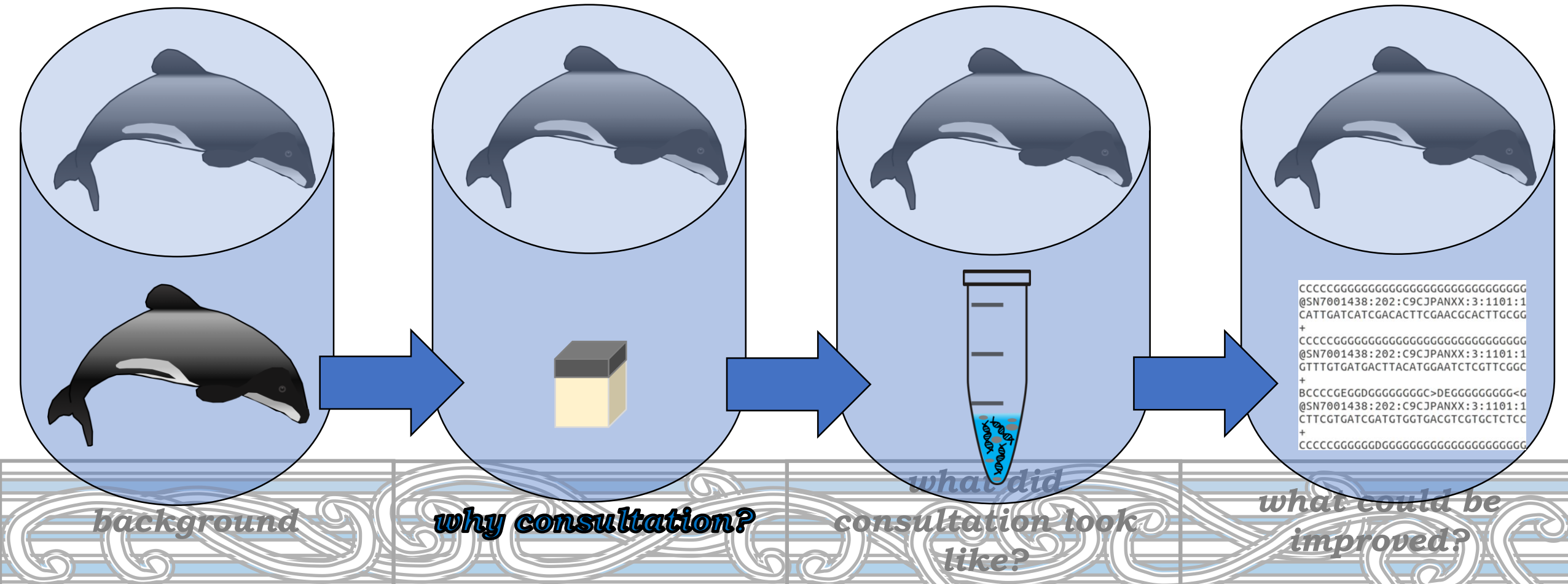
what could be improved?

Why consultation?



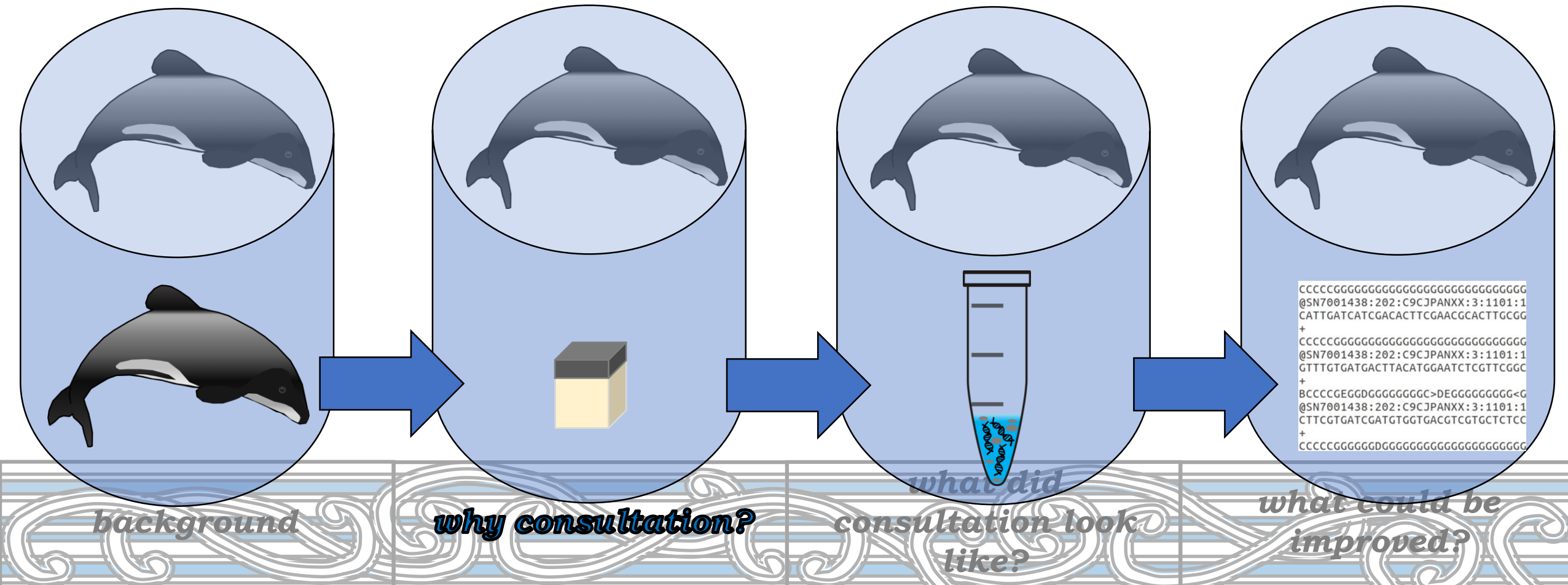
Why consultation?

It is Te Tiriti o Waitangi obligation...but regardless of national and international treaties (e.g. Nagoya), it is the right thing to do



Why consultation?

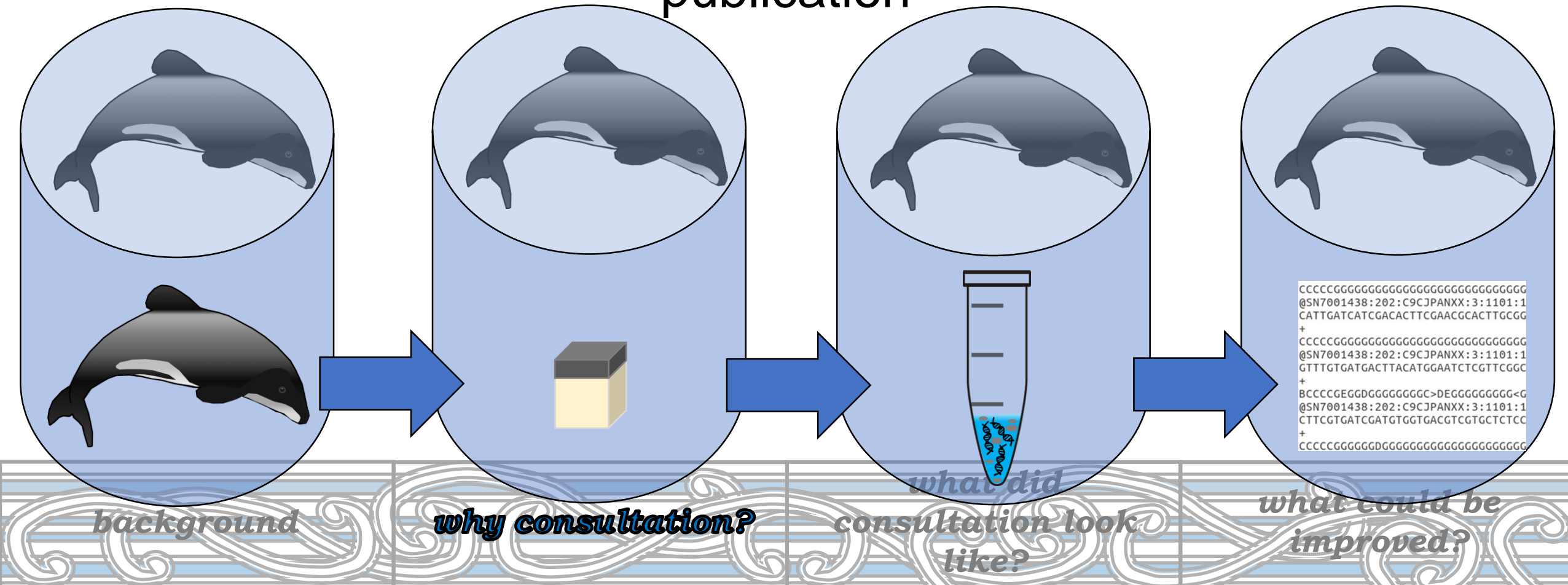
It makes your research better to consider diverse perspectives



Why consultation?

It makes your research better to consider diverse perspectives

It is required for funding opportunities, and increasingly for publication



What *is* consultation?

Consultation is establishing whanaungatanga
relationships

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

What *is* consultation?

Consultation is establishing whanaungatanga
relationships

“You don’t just meet someone at the pub and marry them the next day”

“Do you even want to marry them? There are ups and downs along the way”

“Relationships don’t start or end easily”

‘Community Engagement – More than just a focus group’ – Dr. Anna Rolleston

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

What did consultation look like?

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

What did consultation look like?

Started with the University of Otago Ngāi Tahu Research
consultation committee

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

What did consultation look like?

Started with the University of Otago Ngāi Tahu Research consultation committee



NGĀI TAHU RESEARCH CONSULTATION COMMITTEE
TE KOMITI RAKAHAU KI KAI TAHU

The Committee considers the research to be of interest and importance.

The Committee notes that this research is based on Hector's Dolphin (upokohue), a taonga species under the Ngāi Tahu Claims Settlement Act 1998; Sections 287, 293 and 294, Schedule 97. As such appropriate consultation is mandated through Te Rūnanga o Ngāi Tahu and asks if consultation has been carried out.

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

What did consultation look like?

Started with the University of Otago Ngāi Tahu Research consultation committee

Wrote up an email to introduce myself and the aims of the project, and ask if there were any issues or anything else that should be considered

background

why consultation?

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consultation look
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*what could be
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Shot emails out to individuals/paptipu rūnaka/hapū/iwi around the country (n = 43)

background

why consultation?

*what did
consultation look
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*what could be
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What did consultation look like?

Started with the University of Otago Ngāi Tahu Research consultation committee

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Shot emails out to individuals/paptipu rūnaka/hapū/iwi around the country (n = 43)

-- Followed up by email and phone after a few weeks (n = 185)

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Whakawhanaungatanga important *Relationships*

- Get an introduction if possible

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Whakawhanaungatanga important *Relationships*

- Get an introduction if possible



<http://www.tkm.govt.nz/>

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Whakawhanaungatanga important *Relationships*

Subject: [...] interest in genome sequencing project of upokohue (Hector's dolphins)?

Tēnā koutou, *Hello all* *mini-pepeha*

Ko Alana ahau, ko Ngāpuhi te iwi, ko Te Hikutu te hapū. Nō Tāmaki Makaurau ahau, ēngari kei Ōtepoti ahau e noha ana.
My name is Alana Alexander, and I am a postdoctoral research fellow in the Department of Anatomy at the University of Otago, although I'm originally from up north.

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Whakamāori tō pūtaiao

Translate your science

I'm in the process of getting a project off the ground looking at Hector's dolphins (*ko waiaua, ahoaho, pehipehi, tūpoupou, tutumairekurai, me upokohue* **ngā ingoa Māori** *mō Hector's dolphin*) and utilising genomics to look at their biological **Māori names** *whakapapa* and changes in population size through time. **genealogy/connections**



background

why consultation?

what did
consultation look
like?

what could be
improved?

Whakamāori tō pūtaiao

*genealogy/
connections*

Translate your science

*guardianship/
obligations*

We've suggested this project could contribute to **kaitiakitanga** as the use of genomes and microbiomes (the genomes of the little bugs that live on the dolphins) will reveal the deep-time

whakapapa of the dolphins and show how their populations may have responded to past events such as the last glacial maximum. Information about the long-term population sizes of these subspecies could assist **mana whenua** in assessing recovery of populations from human influences (e.g. bycatch in monofilament gill nets).

*iwi and hapū who have
traditional authority over land*

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Tone important

"Consultation does not mean negotiation or agreement. It means: setting out a proposal not fully decided upon; adequately informing a party about relevant information upon which the proposal is based; listening to what the others have to say with an open mind (in that there is room to be persuaded against the proposal); undertaking that task in a genuine and not cosmetic manner. Reaching a decision that may or may not alter the original proposal." -- Justice McGechan

<https://www.otago.ac.nz/administration/policies/otago003272.html>

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

*Hector's
dolphin*

Tone important *country*

Upokohue samples from all around the **motu** were previously collected (from strandings and biopsies) with permission from local **iwi/hāpu**, **papatipu rūnanga** given for doing downstream genetic analyses (including genome sequencing) before the samples were taken, so this is not consultation for a DOC permit to do sampling or anything like that. However, I'm keen to make sure that any concerns, questions and suggestions that relevant **hapū** (I'm *sub-tribe* hoping to use samples from multiple places around the **motu**) have about specifically sequencing the genome are addressed before I get this project underway, especially as **upokohue** are **taonga**.

tribe *ancestral land council* *treasured*

background

why consultation?

*what did
consultation look
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*what could be
improved?*

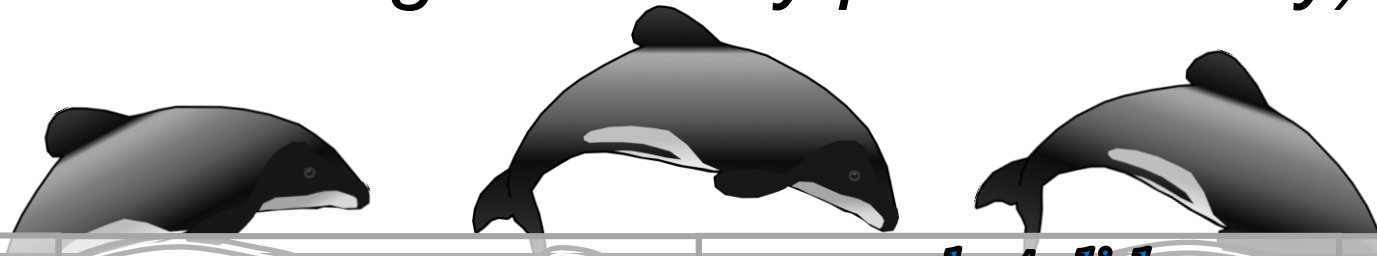
Tone important

North Island

The plan, subject to feedback, is to sequence a Māui dolphin from **Te Ika-a-Maui** and a Hector's dolphin from **Te Waipounamu** to get good quality genomes, and then to resequence a few more dolphins from around the **motu** using these good quality genomes as a scaffold to organize the DNA data of these other samples against. Some of the samples (~5 or so) that will be useful to sequence (because of where they are from, and because they were sampled not too long after they passed away) are from [...]'s **rohe.**

boundaries

country



background

why consultation?

what did
consultation look
like?

what could be
improved?

however

Tone important

The Pākehā world

*A few things that I am already aware of and will be careful to avoid: no tissue will go overseas, and no information that we generate as part of this study will be patented (we are doing it purely to try and find out helpful information about the dolphins). I will also be following Matua Karaitiana's guidelines for tikanga around these samples (<https://www.taiuru.maori.nz/wp-content/uploads/KTaiuru-Presentation.pdf>), particularly appropriate karakia, poroporoaki, and pōwhiri. **Heoi anō** I was raised in **Te Ao Pākehā** so please advise if there is anything you think I am missing (as I'm still very much on a **haerenga** to claw my **reo** and **tikanga** back!).*

journey language protocols

background

why consultation?

*what did
consultation look
like?*

*what could be
improved?*

Allow sufficient time...

If folks are OK with what I am planning on doing, I am hoping to obtain the loan of samples from the University of Auckland in mid-October, so if you have concerns or criticisms (or if you think I should also be in contact with other people in regards to this), it would be great if I could hear from you on or before September 30th. However, please let me know if you need more time to think about things. If you'd like to talk/chat/email about this further, I'd be delighted to hear your thoughts, and thanks for your time reading this (epically long!) email. I've also attached the proposal in case you want some more details on the science side of things.

background

why consultation?

what did
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what could be
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Whakamāori tō pūtaiao

Translate your science

*We've suggested this project could contribute to **kaitiakitanga** as the use of genomes and microbiomes (the genomes of the little bugs that live on the dolphins) will reveal the **deep-time whakapapa** of the dolphins and show how their populations may have responded to past events such as the last glacial maximum. Information about the long-term population sizes of these subspecies could assist **mana whenua** in assessing recovery of populations from human influences (e.g. bycatch in monofilament gill nets).*

background

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what could be
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Don't presume

*I'm in the process of getting a project off the ground looking at Hector's dolphins (**ko waiaua, ahoaho, pehi, tūpoupou, tutumairekurai, me upokohue ngā ingoa Māori mō Hector's dolphin**) and utilising genomics to look at their biological **whakapapa** and changes in population size through time.*

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“I hadn't heard of any of these names”
(aihe, pahu)

background

why consultation?

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Don't presume

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background

why consultation?

what did
consultation look
like?

what could be
improved?

Add some koha

gift



background

why consultation?

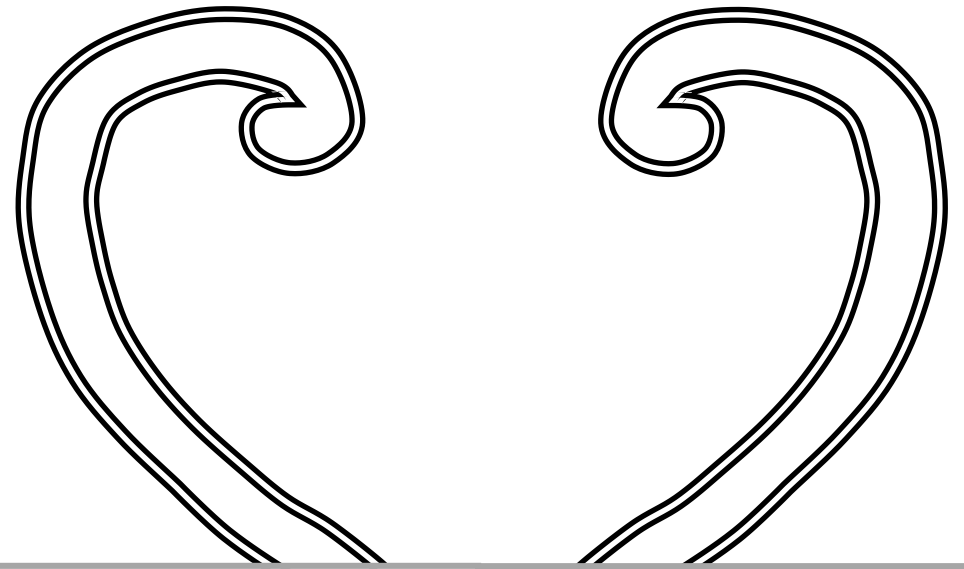
*what did
consultation look
like?*

*what could be
improved?*

Add some koha
gift



Face to face
**Kanohi ki te
kanohi, if
possible**



background

why consultation?

*what did
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Disclosure of risks

When genomic data is published internationally* there will be

- Loss of data sovereignty
- Loss of rangatiratanga
- Loss of kaitiakitanga

* Uploaded onto GenBank,
published in an international
journal

background

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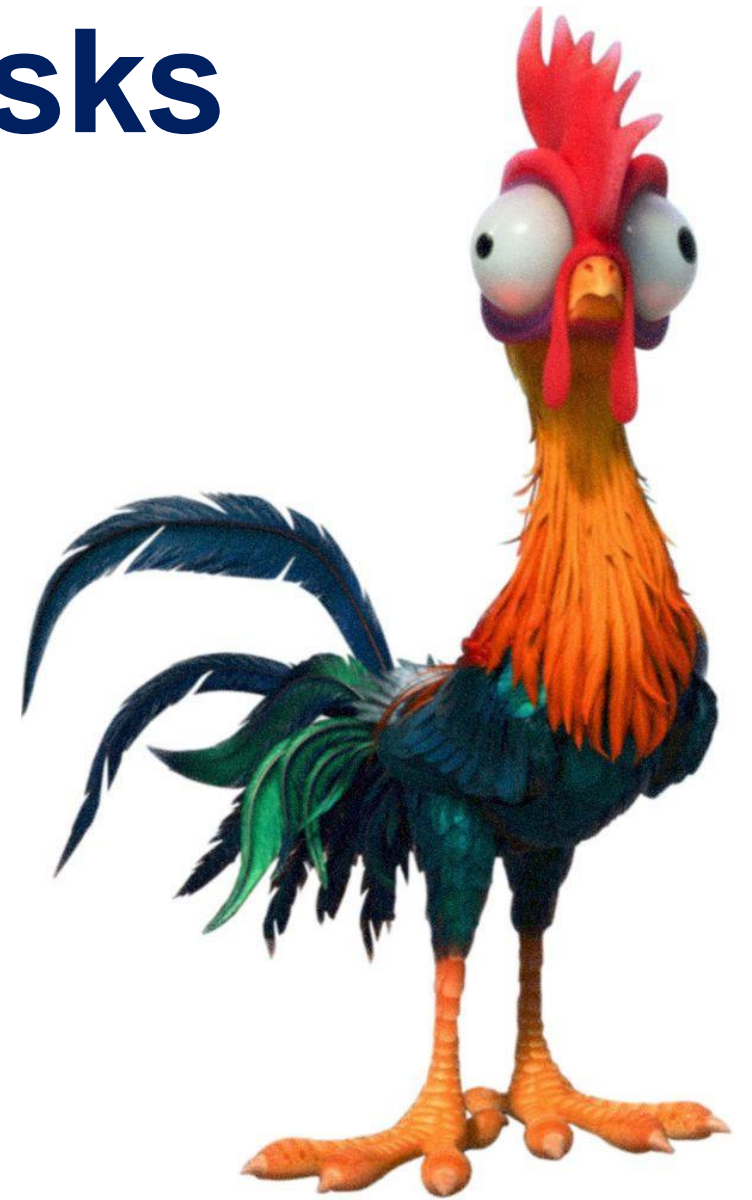
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**genomics
aotearoa**



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The tuatara genome: insights into vertebrate evolution from the sole survivor of an ancient reptilian order

Neil J. Gemmell^{1*}, Kim Rutherford¹, Stefan Probst^{2,3}, Marc Tollis^{4,5}, David Winter⁶, J. Robert Macey⁷, David L. Adelson⁸, Alexander Suh⁹, Terry Bertozzi^{8,10}, José H. Grau^{11,12}, Chris Organ¹³, Paul P. Gardner¹⁴, Matthieu Muffato¹⁵, Mateus Patricio¹⁵, Konstantinos Billis¹⁵, Fergal J Martin¹⁵, Paul Flicek¹⁵, Bent Petersen¹⁶, Lin Kang¹⁷, Pawel Michalak¹⁷⁻¹⁹, Thomas R. Buckley^{20,21}, Melissa Wilson⁴, Yuanyuan Cheng²², Hilary Miller²³, Ryan K. Schott²⁴, Melissa Jordan²⁵, Richard Newcomb²⁵, José Ignacio Arroyo²⁶, Nicole Valenzuela²⁷, Tim A. Hore¹, Jaime Renart²⁸, Valentina Peona⁹, Claire R. Peart^{9,29}, Vera M. Warmuth^{9,29}, Lu Zeng⁸, R. Daniel Kortschak⁸, Joy M. Raison⁸, Valeria Velásquez Zapata²⁷, Zhiqiang Wu²⁷, Didac Santesmasses³⁰, Marco Mariotti³⁰, Roderic Guigó³⁰, Shawn M. Rupp⁴, Victoria G. Twort^{20,21}, Nicolas Dussex¹, Helen Taylor¹, Hideaki Abe¹, James M. Paterson³¹, Daniel G. Mulcahy³², Vanessa L. Gonzalez³², Charles G. Barbieri⁷, Dustin P. DeMeo⁷, Stephan Pabinger³³, Oliver Ryder³⁴, Scott V. Edwards³⁵, Steven L. Salzberg³⁶, Lindsay Mickelson³⁷, Nicola Nelson³⁷, Clive Stone³⁸, Ngatiwai Trust Board³⁸

**genomics
aotearoa**

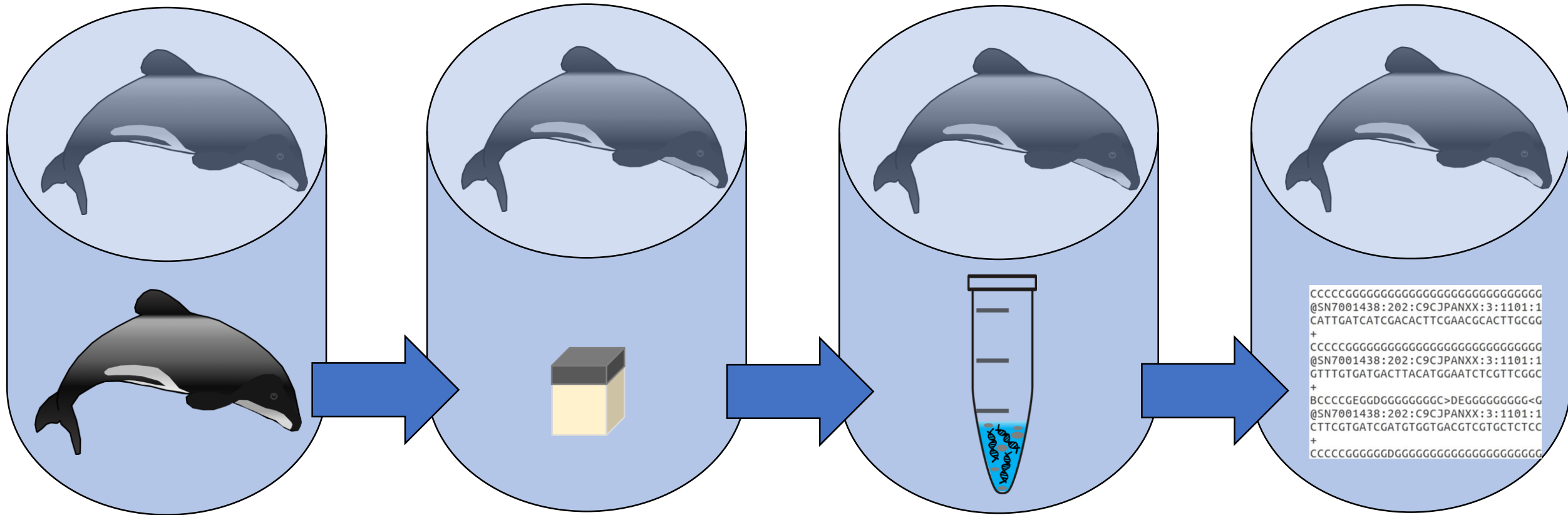
background

why consultation?

*what did
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*what could be
improved?*

Consultation outcomes



background

why consultation?

*what did
consultation look
like?*

what could be improved?

Whakarāpopoto

summary

Consultation is establishing whanaungatanga
relationships

- Whakawhanaungatanga [relationships] important
- Whakamāori tō pūtaiao [translate your science]
Kaua e māhaki: don't flaunt your knowledge
- Tone important: "listening to what the others have to say with an open mind"
Kaua e takahia te mana tangata: don't trample the integrity of others

background

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Whakarāpopoto

summary

Consultation is establishing whanaungatanga
relationships

- Allow sufficient time
- Don't presume: be informed by the folks you are consulting with
- Add some koha
- Kanohi ki te kanohi [face to face], if possible
- Disclosure of risks

background

why consultation?

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What *is* consultation?

Consultation is establishing whanaungatanga
relationships

“You don’t just meet someone at the pub and marry them the next day”

“Do you even want to marry them? There are ups and downs along the way”

“Relationships don’t start or end easily”

‘Community Engagement – More than just a focus group’ – Dr. Anna Rolleston

background

why consultation?

*what did
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Thanks!

alana.alexander@otago.ac.nz

 @laninsky

- Awarua Rūnanga, Ngāi Tahu Research Consultation Committee, Kāti Huirapa Rūnaka ki Puketeraki, Keelan Walker, Kevin Abbott (Wayne), Ngāi Tai ki Tāmaki, Ngāti Apa ki te Rā Tō, Ngāti Kōata, Ngāti Kuia, Ngāti Maru (Hauraki), Ngāti Rārua, Ngāti Tama ki Te Tau Ihu, Ngāti Tamaoho, Ngāti Tamaterā, Ngāti te Ata, Ngāti Toa Rangatira, Ngāti Whātua, Ōnuku Rūnanga, Ōraka-Aparima Rūnaka, Peter Meihana, Rangitāne o Wairau, Te Ākitai Waiohū, Te Atiawa o Te Waka-a-Māui, Te Iwi o Te Roroa, Te Kāhui o Taranaki Trust, Te Kawerau a Maki, Te Ngāi Tūāhuriri Rūnanga, Te Rūnanga o Arowhenua, Te Rūnanga o Hokonui, Te Rūnanga o Kaikōura, Te Rūnanga o Koukourārata, Te Rūnanga o Makaawhio, Te Rūnanga o Moeraki, Te Rūnanga o Ngāi Tahu, Te Rūnanga o Ngāti Waewae, Te Rūnanga o Ōtākou, Te Rūnanga o Rāpaki, Te Rūnanga o Waihao, Te Taumutu Rūnanga, Te Uri o Hau, Waihōpai Rūnaka, Waikato-Tainui, Wairewa Rūnanga
- Department of Conservation and the public for collecting samples, co-authors on the science side of the project, Gemmell Lab, funding:

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OTAGO
Te Whare Wānanga o Ōtāgo
NEW ZEALAND

Māori led, rather than 'just' consultation

<https://bioheritage.nz/about-us/vision-matauranga/>

1. Research with no specific Māori component
2. Research specifically relevant to Māori
3. Research involving Māori
4. Māori-centred research
5. Kaupapa Māori research



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