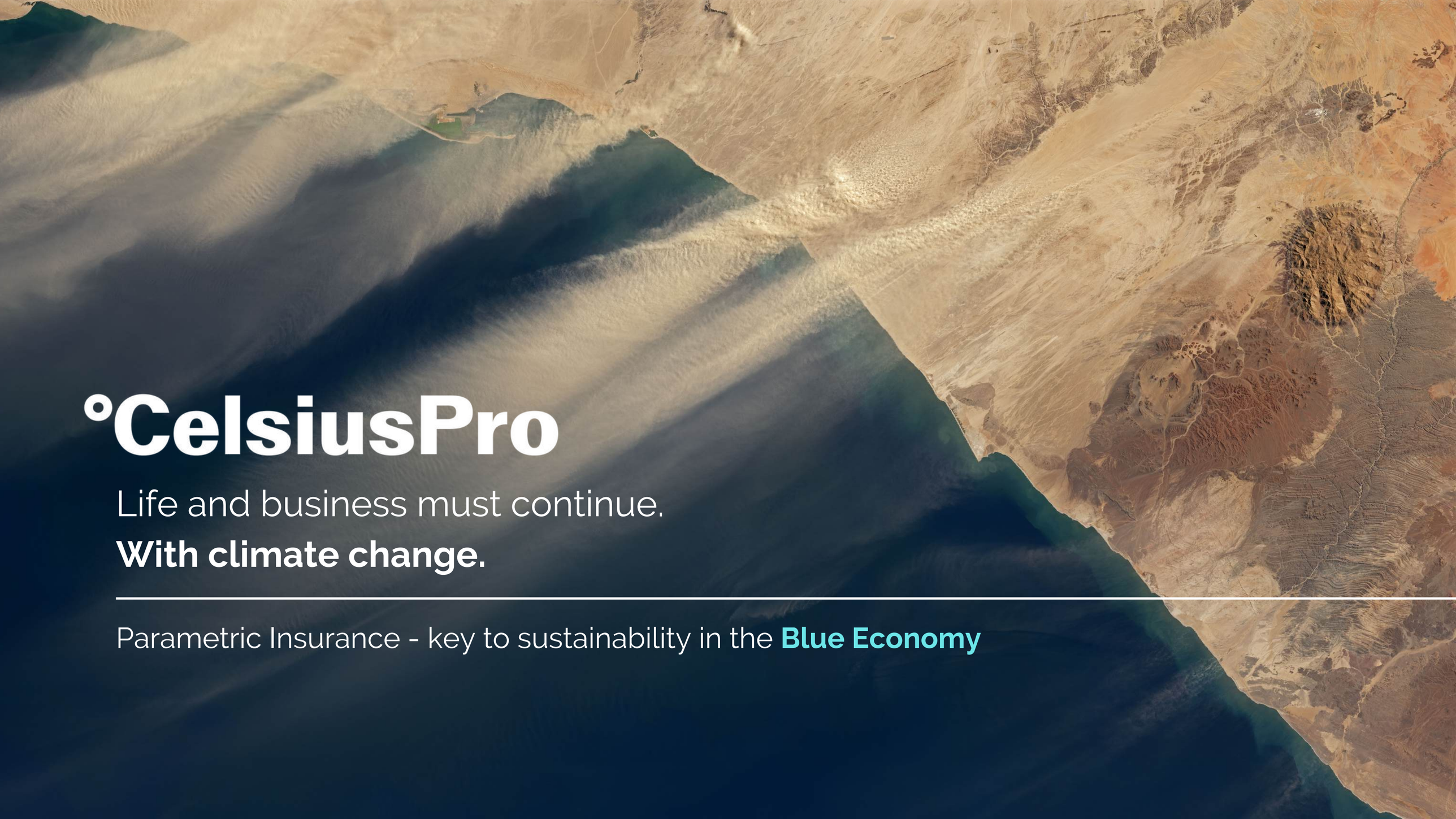

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Life and business must continue.

With climate change.

Parametric Insurance - key to sustainability in the **Blue Economy**

You learn a lot being in the risk transfer market for 40 years

Dr. Jonathan Barratt

Parametric/Index Based insurance is used in the market to build resilience against catastrophic events and events that affect yield.

There is no reason that this insurance cannot be used to help industries involved in the Blue Economy.

With your help, industry-appropriate insurance can be **streamlined to make sense (FOO 2025).**

Why do we exist?

We aim to ensure life and business worldwide continue. With climate change.

What is our mission?

We aim to elevate parametrics from fringe to centre stage in climate risk protection.

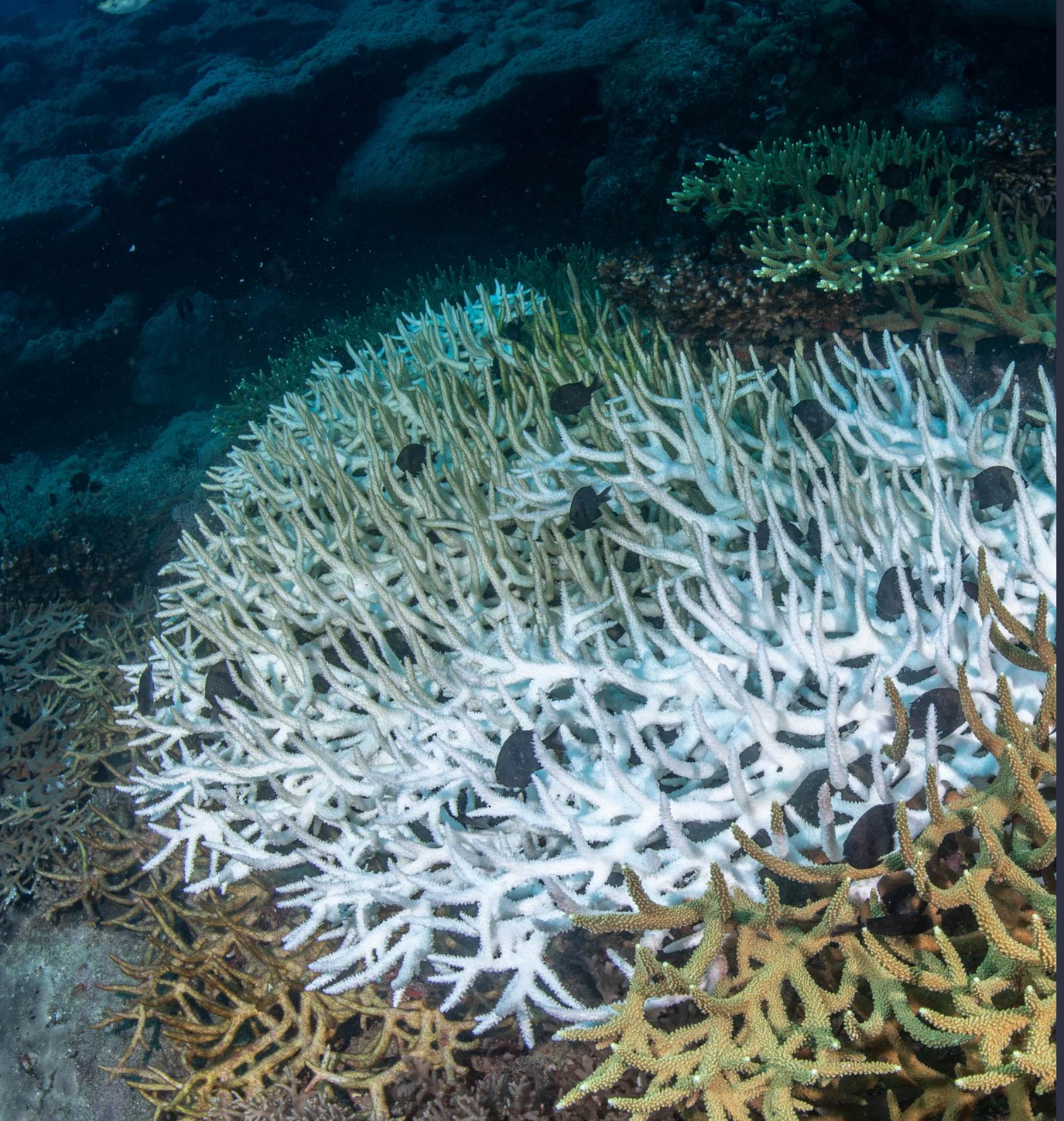
“

We have seen devastating impacts of marine heatwaves on our kelp forests, seagrass meadows and coral reefs, and this **has affected the ecological, economic and cultural benefits Australian’s derive from the oceans**

These extreme events are having a **profound effect on us a marine nation.**

”

Professor Thomas Wernberg



Marine heatwaves have already caused **mass deaths of key species along 45 percent of Australia's coastline.**

Australia's giant kelp forests have declined by **more than 90 percent due to ocean warming.**

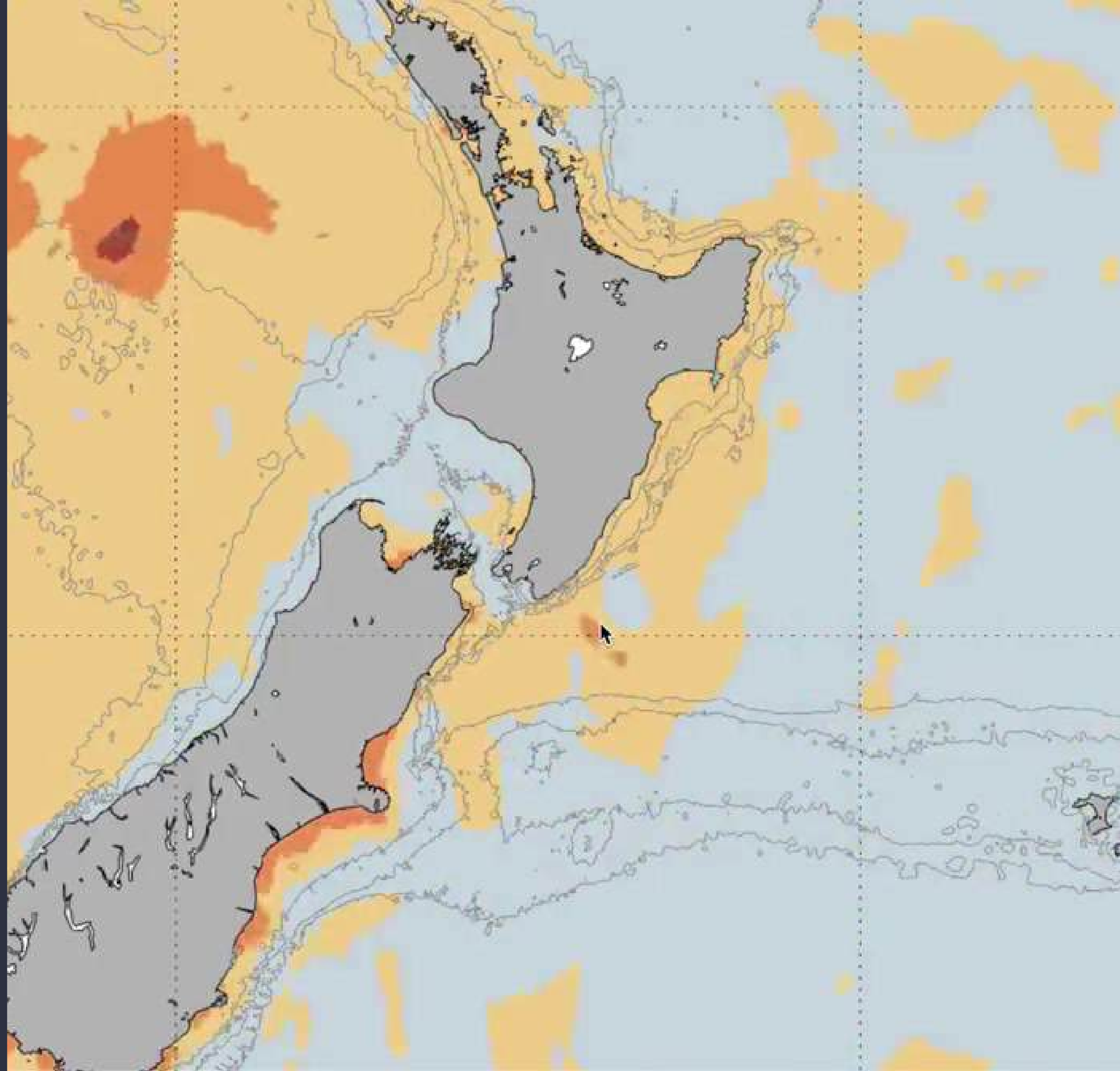
The incidence of marine heatwaves has doubled since the 1980s.

You already know the effects that Marine Heat Waves (MHW) have on the Blue Economy, &
Since 2023 we have been collaborating on researching solutions.

Whilst the long-term ecological impacts are a complex problem to solve,

We see a solution to the economic impacts that affect small and large businesses using

Parametric Insurance




Insurance Works
Insurtech Enables

Parametric Insurance

There are two types of insurance we use in primary production:

1. **Indemnity policies:** These take the form of traditional insurance covers such as fire, storm and tempest, hail, etc.
2. **Non-indemnity policies:** such as parametric index insurance which covers events that cause the losses rather than insuring the value of the asset. The insurance is based on the expected loss of an event occurring that causes the damage.

What is Parametric Insurance?

Parametric Insurance is **bound by predetermined parameters** (triggers and thresholds), all agreed up-front when the policy is purchased. If the parameters are met, the policy is triggered, and a payout is made. **Claims are processed quickly**, which means businesses **have income in the immediate aftermath** of an event to meet the challenges of re-establishing their income flow after an adverse weather event.

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What are parametric or index based risk management products?

Indemnity insurance settlement process (the old way)

Weather Related Insurance Event Occurs

Insured Assess their Damge

Insured Submits Claim

Insurer reviews the claim

Insurer assesses the claim

Payout is based on Insurer assessment

Parametric Insurance Settlement Process (the new way)

Client and Insurer negotiate pre-determined cover amount and trigger for required peril

Pre-determined trigger event occurs

3rd party verifies trigger has been met (e.i BOM)

Pre-determined payout is issued

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Two years ago at FOO, we asked a question.

Could we insure Aquaculture against the impacts of MHWs?

Research Project

To develope an alternative risk transfer mechanism to **help build resilience to adverse climate events** that affect marine industries.

Partners and Collaboration

- **CSIRO** (Alistair and Jason),
- **BOM** (Claire),
- **CelsiusPro** (myself) and,
- **UniSQ**

The manuscript is currently being peer reviewed.

Parametric Insurance can be used in the blue economy

Newfoudland Case Study

In August–September 2019, a marine heatwave (MHW) triggered a record mortality event at Atlantic salmon farms off the southern coast of Newfoundland, Canada, **killing 2.6 million fish and wiping out roughly half of the farms' stock and income.**

We analysed the Newfoundland case to assess the **applicability of terrestrial index insurance methodologies to marine contexts**.

Insurance Structure

Fortune Bay, Newfoundland.

Pen ---------- Circumference 100m. Depth 15m.
Price ---------- 110,000kg of adult fish.
Value at risk -- The wholesale price US6.50 per kg
110,000kg x US6.50kg = **US715,000.**

Aim ---------- To insure losses of adult fish should the SST consistently exceed 18˚C on any one day.
Structure ------ CDD Tmax applied to sea surface temperatures at 0.5m.
Geo Location-- Grid 47.49˚N, 55.70˚W
Threshold ----- SST of 18˚C or above
Risk Period ---- July through August
Cover length -- Cover length: 10˚CDDs
Tick value ----- Tick value: $50,000/degree
Sum insured -- Sum insured: US$500,000

If the temperature is recorded above 18˚C on any day, at the end of the risk period, **all the degrees above 18˚C are added up.**

The number of degrees is then multiplied by the tick value, resulting in a payout.

Example:

Between 15-21 August 2019 temperatures exceeded 18˚C (18.2˚,18.4˚,18.6˚,18.8˚, 19.0˚ 18.4˚ and 18.2˚) cumulated to a total of 3.6 CDDs resulting in a **payout of US$180,000**.

The loss associated with the actual temperatures was US$214,500. The insurance compensated 83.7% of the loss caused by the MHW.

We then applied this structure to Aquaculture Industries in Tasmaina.

Given that aquaculture sustainability is increasingly threatened, **we looked at an index insurance cover for Salmon farming in warming hotspots around Tasmania.**

CDD Tmax Case Study: Salmon Farms

Tasmanian Salmon Industry

The Tasmanian Salmon industry represents one of Australia's most valuable seafood industries.

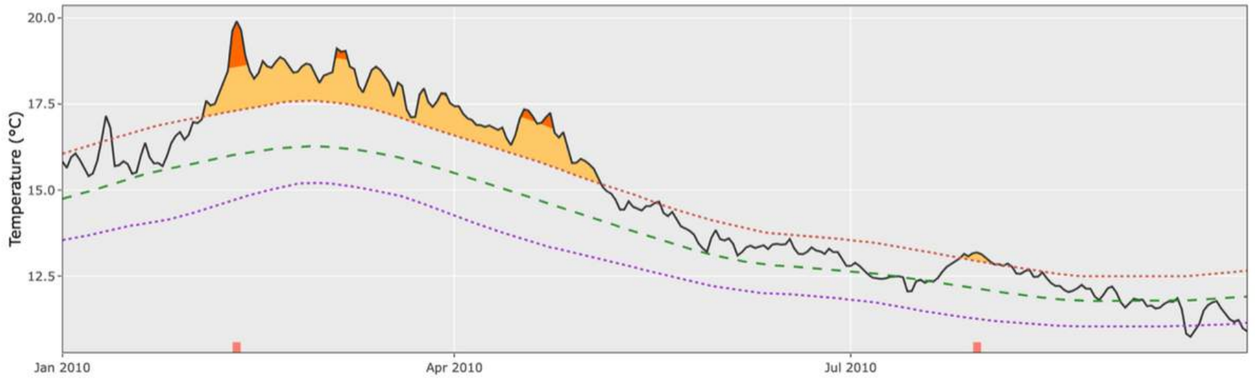
Average temperatures in this region are projected to be **2.8 °C higher than the 1990–2000 average by 2050**

Thermal tolerances are predicted to be exceeded more frequently, which could **lead to degraded fish health, increased disease outbreaks and mortality.**

The salmon industry is considered vulnerable because salmon are currently grown in coastal waters that in some years **exceed a thermal limit of about 18 °C**.

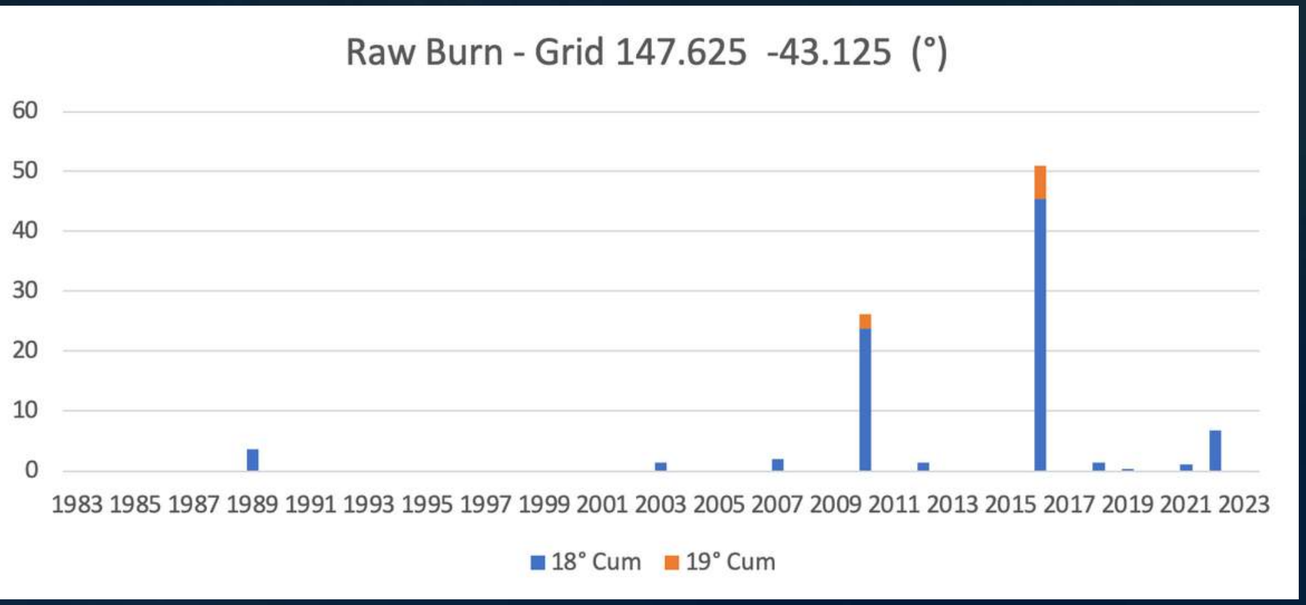
We can design a structure to combat lost income due to these Marine Heat Waves.

CDD Tmax Case Study: Salmon Farm



2010 Marine Heat Wave for grid 147.625, -43.125

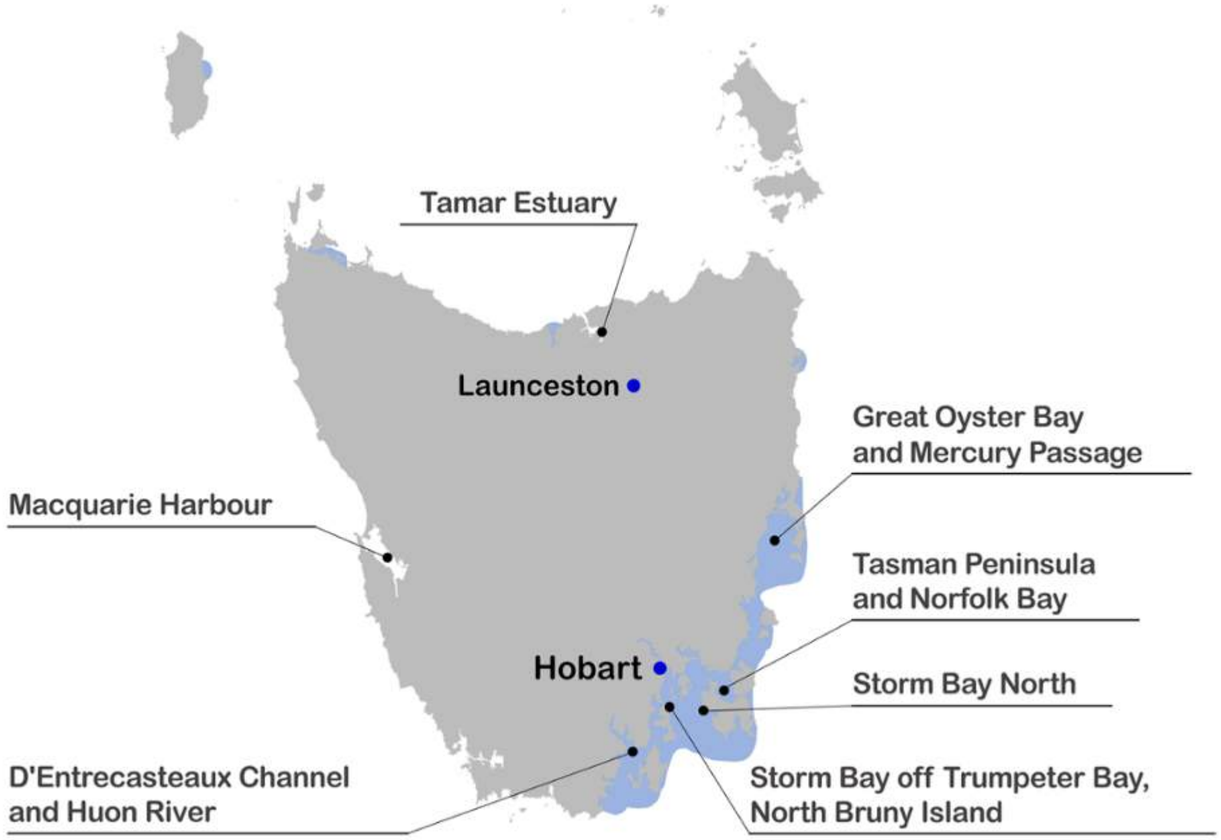
2016 Marine Heat Wave for grid 147.625, -43.125

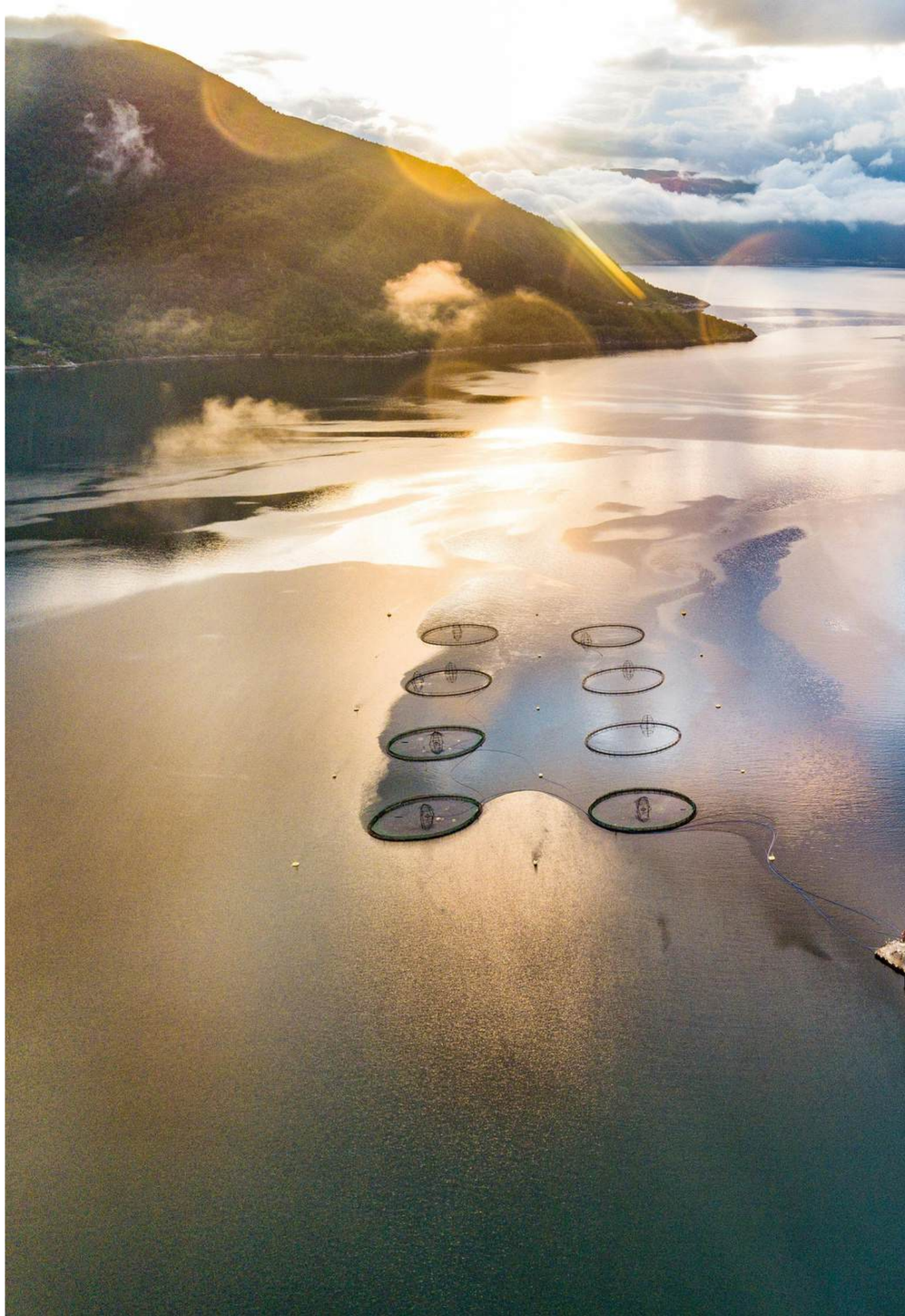


This Tasmanian Salmon Farm reported **significant mortality rates** and **decreased quality of produce** during these Marine Heat Waves. Resulting in loss of income.

This CDD Tmax Cover would have recovered some of these losses

Tasmanian Aquaculture Regions





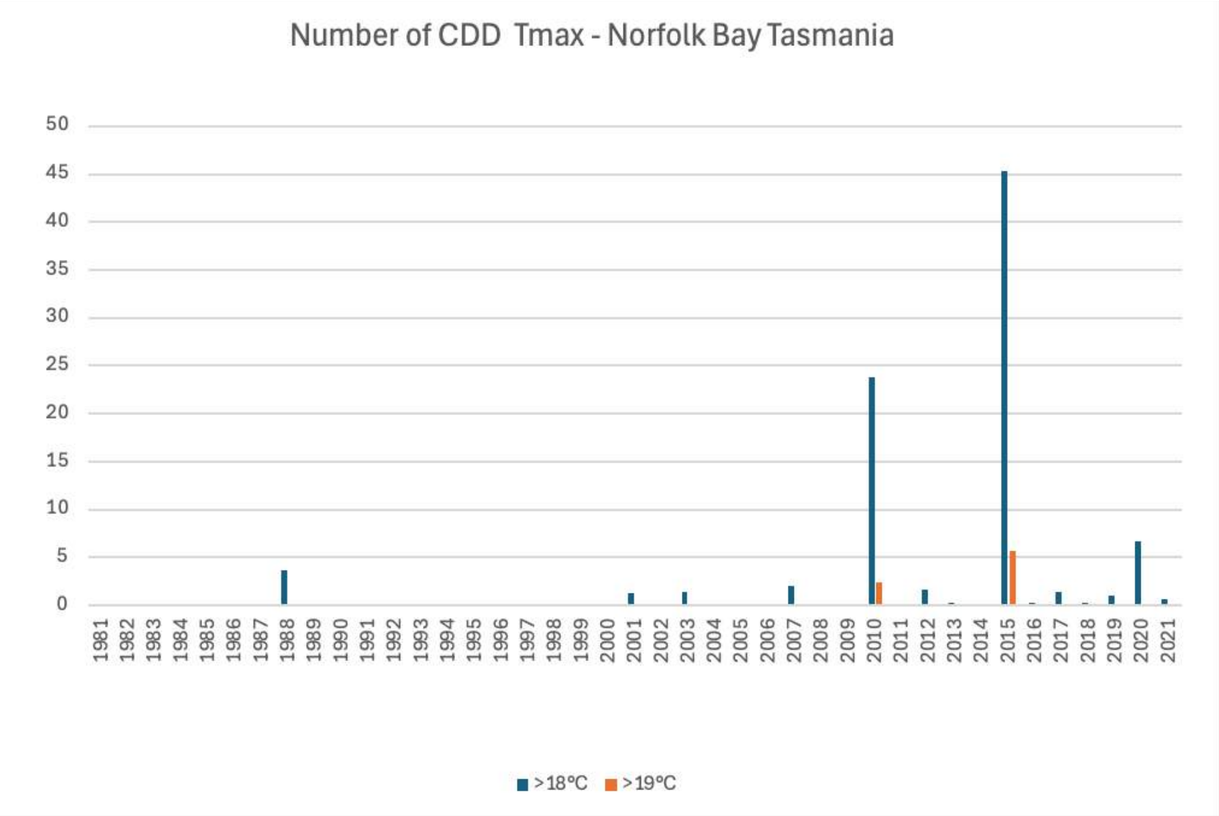
Understanding Basis Risk
in the context of Aquaculture

Design Basis Risk: This arises when the index does not fully capture all relevant parameters or information.

Spatial Basis Risk: This occurs when there is a significant distance between the location of the measurement point and the insured location (Leblois et al., 2014; Ritter et al., 2014).

Temporal Basis Risk: This results from imperfect timing in index measurements ie the event occurring outside the risk period nominated or contract parameters (Deng et al., 2007; Díaz-Nieto et al., 2010).

Norfolk Bay Index Insurance Structure



Risk Period ------- 122 days during December and March

Sum insured ----- AUD$1,000,000

Cover 1---------- AUD$500,000

Cover 2 ---------- AUD$500,000

Trigger 1 ---------- cumulative degrees >18˚

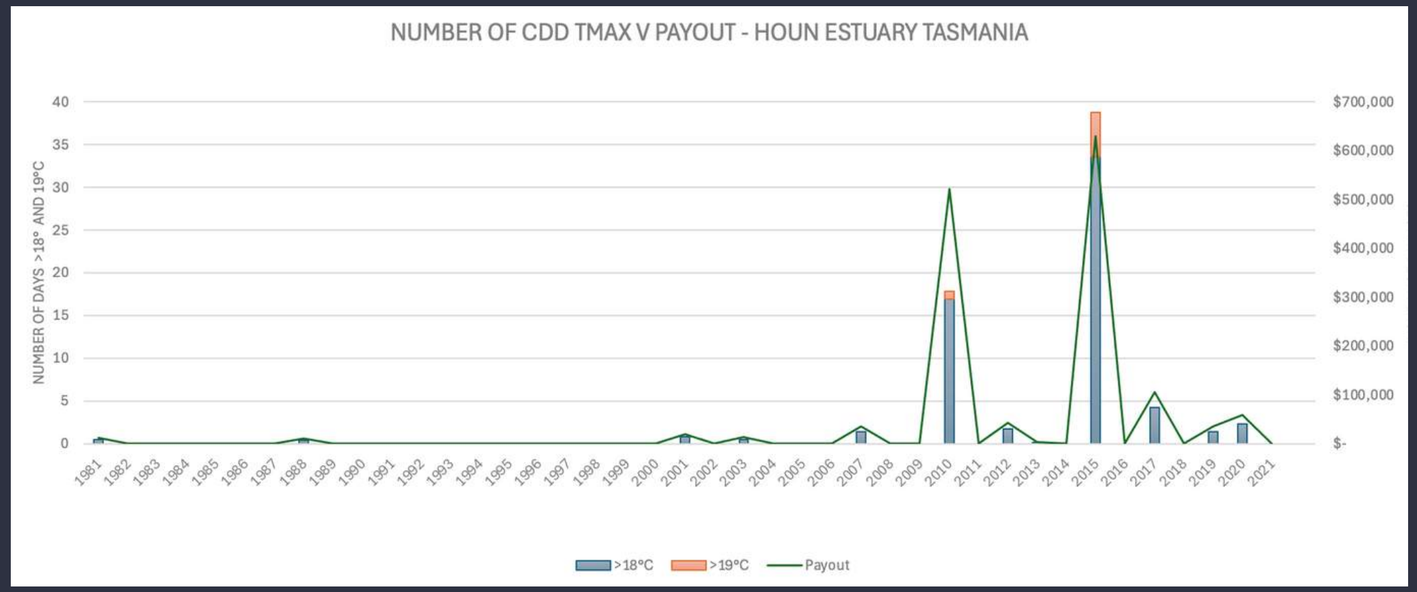
Trigger 2 --------- cumulative degrees >19˚

Cover length ----- 20˚C

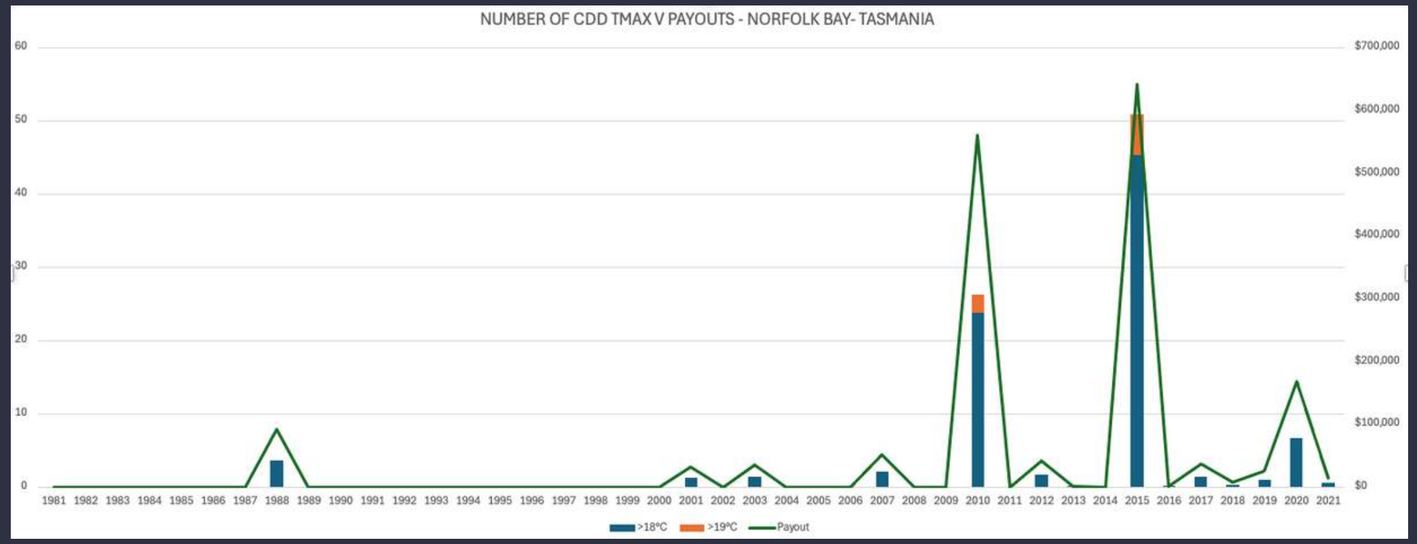
Index Insurance Summary for Tasmanina Salmon Farming

Location	Risk Period	Maximum Historical high C °	Policy	Attachment C°	Tick Value paid /CDD	Cover length CDDs °	Sum Insured	Premium cover	Premium % of sum insured
Norfolk Bay	Dec, Jan, Feb,Mar	19.91	Cover 1	18	$25,000	20	$500,000	16.30%	
			Cover 2	19	$25,000	20	$500,000	4.86%	
							$1,000,000		10.58%
Storm Bay	Dec, Jan, Feb,Mar	19.03	Cover 1	18	$25,000	20	$500,000	10.10%	
			Cover 2	19	$25,000	20	$500,000	3.09%	
							$1,000,000		6.60%
Houn Estuary	Dec, Jan, Feb,Mar	19.99	Cover 1	18	$25,000	20	$500,000	14.96%	
			Cover 2	19	$25,000	20	$500,000	4.66%	
							$1,000,000		9.81%
D'Entrecasteaux Channel	Dec, Jan, Feb,Mar	19.03	Cover 1	18	$25,000	20	$500,000	10.10%	
			Cover 2	19	$25,000	20	$500,000	3.09%	
							$1,000,000		6.60%
Macquarie Harbour	Dec, Jan, Feb,Mar	20.73	Cover 1	19	$10,000	25	$500,000	22.15%	
			Cover 2	20	$10,000	25	$500,000	3.08%	
							$1,000,000		12.62%

Houn Estuary Results



Norfolk Bay Results



Next Step: Testing the Efficiency

To examine the utility of an indexed-based insurance option that could help to financially protect clients, we **measure the efficiency of the insurance, through these 5 tests:**

a)
An economic assessment was made by taking the Average of heatwave Income - (Average of heatwave Income - Premium + Payouts) if the result was less than 0 the insurance was economical

b)
A Premium verses Payout Assessment over 40 yrs . Premiums Paid - Payouts Received > 0 then insurance is economical

c)
Assessment of the volatility of marine income through measuring the standard deviation on incomes

d)
Measurement of whether insurance will increase client's revenue in years during extreme heatwave conditions via a Conditional Tail Expectations (CTE) approach

e)
Assessment of the extent to which a contract reduces downside risk (i.e. does insurance minimise the loss in poor years) via a Mean Root Square Loss (MRSL) approach

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The 5 Essential Ingredients

In order to provide a good parametric Insurance product we require the following:

1. **Historical and Daily independent Data that is recognised globally (BOM)**
2. **Engagement from the Industry to research willingness to buy (structure and affordability)**
3. **Engagement from underwriters to gauge willingness to provide**
4. **Insurtech software to structure and settle policies**
5. **Good Educational process**

If your industry is affected by:

- **Cyclones**
- **Water Temperature (Marine Heat Waves)**
- **Air Temperature**
- **Wind**
- **Droughts**
- **Rainfall**

It can be covered by Parametric Insurance

Making it worthwile

In order to make an insurance policy worthwhile, all stakeholders need to be involved and collaborate to insure the best possible outcome:

1. **We need to make sure the Data is Reliable**
2. **Continuous Research and Development**
3. **Activate and engage Industry Participants**
4. **InsurTech to deliver Price Discovery and Settlement**
5. **Engage Reinsurance Providers**

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Dr.Jonathan Barratt
jonathan@celsiuspro.com.au
0418 384 270
celsiuspro.com