



# Social science and seafood: What do we need for a viable climate future

**Can extreme events help raise awareness and change behaviour?**

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MARINE AND ATMOSPHERIC RESEARCH  
[www.csiro.au](http://www.csiro.au)

February 2020



# Australia pretty good at doing record breaking extreme events

Fires



Floods



Dust storms



Hail storms



It all happened in New South Wales in one month in 2020



# Marine heatwaves also an extreme event

Severe ocean heatwaves are **like bushfires** – they can wipe out sea life across large areas

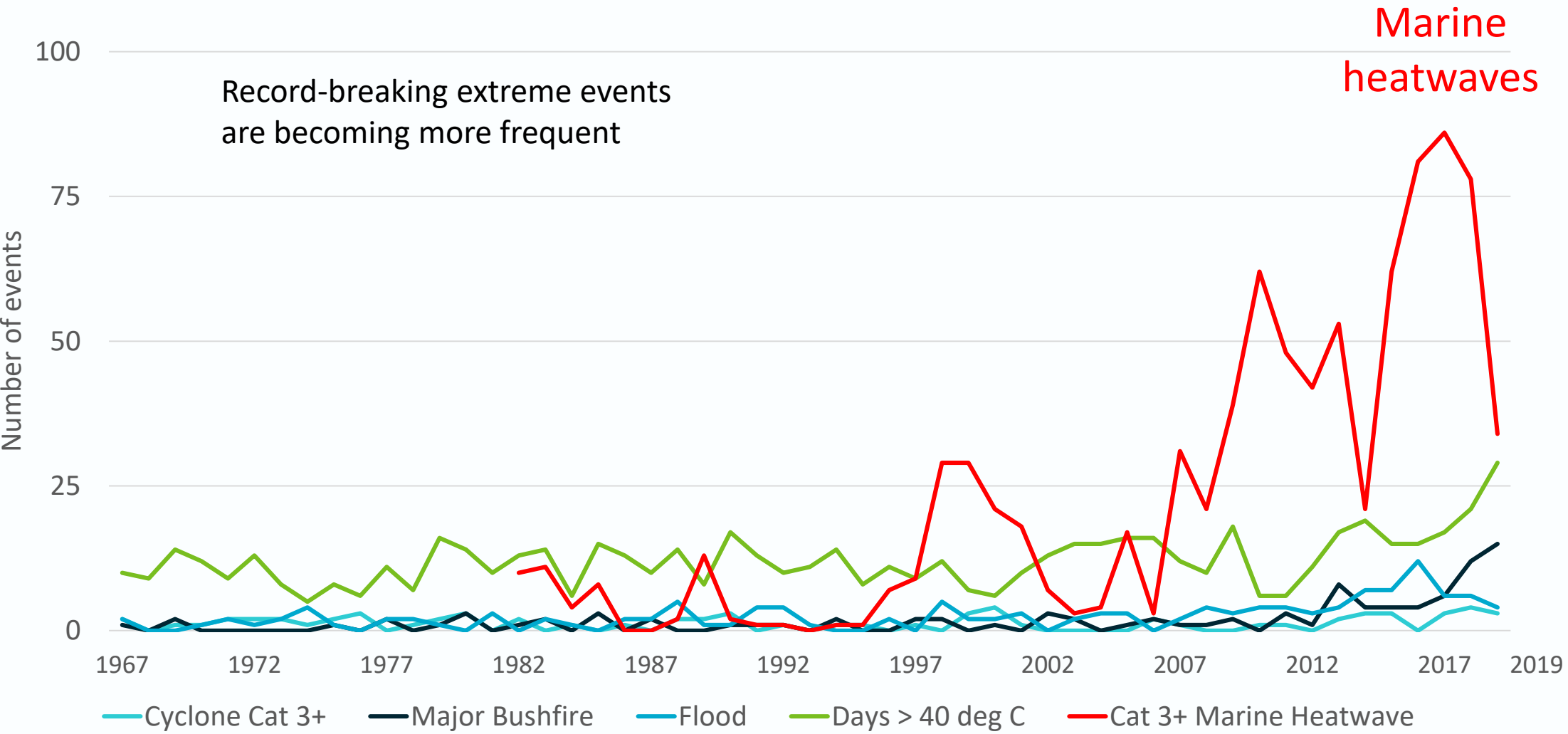


Smale, D.A., Wernberg, T., Oliver, E.C.J. *et al.* Marine heatwaves threaten global biodiversity and the provision of ecosystem services. *Nat. Clim. Chang.* 9, 306–312 (2019).

<https://www.wired.com/story/oceans-are-spiking-a-fever-with-record-heat-waves/>

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# Frequency of extreme events (in Australia)



Data collated by Beth Fulton (CSIRO)  
Frölicher & Laufkötter 2018 Emerging risks from marine heat waves, Nature Communications, (2018) 9:650





# Our experience of marine heatwaves?

(I'm using marine heatwaves and marine extreme events interchangeably)

Compared to land based extreme events, relatively little attention is paid to extreme events in water

Marine animals are disappearing at double the rate of land-based species

For many, marine events are **'Imperceptible'** to direct human experience



<http://www.marineheatwaves.org/tracker.html#>

Eric C. J. Oliver [https://www.climatechange.org.au/sites/default/files/13%20OliverEric\\_MarineHeatWaves.pdf](https://www.climatechange.org.au/sites/default/files/13%20OliverEric_MarineHeatWaves.pdf)

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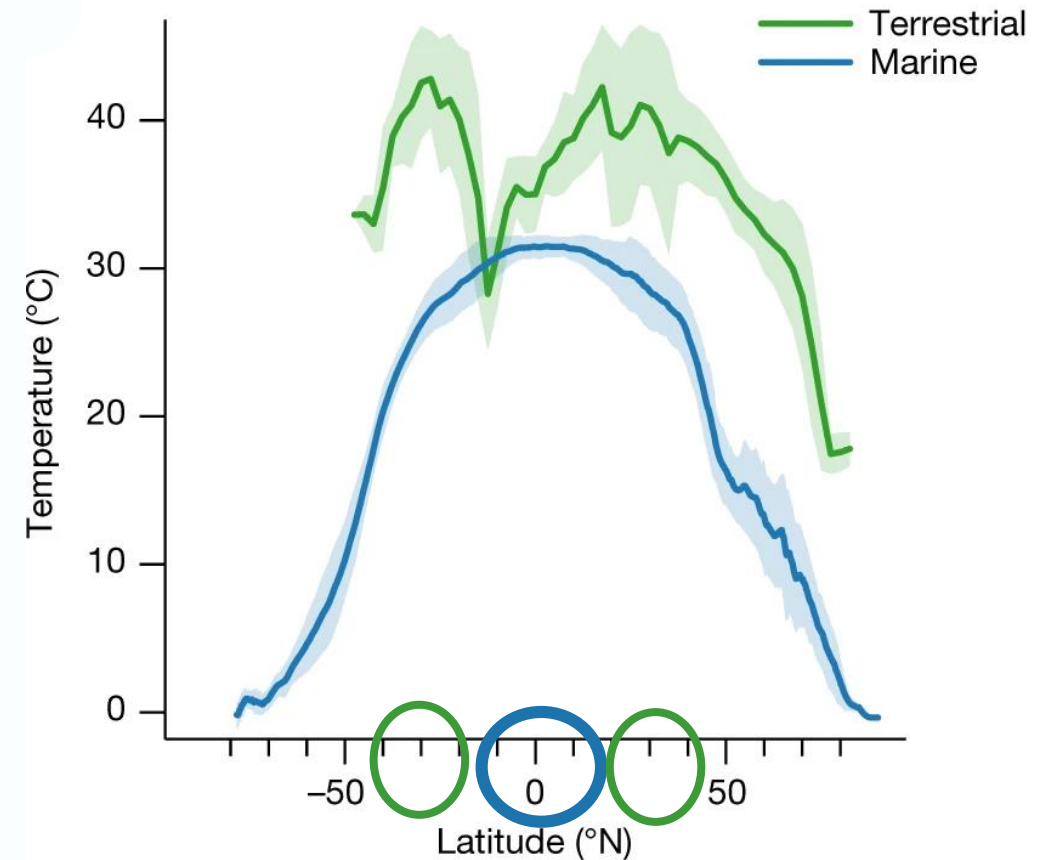


# Warmest extremes are in the tropics

Species near the **equator** are among the **most vulnerable** to global warming and heatwaves

They already live near the **edge** of their heat tolerance

Especially those that live in **shallower** coastal waters (where a lot of fishing happens)



Warmest extremes are at mid-latitudes on land and in the tropics in the ocean.  $n = 1,454$  (land) or  $691,150$  (ocean)

# Local impact of marine heatwaves on seafood

Tropics has high reliance on seafood as source of protein

Locally caught fish are important for livelihood

These regions are generally already disadvantaged

These regions are most impacted.....





# The physics is easy

Hot water floats and cold water sinks

Increase in temperature



Shallower mixing layer

**Thermocline** is more 'hockey-stick like'



Nutrients sink to the bottom

Less nutrients mixed to the surface

Impact on ecology (not so easy)

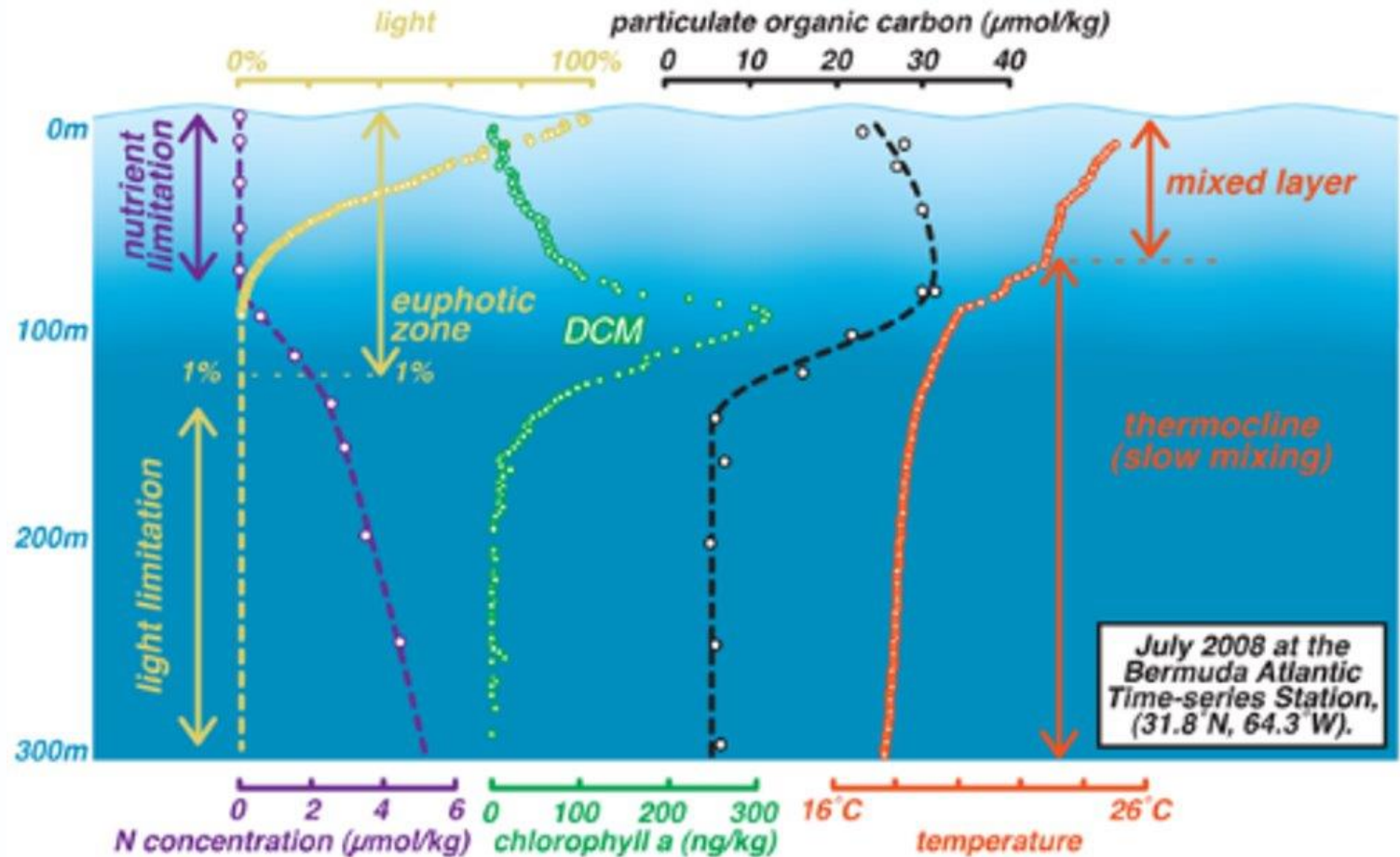


Changes in the vertical structure

Changes in the currents & circulation



Increase in marine heatwaves





# Attributing extreme events to climate change

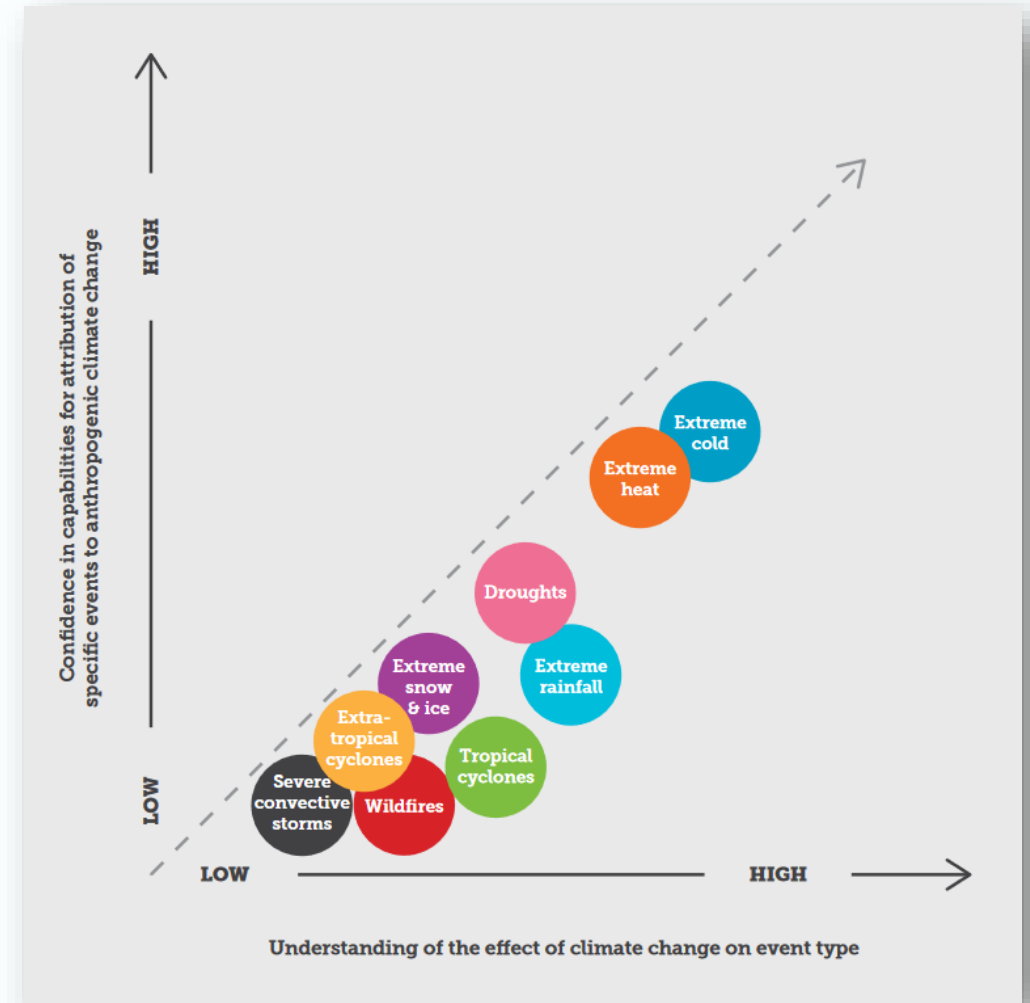
Climate scientist's confidence in the attribution

To do attribution - scientists need

A robust **physical understanding**  
of the mechanisms behind extreme events ✓

High-quality **observations**  
to see if the event changes the  
observational record ✓

Climate **models**  
that can **accurately simulate** and  
**reproduce** extreme events ✓



# Summary so far

- Extreme events getting more **frequent**
- **Marine heatwaves** topping the charts
- **Ecological impact** of marine heatwaves is severe  
Especially around the tropics and inshore
- **People** who are already **vulnerable** are most impacted by marine heatwaves  
Especially in terms of seafood availability
- But marine heatwaves remain **imperceptible** to many  
People are not directly experiencing them and they are not 'in the news'



# People are not making the connection

People **don't know** about marine heatwaves and don't necessarily **make the connections** between marine heatwaves and climate change (that scientists know exists)

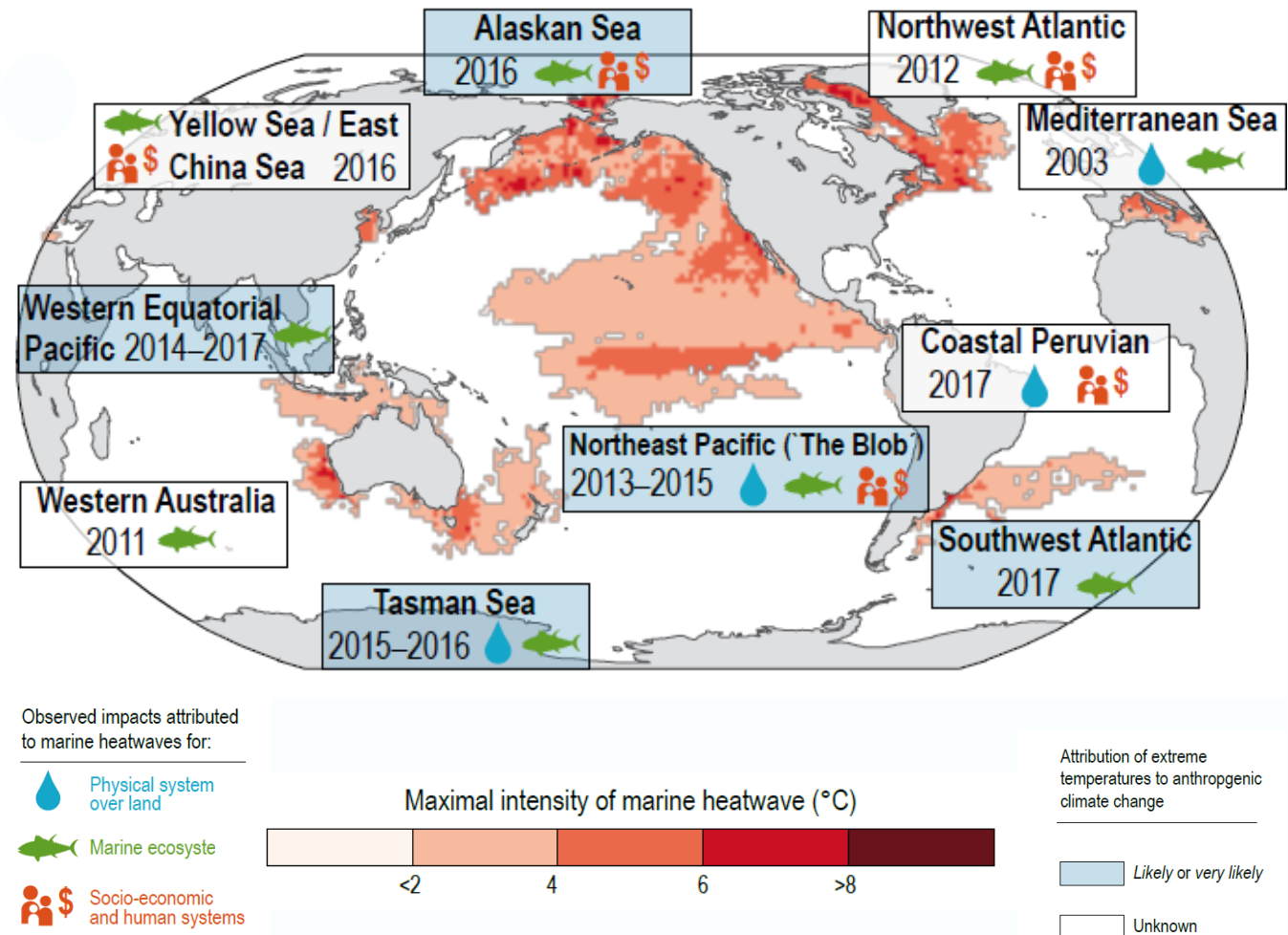
## Need to connect the dots

Connecting the dots between climate change and marine heatwaves is tricky

Connecting the dots doesn't always lead to concern

Concern doesn't always lead to a change in behaviour (adaptation)

But changing behaviour & adaptation is what is needed



Collins et al 2019: Extremes, Abrupt Changes and Managing Risk. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate

Howe, P.D. Feeling the heat is not enough. *Nat. Clim. Chang.* **9**, 353–354 (2019). <https://doi.org/10.1038/s41558-019-0464-2>

# Connecting the dots

Brains are wired to ignore things

## Confirmation bias

The information that we seek out tends to **confirm** what we **already believe**

## Motivated reasoning

We tend to **not scrutinise ideas** that are **contrary to our own**

Linking an extreme events to climate change can send people in the opposite direction and make them even more of a skeptic

**'boomerang effect'**



**Cognitive bias** - we don't do this on purpose; we do it unknowingly



# Connecting the dots – doesn't mean concern

(also impacted by cognitive biases)

## Far into the future

Evolved to pay attention to **immediate threats**. We focus on what might kill or eat us now

## Too big to believe

**Denial** is default for **self-preservation**. Our minds try to **save us** from a **feeling of hopelessness** by pushing aside thoughts of climate change



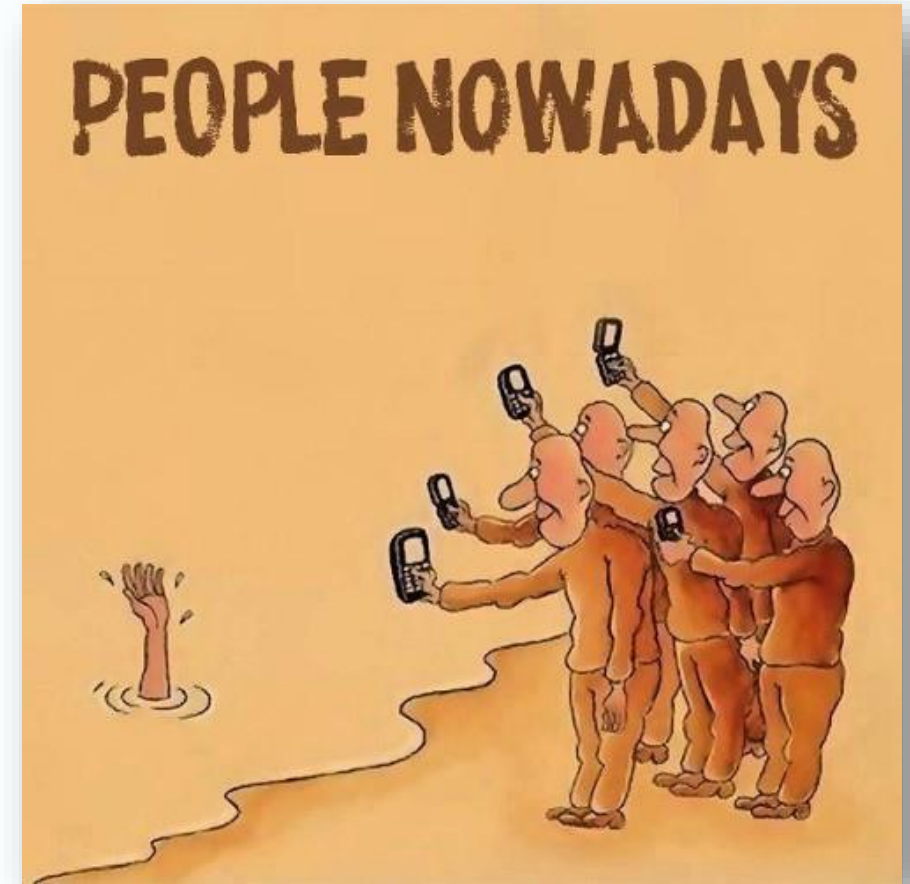
<https://www.lifehacker.com.au/2013/01/how-denial-negatively-affects-your-choices/>

# Connecting the dots – concern doesn't mean action?

## ‘Bystander effect’

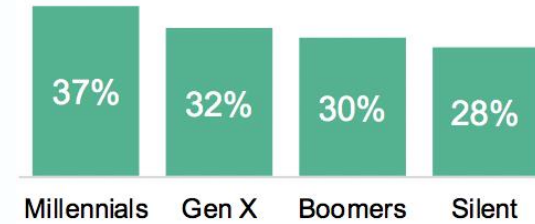
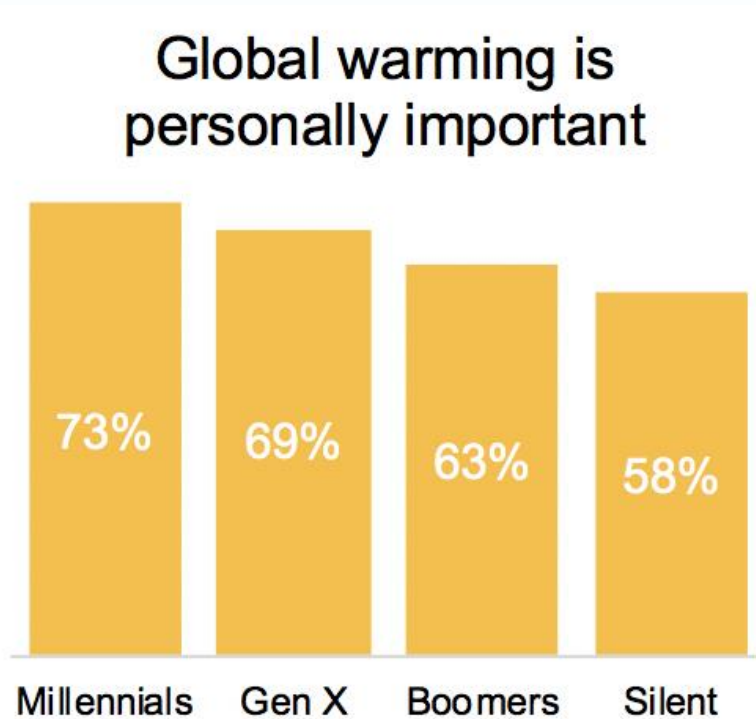
Issues that need **collective action** on a scale that exceeds our (evolutionary) capacities makes us **stand by and do nothing**

We make ourselves believe that **someone else will deal with it**. The larger the group, the more challenging it gets

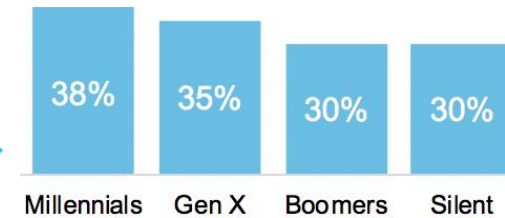




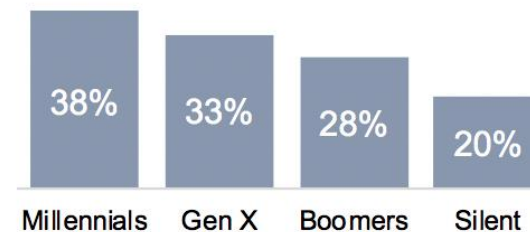
# Concern does not automatically lead to action



Willing to contact government officials about climate issue



Willing to donate money to climate cause



Willing to volunteer for climate cause

# Extreme events can help create action

Extreme events are **low** probability – **high** risk

We under-estimate them because they don't happen often

But when a small probability event has **recently** been **experienced** - all this changes

That experience means we now **over-estimate** the perception of risk

Over-estimation of risk is an **opportunity for change**



<https://m.capitalwatch.com/article-4709-1.html>

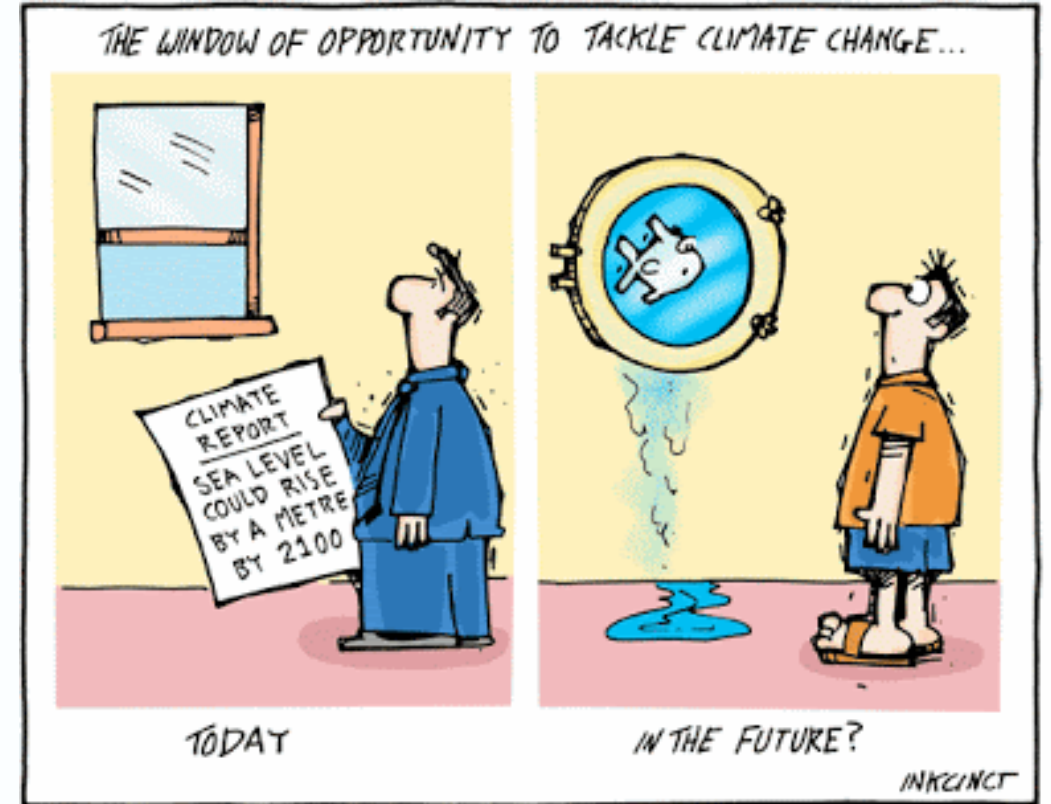
# More frequent extreme events

Because of the 'recency weighting' and the 'personal experience'

peoples **choices** can be influenced

peoples **opinions** can be influenced

peoples **behaviour** can be influenced



Extreme events that people are personally experiencing are 'windows of opportunity' for behaviour change



# The window for behaviour change doesn't last long

Personal experience of extreme event has only a **short-lived** effect

The effect largely disappears after about **three months**

How can marine heatwaves become **more 'experiential'** because they are very frequent and very destructive?



<https://www.businessinsider.com.au/>

# Summary so far

- For people to make a connection between extreme events (marine heatwaves) and climate change is not easy (cognitive biases)
- Changing the level of concern & taking action is also tricky (more cognitive biases)
- But extreme events provide a venue to change behaviour and take action
  - Extreme events getting **more frequent**
  - Small **window of opportunity** to **change** people's **behaviour** after experiencing (high risk – low probability) extreme event

Need to achieve **long term behaviour change** in a relatively short timeframe

Need to **change social norms**

# What are social norms?

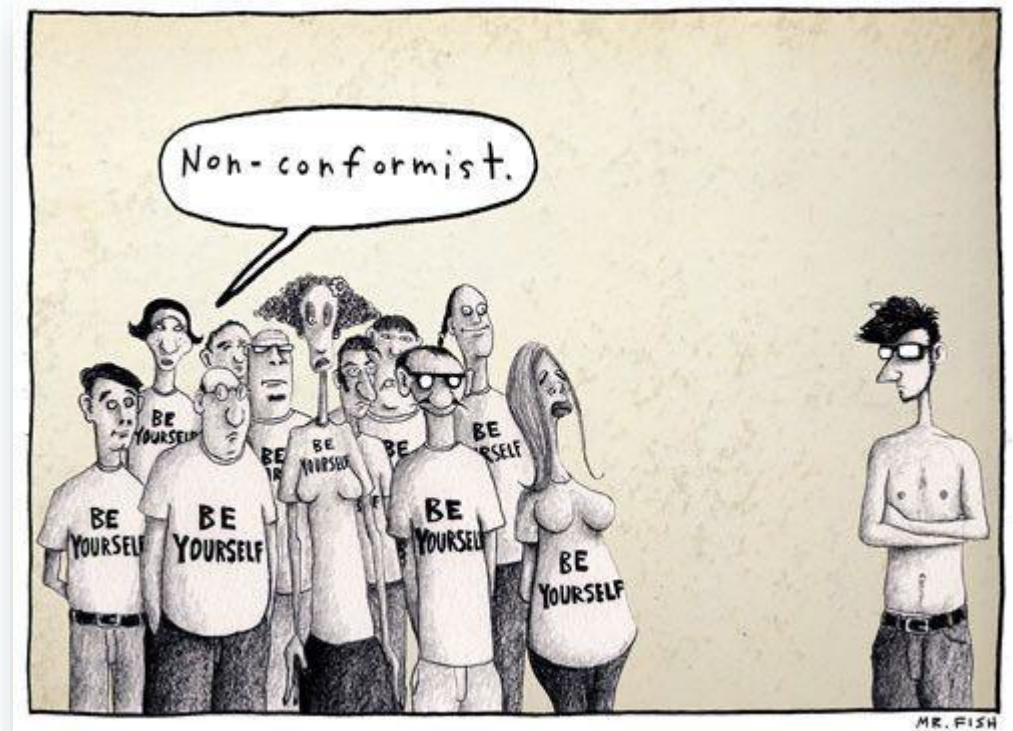
Unwritten shared rules

(shared by members of the same group or society)

The standards we use to **judge the appropriateness** of our own behaviour

Perceived socially acceptable behaviour **spreads**

(especially if we are uncertain)



Social norms are **flexible** and can **shift quickly** with the right pressure, from the **right people**



# Pathways to changing social norms

Role models & correcting misperceptions

We tend to **extrapolate** what people think from the opinions of authority figures

Leaders can **change our assumptions** about what other people think and what the social norm is

Influential people in small communities can change **social norms** at a large scale



**Former fire chiefs warn Australia  
unprepared for escalating climate threat**

**Major parties must recognise 'national firefighting assets' are  
needed to fight worsening natural disasters, say fire experts**

<https://www.newyorker.com/science/maria-konnikova/how-norms-change>

<https://www.sbs.com.au/news/ex-fire-chiefs-say-government-asleep-at-the-wheel-when-it-comes-to-climate-crisis>

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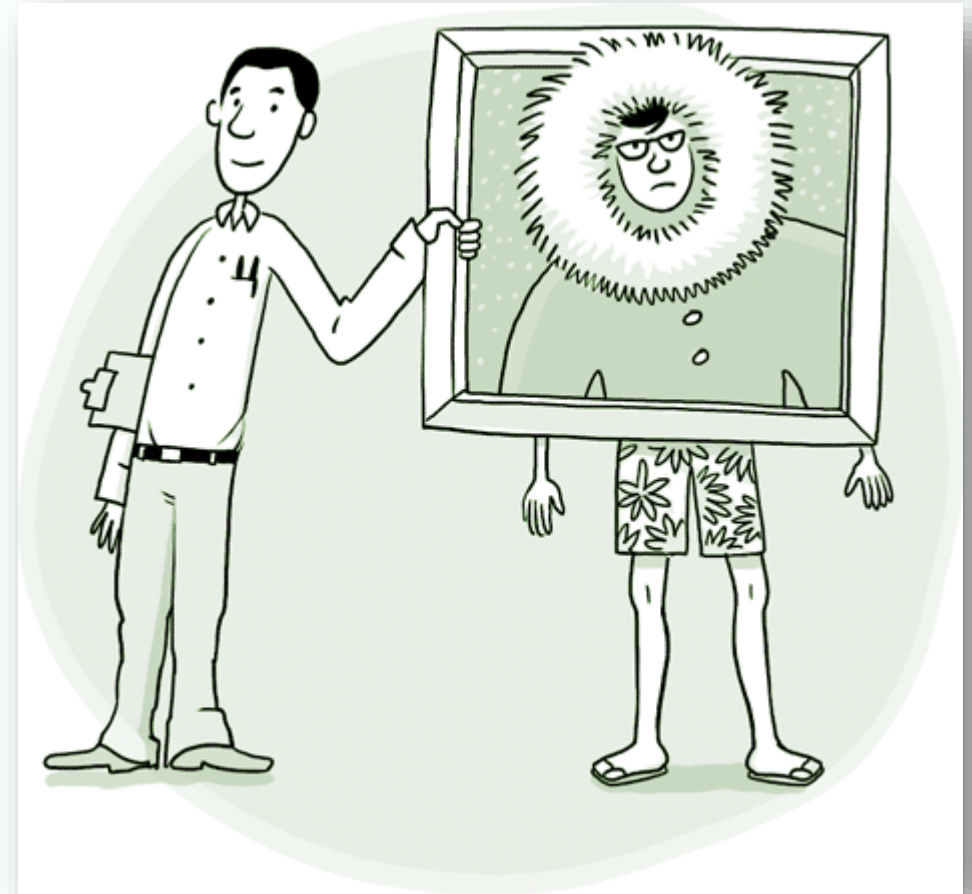
# The way we deliver information about climate change

People are more receptive to change (and take action) when the information being communicated has **salience**, **authority**, relevance, and legitimacy

**Authority** is the right to act in a specified way. This right is delegated from one person to another

**Salience** is the quality of being particularly noticeable or important

Communication through role models can have a big impact



# Changing social norms quickly

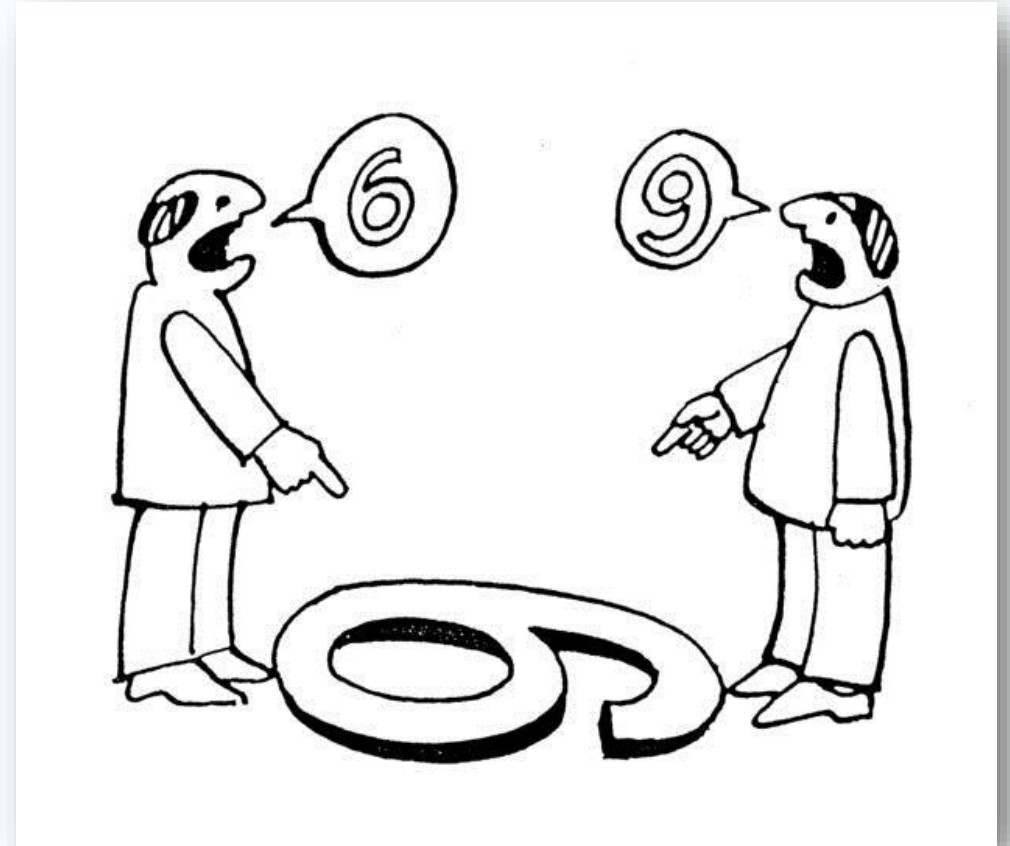
Determined by several factors

To establish a social norm quickly you have to develop a communication method that

Message is given by a large number of members of a group (**uniformly**)

The message is **consistent**

The message is given **frequently** and is **visible** to people



<https://www.feverbee.com/norm/>



# Visibility can be helped

because the media loves extreme events

Media focusses overwhelmingly on extreme weather events

Coverage of extreme events **outpaces** all other climate change impacts (even public health)

We need ***powerful stories*** told by role models about the human impacts of marine heatwaves to make the experience of these events more **our own**



Thousands of common murres such as this one died and washed ashore as a result of a marine heat wave known as "the blob."  
(Image: © COASST)

# People are shaped by powerful stories



People think that stories are shaped  
by people. In fact, it's the other way  
around.

— *Terry Pratchett* —

AZ QUOTES

- Need for increased awareness of marine heatwaves (marine extreme events)  
Because it has a large impact on food security in vulnerable areas of the world
- Extreme events provide an opportunity to influence behaviour
- Influential role models can correct misperceptions and affect social norms  
They can also create the 'experiential' aspect of marine heatwaves through stories
- Behaviour change and adaptation and changes in social norms go together
- **A desirable social science legacy would be a contribution to changing social norms about climate change and marine extreme events**

# Thank you