



# Predicting recreational fisher behaviour in a changing world: What we need to know for successful management interventions

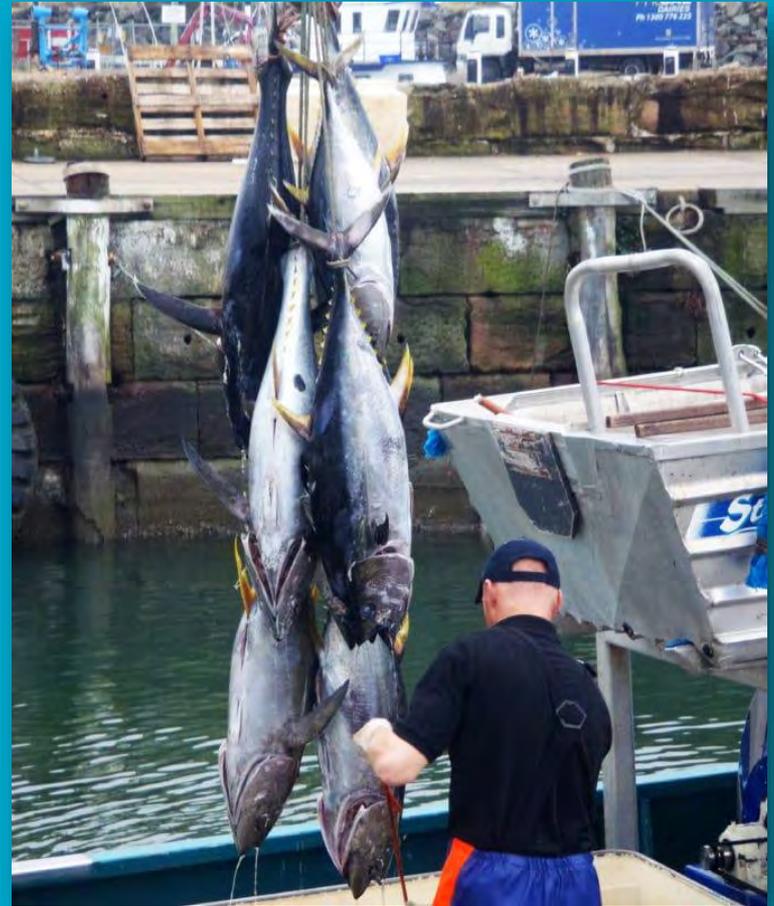
Presented by:

Ingrid van Putten

World Recreational Fishing Conference 2021

Gratefully acknowledging my colleague Dr Mary Mackay (CSIRO) for much of the work and thoughts presented here

Australia's National Science Agency



<https://tunaaustralia.org.au/news/crew-safety-at-the-forefront-in-new-tuna-australia-research-project/> © AFMA

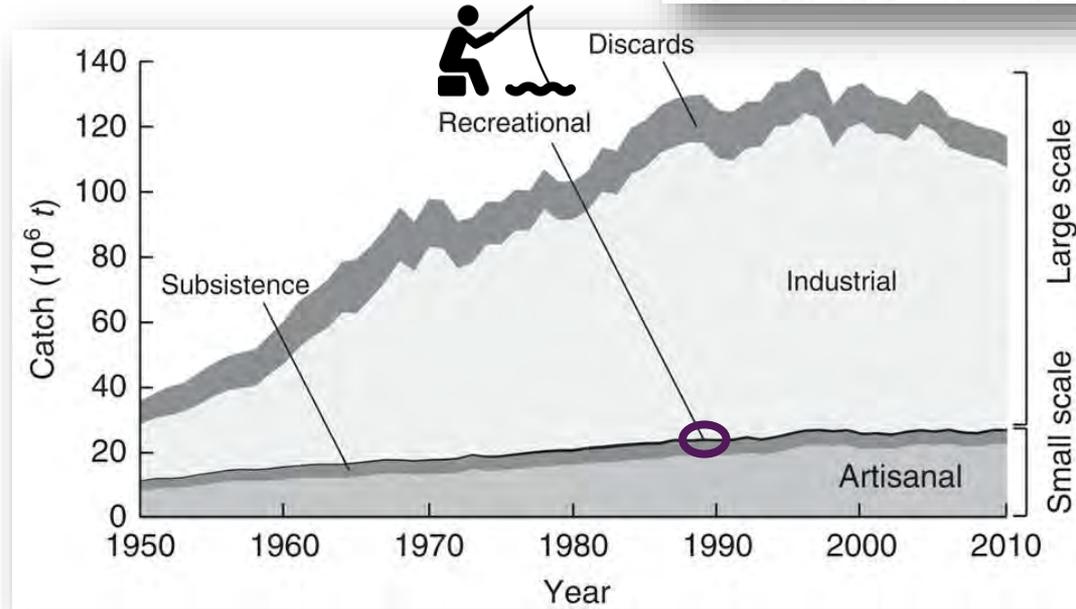
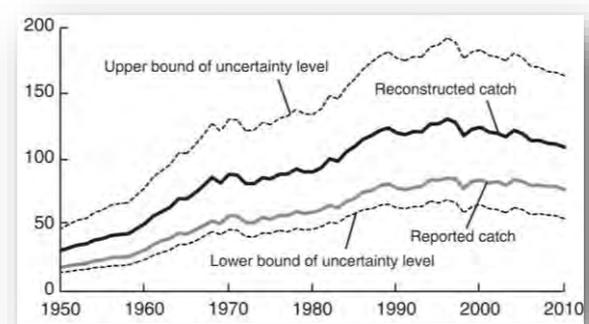
# Reconstructed marine catches

for all countries in the world, plus High Seas

Global marine fisheries catches 130 million tonnes in 2010

Marine recreational catches account for slightly less than 1% of total global marine catches.

Global estimates of marine recreational catches that are retained and landed were around 900,000 tonne per year in 2014



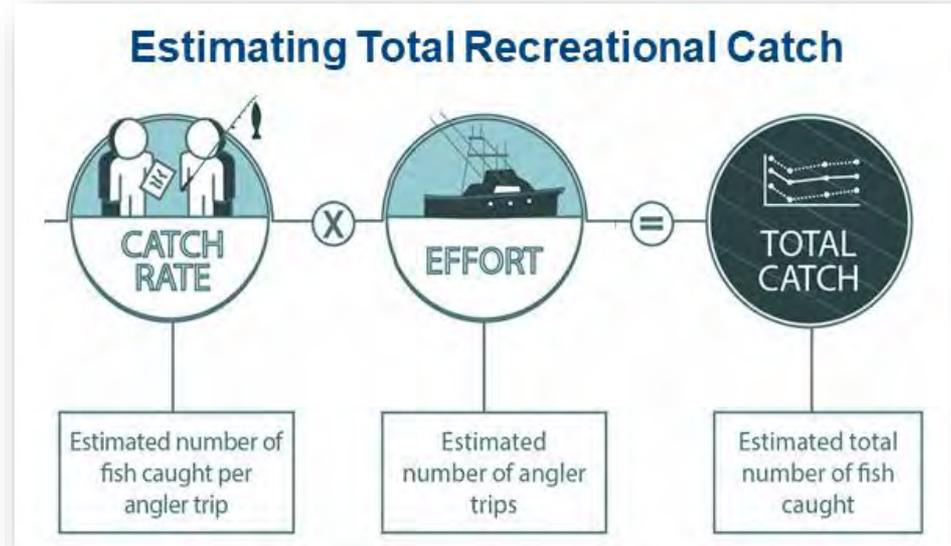
# The art of estimating recreational catches

Reporting on recreational fishing activity is **sparse**

Reporting is **inconsistent** within and between countries and over time

Recreational fishing can overlap with **subsistence** (artisanal) fisheries

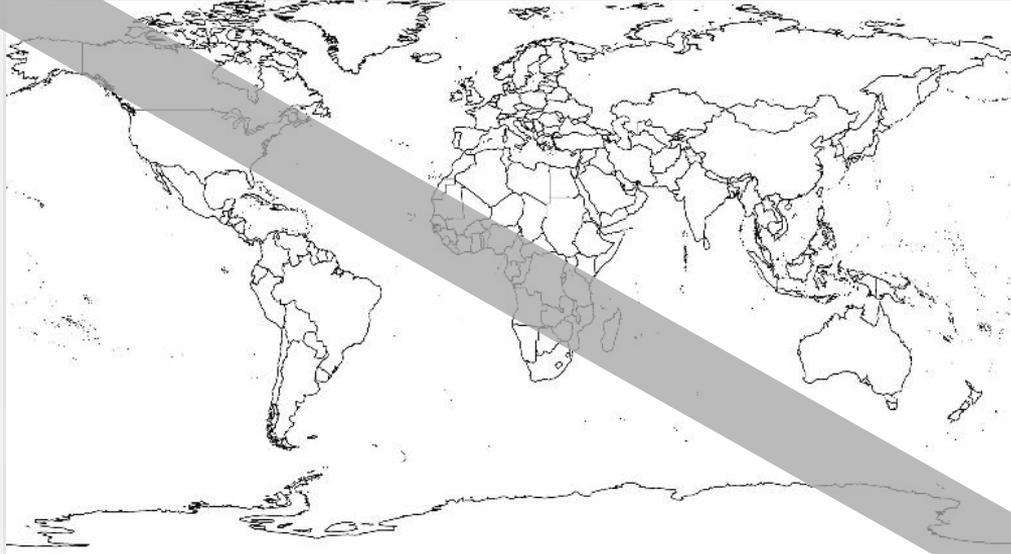
It is difficult to know the **boundaries**



<https://www.fisheries.noaa.gov/recreational-fishing-data/estimation-methods-overview>

# Mapping recreational catch distribution

Even though we estimate total global catches – distributional maps not so easy to create



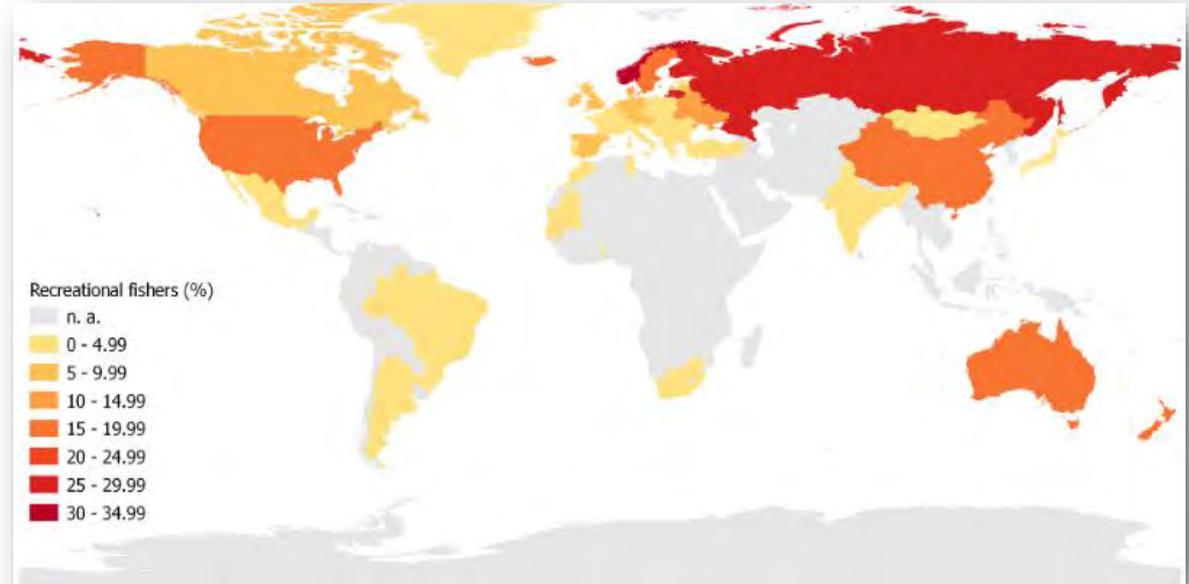
Recreational fishing catch data

Not  
available

# But we know about participation in recreational fishing

Participation is directly related to the country's **level of development**

Having the available **resources** and **time**, and being **socialised** into recreational fishing makes a difference



\*( as a fraction of the entire population of a country)

# Global participation in recreational fishing

In developed nations, **1 in 10 people** fish for pleasure

World Bank (2012) estimated a minimum of **220 million** recreational fishers globally\*

More than 5 times the number of commercial capture fishers

\* But likely to be an underestimate given China alone is possibly 220 million

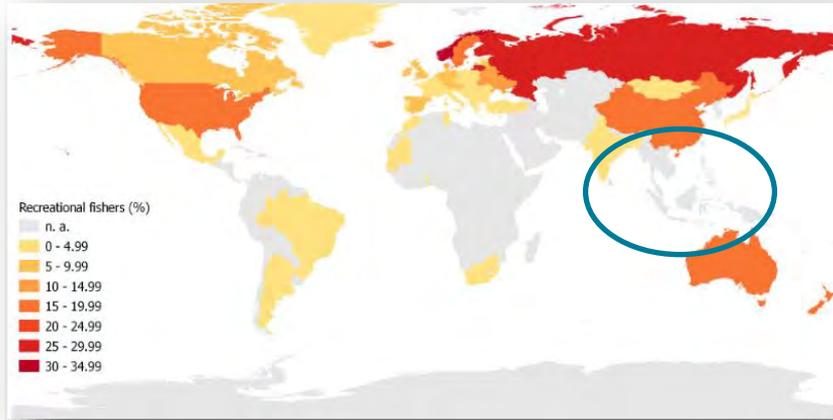


<https://theconversation.com/plenty-of-fish-in-the-sea-not-necessarily-as-history-shows-84440>

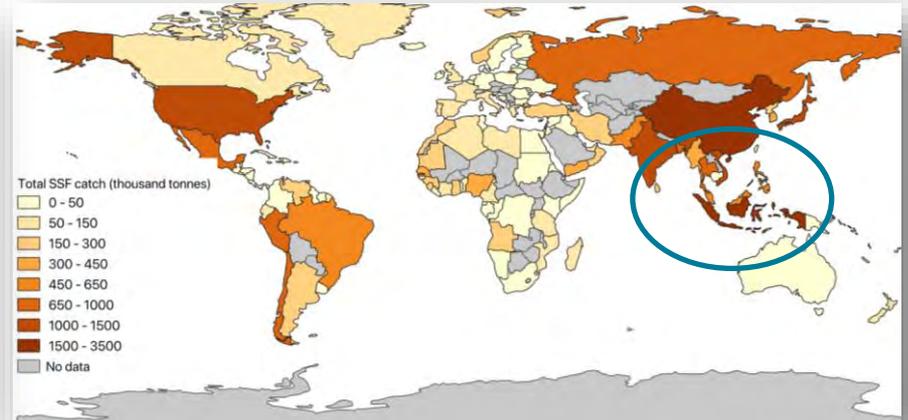
# Recreational and subsistence fishing

The distinction between recreational and subsistence/artisanal fishing can be quite small

Recreational fishing is defined as mainly for **pleasure** or **competition** but (like in subsistence and artisanal fishing) consumption – and many other things like relaxing are also very important



Not a lot of recreational fishing participation data



A lot of participation in subsistence/artisanal fishing and catch is high

Sarah Schumann, Seth Macinko, 2007 Subsistence in coastal fisheries policy: What's in a word?, *Marine Policy*, Volume 31, Issue 6, Pages 706-718

Cooke, SJ, Twardek, WM, Lennox, RJ, et al. The nexus of fun and nutrition: Recreational fishing is also about food. *Fish Fish*. 2018; 19: 201– 224. <https://doi.org/10.1111/faf.12246>

Arlinghaus et al (2021) Global Participation in and Public Attitudes Toward Recreational Fishing: International Perspectives and Developments, *Reviews in Fisheries Science & Aquaculture*, 29:1, 58-95

Harper S, Adshade M, Lam VWY, Pauly D, Sumaila UR (2020) Valuing invisible catches: Estimating the global contribution by women to small-scale marine capture fisheries production. *PLOS ONE* 15(3)

# Differences in consumption & catch orientation

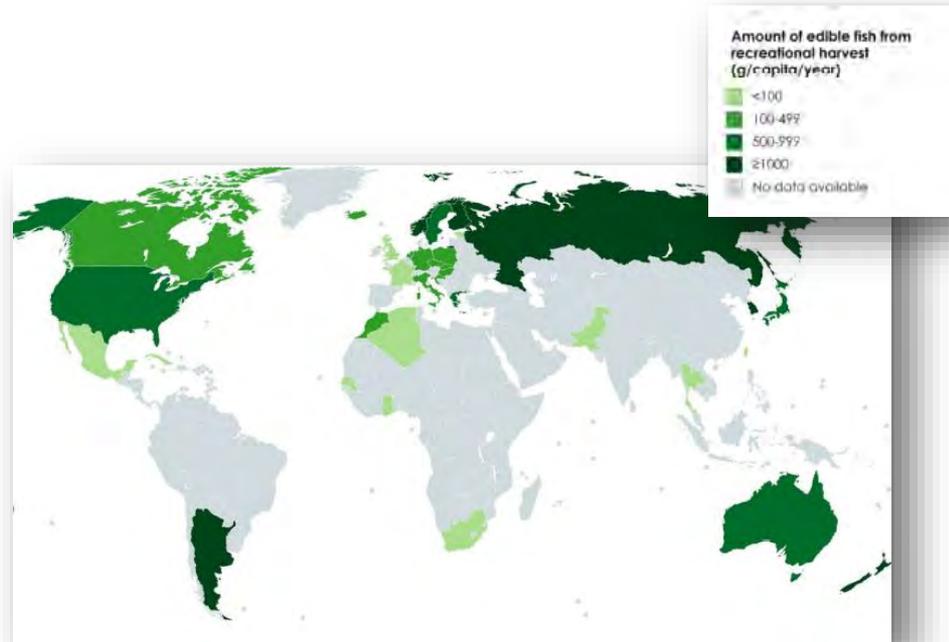
Variation between countries and ethnicities

**Norwegians** are more catch oriented and more focused on consumption than North Americans

**African Americans** also retain the fish for consumption more than Anglos. They also like catching large numbers and large fish

**East Asian fishers in Australia** are more likely to be consumption oriented and trophy fishers

**Australian'** ethnic background more likely to be 'outdoor enthusiast'



Population / **demographic mix** in high income countries changing over time

McIlgorm, A., et al (2016). Improving our understanding of the motivations and attitudes towards fisheries management of recreational fishers in NSW.

Aas, Ø., & Kaltenborn, B. P. (1995). Consumptive orientation of anglers in Engerdal, Norway. *Environmental Management*, 19, 751–761.

Cooke, SJ, Twardek, WM, Lennox, RJ, et al. The nexus of fun and nutrition: Recreational fishing is also about food. *Fish Fish*. 2018; 19: 201–224. <https://doi.org/10.1111/faf.12246>

Hunt, K. M., Floyd, M. F., & Ditton, R. B. (2007). African-American And Anglo anglers' attitudes toward the catch-related aspects of fishing. *Human Dimensions of Wildlife*, 12, 227–239.

# Quick summary so far

- Participation in recreational fishing is **high** in developed countries (average 1 in 10)  
Participation is related to having resources, time, and socialisation into fishing
- Global estimates of marine recreational catch indicate it is a little less than 1% of total catches  
No clear picture of geographic distribution of global recreational catches  
Complicated by similarities between artisanal and recreational fishing
- Recreational fishers fish for different reasons (leisure & consumption etc.)  
Recreational fishers are a diverse group with different motivations  
There are some important cultural characteristics to fishing orientation

# Recreational fisheries management goals

The goals of recreational fisheries management is to provide for the **optimum use** and recreational **enjoyment** of fisheries resources

Recreational fishing management approaches need to (amongst other things):

- Be responsive to **signals of scarcity**
- Provide **incentive structures** that align fishers' interests with fishery *sustainability*

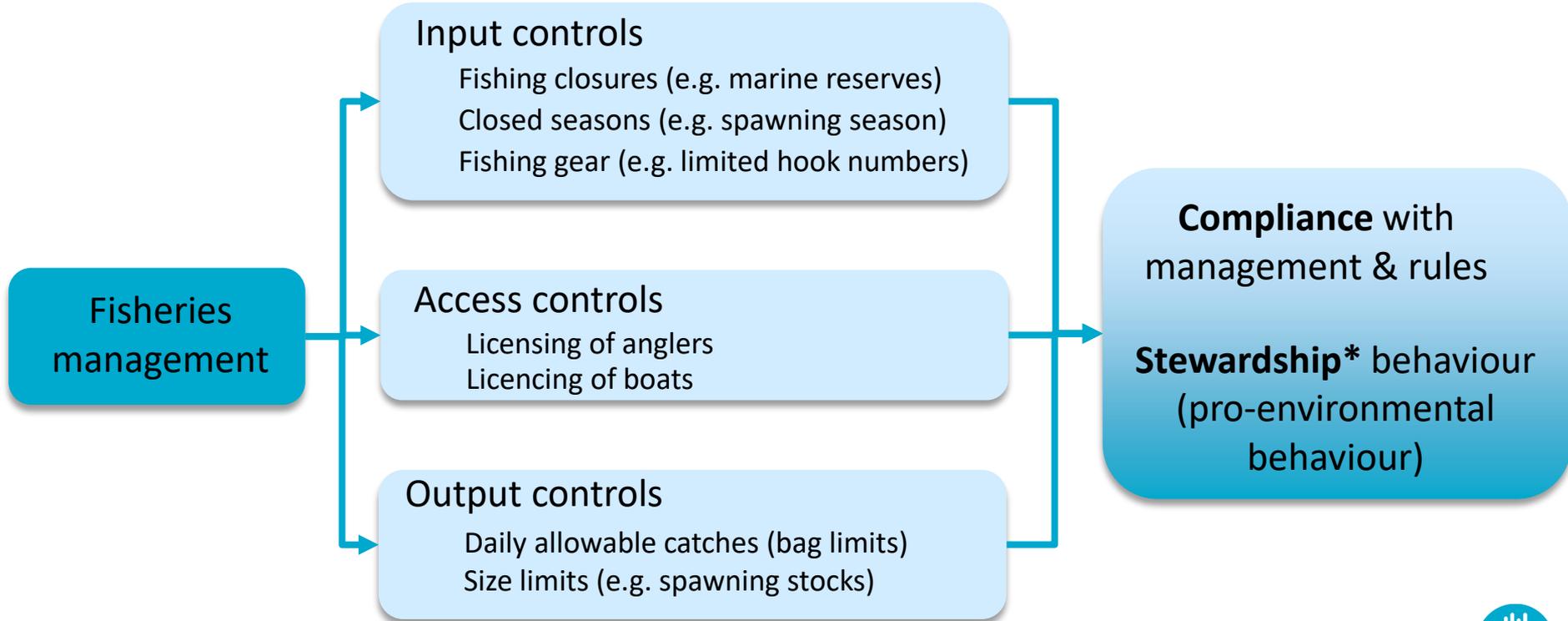


<https://www.australiangeographic.com.au/topics/science-environment/2018/01/a-guide-to-sustainable-seafood/>

# Recreational fishing management tools

Goal: to align fishers' interests with fishery sustainability

## Management tools



\*Stewardship is an obligation to be responsible for taking care of another person's property.

# Different ways of motivating\* stewardship and compliance

- Provide **incentives** (interventions) that **'motivate'** someone to behave in a certain (desired) way
- Interventions can be based on **rewards** (carrots)\*\* and **punishment** (sticks)
- Often need to use a **combination** of both carrots and sticks



\*There are many different motivation theories starting with Maslow's Need Hierarchy Theory

\*\* Rewards ensure **longer lasting** behaviour change than punishment

# Encouraging stewardship & compliance

Punishment

Rewards

# Encouraging stewardship & compliance

Punishment



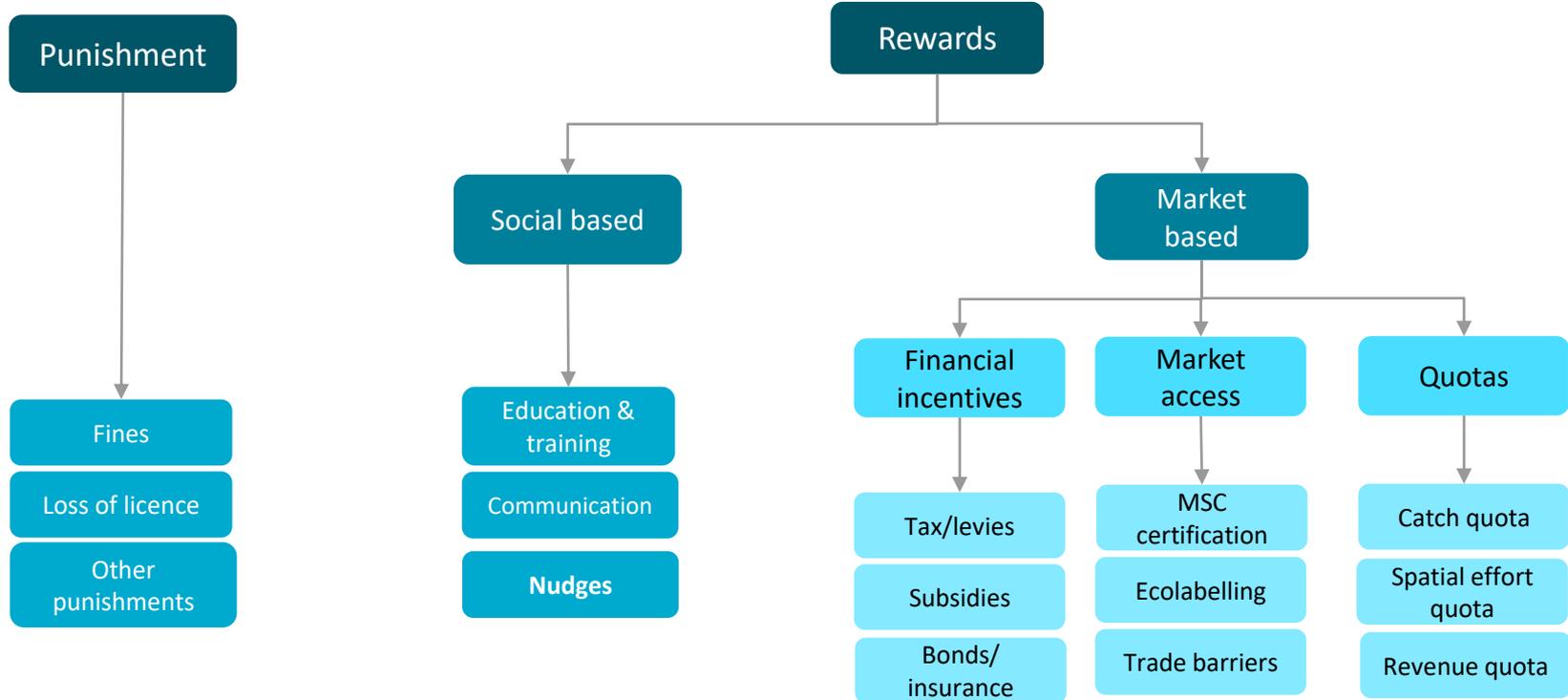
Fines

Loss of licence

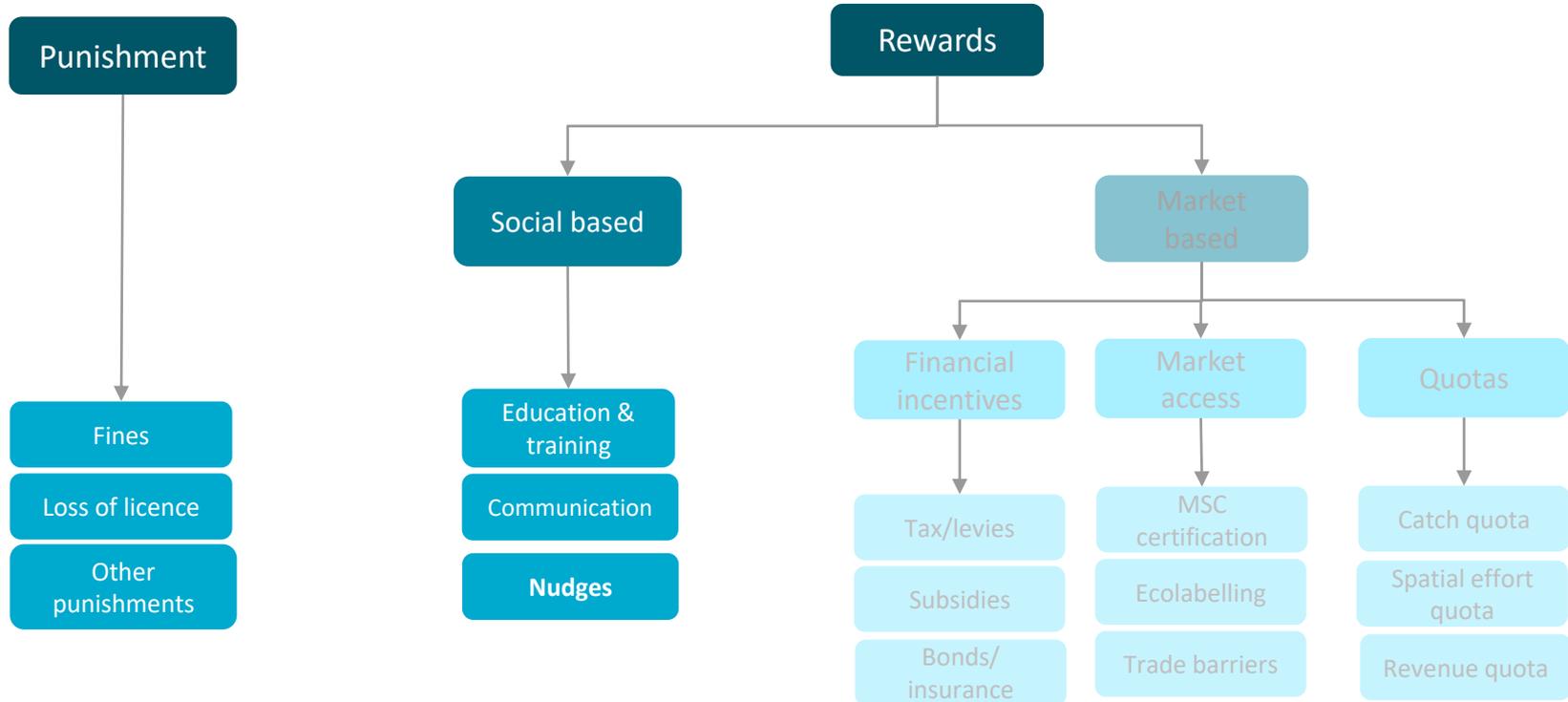
Other  
punishments

Rewards

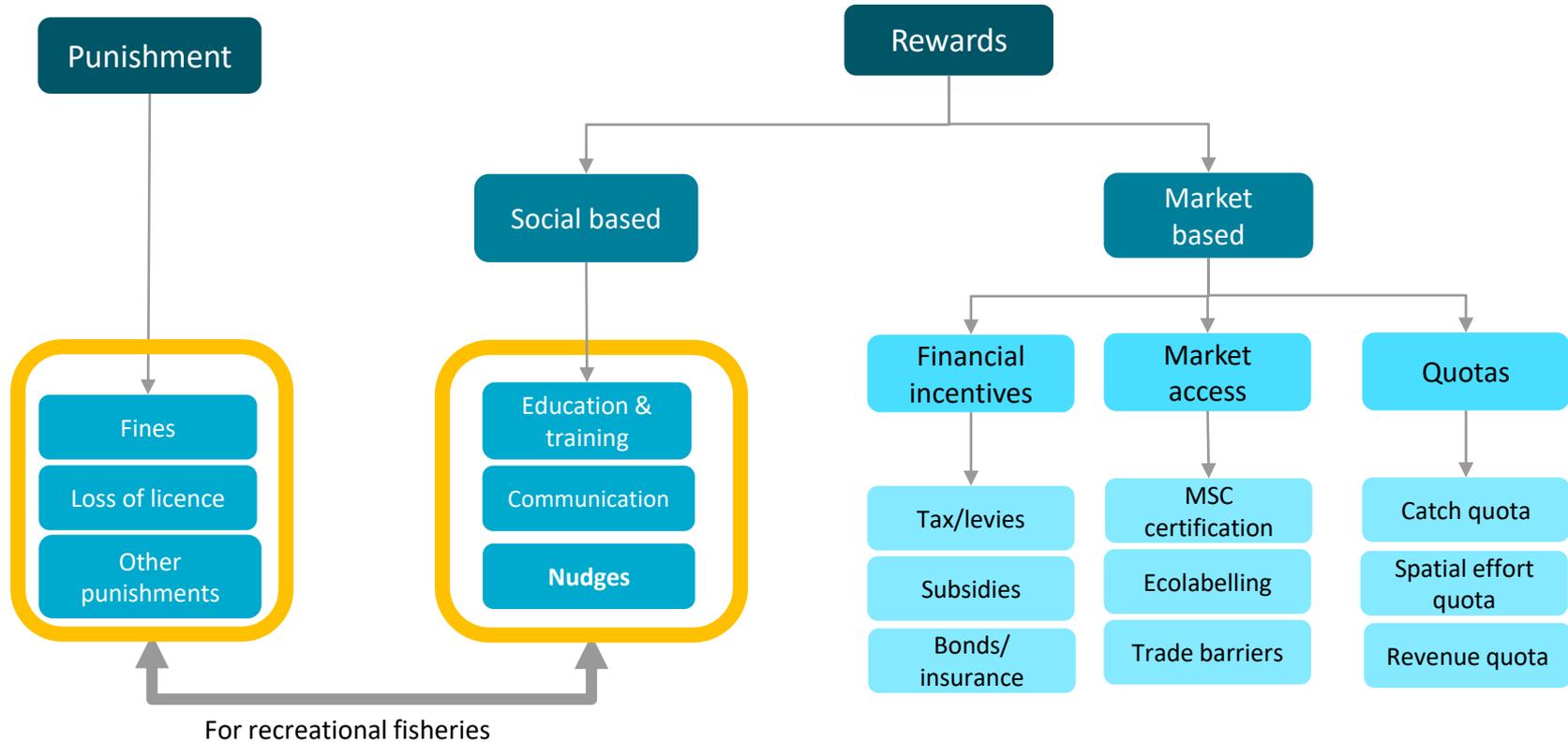
# Encouraging stewardship & compliance



# Encouraging stewardship & compliance

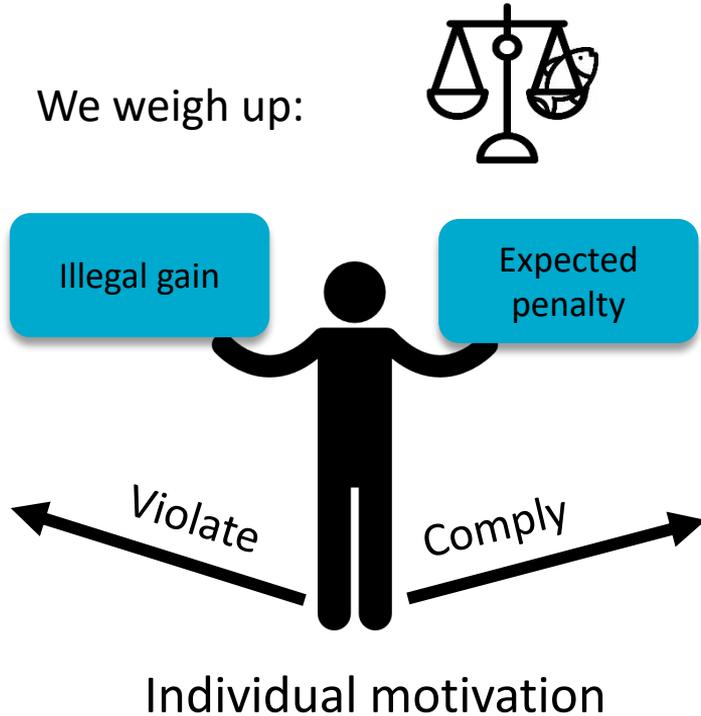


# Encouraging stewardship & compliance



# Punishment to encourage compliance:

## Deterrence theory

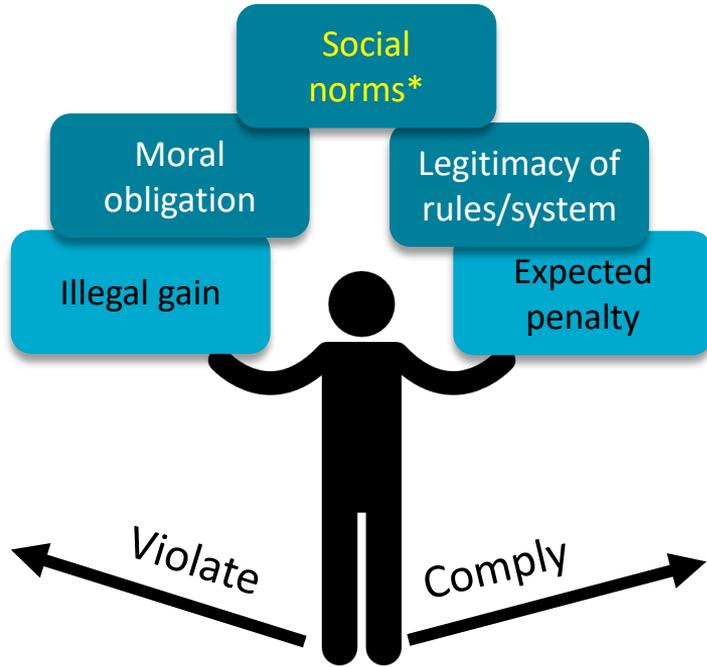


**Level** of expected penalty for the offence (Severity)  
(has to be severe enough but not unfair)

**Probability** of **apprehension** and punishment (Certainty)

**Swiftness** with which **sanctions** are applied after getting caught (Celerity)

# Individual motivation: bit more complicated



Social norms have a **powerful influence** on the way we **behave**, and this influence is often “under-detected”

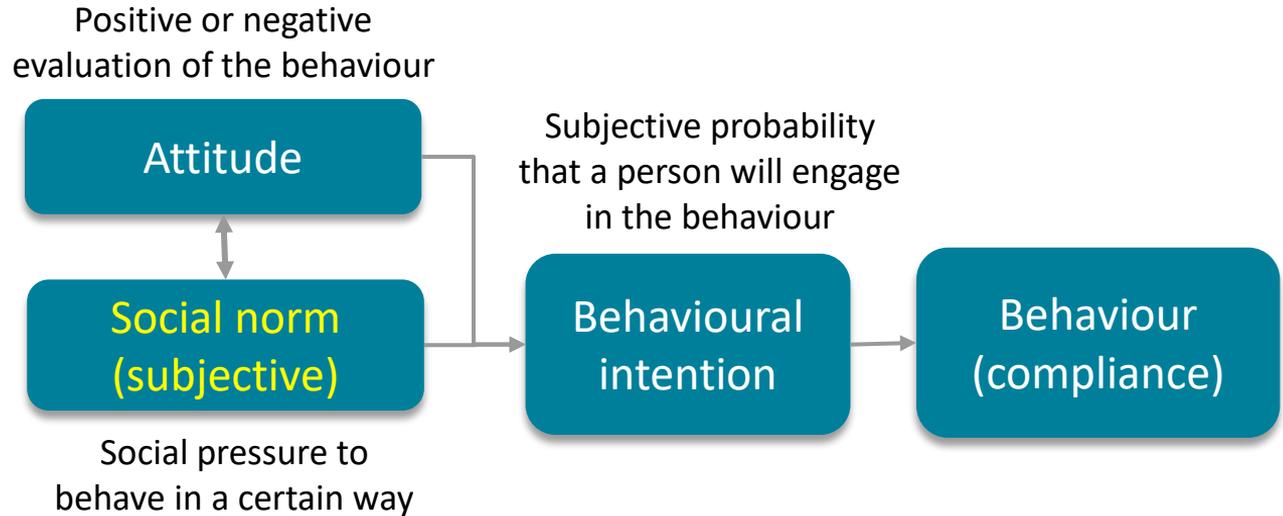
\*Social norms are **shared expectations** of **acceptable** behaviour by groups.

humans are inclined to model behaviour on what others do, or what they believe others do



\*Social norms are **different from personal norms** which represent what people believe to be appropriate behaviour for themselves

# Compliance in recreational fishing: Where do social norms come in?

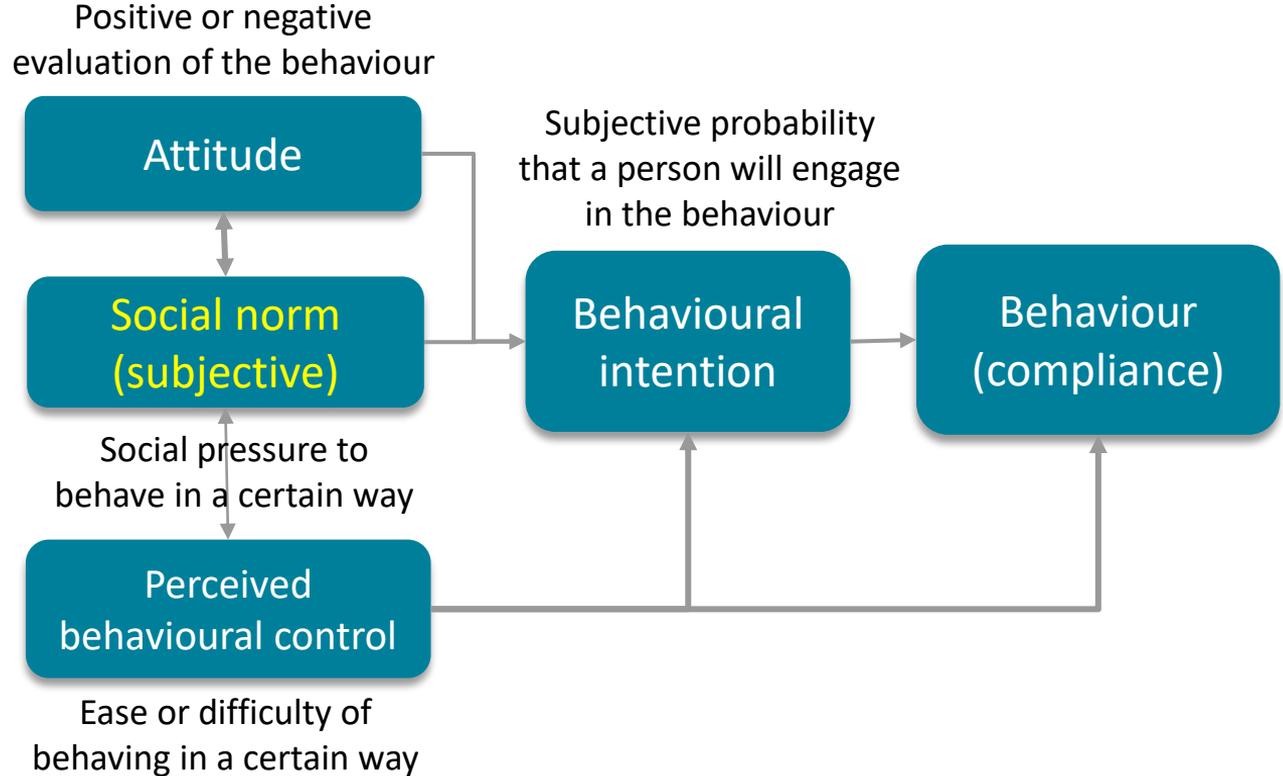


## Theories of behaviour (reasoned action – planned behaviour – social norms)

(TRA Ajzen & Fishbein 1980; TPB, Ajzen 1991; SNT Perkins and Berkowitz 1986)

Macovei, O.-I. (2015) Applying the Theory of Planned Behavior in Predicting Proenvironmental Behaviour: The Case of Energy Conservation, Acta Universitatis Danubius. OEconomica 11(4) 15-32.

# Compliance in recreational fishing: Where do social norms come in?



# Compliance in recreational fishing

making 'majority supported' decision  
(probably the right decision?)

Our perception of what  
people typically do

Descriptive  
social norm

Injunctive  
social norm

Our perception of what  
people typically approve  
or disapprove of

gaining social approval

motivational antecedent

Positive or negative  
evaluation of the behaviour

Attitude

Social norm  
(subjective)

Social pressure to  
behave in a certain way

Perceived  
behavioural control

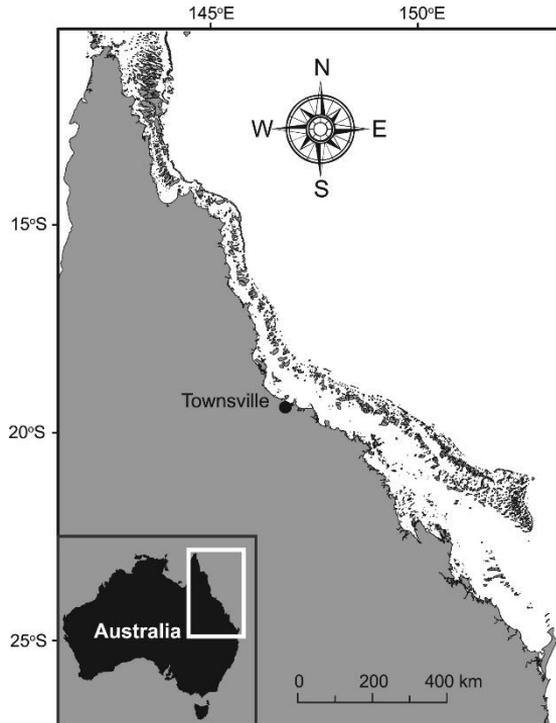
Ease or difficulty of  
behaving in a certain way

Subjective probability  
that a person will engage  
in the behaviour

Behavioural  
intention

Behaviour  
(compliance)

# Recreational fishing compliance in the Great Barrier Reef Marine Park



Great Barrier Reef, Australia

## Great Barrier Reef Marine Park Authority

Communication strategies can help to reduce poaching and foster voluntary compliance

Campaign to inform people of the ecological benefits of marine reserves (bigger and more fish)- assuming that this helps against illegal fishing

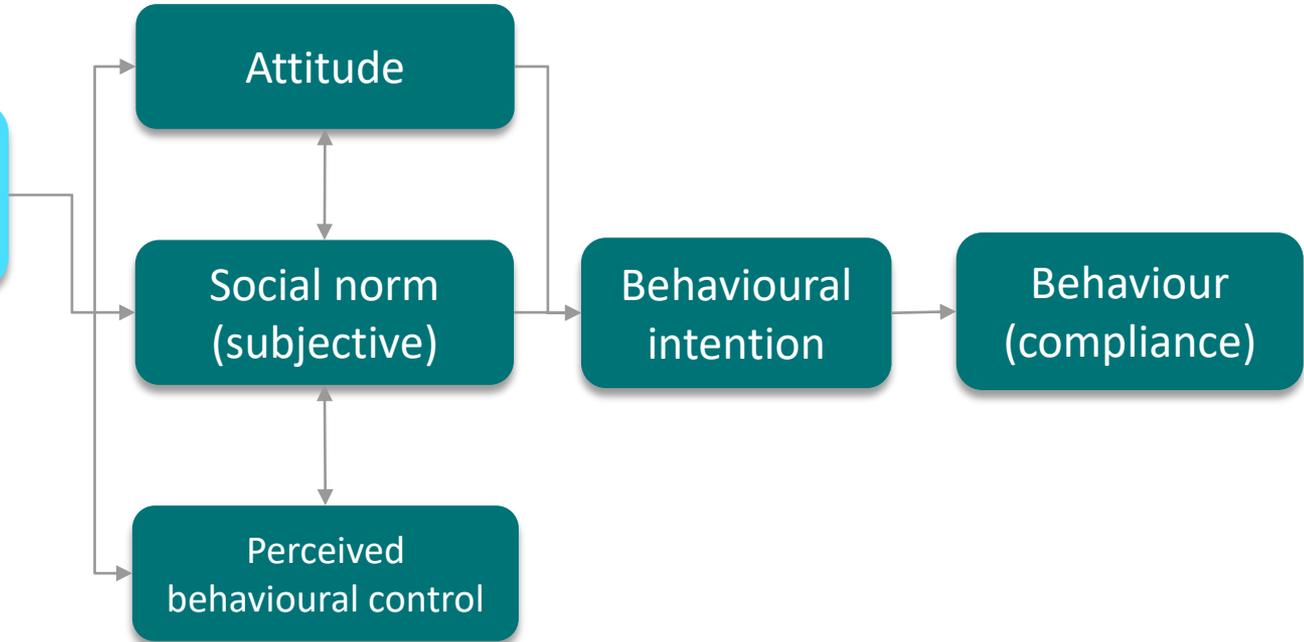


# Compliance response to MPA communication

**'majority supported' decision**

Fishers who fished illegally over-estimated the number of people who also fished illegally  
**(False consensus\*)**

Descriptive social norm

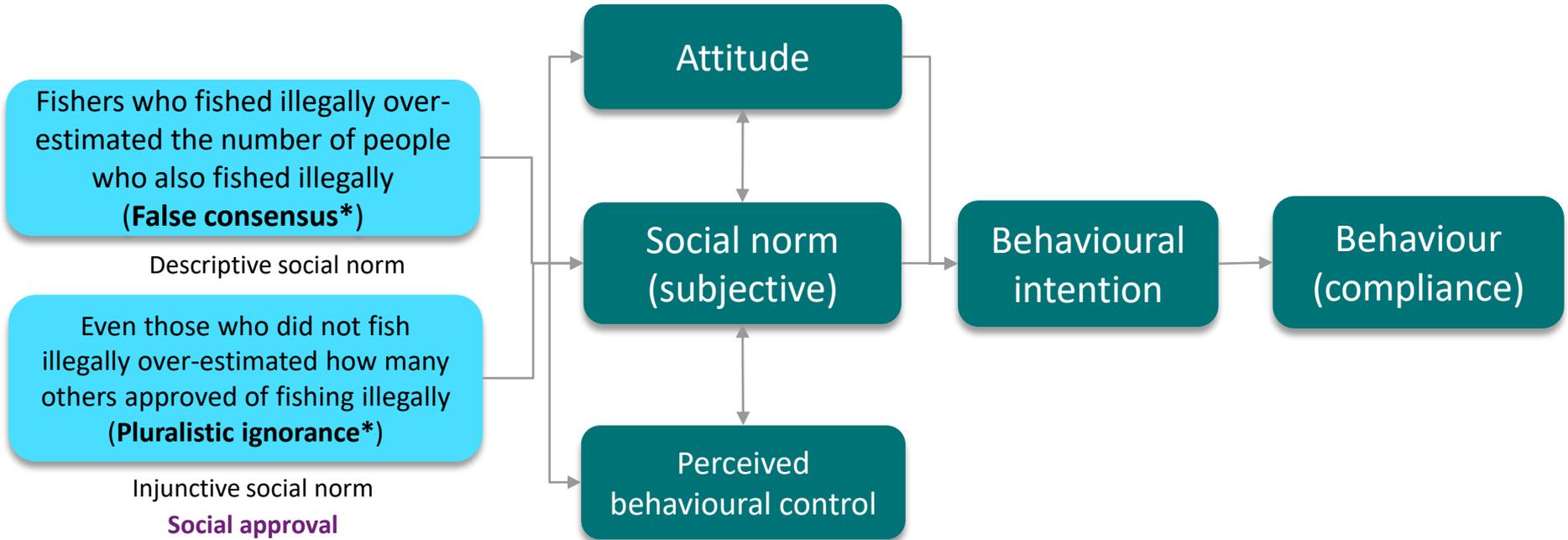


False consensus and pluralistic ignorance are so called **cognitive biases** related to social norms (mistake in reasoning, evaluating, remembering)

B.J. Bergseth, M. Roscher, Discerning the culture of compliance through recreational fisher's perceptions of poaching, *Marine Policy* 89 (2018) 132-141.

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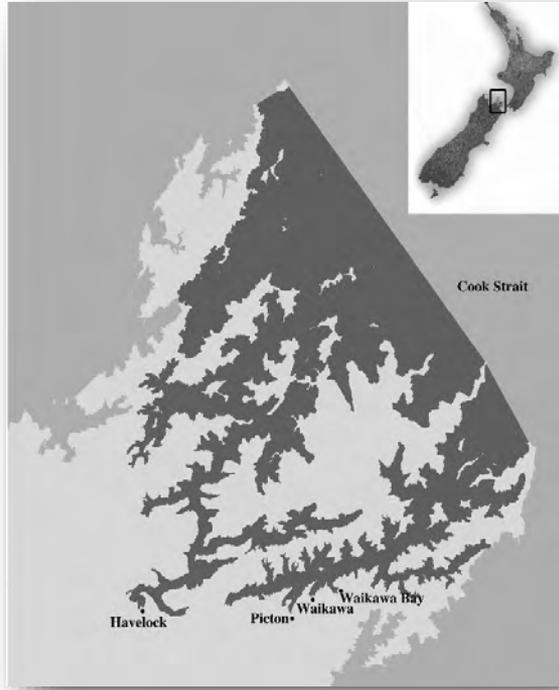


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# Social norms influence compliance with different management tools



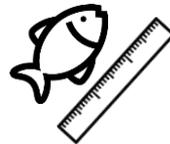
Recreational blue cod fishery in the Marlborough Sounds, New Zealand

Are there any differences in compliance behaviour with respect to different regulatory approaches?

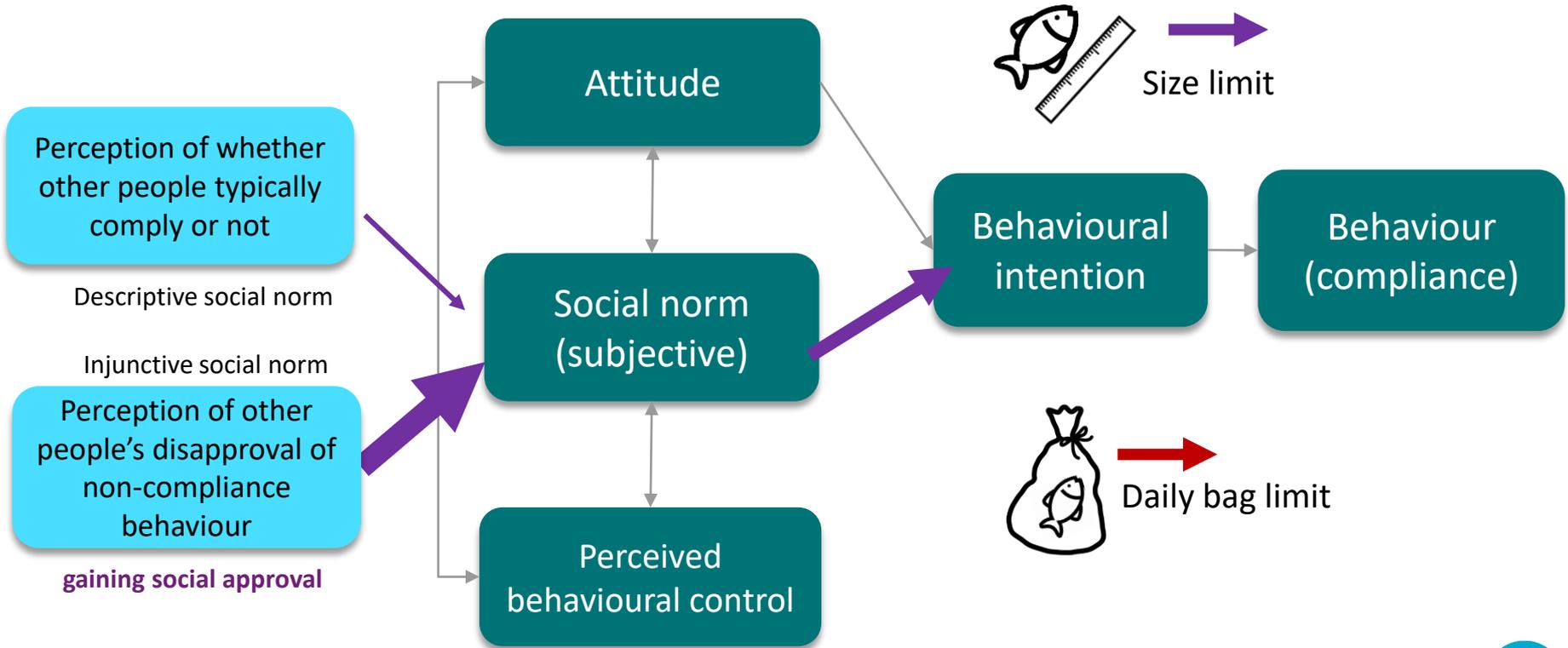
Daily bag limit



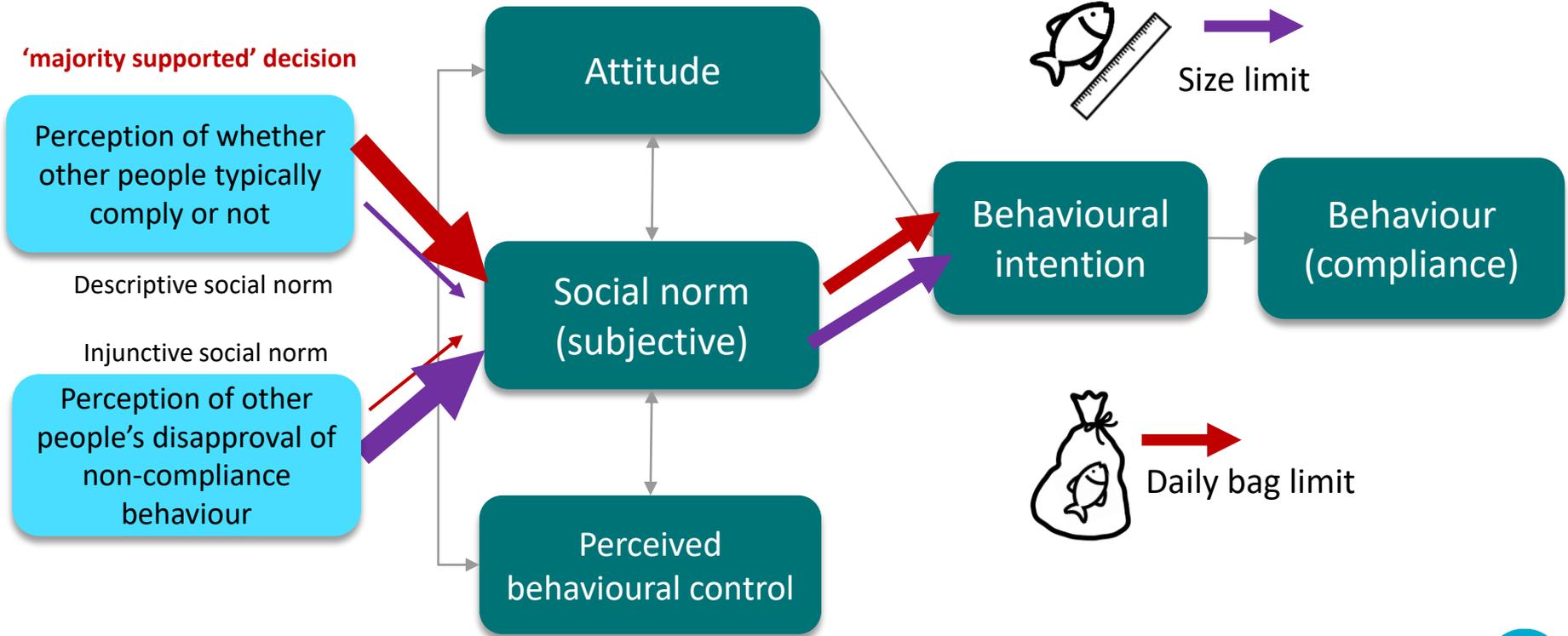
Size limit



# Compliance responses to different regulations



# Compliance responses to different regulations



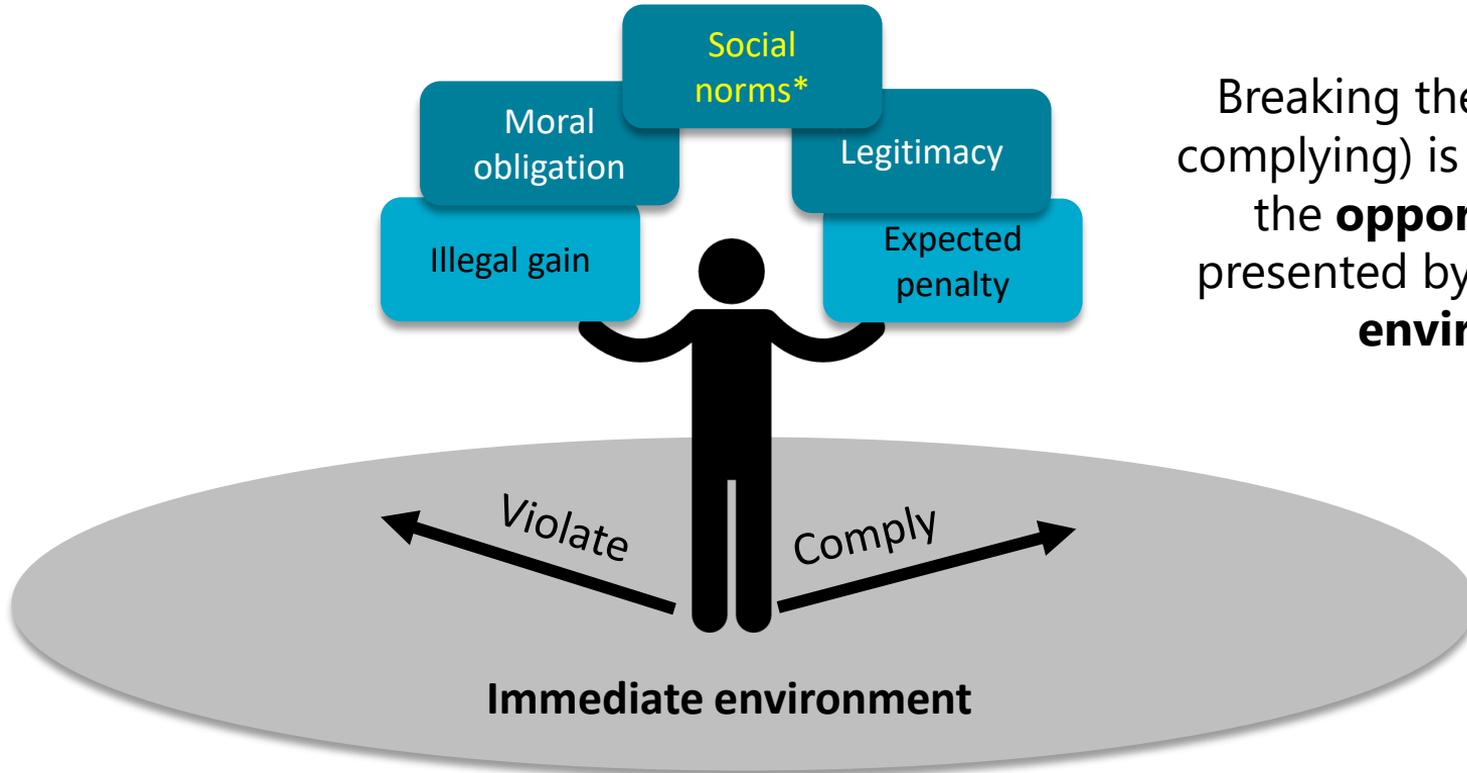
# Another quick summary

- Managing recreational fishing is about encouraging **compliance** and **stewardship** behaviour
- Rewards and punishment can be used to **motivate** the desired behaviour
  - Motivation to comply does not only depend on the size of the fine and the illegal gain
- It is important to understand the influence of **social norms** (amongst other things)

Because different aspects of social norms can influence compliance **responses** to different **management tools** (New Zealand example)

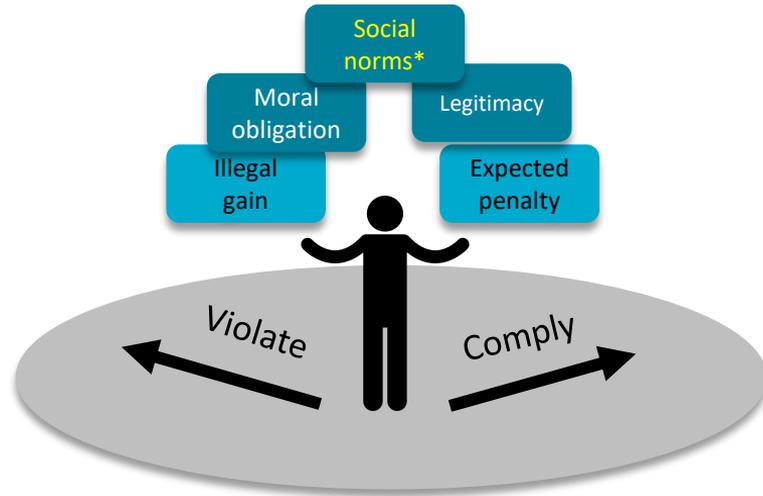
Because understanding social norm (mis)perceptions can avoid unintended consequences from communication campaigns (Great Barrier Reef)

# Compliance is not just about individual motivation



Breaking the rules (and not complying) is also a product of the **opportunity** that is presented by the **immediate environment**

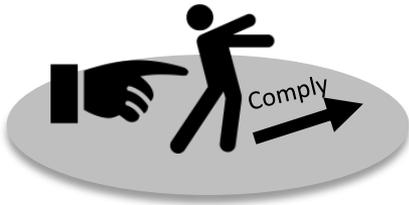
# Nudge in the right direction



A nudge can encourage a change in behaviour by changing the immediate environment within which the choice takes place (the **choice architecture**).

‘Social norm nudges’ can prompt people to act the way others are acting, because humans are inclined to model behaviour on what others do, or what they believe others do

# A 'social norm nudge' in the right direction



# A 'social norm nudge' in the right direction



**Social norms**  
(and comparisons)



**Simplification**  
**framing**



**Changes to the**  
**physical**  
**environment**



**Changes to the**  
**policy default**

**Opt-out**



Check the box if you **don't** want to participate in the organ donor program

# Social norm nudge in recreational fishing

Say the legal catch limit (bag limit) is 2 fish



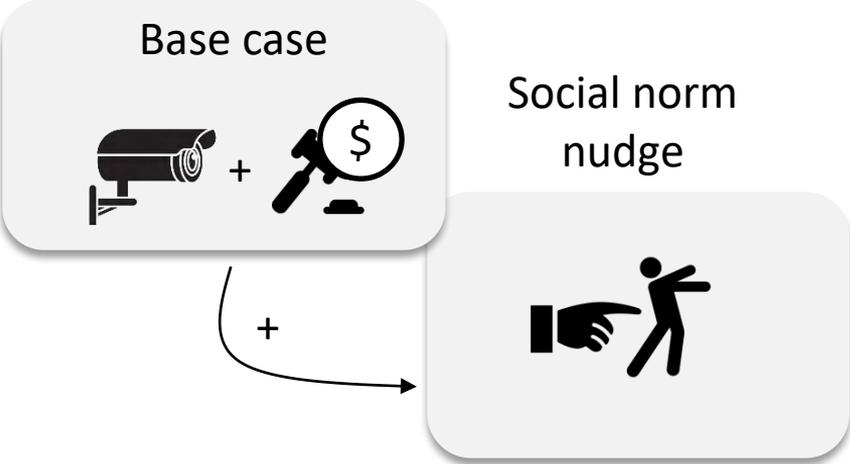
## Social norm nudge

**“According to last year’s data the average fisher chose to catch only ONE (1) fish”**

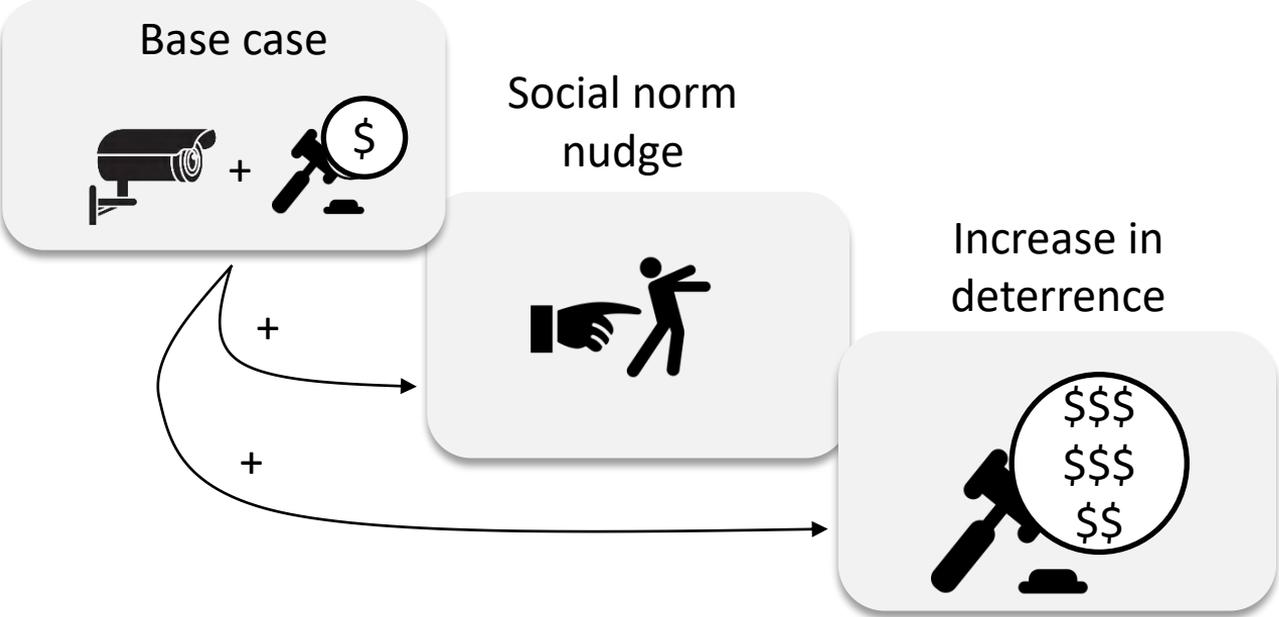
## Deterrence

There is a **5%** chance that the fisher will come across an inspector who will check their catch. If they are over the limit you will lose their catch

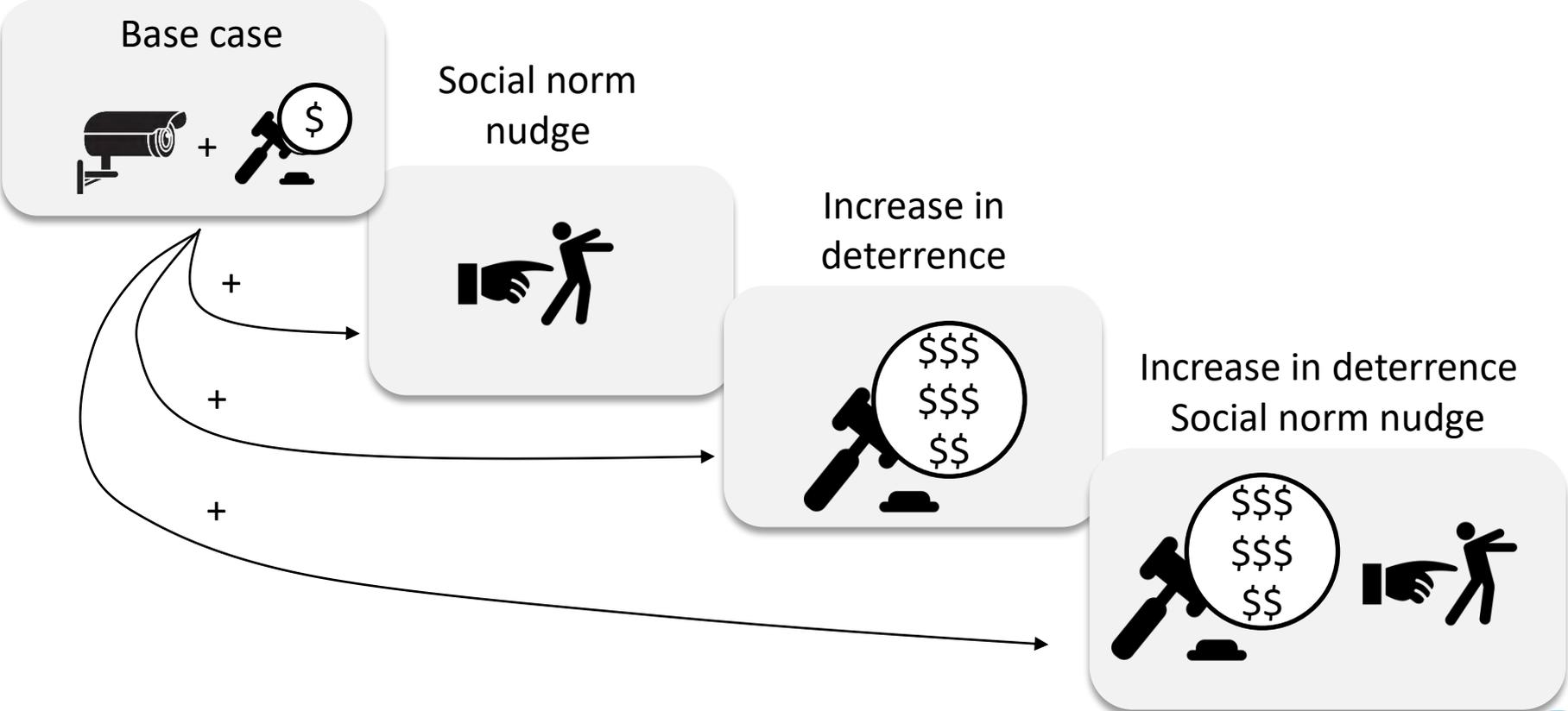
# Compare social norm nudge with deterrence



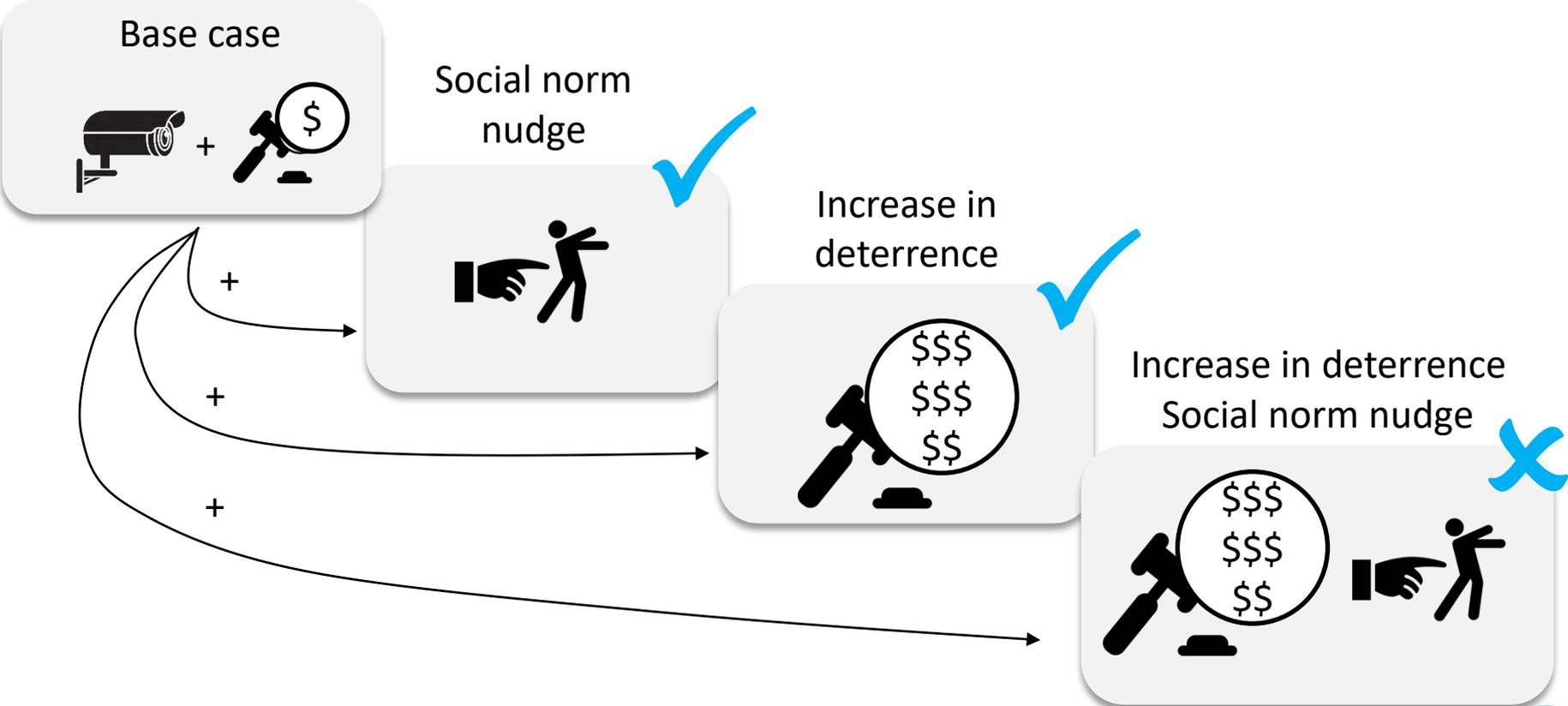
# Compare social norm nudge with deterrence



# Compare social norm nudge with deterrence



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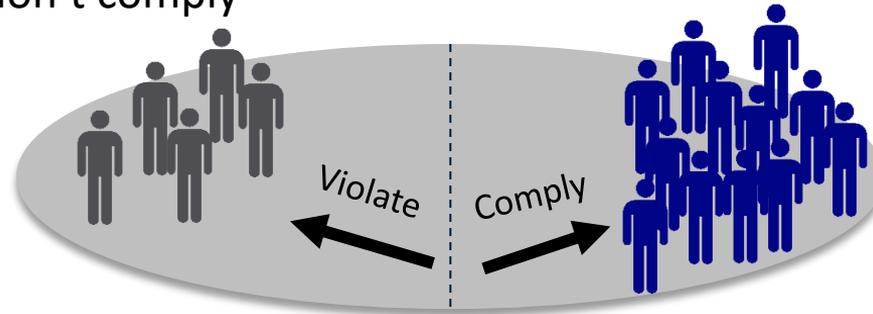


# Not every fisher will respond in the same way



Some fishers  
don't comply

Most comply

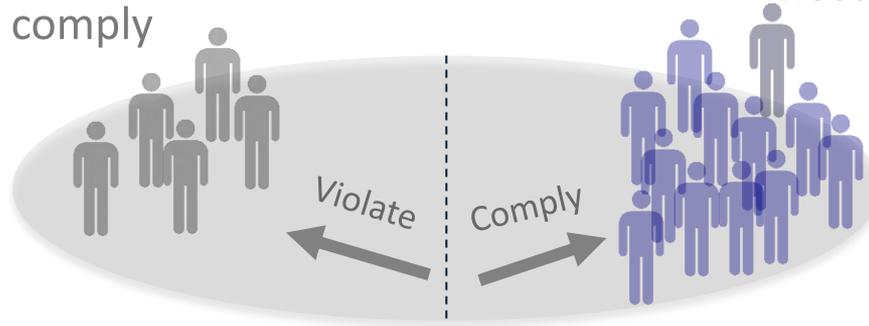


# Not every fisher will respond in the same way

Base case



Some fishers  
don't comply



Most comply

Increase in deterrence

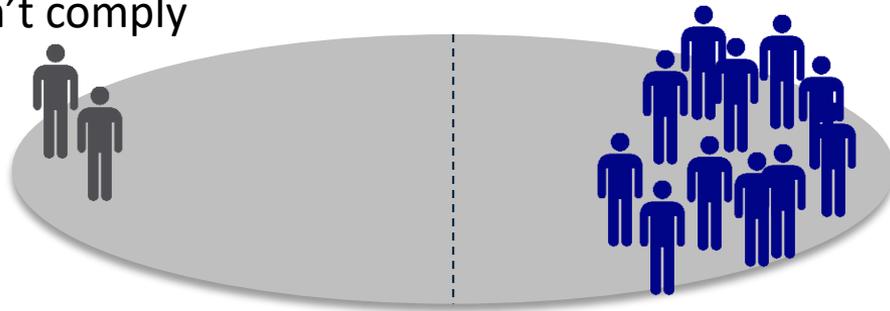


or



Social norm nudge

Some still  
don't comply



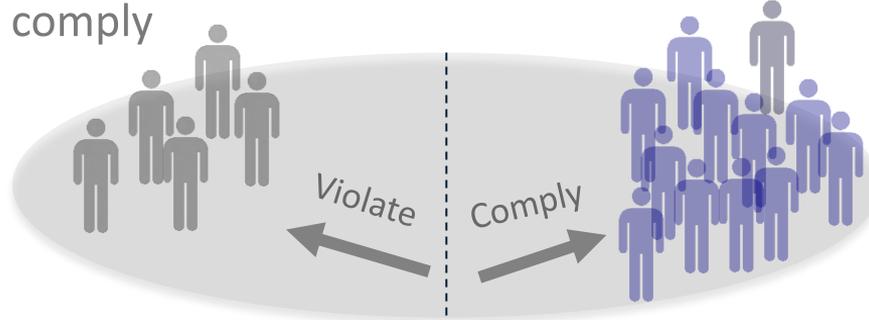
Most still  
comply

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Base case



Some fishers  
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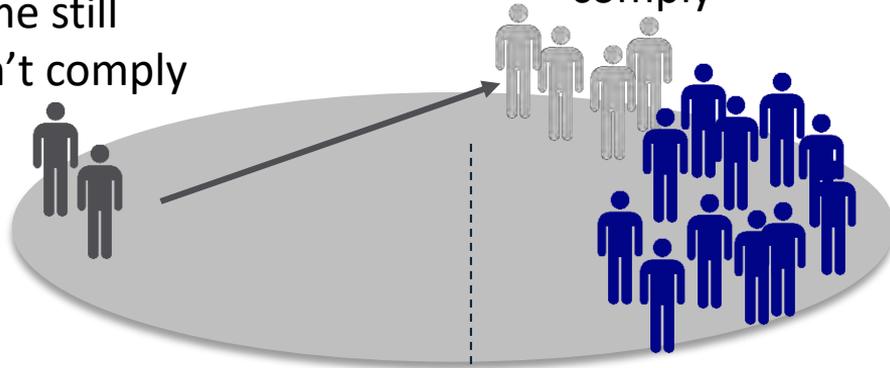


or



Social norm nudge

Some still  
don't comply



Some now  
comply

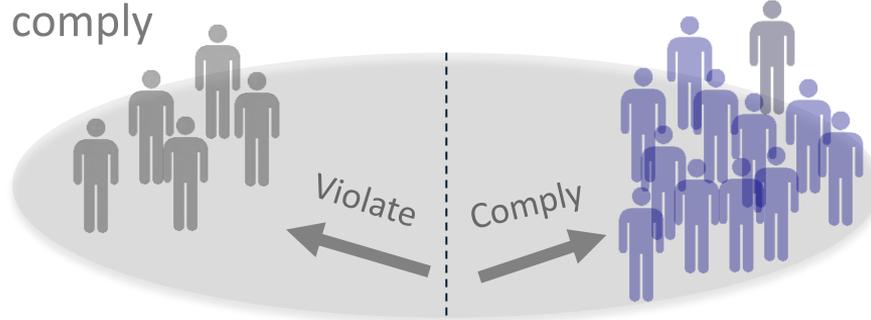
Most still  
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Base case



Some fishers  
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Most comply

Increase in deterrence

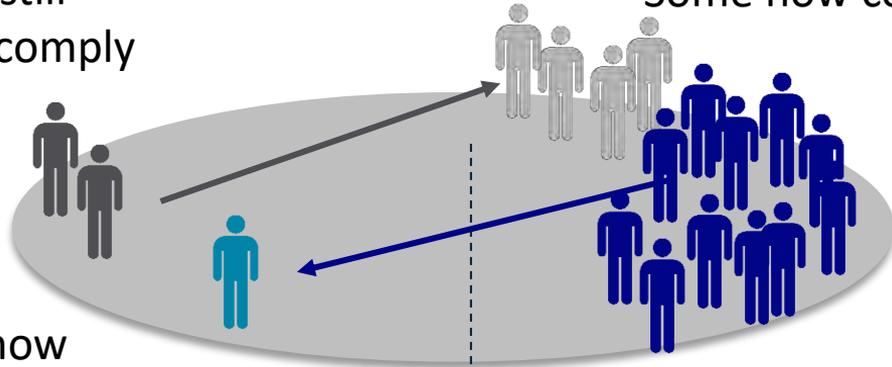


or



Social norm nudge

Some still  
don't comply

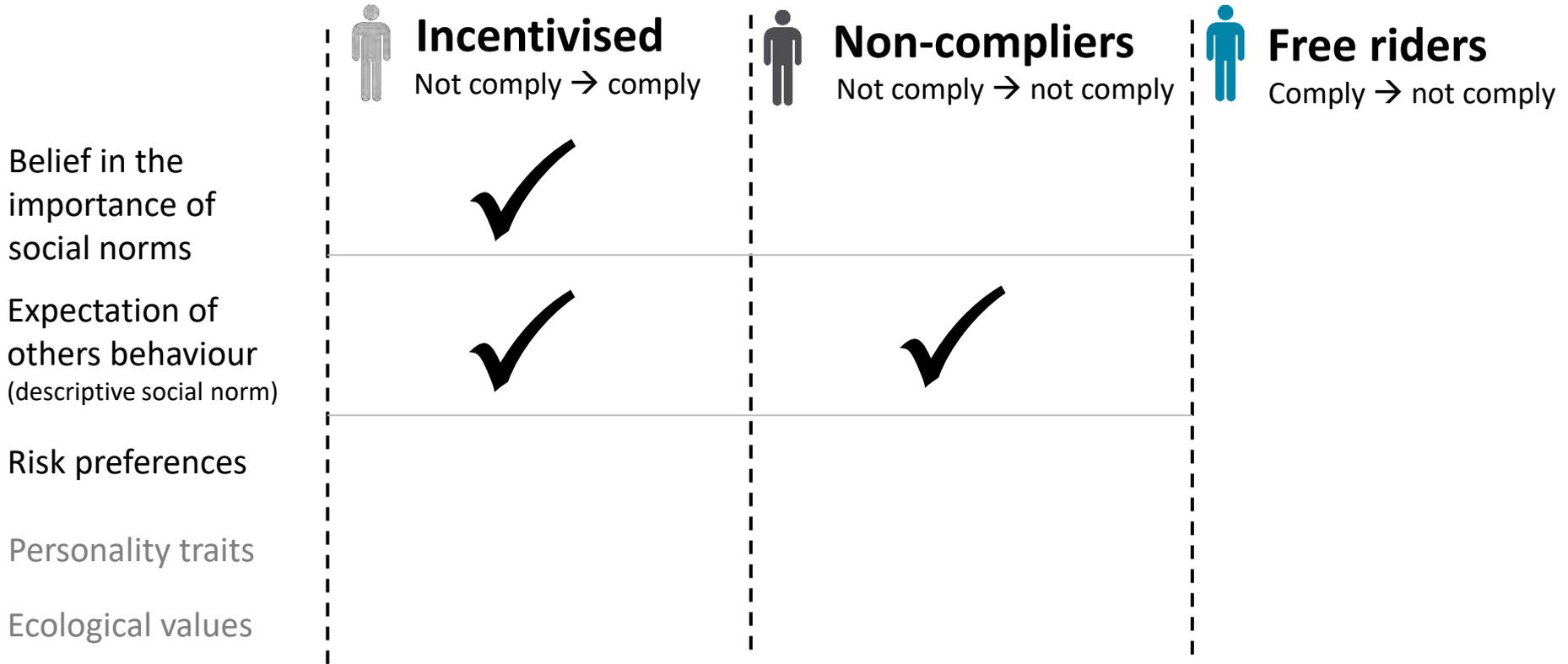


Some now comply

Most still  
comply

Few now  
don't comply

# Responses social norm nudge / increase in deterrence



# Recreational fisher responses social norm nudge

	 <b>Incentivised</b> Not comply → comply	 <b>Non-compliers</b> Not comply → not comply	 <b>Free riders</b> Comply → not comply
Belief in the importance of social norms	✓		
Expectation of others behaviour (descriptive social norm)	✓	✓	
Risk preferences	✓	✓	
Personality traits	✓	✓	✓
Ecological values	✓		

# Recreational fisher responses social norm nudge

	 <b>Incentivised</b> Not comply → comply	 <b>Non-compliers</b> Not comply → not comply	 <b>Free riders</b> Comply → not comply
Belief in the importance of social norms	✓		 Norms communicated explicitly can result in anti-conformity
Expectation of others behaviour (descriptive social norm)	✓	✓	
Risk preferences	✓	✓	
Personality traits	✓	✓	
Ecological values	✓	✓	

# Long summary

- To manage recreational fishing we need to encourage **stewardship behaviour** and **compliance**
- It is important to understand the influence of **social norms** (amongst other things)
  - Can inform different **responses** to **management tools**
  - Avoid **unintended consequences** of communication interventions
- Fishers have **individual motivations** to comply or not, but the environment they make decision in can influence (non) compliance
- **Social norm nudges** can influence fisher decision making and compliance behaviour
- Perception of the importance of social norms in recreational fisheries matters
  - Descriptive social norms matter but may not lead to behaviour change for some (because explicitly mentioning a social norm can backfire)
- To encourage compliance and stewardship we need to take account of the different ways fishers might respond to social incentives (rewards) and understand the role of social norms

# Multi-culturally diverse recreational fisheries

Culturally different motivations for fishing

Different ethnic groups participate in fishing

Cultural background (ethnicity and nationality) impacts responses to behavioural incentives

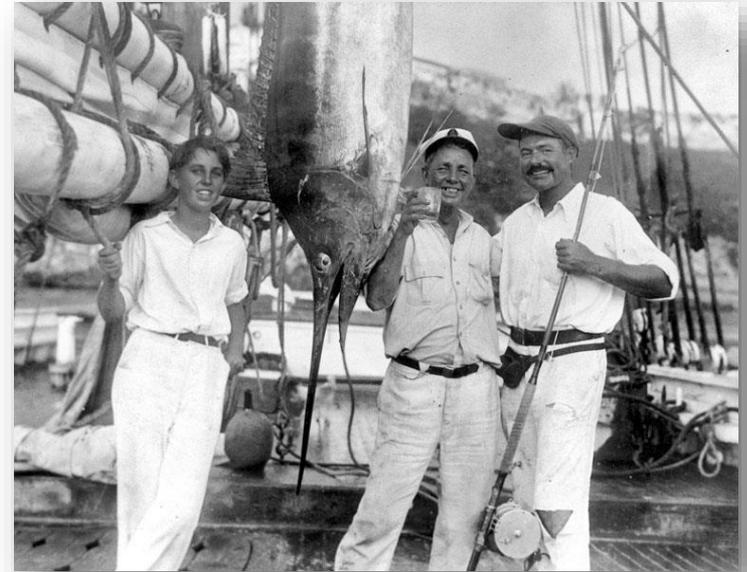
**Knowledge on behaviour and behavioural responses dominate by WEIRD knowledge\***

Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies

\*96% of subjects for studies were from Western industrialized countries

Anglo-Saxon notions of incentive system that work - may be inapplicable in another context

Making a case for more focus on culturally sensitive incentive research for recreational fisheries management



<https://www.britannica.com/topic/The-Old-Man-and-the-Sea-novel-by-Hemingway>



# Thank you

Oceans and Atmosphere  
Ingrid van Putten  
Senior Research Scientist  
Team Leader

+61 3 6232 5048  
Ingrid.vanputten@csiro.au

And again thanking my colleague Dr Mary Mackay (CSIRO)  
Australia's National Science Agency

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MELBOURNE,  
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