Using perceptions to examine human responses to blanket bans: The case of the thresher shark landing-ban in Sri Lanka

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A B S T R A C T

Species-specific bans are increasingly being implemented to stem loss of vulnerable marine species, but there is a paucity of evaluative research into resulting socio-economic and ecological consequences. In 2012, a blanket ban on landing Alopiidae (thresher) sharks was introduced in Sri Lanka. We used fisher perceptions, shown to influence support and compliance with conservation policies, to examine human responses. Data, gathered over a ten-month period in 2019 from focus groups and informal engagement during site visits, suggest support for the ban was lowest amongst fishers who perceived negative social consequences to be higher. Perceptions were also undermined by feelings of poor engagement from institutions and a lack of ecological necessity. The ban appears effective in halting targeted fisheries; however, persistent bycatch was reported by fishers. Further, bycatch appears to be widely unrecorded partly owing to mistrust and confusion amongst fishers. Occasional illegal landings were reported, seemingly motivated by interlinked factors such as good economic returns for thresher meat and high vessel running costs. The potential severity and inequity in social consequences stemming from blanket bans was highlighted, particularly when bycatch and targeted fisheries co-exist. Case study lessons are translated into a checklist containing key questions, designed to aid policy-makers to assess data provision and needs prior to introducing bans. Increasing data provision could enhance the capability of policies to predict and adapt to human behavioural responses, a key requirement considering continuing global declines in sharks despite increasing conservation effort.

1. Introduction

Continuing declines in sharks and rays (subclass: Elasmobranchii; herein "sharks") have led to increased urgency in implementing conservation policies designed to protect them at global and national levels [1]. Introduced policies are primarily designed to halt or limit fisheries-induced mortality, identified as the key threat to sharks [2], but policy suitability is highly context-specific, dependent on factors such as population-status and exploitation patterns [3]. Accordingly, researchers have advocated for the development of numerous and complimentary policies to address the multifaceted nature of shark fisheries [4].

A sense of urgency to implement protection, poor data availability and the inherent complexity of many shark fisheries means policies are often implemented with limited understanding of social dimensions [5]. Forty percent of global shark landings come from countries categorised as having low or medium Human Development Indices [3] and shark

fishing communities often have vulnerable socio-economic status [6]. Therefore, social consequences of reduced income from shark fisheries may be severe, especially if fishers are engaged in specialised, targeted fisheries for one or more species [7]. For example, shark fishers in the Maldives reported generating lower profits after switching to alternative fisheries following the ban on exploitation of sharks [7]. In Indonesia, income reductions from shark fisheries increased the likelihood of fishers resorting to high risk livelihood options, such as illegal fishing [8]. Negative perceptions of these economic consequences resulting from shark bans can also undermine support for bans amongst fishers [9]. Consequently, identifying and incorporating social dimensions is important, both to establish potential human impacts and assess predicted levels of support prior to the introduction of blanket bans.

Understanding social motivations for shark fisheries can aid the creation of policies that can predict or adapt to negative behavioural responses, such as non-compliance amongst fishers [10]. Compliance with conservation policies is a key requirement for policy success [11,

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12] and non-compliance is identified as a primary challenge to halting shark population declines globally [1,7,13]. A large body of research spanning multiple disciplines has examined the theoretical underpinnings of non-compliance [14]. Historically, conservation theory and practice has often focused on understanding human behaviour using singular theoretical approaches, many of which have had a strong focus on behavioural economics, depicting humans as "rational utility maximisers" [15,16]. For example, deterrence theories, which assert that individuals primarily make decisions heuristically by weighing up perceived profits from an activity compared with losses [15,17]. However, conservation research increasingly advocates for wider inclusion of multiple socio-ecological factors, drawing on current paradigms of human behaviour from across disciplines including psychology and behavioural theory, as part of a systemic understanding of compliance [11]. This requires that practitioners understand and collect data on multiple exogenous and endogenous factors such as social norms (what other people do and what other people approve of) [18], personal moral obligations [19] and how stakeholders engage with policy decisions [12]. Understanding of these factors should then be incorporated to create tailored policies capable of adapting and reacting to their unique socio-economic context [20,21]. This should preferably occur during policy planning processes, allowing for the inclusion of predictive knowledge, e.g. scenario modelling of likely responses, to help identify potential ways of managing and mitigating behavioural responses before they affect policy success [10].

In reality, the collection of data concerning policy responses is often restricted by both time and resource constraints, and the best way to gather predictive and evaluative knowledge, including specific tools for data gathering, is likely to be context-specific and dependent on existing level of understanding [10]. There is increasing awareness of the utility of social science techniques for studying complex, messy issues such as human behaviours [22]. One suggested approach is the exploration of "perceptions", which can be defined as "how an individual observes, understands, interprets and evaluates a policy, or outcome" [23]. Favourable perceptions of factors such as social outcomes [24], ecological effectiveness in protecting marine habitats [25] and legitimacy of institutions have been found to predicate policy success [11, 26]. Therefore, perceptions can provide important insights into how those affected by policies evaluate policy success and identify potential issues undermining and motivating support for a policy, which has been identified as a key predictor of compliance [23,27].

This paper studies responses to the national blanket ban on landing thresher sharks (*Alopiidae*) in Sri Lanka. The ban was introduced in 2012, primarily in response to the Indian Ocean Tuna Commission (IOTC) decision in the same year to ban all exploitation of threshers for contracting parties. Blanket bans, defined as a complete prohibition on exploitation of a species, are an increasingly popular policy used for shark management [28]. This is owing to their relative simplicity, which makes them well-suited to situations where sustainable fisheries management is constrained by available resources and capacity [29]. In addition, blanket bans fulfil countries obligations under international treaties, such as The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and offer absolute protection for highly vulnerable species [3]. Threshers, considered to be the most vulnerable pelagic shark family [2] were listed on Appendix II of CITES in 2018, and are listed as either Vulnerable (*Alopias vulpinus, Alopias superciliosus*) or Endangered (*Alopias pelagicus*) by the IUCN Red List [30–32].

Within Sri Lanka, sharks are typically caught as part of multi-species fisheries in both coastal and offshore areas and generate earnings through domestic sales of meat and export of fins and teeth, as well as contributing to food security [33,34]. National landing figures (encompassing all catches landed to domestic ports in Sri Lanka) suggest that prior to the ban in 2012, threshers accounted for 14% of national shark landings [35,36]. The National Plan Of Action for Sharks (NPOA-Sharks) stated that landings were primarily from small, artisanal

vessels targeting threshers off the south coast [36]. In addition, a small proportional contribution was reported from semi-industrial vessels fishing for large pelagics off the south and west coasts, that landed threshers caught as bycatch [36]. However, the NPOA-Sharks highlighted issues with landings data, particularly for artisanal vessels [36] and there was uncertainty as to the contribution of bycatch to landings, as logbooks for semi-industrial vessels were only introduced in 2012 [34]. Accordingly, these gaps in understanding hindered prediction of human responses to the ban, although it was anticipated that socio-economic consequences would more severe for the artisanal fleet engaging in targeted fisheries, compared with the semi-industrial fleet [36]. This anticipated distinction would enable comparative research into the relationship between severity of impacts and overall support and compliance with blanket bans.

1.1. Study objectives

The overall study aim was to examine human behavioural responses to a blanket ban and assess what effect these responses may be having on overall policy success, e.g. in halting exploitation of threshers. There was an identified need to first gather data on magnitude and nature of pre-ban reliance on threshers amongst fisher groups on the south and west coasts of Sri Lanka, the findings of which we report in the methods section primarily. Secondly, we examined fisher perceptions of the following aspects of the ban: a) social consequences; b) ecological effectiveness in protecting thresher populations; c) legitimacy of governance institutions and policy processes; and, d) social acceptability [23]. Overall support and compliance with the ban were also investigated. Thirdly, comparative, qualitative analysis of perceptions was conducted to identify factors undermining or motivating behavioural responses. Finally, we examined how lessons from this case study could be used to improve future success of blanket bans in meeting their conservation objectives.

2. Methods

2.1. Study context

From a review of national reports and communication with in-country researchers, we identified a number of historical landing sites for threshers on the south and west coasts in Sri Lanka [34,36]. In order to designate study communities that were representative of artisanal and semi-industrial fisher groups (as described in Table 1), 40 community visits were conducted during a 7-month preliminary investigative phase (January–July 2019). During these visits, Research Assistants (RAs) used convenience sampling to approach fishers and middlemen engaged in shark fisheries (predominantly at landing sites) to conduct informal, unstructured conversations and observe behaviours (e.g. illegal landing of threshers). These conversations were carried out in Sinhalese by Sri Lankan RAs (n = 3) who received comprehensive in-situ training throughout the preliminary phase. Participants were first informed that all data were collected anonymously for a student project. RAs either took notes or recorded conversations, with participant permission, and transcripts of conversations, along with behavioural observations, were recorded as field notes using a structured template (Appendix A). Data were used to designate four study communities (Fig. 1) and to define and characterise the two study groups and their social reliance on threshers pre-ban (Table 1). This phase also enabled RAs to build a rapport with communities which facilitated subsequent data collection [37].

2.2. Study methods

During the preliminary phase, RAs also collected data on support for the ban, compliance and socio-economic outcomes by conducting informal conversations and observing behaviours. These data were used to build an understanding of stakeholder viewpoints to inform

Table 1

Descriptions of the defining characteristics for the two study groups of fishers, which have been separated primarily by their vessel type. The name for each group is taken from the vessels that they typically operate with, these names are shortened to IMUL and OFRP, which are widely used terms within Sri Lanka to refer to these types of vessels. Information is taken from the preliminary investigative phase and supplemented by national reports [33,34].

Characteristics	Fisher group 1: hereafter referred to as "IMUL"	Fisher group 2: hereafter referred to as "OFRP"
Vessel type	Vessels with in-board engines (typically 9–15 m long), commonly referred to as "multi-day vessels"	Fibre reinforced plastic boats powered by outboard motor engines (typically 6–7 m long) *Note: study data indicates that fishers within this group would occasionally use small IMUL vessels to target threshers off the South coast*
Fishing location	Trips of 2 to 8 weeks, within Exclusive Economic Zone (EEZ) and high seas areas. Threshers were targeted in areas off the south and west coasts and in high seas areas/foreign countries EEZs	One-day trips, primarily to near-shore (coastal) areas off the south coast. Threshers were targeted primarily off the south coast
Gears	Multi-gear fisheries using long-line and gill-nets	Long-line
Target species assemblage	Medium and large pelagics, most commonly tuna, billfish and sharks	Threshers targeted seasonally
Seasonality	June–August (thresher targeting season) *Note: study data indicates that vessels interact with threshers all year round, due to the wide geographical range of vessels*	November–April (thresher targeting season)
Socio-economic reliance	Fishers at sites 3 and 4 explained that historical reliance on thresher landings was highly variable. Three main reliance types were described; 1) threshers were a valuable bycatch species, caught during fishing for other large pelagics, 2) threshers were important as a seasonal target species targeted annually by some vessels, 3) threshers were important as a target species, which some vessels would target opportunistically when target species catch was low (e.g. not every year) **Low-Medium socio-economic reliance (highly variable)**	Fishers at sites 1 and 2 confirmed that targeted thresher fisheries were the main income source for multiple fishers in their communities. Fishers explained that they relied on the income from these seasonal fisheries to provide from them and their families year-round. **High socio-economic reliance**

development of the protocol for the primary study method, namely focus groups. Focus groups were chosen due to their recognised value in capturing contrasting perceptions towards a specific issue amongst different participant groups [38]. A total of nine key questions were asked during focus groups and question content was aligned to key issues identified during preliminary data collection: 1) perceived individual and overall social consequences; 2) ecological justification and effect of the ban; 3) perceived legitimacy of governance and decision-making processes, e.g. credibility of institutions; 4) fairness and acceptability, and 5) attitudes and behaviours relating to non-compliance (discussion guidelines provided in Appendix B). Three questions were accompanied by a ranking exercise, where fishers collectively decided on the importance of given answers, according to a three-point scale (High Importance, Medium Importance, Low Importance). Questions were deliberately designed to be open, and facilitators used both prepared and impromptu prompts to encourage discussion. Due to the potentially sensitive content, facilitators encouraged an informal atmosphere by asking a non-sensitive question first and allowing fishers to decide a familiar location for discussions to be held, e.g. vessel engine rooms [38].

Focus groups were conducted over a two-month period in October–November 2019, and participants were recruited at landing sites using convenience sampling [39]. Groups were homogenous in terms of fishery type (e.g. Group 1 or Group 2), and a mixture of on-board roles were present (e.g. vessel captains and crew) in each discussion, with group size ranging from 3 to 6 persons. Duration of discussions averaged 42 ± 6 min. During an introductory statement, facilitators explained that data was anonymous and confidential, and fishers agreed verbally to participate (and be audio-recorded). Discussions were then transcribed and translated into English by RAs. Data analysis was completed concurrently to data collection, by the lead author, in order to verify method suitability and assess data saturation. Saturation is a key concept used in conjunction with qualitative data analysis, and refers to the point where no novel data is found that can further understanding and was used in this study to guide decisions about the total number of focus groups [40]. All methods were approved by the University of Exeter Ethics Committee (Ref: eCORN001727 v4.1).

2.3. Data analysis

Our analysis followed a three-stage process. Firstly, an analytical

framework (adapted from Ref. [23]) was created to organise perceptions into five categories: a) social outcomes; b) ecological effectiveness; c) legitimacy of governance institutions and processes; d) fairness and acceptability; and, e) compliance. This framework was further informed by scientific literature examining how perceptions can interact with policy support [24,27,41] and how to study and understand compliance with policies [11,14,16,20,42]. Secondly, all data were organised against this framework (Appendix C) by assigning relevant thematic codes line-by-line. Inductive, data-driven codes were created where existing ones did not match, and codes were reviewed and re-arranged hierarchically in an iterative process. In addition to transcribed focus group discussions, field note data were also analysed to allow for cross-method triangulation which, by gaining different perspectives of a phenomenon or issue, can help to widen understanding and address bias introduced by a particular methodology [43]. This approach has shown to be advantageous when dealing with activities of a complex, illegal nature, e.g. by addressing response bias [39,44,45]. Thirdly, in order to allow for the generation of quantitative data, data-driven descriptive codes were assigned to data from focus groups and, for questions where fishers had ranked their answers, given a level of perceived importance.

3. Results

3.1. Support for the ban

Overall, 12 focus groups (three at each site) were conducted with a total of 53 participants (made up of 31 IMUL and 22 OFRP fishers). When invited to participate in these sessions, refusal rate was higher for IMUL (~30%) than for OFRP (~5%) fishers. This may have increased influence of non-response bias, as IMUL fishers who refused to participate may share certain opinions or characteristics that we are unable to describe for this study. Accordingly, insights from focus groups have been triangulated using data from field notes whenever possible.

Support for the ban appeared highly variable, encompassing both positive and negative opinions, with a wide variety of reasons provided by the fishers as justification for their opinions (Fig. 2). Broadly speaking, OFRP fishers were mostly in favour of it being lifted, citing primarily social reasons. For example, the ban should be lifted to restore their livelihoods. Contrastingly, IMUL fishers as a group held highly variable, and sometimes conflicting, opinions. For example, some fishers said it should be kept to protect threshers, whereas others felt there was
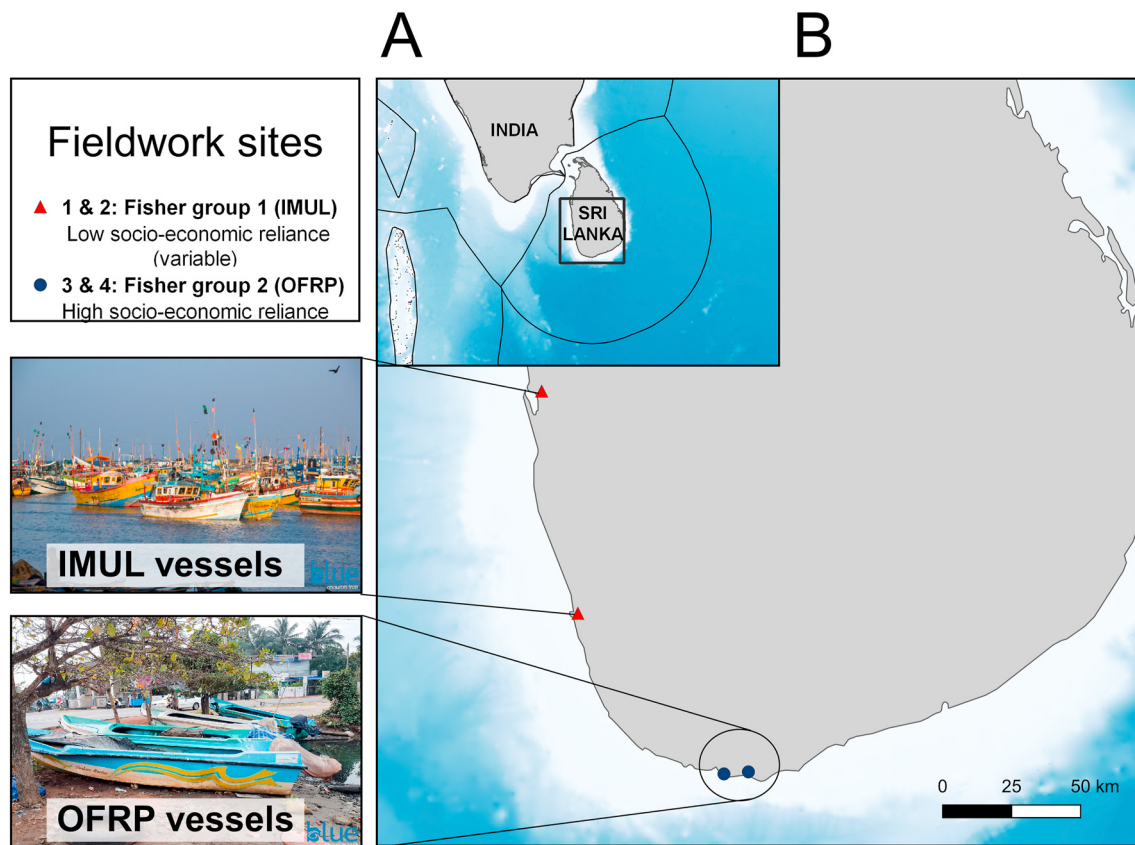
Fig. 1. Study communities and field sites. A. Location of Sri Lanka. B. Location of the four study sites, sites 1 and 2 represent fisher group 1 who operate larger vessels referred to locally as "IMUL". Sites 3 and 4 represent fisher group 2 who operate smaller vessels referred to locally as "OFRP". Pictures of a typical "IMUL" vessel, used by fisher group 1 anda typical "OFRP" vessel, used by fisher group 2 are included. Both images copyright of Blue Resources Trust. Note that community names are not reported to preserve respondents' anonymity. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)
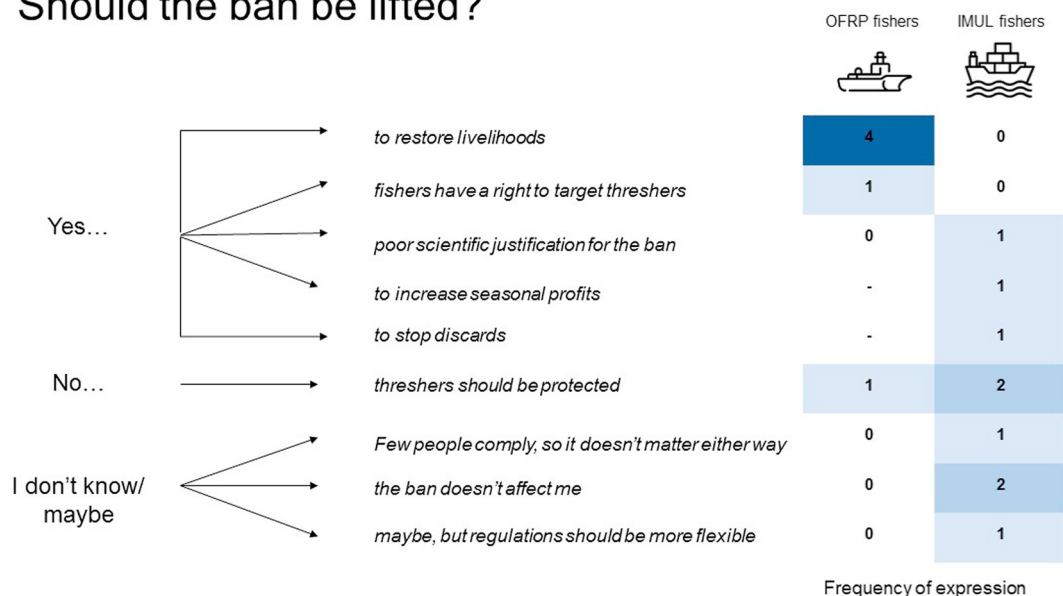

Fig. 2. Schematic showing fisher responses during 12 focus groups (6 OFRP and 6 IMUL groups) to the question "*Should the ban be lifted in your opinion, and why?*" The numbered boxes on the right indicate the number of focus groups in which this issue was raised and are coloured to emphasise frequency with which the opinion was expressed. Note that within some focus groups contrasting opinions were voiced by individual fishers and all of these are represented in the numbers on the right which, therefore, are greater than total number focus groups.

a lack of conservation justification for the ban. Amongst IMUL groups there appeared to be a stronger sense of apathy towards the ban, with fishers in four out of six groups stating that they didn't know/care because it either didn't affect them or because they felt no-one complied with it anyway.

3.2. Perceptions of compliance with the ban

None of the fishers we spoke to during focus groups said that targeted fishing of threshers continued after the ban. However, fishers in all OFRP groups and four out of six IMUL groups stated that some IMUL fishers would try and land threshers caught incidentally (as bycatch). Landings of threshers (always of <5 specimens) were observed at IMUL landing sites during 10% of our 40 site visits. Contrastingly, no groups said that OFRP fishers continued to land threshers post-ban. The likelihood of reporting bias is acknowledged, as there was a sense of unease when speaking with some IMUL fishers about landing non-compliance (although one IMUL fisher did admit to non-compliance during a focus group). Additionally, observations and discussions during site visits and focus groups suggest that fishers try to avoid detection by discarding distinctive caudal fins at sea, landing meat and fins separately (with meat occasionally dried at sea) and/or unloading carcasses and fins in secret to vehicles at markets. Therefore, observations of thresher landings may inaccurately estimate occurrence of these behaviours.

There was a heterogeneity in the reasons given for non-compliance, both within and between fisher group types (Fig. 3). Fishers explained that the most common reasons for non-compliance were economic necessity (two IMUL and six OFRP groups), low risk perception (four IMUL and three OFRP groups) and dislike of discarding (three IMUL and five OFRP groups). Data from both focus groups and site visits also indicated that high economic returns for threshers are an important motivator for non-compliance. For example, both middlemen (engaged in selling shark products) and fishers explained during site visits that thresher

meat was of high value compared to some other commonly landed shark species (e.g. blue, *Prionace glauca*). Correspondingly, both OFRP and IMUL fishers explained that meat, rather than fins, was the primary economic motivator for illegal landings. One OFRP fisher explained this by saying: *"even though the fins have a low price, the meat is still valuable"*. Likelihood of non-compliance appeared dynamic for some vessels, as they will only reportedly land threshers when target species (e.g. tuna) catch was poor. Conversely, fishers said that some vessels will consistently try and land threshers they catch incidentally, in order to cover high vessel running costs.

Fishers across both groups primarily cited sanctions, including fear of fines and/or removal of licenses, as the primary motivation behind compliance (Fig. 4). One fisher explained *"now if we decide to land a thresher we do so with a lot of anxiety. It's a risk"*. Behavioural norms also appeared to be an important motivator for compliance; personal (internal moral obligations) and injunctive (what others approve/disapprove of) norms were mentioned by five out of six OFRP groups. Fishers reported feeling the need to comply due to both internal, moral obligations and negative perceptions of illegal landing of threshers amongst their wider community. For IMUL fishers, personal norms guided by environmental stewardship also emerged as important in determining compliance, as some IMUL fishers reportedly decide to comply only if the thresher is alive on haul-back. One fisher explained this by saying *"it is no use to us or the sea (when dead)"*.

Although sanctions were frequently discussed by both IMUL and OFRP fishers there was a noted disparity in how they perceived the corresponding financial implications. IMUL fishers commonly said the fine was of low-medium concern, e.g. *"(the fine is an) intermediate worry … not a big concern"*. In contrast, OFRP fishers commonly said it would have serious personal consequences, as summarised by one fisher who said, *"big fine … earn a whole year to settle that fine"*. Accordingly, one OFRP group said that IMUL owners were likely to assist in payment of the fines, therefore reducing the economic consequences of sanctions for

What are the reasons for non-compliance?

Fig. 3. Themes in responses of fishers during focus groups (numbered 1–6 for IMUL groups and 7–12 for OFRP groups on the x-axis) to the question "*What are the reasons for non-compliance?*" Blank spaces denote that the issue was not raised by participants during that specific focus group.
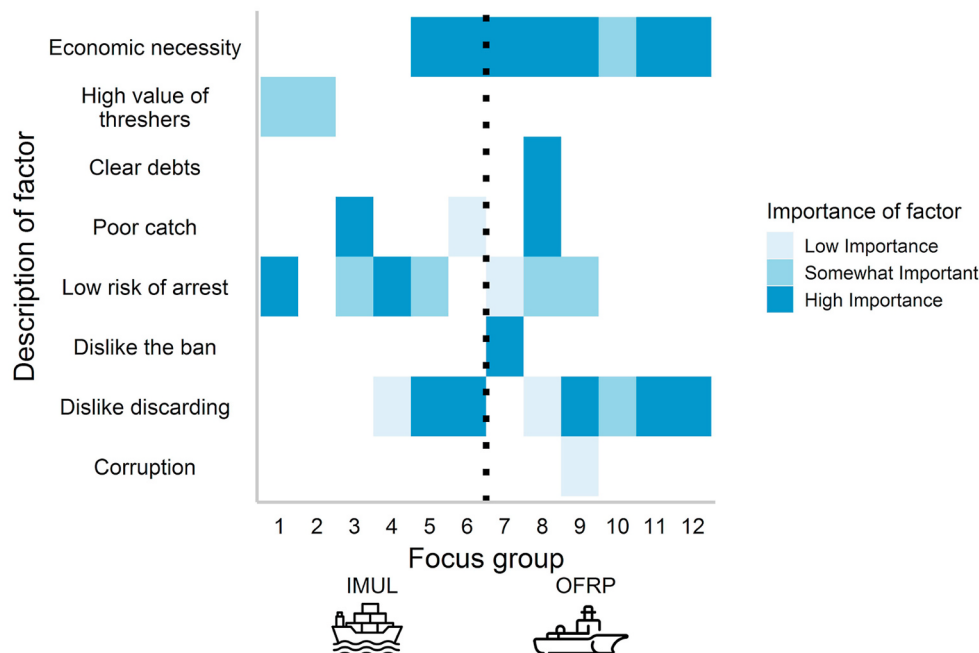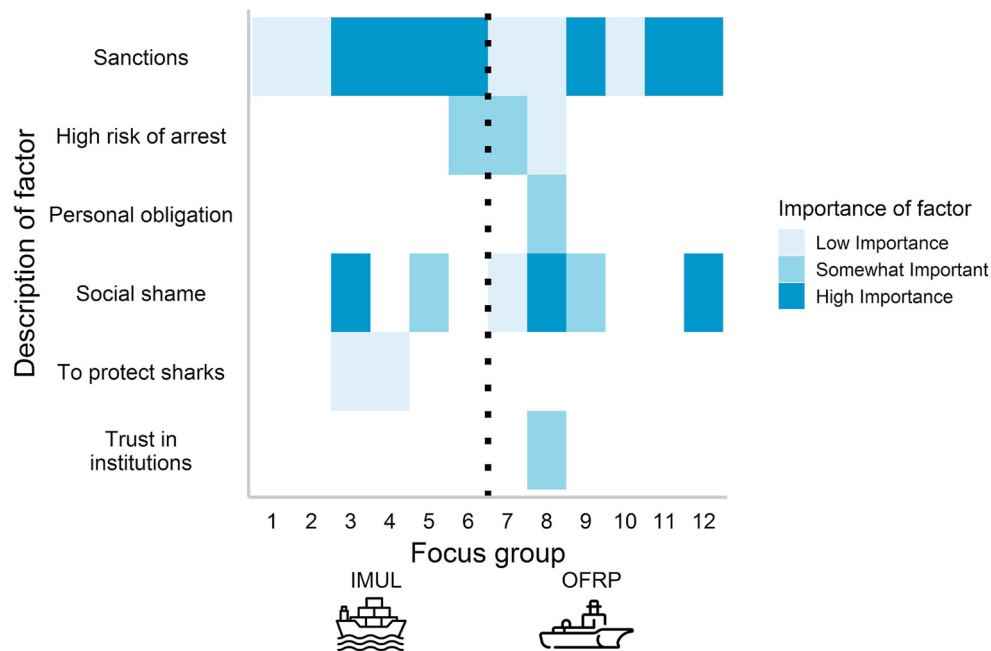
Fig. 4. Themes in responses of fishers during focus groups (numbered 1–6 for IMUL groups and 7–12 for OFRP groups on the x-axis) to the question "*What makes people comply with the ban?*" Blank spaces denote that the issue was not raised by participants during that specific focus group.

some IMUL fishers.

Interestingly, no fishers stated that they recorded discards of threshers. The most common reason for not doing so was fear of punishment from authorities (mentioned by five IMUL groups), who fishers felt would suspect them of intentionally targeting or landing threshers if they were to record discards. For example, one fisher explained "*recording also might bring problems because they think that we have landed them when it's stated in the logbook*".

3.3. Perceptions of the ban

Examining the data, we identified multiple issues across the four perception categories that appear to be potentially undermining or motivating support for the ban (Table 2).

3.3.1. Social impacts of the thresher ban

Our results suggest there may have been a wide range of social consequences at both personal and community levels (Fig. 5). As anticipated, all participating OFRP fishers perceived consequences of the ban as of high, personal importance. One fisher explained "*now what people do is catch fish to survive … other than that we can't earn to make any improvement in our lives*". In contrast, although IMUL fishers in five out of six groups mentioned social consequences, they perceived these to be of low to moderate importance (Fig. 5). This disparity in perceived magnitude of socio-economic consequences was described as unfair by OFRP fishers, with one fisher explaining that "*the biggest impact that the ban had was on small scale fishers. Not the multi-day fishermen*".

3.3.2. Ecological effectiveness of the ban

When questioned about the impact of the ban, only three focus groups (all OFRP) were confident the ban would increase population size. Fishers in all other groups were either uncertain of the effect or, said that non-compliance and high levels of bycatch would negate any positive effect. There were general differences in the opinions and knowledge of IMUL and OFRP fishers as to the scientific reasoning for

the ban, with all IMUL focus groups confident in providing a reason (e.g. vulnerable status of populations) compared to no OFRP groups. Relatedly, perceptions of population status differed between groups. IMUL fishers in four of the six groups perceived that populations had decreased over the last 10 years, citing decreases of up to 75%, whereas OFRP fishers in all groups perceived population levels as high before the ban and commonly said they felt there had been no change in populations post-ban. However, ORFP fishers felt their understanding of populations post-ban was compromised by a shift in fishing sites, meaning they no longer encounter threshers. Fishers from both groups appeared interested in the efficacy of the ban, particularly OFRP fishers, who expressed a desire for feedback from scientists and policy-makers as to whether it was having a positive effect. One OFRP fishers explained that fishers wanted to support the ban but there was a lack of information on its effect on population recovery, saying we "*love these animals but we need proof*".

3.3.3. Legitimacy and effectiveness of management and governance

Issues with governance institutions and policy processes relating to the ban were primarily raised by OFRP fishers. Commonly raised issues included poor communication and prior notice of the ban, paucity of engagement mechanisms (between fishers and policy-makers) and inconsistent policy implementation. IMUL fishers shared some of these insights, however perceptions appeared less negative overall. Inadequate or unsuitable communication regarding the policy was highlighted by both OFRP and IMUL fishers, with one OFRP fisher saying that this was their "*biggest issue*". Some fishers went further and said they were not informed of the reasons for the ban at all, saying "*if they are going to put any regulation, they should at least inform us through a poster the reasons why they put such regulations*". Some OFRP fishers felt the lack of consultation prior to the ban exemplified the lack of meaningful engagement between themselves and institutions. Within one OFRP group they stated "*(they) didn't even consult us before putting this ban; they don't care at all about the impacts the regulations will have on fishers*".

All OFRP groups raised issues with policy-implementation, primarily

Table 2

Main types of issues identified by fishers during focus groups under each perception category, with illustrative quotes (fisher group type is provided after the quotes, which are separated by semi-colons).

Perception category	Identified themes	Illustrative quotes
Socio-economic outcomes, e.g. type and magnitude of social costs and benefits	Loss of fishing livelihoods	*"It directly affected us. We lost our jobs and it hugely affected our economy; main impact was loss of jobs"* (OFRP fishers)
	Lack of profitable alternative fishing livelihood options	*"We have no other fish to catch, what shall we do now; We caught thresher from near waters. So, we spent less money for fuel"* (OFRP fishers)
	Loss of investment	*"The fishers have made all needed gear and equipment investing large amount of money … all the gear and equipment … are almost destroyed"* (OFRP fisher)
	Accruement of debt	*"Those days we had no problem. We got good money. We had no debts to pay; But when they ban this, we are at risk of settling all our costs"* (OFRP fishers)
	Increase in vulnerability to declines in target species	*"When we had less tuna catch, we targeted thresher sharks, because we can't come back home empty-handed, we always try to bring something"* (IMUL fisher)
	Decrease in profitability of IMUL fisheries	*"If we can bring at least a dead one it would help"; "If you have 10 of those sharks in the boat that will help you to cover the costs"* (IMUL fisher)
	Loss of ability to ameliorate costs of bycatch entanglement	*"Yeah it's very difficult when a thresher gets caught in the net. They normally wrap the net around their body when trying to escape"* (IMUL fisher)
	Community-level socio-cultural consequences	*"Our families had to face problems; some actually lose their jobs; we celebrated the new year only because we caught thresher sharks"* (OFRP fisher)
Ecological effectiveness, e.g. impacts on thresher population numbers, consequences for wider ecological systems	Status of thresher populations	*"It is a completely unnecessary regulation; these species could never be in that kind of risk"* (OFRP fisher) *"they have decreased … Lesser than before now. 75% less"* (IMUL fisher)
	Information provision for scientific justification for ban	*"Actually, nobody knows why they have put this ban"* (IMUL fisher) *"People have many conceptions about the reasons for this ban but none of those were informed by authorized official; I think they should have informed us the reason for this ban before*

Table 2 (*continued*)

Perception category	Identified themes	Illustrative quotes
		implementation." (OFRP fishers)
	Intangibility of monitoring of effect of the ban	*"We still do not know if the thresher sharks have disappeared or increased in our waters. So, to check that, the government should lift this ban; we love these animals we also want to protect it. But we need proofs"* (OFRP fishers)
	Factors limiting population recovery, e. g. ongoing discards and non-compliance	*"Threshers get caught and they just die in there"* (IMUL fisher); *"But people operate in multiday vessels still catch and land threshers"* (OFRP fisher)
	Balance of policies across fisheries	*"Actually, they put this regulation for no reason, if they want to protect the fish resource why don't they ban that coarse net fishing"* (OFRP fisher)
Legitimacy of policy and governance e.g. quality and justification for policy-making processes, appropriateness and inclusive of governance structures, legitimacy of institutions	Policy-related communication mechanisms	*"They just put this ban in an instant; The ministry or department, if they are going to put any regulation, they should at least inform us through a poster the reasons why they put such regulations"* (OFRP fisher)
	Policy-implementation, e.g. enforcement	*"Lack of proper implementation of rules and regulations; "(fishers still) illegally catch and murder these species … No one is there to monitor such things, so they do it still"* (OFRP fisher)
	Engagement mechanisms between policy-makers and fishers	*"Didn't even consult us before putting this ban; they don't care at all about the impacts the regulations will have on fishers"* (OFRP fisher)
	Legitimacy of socio-political motivations for the ban	*"Europe informed our government that they are going stop importing tuna from our country unless these shark regulations put in force; this ban is an international trap. We don't need this ban. Our governments sign all international agreements and now we have to follow all what say"* (OFRP fishers)
	Perceptions of corruption within governance institutions	*"Political means the ministers fear that they will lose their votes. No other reason, that's the only reason why they are not banning"* (OFRP fisher)
	Levels of trust in institutions across scales, e.g. local/national	*"That way, we have a good relationship with those officers (local fisheries officers). So, we can't go against them"* (OFRP fisher)
Fairness and acceptability e.g. appropriateness and alignment of policies against socio-	Introduction of undesirable fishing behaviours, e.g. discarding	*"The fish is already dead, and it won't save anything for either the government or the sea; what's the point*

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Table 2 (*continued*)

Perception category	Identified themes	Illustrative quotes
cultural context and fairness of social consequences		*of throwing a dead fish? Our question is, what should we do with a dead fish?"* (IMUL fishers)
	Alignment with traditional management	"*We did that fishery only for 6 months. 6 months we killed sharks, and the rest 6 months we gave a space for them to grow up. We don't go every time of the year to catch threshers*" (OFRP fisher)
	Mitigation of social impacts	"*If they keep putting this kind of ban, fishers will be in huge problems*" (IMUL fisher); "*No one is there to think about us, small scale fishers*" (OFRP fisher)
	Erosion of traditional fisher rights	"*Fishers should have the right to target thresher sharks at their will*" (OFRP fisher)
	Rapid adoption of animal-centric viewpoint	"*They should look at this problem standing by our side, not sharks*" or "*why should we get fined because of a fish?*" (IMUL fishers)
	Fairness of sanctions across fleet	"*If skipper license gets cancelled for us (young ones) we either can go work in the deck. But for elderly people skipper license getting cancelled affects a lot since they cannot work harder with boys on the deck due to physical weaknesses and health*" (IMUL fisher)

focusing on perceived inconsistencies with enforcement, with one fisher opining the "*law should be equal to everyone*". Some OFRP groups further opined that poor enforcement was the primary reason for non-compliance, saying it allowed IMUL fishers to "*illegally catch and murder these species (as) no one is there to monitor such things*". Some of these issues appeared to have affected opinions of the socio-political legitimacy of the ban. OFRP fishers in four groups explicitly stated they felt the ban was motivated by socio-political reasons, including foreign influence. Interestingly, opinions of institutions across scales appeared to differ, as positive perceptions of local institutions were more frequently expressed.

3.3.4. Acceptability of conservation management within socio-cultural context

The ban was described as incongruous with traditional management by both IMUL and OFRP groups. Fishers explained that this was because the ban necessitates discarding of high value fish (an issue primarily mentioned by IMUL fishers) or because it replaced traditional fisheries management (primarily mentioned by OFRP fishers, who felt that their tradition of targeting threshers seasonally was adequate in affording them protection). Gathered insights also suggest fishers felt the ban was part of a continued erosion of their rights as a fisher through increased management and regulations. One OFRP fisher explained that "*fishers should have the right to target thresher sharks at their will*". Relatedly, some fishers implied that the government was adopting an increasingly "animal-centric" viewpoint in both introducing regulations, e.g. "*they should look at this problem standing by our side, not sharks*", and increasing sanctions for non-compliance, e.g. "*why should we get fined because of a fish?*" Fishers across both fishery groups expressed concern about increased coverage of regulations for shark species and the resulting implications, expressing "i*f they keep putting this kind of ban, fishers will be in huge problems*" (IMUL fisher) and "*no one is there to think about us*" (OFRP fisher).
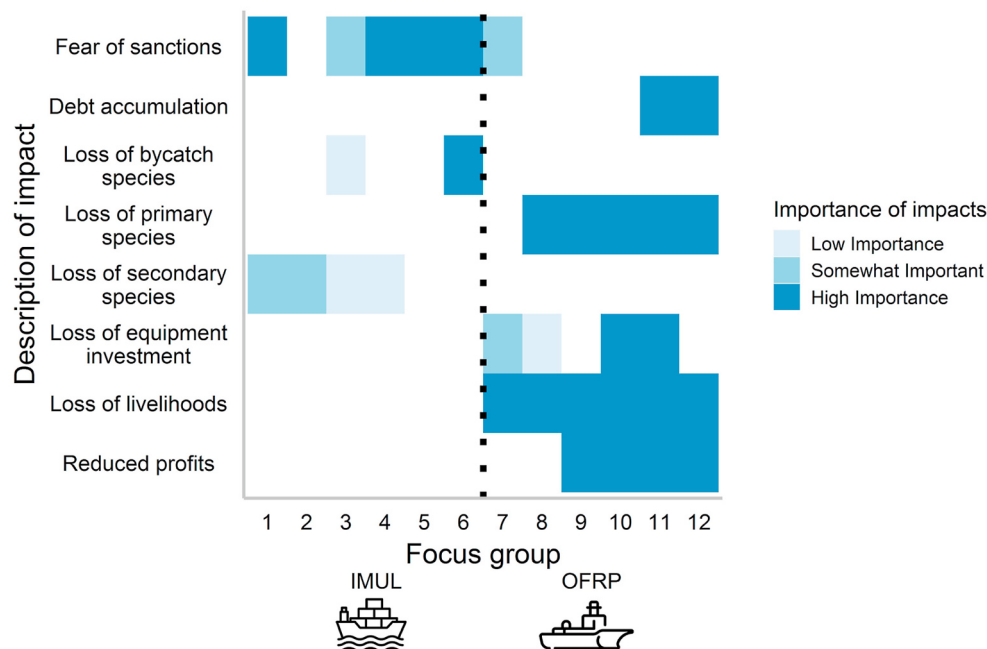

Fig. 5. Themes in responses of fishers during focus groups (numbered 1–6 for IMUL groups and 7–12 for OFRP groups on the x-axis) to the question; "*What are the impacts of the ban?*" Blank spaces denote that the issue was not raised by participants during focus groups.

4. Discussion

Human responses are key determinants of policy success but predictive and explanatory knowledge of these remains poorly integrated into policy frameworks [10]. Study results highlight the complexity of human responses when blanket bans are applied at a national level, especially to a multifarious fleet with a variety of targeting strategies pre-ban.

4.1. What factors affect support for blanket bans amongst resource users?

Lack of support for policies can threaten their long-term success [24, 41]. We found support for the ban was consistently low amongst OFRP fishers and, in contrast, highly variable amongst IMUL fishers. These findings potentially highlight the importance of context, e.g. socio-economic reliance on banned species, in determining relative importance of factors across scales [27,46]. For example, perceptions of severe social impacts strongly undermined support amongst OFRP fishers, but were seemingly less important to IMUL fishers, whom OFRP fishers felt had experienced little or no consequences. This appeared to encourage feelings of unfairness amongst OFRP fishers, a factor which can have a strong negative influence on overall support [47]. Other factors undermining support included mistrust of governance and concern about corruption and foreign influence, all of which were raised across both groups. Fishers also raised issues with a paucity of meaningful engagement during policy-making processes, which can lead to a lack of trust in institutions [48]. In this study, fishers, particularly OFRP groups, appeared amenable and willing to participate. Therefore, identifying what barriers exist to engagement between fishers and policy-makers could be an important step in increasing participation and support for future policies.

Our results suggest there is a high degree of uncertainty and a lack of confidence concerning the intended and observed conservation benefits of the ban, both of which can be important determinants of support [49]. This appeared interlinked with feelings of an absence of monitoring by authorities. Perceptions of ecological impact are important for policy support, particularly in the case of policies such as blanket bans where fishers are unlikely to experience tangible benefits, e.g. through increased resource provisioning [49,50]. The intangibility of benefits and severe social consequences decreased the acceptability of the policy for some fishers. This was further eroded when fishers felt it was incongruous with traditional seasonal management or, that the required increase in discards was paradoxical for conserving populations. These findings highlight the special attention that policy-makers need to take when introducing blanket bans, to ensure that they are capable of being sensitive to existing cultural norms and practices and, wherever possible, are accompanied by mitigation of severe human impacts.

4.2. What can perceptions tell us about compliance with conservation policies?

Determining the nature and magnitude of non-compliance is important for policy success [51]. Limitations in study methodology and the introduction of bias, e.g. fishers engaging in behaviours to avoid detection, mean we are unable to accurately determine magnitude (although results indicate relatively low levels of non-compliance). Nevertheless, results provide important insights for the 5Ws of compliance (e.g. Who, What, Where, When and Why) [14]. Non-compliance appears to be restricted to IMUL fishers, who apparently engage in behaviours both routinely and opportunistically, and evidence suggests some traders may be complicit, e.g. by continuing to knowingly export fins. Illegal behaviours appear to occur along a gradient, incorporating discarding of fins at sea and landing fins and carcasses separately. The finding that fishers are discarding fins at sea, atypical behaviour for Sri Lankan fishers [34], evidences the potential for negative behavioural responses to policies [42]. As well as encouraging unsustainable practices, these responses obscure understanding of policy impacts due to their illicit nature. Interestingly, fishers indicated targeting of sharks in foreign countries waters, an illegal activity reportedly engaged in by some IMUL vessels [52], had reduced post-ban. This indicates the potential of policies to also cause unintentional positive behavioural responses. In terms of when and where, the reported absence of seasonality or hotspots for illegal behaviours is likely owing to the highly mobile nature of the IMUL fleet, which may increase the likelihood of incidental capture of threshers year-round [34].

Illegal fishing has been described as a primarily economic activity [17] and economic incentives for illegal shark fisheries are well-documented [13]. Accordingly, high value of threshers was identified as an incentive, however, in contrast to traditional conservation discourse, results suggested that meat, not fins, are the primary economic incentive for illegal landings [53]. These findings add to the growing body of research identifying meat as an important driver for shark fisheries in some countries [54] and highlights the importance of understanding unique social context of policies. Results advocate for the inclusion of a wider number of factors (beyond simply economic considerations) in building understanding of compliance [55]. For example, findings suggested that socio-psychological factors, e.g. behavioural norms, were more important for OFRP than for IMUL fishers. Interestingly, overall policy support did not appear to be a key determinant of compliance, although the impact of lack of support long-term is currently unclear. Results also emphasise the importance of adopting a socio-ecological lens to understand the interlinked manner in which factors can influence compliance likelihood [56]. For example, IMUL fishers reportedly land threshers to cover high vessel running costs, but the likelihood of compliance appears to be moderated by factors such as target species catch.

How resource users perceive benefits of illegal activity depends not only on the expected benefits, but also on perceptions of the risk and consequences of enforcement [17,57]. Our findings, that there is high variance in both perceptions of enforcement risk, and deterrent effect of sanctions, exemplifies difficulties in implementing sanctions across disparate fleets with variable socio-economic assets. These findings further emphasise the need to identify and understand the relative importance of factors that influence compliance across scales, and not just at a national level [26].

4.3. What factors influence how fishers adapt to blanket bans?

The ability of resource users to respond to conservation policies depends on adaptive capacity, which is reliant on multiple interlinked endogenous and exogenous factors [58]. We hypothesised that OFRP fishers would have reduced ability to adapt to the policy, primarily due to their higher reliance on threshers pre-ban. Results confirm that OFRP fishers had struggled to adapt and accentuated the potential severity of consequences following changes in shark fisheries [8]. Notably, the adaptive ability of OFRP fishers appeared undermined by both a lack of alternative livelihoods and a paucity of assets (partly owing to previous investment in gear for targeting threshers). In addition, this case study also highlighted how the ability of social assets to ameliorate consequences of policies can be reduced when whole communities are impacted by policies.

IMUL fishers were anticipated to have a higher adaptive capacity due to lower levels of reliance on threshers pre-ban. Accordingly, data suggests that IMUL fishers were able to adapt by targeting other species. However, the ban evidently reduced their economic opportunities by removing a valuable bycatch, or secondary species. Fishers appeared worried about future regulations and findings potentially indicate the cumulative effect that increasing regulatory coverage may have on adaptive capacity, leaving them increasingly vulnerable to socio-ecological shocks, e.g. declines in target species or fuel price increases [59]. Therefore, prior to policy introduction, there is a need for empirical assessments of adaptive capacity across scales, e.g. at regional and

fleet levels. This could help mitigation of social consequences and help predict adaptive behaviours that may be undesirable from a conservation perspective, e.g. pursuit of unsustainable activities including regulatory displacement to other shark species [8,27].

4.4. What can findings tell us about policy success?

Identifying factors which may be impacting on the success of conservation policies is imperative to evaluate their human impacts and conservation benefits [60]. Although we cannot ascertain how successful the policy has been in achieving its conservation objectives, e.g. protecting threshers from exploitation, results indicate several factors that may be compromising policy success. For example, there was a broad consensus that incidental capture of threshers continues (for both gill-net and long-line gears). A high proportion of global shark mortality stems from bycatch [61], and blanket bans are ineffective in halting bycatch, unless accompanied by mitigation measures (which are often expensive or ineffective) [62]. Accordingly, success of blanket bans in reducing mortality is likely greater where fisheries are targeted, and bycatch is low for all fisheries operated under its remit [62]. This is particularly pertinent for species such as threshers that have high post-capture mortality rates [63]. In order to determine the effect of ongoing interaction with a species there is a need for collection of both fisheries-independent (e.g. post-capture mortality studies) and fisheries-dependent data (e.g. observer programmes or logbooks). Our results indicate key shortcomings in the coverage and uptake of data collection protocols, particularly for discarded bycatch, motivated by confusion as to the purpose and utility of data on discards. There is an identified need to address factors limiting uptake of protocols, including mistrust of fishers about the utility of discards data. We suggest that benefits of improved data provision for bycatch could be two-fold, by advancing understanding of policy impact and, also, leading to greater engagement and clarity in participation between institutions and resource users. It is also noted that policy success is likely hindered by non-compliance, which can render bans biologically ineffective [64]. Multiple factors were identified as potential drivers for non-compliance, some of which, including negative perceptions of discarding of valuable fish, may also be addressed by enhanced engagement between policy-makers and fishers.

From a human perspective, findings raise sensitive questions regarding acceptability of social consequences resulting from conservation policies. Human impacts of a policy are often poorly incorporated during evaluations of whether a policy can be deemed successful or not. However, conservationists are increasingly debating the ethical and moral aspects of conservation [65] and there are calls for advancements in discussions around trade-offs between social and ecological policy impacts during all stages of policy processes [5]. Our case study results demonstrate that blanket bans can have serious social consequences and, also, that failure to acknowledge and mitigate can drive negative policy evaluations.

Key recommendations to ensure long-term sustainability of the ban involve improvements in data collection and monitoring processes. In particular, continued by-catch was identified as a key problem that is largely unrecorded, and has the potential to both limit population recovery and encourage non-compliance. Assessment of bycatch management scenarios should be conducted, potentially by applying a risk-based framework, such as the mitigation hierarchy framework, to test hypothetical scenarios and set quantitative goals for bycatch reduction [66]. Specific social goals relating to the policy could also be assessed in a similar manner, as provision of information and engagement with fishers, particularly OFRP, was identified as a key concern.

4.5. The future of blanket bans as a tool for shark conservation and management

Overall, results highlight the need for integrated understanding of policy implications within the wider socio-ecological systems where they are applied and advocates for a need to consider policy responses across scales, e.g. at national and community level. We advocate for continued improvements in data collection at all stages of policy making processes, e.g. problem framing, policy or intervention framing, implementation and evaluation [10]. However, we emphasise the need to move towards prospective from retrospective evaluation of human responses to policies, in order to help identify issues before they negatively impact on policies. This should involve formalisation of a predictive approach throughout policy stages, including problem-framing and implementation [10]. We also recognise the role of regional and international management and regulatory bodies in stimulating and regulating introduction of national bans and suggest that increased advice and guidance to members and contracting parties on prospective evaluation of bans is needed. This could include building knowledge and information-sharing networks between countries concerning effectiveness of management measures.

We identified key uncertainties and complexities that may be impeding our ability to understand and enhance success of blanket bans. These are included as a checklist of questions designed to guide policy-makers to gauge existing knowledge and information gaps (Appendix D). Methods used to answer the questions will depend on context, e.g. available resources. However, we suggest that collection of qualitative data through methods such as focus groups can be quick, cost-effective and capable of producing understanding of complex realities of human behavioural responses [20,42]. In addition, these methods can help to foster an informal setting to explore divergent perspectives about potentially sensitive issues such as bans. Blanket bans are not a "silver bullet" for shark conservation and may not be suitable for every context, using these questions policy-makers can assess suitability and identify potentially problematic issues.

5. Conclusion

Despite rapid increases in coverage and uptake of shark management policies across levels, populations continue to decrease, highlighting a clear need to review and improve existing policies [4,64]. Our study shows that blanket bans can be effective in halting targeted fisheries and preventing shifts of shark species from bycatch to secondary species. However, our findings highlight the complexity and uncertainty in human responses to blanket bans, driven by highly multifarious fleets with variable socio-economic contexts and corresponding poor data availability [1,3]. We identify a need for continued improvements in incorporating explanatory and predictive knowledge for human responses to conservation policies [10]. These improvements will ensure that blanket bans do not lead to the creation of socio-ecological traps, e. g. forcing pursuit of behaviours that are undesirable from a sustainability perspective [67], and improve conservation of vulnerable shark species.

CRediT authorship contribution statement

Claire Collins: Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Visualization, Writing - original draft. **Tom Bech Letessier:** Funding acquisition, Project administration, Supervision, Writing - review & editing. **Annette Broderick:** Funding acquisition, Supervision, Writing - review & editing. **Isuru Wijesundara:** Investigation, Data curation. **Ana Nuno:** Funding acquisition, Project administration, Methodology, Supervision, Writing - review & editing.

Appendix A

Table containing the data recording protocol for field notes (completed by researchers following each site visit during the preliminary period).

Field Note Template
Date:
Start time and End time (HH:MM; HH:MM):
Place of Observation:
Researcher:
How many surveys were completed today (no. & type of survey):
Description/facts of event e.g. details of activities carried out and all observed behaviours:
Quantitative Information, e.g. prices of shark products or number of traders:
Conversation transcripts (all conversations with participants from long in-depth conversations to short phrases exchanged):
Contacts obtained for follow-up:
How many people refused to speak to you (provide details):
Personal analysis about how these relate to the project:
Specific questions about observations for future project investigation:
Decided follow-up tasks and deadlines:

Appendix B

Focus group data collection protocol (used by researchers).
Introductory statement to be read.

Welcome, our names are _____ and we are conducting a student project looking at multi-day fisheries in Sri Lanka. Thank you for all coming today to this discussion designed to collect your thoughts on regulations regarding management of shark fisheries and, in particular, the ban on landing threshers.

This discussion will be guided by myself and ____ and ____ is going to be taking notes throughout the discussion. We are going to ask you questions and we will also be conducting some activities with sticky notes in front of you. We encourage you to all join in, and respond to each other as well as our questions, and there are no wrong or right answers and everyone's views are welcome.

It will last for approximately 30 min and we will be recording using audio devices (show). Any information provided will be shared only with the research team and all recordings are deleted after they have been typed up. This information will be held totally anonymously, so that it is impossible to trace this information back to you. The purpose of the focus group is to hear what fishers opinions are of the ban. Please do not talk to people outside of this group about what was said during the group. This information will be used to prepare documents which will be shared with you, if you are interested, in the next year.

Is everyone happy to continue/has anyone got any questions?

We are now going to have a discussion as a group. This activity should take around 25 min and feel free to ask any questions/provide any further information on your answers at any point.

No.	Questions	Prompt
Q1	*I would like to initially start by asking everyone what they think are the biggest challenges facing multi-day fishers in your port right now?*	**n/a**
Q2	*Please write down on stickies what impacts the thresher ban has had on you and people you know. Please separate the impacts to different stickies.* **Give them a few moments to write them down. When they have finished one facilitator should arrange the stickies in front of the group, so they can see what others have written.** *We are now going to arrange these on the paper in front of us. Are there any we have forgotten?*	Are these all negative impacts? *As a group, which impacts do we think are most important and which are least important?* **Note-taker should arrange the stickies from least important to most important on the A3 sheet you have with you.**
Q3	*How has the number of threshers changed in areas you fish in over the last **10 years**?* **Ask participants to specify their answers in relation to gear type, fishing area and targeting strategy.**	Do you think populations have gone up or down? Why do you think these changes have occurred?
Q4	*For what reasons do you think the ban on landing threshers was introduced?*	What information did you receive about the ban? From whom did you receive information? And, How?
Q5	*What impact will the ban have on thresher populations?*	Will it have a positive or negative effect on population size? Why do you think this?
Q6	*Do you worry that the government will introduce more regulations on shark fishing in the future?*	Do you think the government should introduce more bans? Why/why not?
Q7	*Please write down on stickies the reasons that people from your port comply with the ban on landing threshers.* **Give them a few moments to write them down. When they have finished one facilitator should**	*As a group, which impacts do we think are most important and which are least important?* *Who do you think doesn't comply with the regulations?*

(*continued*)

No.	Questions	Prompt
	arrange the stickies in front of the group, so they can see what others have written. *We are now going to arrange these on the paper in front of us. Are there any we have forgotten?*	**Note-taker should arrange the stickies from least important to most important on the sheet.**
Q8	*Please write down on the stickies the reasons that people may not comply with the ban on landing threshers?*	What benefits are there to landing threshers?
	Give them a few moments to write them down. When they have finished one facilitator should	*As a group, which impacts do we think are most important and which are least important?*
	arrange the stickies in front of the group, so they can see what others have written. *We are now going to arrange these on the paper in front of us. Are there any we have forgotten?*	**Note-taker should arrange the stickies from least important to most important on the sheet.**
Q9	*Do you think it is important to records discards of threshers?*	Have you ever recorded discards of sharks? If there were fines for not recording discards, would you start recording them?
Q10	*What do you all think about whether the ban should be lifted or not?*	Do you think there is a better way to reduce catches of threshers? What about for sharks in general?

Has anyone got any other issues or points they would like to discuss today?
  Closing statement
  That is all the questions we had for you today. Thank you very much for coming and providing all the information that you did. We will now type up our notes and look for similarities and differences in your opinions and how that relates to current management. We will produce a document summarising these findings which you can request if you wish.
  Hand out information sheet
  You will find our contact details on the information sheet so please ask us any questions you think of after you leave this session.

Appendix C. Analytical framework

Thematic framework used for analysing data, assisting by NVivo software, including description of thematic codes used.

Category	Sub-category	Description
Exploitation of threshers	Targeting behaviours	Descriptions of exploitation (both current and historical) of threshers e.g. month of activity, fishing strategy and rate of exploitation
	By-catch of threshers	Description of interactions with threshers, including by-catch and mortality rates, and related actions such as discarding
	Socio-cultural importance of historical fisheries	Attitudes and sentiments expressed towards socio-cultural importance of exploitation of threshers, e.g. personal and community identities and traditional, skills and knowledge
	Socio-economic market chains	Descriptions of value chains (both current and historical) for threshers, including social importance
Perceptions and attitudes towards the ban	Awareness of regulations	Knowledge of regulation specifics, including potential personal implications and consequences
	Conservation awareness	Opinions and knowledge concerning need for conservation and management of sharks, as well as personal and collective responsibilities
	Engagement with decision-making processes	Feelings of engagement with both policy-making decisions and policy-implementation, including feelings of empowerment and autonomy
	Perceived legitimacy of ban	Perceptions of strength of biological/ecological justification and legitimacy for introduction of the ban
		Feelings of legitimacy of the effectiveness of the ban in achieving perceived purpose(s)
		Perceptions of the socio-political motivations behind ban
		Perceived legitimacy of policy-making/implementing institutions
	Perceived fairness of the ban	Fairness in equity of impact across and within fisher groups/communities
		Fairness of enforcement processes, including equal and fair application of enforcement of the rules
		Fairness in preserving stakeholders rights vs conservation rights
	Perceived effectiveness of ban	Fisher opinions on enforcement effectiveness in monitoring and ensuring compliance
		Fisher opinions on potential improvement for ban
Impact of ban	Economic impact	Loss of income from targeted catch of threshers, including seasonality of importance and products of importance
		Loss of income from catch as non-targeted species
		Loss of income from investment, including infrastructure and equipment
		Loss of income due to negative consequences of continued interaction with thresher, including gear damage
		Impact of enforcement on fisher livelihoods and wellbeing
	Socio-cultural impact	Descriptions of impacts of loss of fishing on livelihoods and community structure, including alternative livelihoods
		Loss of personal or community identities, including traditions, skill and knowledge
Ecological aspects	Interaction rates with threshers	Description of continued interaction of fleet with threshers, including spatial and seasonal distribution patterns
	Information provision on interaction rates	Information provision on interaction rates, including attitudes and compliance with recording
Compliance	Rate of non-compliance	Description of non-compliance with the ban in terms of perpetrators, distribution of activity and practicalities
	Addition unintended feedbacks	Description of additional of actions to the wider socio-ecological system that could have a negative impact on the ban
		Description of additional of actions to the wider socio-ecological system that could have a positive impact on the ban
	Inter-regulation interaction	Inter-regulation interaction between the ban and other forms of management in place that may cause wider impacts
	Non-economic drivers for compliance	Management suitability for local context, including adherence to culturally normalised rules.
		Importance of social networks and related pressure to undertake non-compliant behaviours
		Importance of social norms (injunctive and descriptive) in perceptions of morally correct behaviour
		Importance of personal norms and moral obligations in compliance
		Perceptions of behavioural or personality traits and their related importance
		Role of feelings of environmental stewardship in compliance decisions
		Perception of likelihood of apprehension and receiving sanctions

(*continued*)

Category	Sub-category	Description
	Economic aspects of compliance decision-making	Degree of effort and likelihood of receiving economic rewards for non-compliance
		Economic rewards arising from successful non-compliance
		Description of limited rationality in relation to information about regulations and related sanctions
		Deterrent effect of sanctions in relation to personal perceived social impacts
		Costs of non-compliance and perceptions of economic necessity

Appendix D

Description: This checklist is designed to be used by individuals/organisations engaged in management and conservation of shark species. Using the results from this study we have identified key uncertainties and complexities that may impact on the success of blanket bans in meeting their objectives. In order to guide assessment of these within each policy context we have written these as questions, which are designed to be used by policy-makers to understand current levels of knowledge and ascertain future data collection needs. Note that this list is not exhaustive and is designed to be tailored to each situation, therefore it should be used as a starting point and additional topics/questions should be added wherever required.

Potential methodologies: In order to answer these questions, it is anticipated that novel data collection will be required however, it is important that the existing knowledge of individuals/organisations is recognised first. Harnessing existing knowledge may include surveys of national researchers, policy-makers or fisher organisations as well as accessing existing databases. Once an assessment of existing knowledge and data has been completed then a data collection plan can be formulated, including choosing suitable methods to answer questions. Specific methodologies used will depend on available resources (including expertise and financial budget) and the available options are numerous (e.g. questionnaires, focus groups, participatory resource creation). In many cases, little may be known about some of these questions and, therefore, there will be a need to explore and describe situations/phenomenon. In addition, shark fisheries management can often be a sensitive topic, due to the substantial potential consequences for fishers and illicit nature of some fisheries. Therefore, qualitative methods such as those used in this study may often be best-suited for initial exploration of issues.

Potential continuation actions: Due to the multitude of questions, and potential answers, further actions following initial data collection will be highly context-specific. However, there is strong recommendation to harness examples of potential actions based from a review of other case studies globally. For example, if initial data collection identifies that there is a strong dislike of discarding that has led to non-compliance with other regulations, then looking to other successful examples of by-catch reduction and motivating compliance across other case studies should be conducted.

Section	Key questions
Ecological effectiveness	• *What is the current interaction rate?*
	• *How is this likely to change after the ban?*
	• *What knowledge do fishers have about discard avoidance behaviours?*
	• *How does interaction rate vary between and within fleets?*
	• *Could bycatch reduction techniques or avoidance behaviours have a significant effect?*
	• *What discarding practices are there?*
	• *What current practices and legislation for recording of discards exist?*
	• *What is the current uptake of discard protocols?*
	• *What is the level of awareness as to the purpose and use of discard data?*
	• *What is the discard mortality rate?*
	• *What is the vessel and gear-specific rates?*
	• *Could it be altered by fisher behaviour?*
	• *How does this affect discard practices?*
	• *What are the existing levels of non-compliance (if policy is in place)?*
	• *What social factors are important in motivating existing fisheries?*
	• *What levels of compliance are there with similar regulations, and what effects these?*
	• *What effect will sanctions have on different groups?*
	• *Are there any unintended behaviour feedback looks which may occur?*
	• *How do stakeholders perceive population levels and species vulnerability?*
	• *What impact do stakeholders think the ban will have?*
	• *How is information on ecological justification going to be communicated to stakeholders?*
	• *How is ecological effectiveness going to be assessed post ban?*
	• *How will this be communicated to stakeholders?*
Socio-economic outcomes	• *What is the socio-economic reliance on the species?*
	• *Who is reliant, including stakeholders involved in processing and trading, on targeted fisheries?*
	• *Who is reliant, including stakeholders involved in processing and trading, on bycatch fisheries?*
	• *What income contributions do landings make, including value of bycatch and occasional targeting?*
	• *What investments in gear and equipment have stakeholders made?*
	• *What is the level of reliance within communities?*
	• *How can social impact be ameliorated?*
	• *How equitable will the impact be within and across fleet types?*
	• *What alternative fisheries options are there?*
	• *What alternative livelihood options are there?*
	• *What cultural importance do fisheries, or related activities have?*
Legitimacy of policy and governance	• *What are the likely perceived socio-political motivations for the ban?*
	• *What mediums of communications exist between fishers and policy-makers?*
	• *How do stakeholders perceive the suitability and quality of these communications?*
	• *What factors motivate existing perceptions of governance?*
	• *What is the best communication strategy throughout decision-making processes?*
	• *What engagement channels with stakeholders already exist?*

(*continued*)

Section	Key questions
Fairness and acceptability	• *How can these existing channels and mechanisms be used for policy purposes?* • *How can feelings of empowerment and stewardship be encouraged?* • *What are the current perceptions of governance institutions, at a local and national level?* • *What relationships between stakeholders and governance institutions exist?* • *What are the desired socio-economic outcomes?* • *What outcomes from the ban are acceptable to stakeholders impacted by the ban?* • *Can we harness fisher solutions to ameliorate socio-economic outcomes of the ban?* • *What socio-cultural conflicts may the policy create?* • *Does the policy conflict with existing ideas of environmental stewardship?* • *How is the ban similar and different to existing management types?* • *How acceptable and fair are the impacts of enforcement?*

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