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LETTER

Effectiveness of interventions to shift drivers of roving banditry and reduce illegal fishing by Vietnamese blue boats

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Abstract

Illegal fishing via roving banditry, or fishing illegally in other countries' territorial waters, continues to threaten the security, sustainability, and biodiversity of global marine resources. Yet, little is known about the behavioral drivers of banditry, and whether interventions can shift these. We address this critical knowledge gap by quantitatively surveying 82 fishers in two known port havens (Da Nang and Sa Ky, central Vietnam) for roving banditry by Vietnamese "blue boats," before and after interventions aimed at reducing illegal fishing. We present three key findings: (1) displacement from the South China Sea and degraded local resources were primary behavioral drivers, (2) interventions increased perceptions of risk and shame if apprehended, and (3) the source of bail money (i.e., family vs. business) was highly predictive of whether fishers saw punishment as an adequate deterrent to illegal fishing. Lastly, we discuss the implications of these findings for regional policy and management strategies.

KEYWORDS

behavioral interventions, deterrence, fisheries conflict, fisheries enforcement, fisheries management, illegal fishing, marine conservation, roving banditry

1 | INTRODUCTION

The history of human fishing typically displays a recurring pattern: intensively fish the most accessible populations to extirpation or collapse, and then expand fishing efforts further afield to fishing grounds that are less exploited (Roberts, 2007). Global assessments indicate that many of the world's fisheries are fully or overexploited while demand and consumption of fish continue to steadily increase (FAO, 2020a). Consequently, policy makers are increasingly viewing fisheries and other marine resources as vital economic resources, whose ownership is increasingly contested (Spijkers et al., 2018). A consequence of these intersecting trends is the occurrence of roving banditry and fisheries conflicts, where "bandits" have no incentive to conserve or manage a resource (Olson, 2000). Instead, they harvest until the resources are degraded or depleted, and then move on to illegally encroach and trespass in territories to which they do not have rights, often causing considerable conflict (Berkes et al., 2006).

When illegal fishing is viewed through this lens, roving banditry by fishers occurs in many different scales, contexts, and types of fishing operations throughout the world. For instance, roving banditry could occur in artisanal coral reef fisheries, as a number of studies have described how "outsiders" from other clans, villages, or fishing districts have poached in others' customary tenure closures or marine protected area (Jupiter & Egli, 2010). Similarly, both artisanal and industrial distant water fishing fleets are known to fish illegally in the Exclusive

FIGURE 1 Pursuit and apprehension of a Vietnamese 'blue boat' by Australian Border Force and Australian Fisheries Management Authority (AFMA) on Lihou Reef, Queensland, Australia, 9 February 2017. These wooden hulled vessels are blue in colour, measuring 16–23m in length, with gross tonnage of 23–89 tons, utilise 90+ horsepower engines, and commercially available GPS plotters. Photos courtesy of AFMA

Economic Zones (EEZs) of countries that lack critical enforcement capacity (Agnew et al., 2009; Österblom et al., 2010; Song et al., 2019). Given that the world's marine biodiversity continues to decline, roving banditry and fisheries conflicts are only likely to increase and intensify in the future (Berkes et al., 2006; Spijkers et al., 2018).

At regional scales, border incursions and illegal fishing are increasingly viewed as substantial threats to countries' natural resources and national security (UN General Assembly, 2008; Haenlin, 2017; Lindley et al., 2019). Roving banditry (i.e., fishing illegally in other countries EEZs) by fishers can therefore put considerable strain on international relations, trade, and economic standing. Vietnam recently received a yellow card from the European Union (EU) because of its insufficient action to reduce roving banditry and illegal fishing by Vietnamese "blue boats" in the EEZs of neighboring countries and small island nations in the Pacific (European Commission, 2017). These wooden hulled vessels are typically blue in color, measure 16–23 m in length, weight 23–89 tons, and utilize 90+ horsepower engines; see Figure 1, Song et al., 2019). Dialogue about the causes of this banditry suggests fishers are being driven further afield from traditional fishing waters due to local resource depletion and rising tensions from Chinese territoriality in the South China Sea (Dupont & Baker, 2014; Pomeroy et al., 2009; Song et al., 2019). However, very little is known about how individual-level behavioral drivers, such as perceptions and motivations, influence fishers' roving banditry behaviors. This is a critical knowledge gap, given behavioral interventions are increasingly advocated for reducing illegal fishing behaviors (Battista et al., 2018; Bergseth, 2018; Mackay et al., 2018).

A diverse range of behavioral drivers and conditions are likely to influence roving banditry and illegal fishing by Vietnamese fishers. An extensive review and comparison of all potential behavioral drivers and relevant frameworks is beyond the scope of this study, but we incorporated salient drivers from a number of seminal theories and conceptual foundations in social psychology, criminology, and behavioral economics, including perceptions of risk and reward (e.g., Deterrence Theory; Becker, 1968), social, and personal norms (e.g., Theory of normative focus; Cialdini et al., 1991), attitudes and underlying beliefs (e.g., Theory of planned behavior; Ajzen, 1991), and other socioeconomic conditions such as livelihood dependence, poverty, and resource availability (e.g., Socioeconomic theory of regulatory compliance; Sutinen & Kuperan, 1999). Furthermore, the effect of these behavioral drivers is likely influenced by sociodemographic characteristics such as age, roles on the boat (e.g., deckhand vs. captain), years of fishing experience, and whether fishers personally know others who have participated in illegal fishing (Bergseth & Roscher, 2018).

Here, we survey 82 Vietnamese fishers in two ports (Da Nang and Sa Ky) that were home ports of all blue boats apprehended in Australian waters between the period of 2015 and 2017. We evaluate the motivations for illegal fishing, and quantify both their perceptions and resulting changes in response to a behavioral intervention. Specifically, we ask: (1) What are the reported motivations for fishers to fish illegally? (2) What are the perceived risks of detection? (3) Is the threat of punishment an adequate deterrent to illegal fishing? and (4) Are fishers' perceptions of risk or shame influenced by behavioral interventions?

2 | METHODS

2.1 | Study site and context

In recent years, a large number of Vietnamese vessels have been apprehended for fishing illegally in the EEZs of many

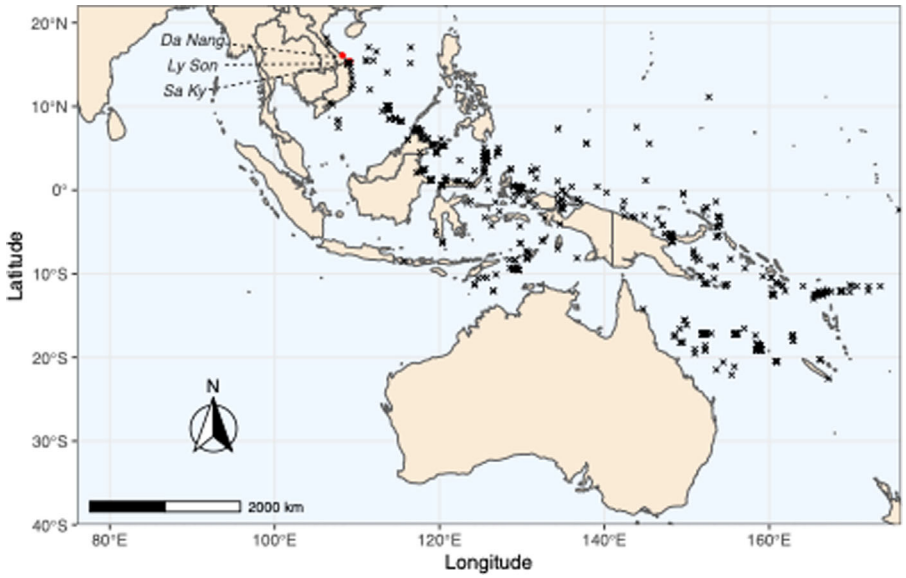

FIGURE 2 Locations of study sites (Sa Ky (incl. divers from Ly Son), displayed with fishing locations of Vietnamese vessels apprehended for illegal fishing in the region. Fishing locations were gathered from GPS plotters confiscated from vessels after apprehension, and are displayed as x's

Asia Pacific countries, including Australia (Field, 2017). In response, Australia and Vietnam signed a Memorandum of Understanding (MOU) in 2017 to address the issue, including through delivery of a collaborative "Public Information Campaign" to reduce illegal fishing by Vietnamese fishers. In 2018, Vietnamese and Australian fisheries officials ran a series of workshops in the two fishing ports (Da Nang and Sa Ky; Figure 2) that were the home ports for all of the blue boats apprehended in Australia's EEZ between 2013 and 2017. During the workshops, officials delivered strong deterrence-based messaging and information about the consequences of roving banditry. The target audience included fishers and other individuals in the communities who had the potential to influence fishers' behavior, including owners of fishing vessels, buyers, processors, and family members of fishers. A total of 146 individuals attended the workshop; we were able to survey a total of 82 fishers in the margins of the workshop.

2.2 | Surveys

Social surveys of respondents' perceptions were individually administered in the margins of a public information campaign workshop. Respondents were asked to take a voluntary survey about fishing in Vietnamese, via SurveyMonkey, on handheld electronic tablets. Respondents were surveyed only once, either before or after the information session. We focused on maximizing survey participation, instead of targeting paired (before–after) samples on the same individuals. Survey questions and respective concepts/theoretical foundations are included in the Supplementary Information (Appendix 1).

2.3 | Statistical analysis

We used generalized additive mixed models (R package mgcv; Wood, 2017) to investigate behavioral drivers of roving banditry and determine whether behavioral interventions were effective in changing fisher's perceptions of the risks and consequences (see Table 1 for summary of models and variables). We selected models based on Akaike information criterion (AIC; Burnham & Anderson, 2002). If multiple models were within the 95% confidence set around the best model (based on AIC) we present variable importance scores for each term. These give the proportion of the 95% confidence set of models containing that term, and model averaged estimates of the parameters, which use the AIC value to give a weighted mean for the parameter across competing models in the set (Burnham & Anderson, 2002).

In cases where missingness of data was approximately monotone, we conducted data imputation using the "Missing at Random" assumption in the MICE package in R (van Buuren & Groothuis-Oudshoorn, 2011). We did not impute values for variables for which missingness was not random and monotone, instead we excluded these variables. Where data required imputation, analyses were conducted on five replicate imputed datasets. Recent reviews of methods for missing data, including applications to survey data, suggest multiple imputation produces less biased and more

TABLE 1 Summary of three regression models performed in this study, including predictor and response variables. Response variables include the error distribution uses for model, in parentheses. Predictor variables are ordinal data, except for categorical variables, indicated by a (c)

Response variables	Predictor variables
(1) Whether punishment is a deterrent to illegal fishing (binomial)	Perceived likelihood of detection; Perceived likelihood of vessel confiscation; Perceived likelihood of being fined; Perceived likelihood of being jailed; Perceived changes in penalties by Vietnamese authorities; Perceived likelihood of penalization by Vietnamese government; Perceived shame if apprehended fishing illegally; Perceived motivations for illegal fishing; Source of bail (c)
(2) Perceived risk of detection (ordinal categorical)	Survey (before/after workshop; c); Respondent role on fishing vessel (c); Attendance at previous workshops (c); Type of gear used on fishing vessel (c); Years of experience fishing; Awareness of European Union yellow card issued to Vietnam (c); Previously spoken to other fishers involved in illegal fishing (b); Awareness that fishers from community had been arrested for illegal fishing (c)
(3) Perceived shame if apprehended fishing illegally (binomial)	Survey (before/after workshop; b); Respondent role on fishing vessel (c); Attendance at previous workshops (c); Type of gear used on fishing vessel (c); Age of respondent; Awareness of European Union yellow card issued to Vietnam (c); Previously spoken to other fishers involved in illegal fishing (b); Awareness that fishers from community had been arrested for fishing illegally (c); Home port (c); Perceived social acceptability of illegal fishing (injunctive norm)

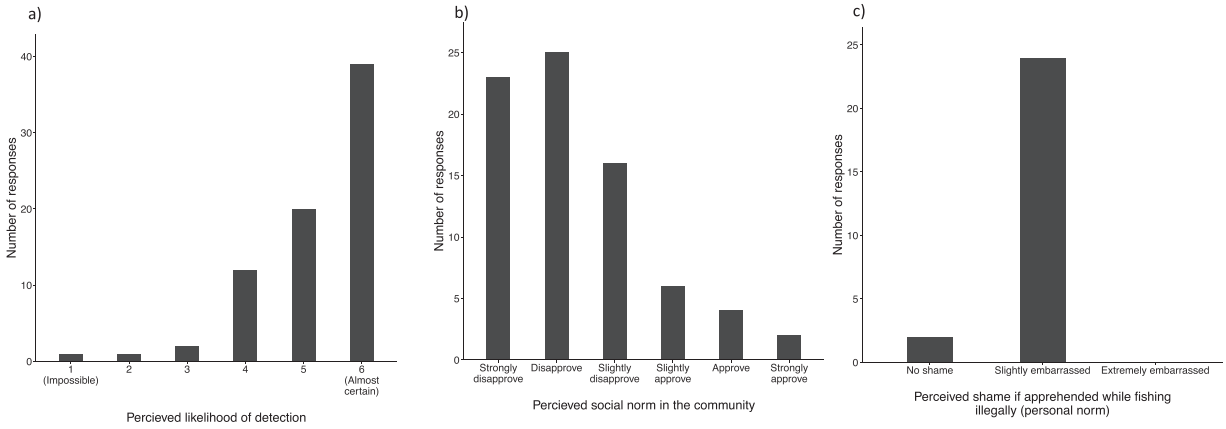

FIGURE 3 Respondent (pre- and post-workshop respondents combined) perceptions of a) the perceived likelihood of detection, b) the perceived social norm of illegal fishing and c) corresponding level of embarrassment or shame if apprehended fishing illegally

accurate estimates than classical approaches, such as case deletion or single imputation (Enders, 2010; Newman, 2014). Variable importance was calculated using AICc weights, adjusted for the number of imputed datasets, across all models within two units of AIC of the best model within the analysis of each imputed dataset. Weights represent the number of times a given variable came up as a component of the best models, across all 5 imputations.

3 | RESULTS

A total of 82 fishers provided survey responses: 51 preworkshop and 31 postworkshop. There were no participants that answered both the surveys. Respondents were mostly male (93%), and most (76%) had worked in the fishing industry for at least five years (Table S1). Nearly half were masters or captains (48%), or reported performing multiple roles on the vessel (45%), whereas only a small fraction (7%) identified as divers (Table S1). The majority of respondents (78%) relied solely on fishing for their livelihood, and masters or captains were overwhelmingly responsible for choosing fishing locations (92%), rather than collective decision-making (8%; Table S1).

Most respondents knew that fishers from their community had been apprehended for illegal fishing (87%), and nearly two-thirds (62%) had spoken to a fisher who had participated in an illegal fishing trip. Overall, fishers (both pre- and postsurvey respondents) perceived a relatively high probability of detection (Figure 3a), and believed their fishing community viewed illegal fishing as socially unacceptable (Figure 3b). However, fishers reported that they

TABLE 2 Variable importance scores across the best models for whether punishment serves as a deterrent for being involved in illegal fishing. Scores are distributed between zero and one, with higher values indicating a variable more frequently appeared in the best models for the data

Term	Summed weight
Bail source	1
Perceived likelihood of boat confiscation	1
Perceived likelihood of being fined	1
Perceived likelihood of penalization by Vietnamese govt	1
Shame if apprehended	0.18
Aware of increased penalties by Vietnamese govt	0.16
Perceived motivations for illegal fishing	0.15
Likelihood of detection	0.14

would only feel somewhat embarrassed if they were caught (Figure 3c). Displacement from the South China Sea was the most prevalent motivation for fishing in foreign country waters, compared to direct economic benefits or other offered reasons (Figure 3).

Our models did not find strong evidence that fishers viewed punishments as deterrents to illegal fishing (Tables 1 and S2). Due to missing data from the responses, we created five replicate datasets with the missing variables imputed ($n = 51$, Figure S1). Based on AICc, the 95% confidence set around the best models for the five datasets included all nine of the variables we evaluated (Table 2). The strongest predictor, based on frequency of appearance in the best models and estimates of its coefficient was the source of bail if arrested. Specifically, fishers were more likely to view punishment as a deterrent to illegal fishing if family members were the source of bail (as opposed to fishing companies or operations; Tables 2 and 3). Although their coefficients were estimated with larger error, the perceived risk of vessel confiscation, being fined, and punishment by the Vietnamese government consistently appeared in the top models (Table 2), though only being fined appeared to have a strong deterrent effect based on its effect size (Table 3).

Our models indicated that interventions significantly increased respondents' perceptions of the likelihood of detection and level of shame associated with apprehension (Figure 5). Model averaged results suggested that knowledge of the yellow card by the EU and the before/after effect of the survey were the most consistently important variables for the perceived likelihood of detection of illegal fishing (Table 4). The respondent's role on the vessel, years of experience fishing, and the interaction between role and survey (pre- vs. postworkshop) had lesser effects, in that order (Table 4). Evaluating the averaged terms in the best set of models demonstrates that fishers who knew about the EU yellow card had 33% higher perceptions of the likelihood of detection (Table 5, compare intercept and EU card median effects terms). Fishers surveyed before the intervention, who worked as crew (vs. captains and masters), or who had been in the fishery less than 5 years all had roughly 33% lower perceptions of the likelihood of detection (Table 5). Furthermore, the positive interaction between role on the vessel and prior/post surveys indicates that crew members' perceptions of the likelihood of detection shifted more than captains and masters after the intervention.

Respondents surveyed after interventions were 17% more likely to perceive high levels of shame associated with apprehension compared to those surveyed before (Table 6). The effect of the intervention was followed in importance by a fisher's role on the boat, age, whether they knew others who had been arrested for illegal fishing, and their perception of whether others would view illegal fishing as acceptable (injunctive social norm). Crew perceived lower levels of shame if apprehended compared to captains or fishing masters. Respondents who knew that others had previously been arrested for illegal fishing were 200% less likely to think shame would result if apprehended (Table 7, compare median effect of intercept and knowledge terms). Overall, the perceived social acceptability of illegal fishing had relatively small negative effects on reported levels of shame compared to other explanatory variables. It is worth noting that there is an appreciable level of uncertainty in the models for reported shame: many of the model averaged coefficients overlap zero in their 95% confidence intervals.

4 | DISCUSSION

Our investigation produced three key findings. First, fishers' primary motivation for roving banditry was displacement from the South China Sea. This reflects the rising geopolitical tensions due to China's increasing territoriality and demonstrates the larger regional implications that can affect countries as far away as Australia or Vanuatu. Recent dialogue has advocated for, or documented, the increased use of military resources in fisheries patrolling and enforcement throughout the world's oceans, especially in the Asia-Pacific and South China Sea regions (e.g., Massola, 2020; Stavridis & Bergenas, 2017). However, our study highlights how adopting this approach is likely to have unintended consequences for neighboring countries, especially those with limited enforcement capacity, because bandits are likely to focus illegal fishing efforts to fish down the governance index (Österblom et al., 2010). This tension

TABLE 3 Coefficient estimates for variables in the model of punishment as a deterrence to illegal fishing by survey respondents. Models coefficients shown are those that appear in the 95% confidence set around the best model, based on AICc. Coefficient estimates are based on model averaged values across the models in the confidence set. Note positive coefficients correspond to an increased deterrent effect. Orthogonal polynomial contrasts were applied to ordinal variables and coefficients are reported for linear (L), quadratic (Q), and cubic (C) trends

		Confidence intervals		
Term	**Coefficient**	**Lower 2.50%**	**Upper 97.50%**	**Median effect**
(Intercept)	−5.59	−625.75	614.57	−5.59
Bail source: family	2.78	1.23	4.34	2.78
Bail source: family and ship owner	19.10	1430.73	1468.94	19.1
Bail source: ship owner	1.53	−0.01	3.08	1.53
Likelihood confiscation (L)	−0.41	−2.17	1.35	−21.48
Likelihood confiscation (Q)	−1.24	−2.45	−0.03	
Likelihood fined (L)	12.35	1651.70	1676.40	38.04
Likelihood fined (Q)	−8.89	1249.20	1231.42	
Likelihood fined (C)	3.00	−551.68	557.69	
Likelihood penalized Viet govt (L)	−0.96	−1.56	−0.35	−2.88
Shame if apprehended (L)	−0.29	−0.94	0.37	−0.58
Increased penalties Viet govt (L)	0.91	0.07	1.75	−13.32
Increased penalties Viet govt (Q)	−0.66	−1.80	0.48	
Increased penalties Viet govt (C)	−0.40	−1.77	0.97	
Perceived motivations for illegal fishing: displacement from South China Sea	0.09	−0.63	0.82	0.09
Perceived motivations for illegal fishing: other	1.51	−0.64	3.67	1.51
Likelihood of detection	0.08	−0.22	0.38	0.48

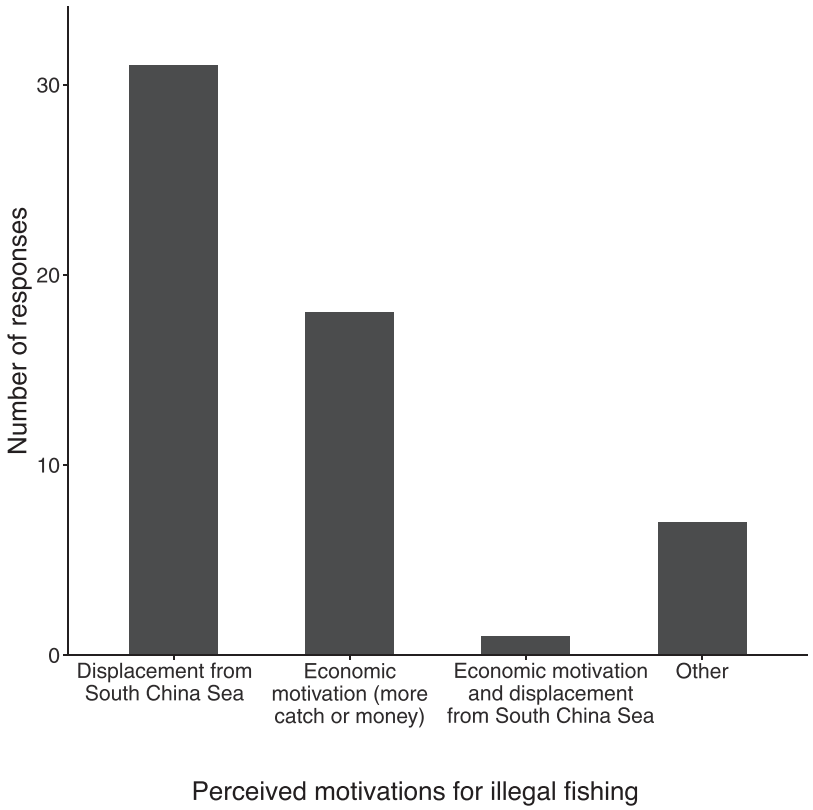

FIGURE 4 Perceived motivations for fishing illegally in foreign territorial waters. Note that respondents were able to include more than one choice

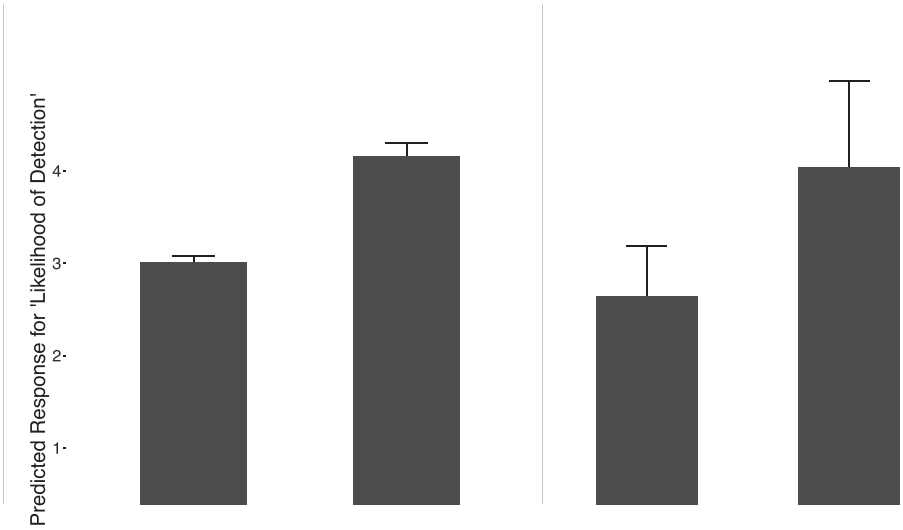

FIGURE 5 Marginal effect plot for the survey component in the models for (a) likelihood of detection and (b) shame if caught. All other terms are held at their frequencies in the data, for discrete variables, or at their median value, for continuous variables. Error bars show the standard error for the estimated values. Numerical scores for the likelihood of detection go from 1 (impossible) to 6 (almost certain)

TABLE 4 Variable importance scores across the best model of perceived likelihood of detection by survey respondents. Scores are distributed between zero and one, with higher values indicating a variable more frequently appeared in the best models for the data

Term	Summed weight
Knowledge of EU yellow card	0.88
Survey (prior or post intervention)	0.88
Respondent role on vessel	0.26
Years of fishing experience	0.16
Role × survey	0.13

TABLE 5 Coefficient estimates for variables in the model of perceived likelihood of detection by survey respondents. Model coefficients shown are those that appear in the 95% confidence set around the best model, based on AICc. Coefficient estimates are based on model averaged values across the models in the confidence set

		Confidence interval		
Term	Coefficient	Lower 2.50%	Upper 97.50%	Median effect
Intercept	3.73	1.54	5.93	3.73
Knowledge of yellow card: yes	1.20	0.08	2.31	1.20
Survey: prior	–1.34	–2.99	0.32	–1.34
Years worked: less than 5	–1.43	–3.99	1.14	–1.43
Role on vessel: worker	–1.28	–3.67	1.11	–1.28
Role on vessel: worker × Survey: prior	2.06	–0.63	4.76	2.06

is ongoing, with a recent and purportedly intentional collision between a Chinese research vessel and a Vietnamese fishing vessel (Lau, 2020), and is likely to further intensify due to revisions of Chinese policy enabling their coast guard to fire on foreign vessels (Jennings, 2021).

Second, our results suggest that the behavioral interventions were effective in increasing fishers' perceptions of deterrence. Specifically, fishers surveyed after the workshops perceived higher risks of detection and levels of social shame if apprehended compared to fishers surveyed before the workshop. However, these efforts may be only marginally effective in deterring fishers, considering that most fishers already had markedly high perceptions of the risk and associated shame of being caught. Our analysis of the perceived likelihood of detection, and associated shame revealed that the effect of the intervention was relatively small in comparison with the intercept term (36% and 17%, respectively). This indicates that while the campaign did shift perceptions, fishermen already perceived relatively high likelihoods of detection and shame if apprehended.

TABLE 6 Variable importance scores across the best models for the level of shame experienced by fishers apprehended while involved in illegal fishing. Scores are distributed between zero and one, with higher values indicating a variable more frequently appeared in the best models for the data

Survey	
Role simple	
as.numeric (age)	0.651863176
Knowledge fishers arrested	0.513170432
as.numeric (perceived social norm)	0.431261048
Term	Summed weight
Survey (post or prior)	0.94
Role on vessel	0.94
Age	0.65
Knowledge of fishers arrested	0.51
Perceived social acceptability of illegal fishing	0.43

TABLE 7 Coefficient estimates for variables in the model for the level of perceived shame experienced by fishers if apprehended while involved in illegal fishing. Model coefficients shown are those that appear in the 95% confidence set around the best model, based on AICc. Coefficient estimates are based on model averaged values across the models in the confidence set

		Confidence interval		
Term	Coefficient	Lower 2.50%	Upper 97.50%	Median effect
Intercept	9.19	−1394.80	1413.17	9.19
Age	0.49	−0.07	1.05	1.47
Perceived acceptability of illegal fishing	−0.41	−0.98	0.15	−0.83
Role on vessel: worker	−1.42	−2.73	−0.10	−1.42
Survey: prior	−1.42	−2.82	−0.03	−1.42
Knowledge of fishers arrested: yes	−15.11	−1974.90	1944.68	−15.11

Fishers' perceptions of the likelihood of being caught in Australian waters shifted more after interventions compared to their perceptions of shame. This likely reflects the difference in information available to participants before the intervention. Many fishers may be relatively unaware of the effort and technology directed at detecting foreign vessels in Australian waters. Thus, introducing new information about detection capabilities appears to have a considerable deterrence effect. In comparison, perceived shame is an internal cognitive process which is shaped by personal and local social norms. As such, providing information about foreign international perceptions of the acceptability of illegal fishing is less likely to have an effect compared to the perceptions of important referent others such as family or friends (Fishbein & Ajzen, 2011; Morris et al., 2015). Indeed, fishers who personally knew others who had been arrested for illegal fishing had much lower perceptions of the associated shame. This suggests that fishers may have "learned" (Bandura, 1977) that being apprehended for illegal fishing is not shameful, either via direct experience, or via indirect observations of the social consequences for others in the community who were apprehended.

Perceptions of detection likelihood and associated shame were also higher amongst vessel captains compared to workers. Captains were also less responsive to the information campaign with respect to the likelihood of detection, likely due to the higher level of prior information they hold. Based on our surveys, captains nearly always choose fishing locations, and are therefore more likely to bear the consequences if apprehended. Yet, they still appear to direct their vessels to fish illegally. This is readily apparent in the waypoints from the navigation devices onboard Vietnamese vessels apprehended fishing illegally in Australia and surrounding countries (Figure 2). Assuming vessel waypoints are roughly representative of movement patterns and fishing locations, one can see that the Vietnamese vessels skirt the South China Sea, spreading out through Indonesian, Malaysian, Papua New Guinea, Timor Leste, Australia, Philippine, and Palau EEZs. This displacement effect is corroborated by the frequency of respondents reporting displacement from the South China Sea as a major factor influencing their fishing location decisions.

Third, the clearest relationship for fishers reporting that punishments were adequate deterrents to illegal fishing was the source of their bail when arrested. Fishers were more likely to think punishments were adequate deterrents if their families had to pay bail compared to those who were supported by fishing organizations or vessel masters. While only speculative (due to a lack of data balance and small sample sizes), our analysis also suggests that the effect of deterrence increased as the various punishments increase. However, as the punishments become more certain, the change in the deterrent effect of each increment decreases, a non-linear relationship between deterrence and punishment severity which has been previously documented in studies examining the effects of punishment severity on recidivism rates (e.g., Moffatt & Poynton, 2007).

Several caveats apply to our findings. First, this study was not designed as a random controlled experiment. While this increases the complexity of our analysis, and likely reduces its statistical power, especially given a

relatively small sample size, integrating our surveys into a real-world, multinational effort to use behavioral interventions to reduce illegal fishing provides a unique and novel opportunity to understand illegal fishing and potential interventions. Second, we were unable to obtain direct observations of behaviors. Given this limitation, we could only examine the theoretically grounded concepts and perceptions that likely influence these behaviors. Statistics in psychology has a long tradition of using latent variables to connect survey results and behaviors, using tools such as structural equation modeling. We elected not to use this approach, instead focusing on the links between profiles of the respondents and our three key responses of interest, (perceived deterrence, likelihood of detection, and shame when apprehended). Finally, while we chose not to construct latent variables, such as compliance preference, which is sometimes used to evaluate causality in behavioral studies, it is worth noting that there has not been a single incursion of a Vietnamese blue boat in Australian waters since the delivery of this workshop. The strong shift in incursions suggests the workshops we studied were likely linked to deterring future illegal fishing ventures to Australia. However, it is possible that other drivers, such as the associated attention from the Vietnamese government, have had a deterrent effect.

Ultimately, the decision to fish illegally in foreign EEZs is influenced by the condition of resources in the flag state of vessels, their access to high seas resources, and the trade-off of violating another country's sovereignty. The most common illegal fishing violation in the Southeast Asian region is cross-border encroachment like that documented here (FAO, 2020b). In the case of Vietnamese vessels, fishers are acting as roving bandits throughout the Asia-Pacific region, both due to depletion of stocks at home and displacement from contested international waters. However, we reveal how captains on the vessels are making these choices in full awareness of the probable legal and social consequences. This underscores the likely futility of purely punitive enforcement strategies to address these problems'if captains of fishing vessels have no other viable options, it seems they are likely to fish illegally even with clear knowledge of the consequences. This has implications concerning the return on investment for strategies to reduce illegal fishing. The campaigns studied here are an attempt to influence fishers through deterrence-based messaging and social norms, are likely less costly than on-water interception and prosecution. Ultimately, regional investment in fish stock management and rebuilding may be the strategy with the highest long-term return on investment in terms of reducing illegal fishing. Recent results suggest that with investment in management, a shift toward rebuilding is possible (Hilborn et al., 2020). In the absence of access to economically viable fish resources, captains and their crews will opt to balance the economic return on fishing in a location, legal or not, against the legal and social penalties for doing so—leading them to the countries in the region least equipped to combat them.

ACKNOWLEDGMENTS

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AUTHOR CONTRIBUTIONS

BJB and CW contributed equally to all components of this study, including ideation, survey design, analysis, interpretation, and scientific writing.

ETHICS STATEMENT

Data for this study were collected by the Australian Fisheries Management Authority and the Vietnamese Directorate of Fisheries in the course of their normal operations under their respective legislative authorities. Data were provided to BJB and CW for analysis in an anonymized form.

DATA ACCESSIBILITY STATEMENT

The data that support these findings of this study are available from the corresponding author upon reasonable request, subject to approval from the Australian Fisheries Management Authority.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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