



Contents lists available at ScienceDirect

## Marine Policy

journal homepage: [www.elsevier.com/locate/marpol](http://www.elsevier.com/locate/marpol)

## Understanding causes of gear loss provides a sound basis for fisheries management

Kelsey Richardson<sup>a,\*</sup>, Riki Gunn<sup>b</sup>, Chris Wilcox<sup>c</sup>, Britta Denise Hardesty<sup>c</sup>

<sup>a</sup> University of Tasmania, Commonwealth Scientific and Industrial Research Organisation, Oceans and Atmosphere (CSIRO), A: 3-4 Castray Esplanade, Hobart, TAS 7000, Australia

<sup>b</sup> GhostNets Australia, A: PO Box 619, Ravenshoe, QLD 4888, Australia

<sup>c</sup> Commonwealth Scientific and Industrial Research Organisation, Oceans and Atmosphere (CSIRO), A: Oceans and Atmosphere, CSIRO, Hobart, Tasmania, Australia

### ARTICLE INFO

#### Keywords:

Abandoned, lost or otherwise discarded fishing gear (ALDFG)  
Arafura Sea  
Fisheries management  
Ghost nets  
Illegal, unreported or unregulated fishing (IUU)  
Marine debris

### ABSTRACT

Derelict fishing nets comprise a significant amount of the marine debris in the world's oceans and on its shorelines. These 'ghost nets' result in economic losses for the fishing industry, pose hazards to navigation at sea, and can entangle marine and terrestrial wildlife. Ghost nets are an acute problem along Australia's northern coastline, with most nets originating from Southeast Asian fishing vessels outside Australia's Exclusive Economic Zone (EEZ). To understand the causes of gear loss and identify tractable solutions to this transboundary problem, Australian and Indonesian fishers (N = 54) were asked why, when and in what circumstances and conditions they are likely to lose gear. Fishers identified snagging of nets (78%) and gear conflicts (19%) as the main causes of gear loss. These interviews informed the development of a fault tree, as a tool to identify the chain of events that result in gear loss or abandonment. The fault tree analysis provides recommendations for interventions and improvements in regional fisheries management to reduce fishing gear loss ultimately resulting from overcrowding, overcapacity and illegal, unreported and unregulated Fishing (IUU).

### 1. Introduction

Abandoned, lost or otherwise discarded fishing gear (ALDFG) comprises a significant amount of global marine plastic pollution, with an estimated 640,000 t of fishing gear lost to the marine environment each year [1]. This ALDFG is widely recognised to result from a number of environmental, spatial, operational, economic, and enforcement pressures. These pressures may include poor weather, overcrowding, gear conflicts, improper gear storage, lack of shore-side collection facilities for end of life gear, high costs of gear disposal and vandalism or theft [1–3]. One of the significant challenges with this gear is its potential to continue to fish, as well as entangle and ensnare other marine wildlife as nets remain in the ocean and travel with ocean currents. These derelict nets are commonly referred to as 'ghost nets' for this continued ability to ensnare unintended 'catch' [4–6]. Most modern fishing nets are made of plastic materials. This not only results in increased durability for fishing, but also means that when these nets become derelict fishing gear they are persistent and long lasting in the marine environment, further exacerbating potential impacts [1].

Derelict nets are especially problematic in northern Australia's Gulf of Carpentaria ('the Gulf'), where thousands of nets have been recorded

along the region's remote coastlines. Up to 3 t of derelict nets have been reported per kilometre of coastline in a given year, which is among the highest levels recorded globally [7–9]. Ghost nets have been documented to entangle invertebrates, crabs, fish, sharks, rays, sawfish, turtles, crocodiles and dugongs (Fig. 1, a and c) [9–11]. Other impacts from ghost nets include damage to fragile benthic habitats, hazards to navigation and high costs of removing nets, particularly in remote locations (Fig. 1, a–f) [1,7,12].

More than 85% of nets found in the Gulf are presumed to originate from fishing vessels operating outside of Australia's Exclusive Economic Zone (EEZ), most likely in Indonesian waters of the neighbouring Arafura Sea [13]. Net fisheries operating in the Arafura Sea use mostly trawl and gillnets, and some purse seine nets to target prawns, sharks and finfish including snappers, mackerel, and tuna [12,14,15]. When nets from these fisheries are lost or discarded in the Arafura Sea they can be transported by currents and north-western monsoon winds to the Gulf (Fig. 1, g) [10,11].

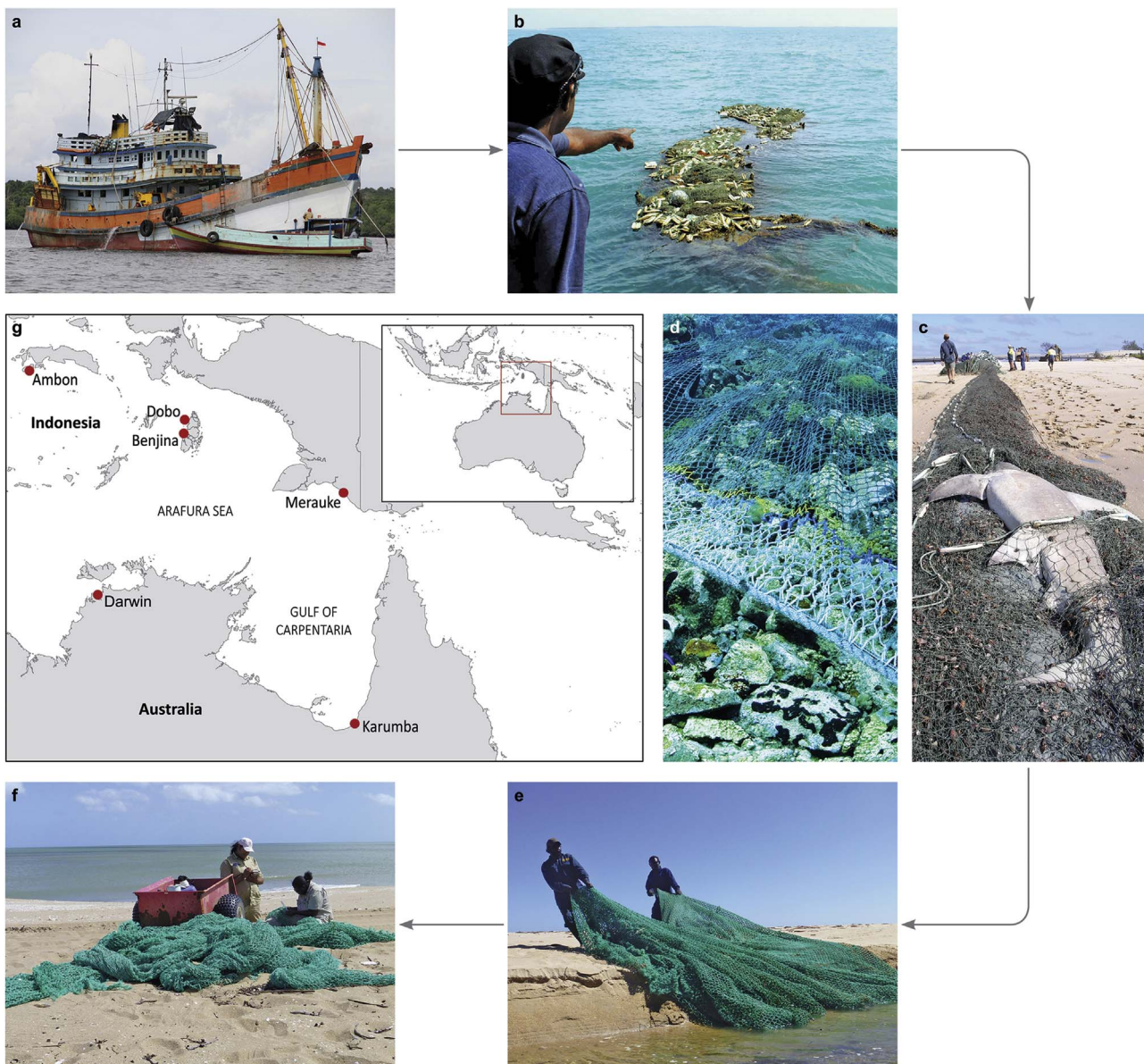
A range of stakeholders in the Gulf including the Australian government, Indigenous communities, non-profit organisations and researchers have been working since the 1990s to collect data about these nets and remove them. For example, since 2004 the non-profit

\* Corresponding author.

E-mail addresses: [kelsey.richardson@csiro.au](mailto:kelsey.richardson@csiro.au) (K. Richardson), [riki.ghostnets@northerngulf.com.au](mailto:riki.ghostnets@northerngulf.com.au) (R. Gunn), [Chris.Wilcox@csiro.au](mailto:Chris.Wilcox@csiro.au) (C. Wilcox), [Denise.Hardesty@csiro.au](mailto:Denise.Hardesty@csiro.au) (B.D. Hardesty).

<https://doi.org/10.1016/j.marpol.2018.02.021>

Received 28 October 2017; Received in revised form 16 February 2018; Accepted 21 February 2018  
0308-597X/© 2018 Published by Elsevier Ltd.



**Fig. 1.** Ghost nets in the Arafura Sea can be transported by currents and winds to the Gulf of Carpentaria. Moving clockwise from top left, fishing nets can be lost from vessels (a) where they can act as hazards to navigation (b), and result in impacts to wildlife (c) and benthic habitats (d). These nets can either sink (d) or wash ashore along the Gulf where they are removed (e) with data collected (f). Map includes the ports where fisher interviews were conducted (g) (Australia: Darwin and Karumba; Indonesia: Ambon, Benjina, Dobo and Merauke).

organisation Ghost Nets Australia (GNA) and its partners have removed more than 14,000 ghost nets along the Gulf's more than 3500 km of coastline, extending from the Torres Strait in the Northeast to the Arafura Sea in the Northwest (Fig. 1, e and f) [16]. The work of these stakeholders has been invaluable in informing and mitigating the impacts of the ghost net issue. However, long-term, sustainable solutions require an understanding of the causes and underlying drivers of net loss that can inform solutions designed to reduce gear loss at its source.

This paper identifies the chain of events that lead to fishing net loss. To identify these events, structured interviews were carried out with Australian and Indonesian fishers who are active in trawl, gill net and purse seine fisheries in the region. The overall goal was to develop a tool that could be used to identify strategic management responses and reduce future gear loss. This paper addresses four main questions: 1) what are the primary causes of gear loss; 2) what are the chains of events that ultimately result in gear loss; 3) what, if any, ongoing and past initiatives have been undertaken to address these causes of gear loss; and 4) what additional interventions and measures could be undertaken to further reduce gear loss.

## 2. Methods

### 2.1. Interviews

Interviews were undertaken with 54 Australian and Indonesian fishers from two ports in Australia and four ports in Indonesia that use trawl, gill and purse seine nets as their primary gear types (see locations of ports where interviews took place in Fig. 1, g). An oceanic drift model was used to trace the paths of ghost nets found along the shores of the Gulf of Carpentaria northwest to their likely origins of loss or discard in the Indonesian jurisdiction of the Arafura Sea [10]. Previous analyses showed that the bulk of nets recovered along the Gulf's shorelines are likely from Southeast Asia, including largely Indonesian origins [17,18]. Hence, interviews focused on Indonesian and Australian fishers. An investigation into the profiles of Australian and Indonesian fisheries operating in the Arafura Sea-Gulf region was additionally used to determine locations and fisheries for interviews, which is further summarised in Section 2.3.

Interview questions aimed to identify the causes for gear repair/

Download English Version:

<https://daneshyari.com/en/article/11005378>

Download Persian Version:

<https://daneshyari.com/article/11005378>

[Daneshyari.com](https://daneshyari.com)