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Potential threats facing a globally important population of the magnificent frigatebird *Fregata magnificens*

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Tracking of seabirds has been used to identify foraging hotspots, migratory routes and to assess at-sea threats facing populations. One such threat is the potential negative interaction between seabirds and fisheries through incidental by-catch. In 2012, 60 magnificent frigatebirds *Fregata magnificens* were found dead, entangled in fishing line, at the globally important breeding site in the British Virgin Islands (BVI). To assess the potential relationship between foraging behaviour and fishing activity, data loggers were deployed on breeding magnificent frigatebirds to record foraging movements. In addition, a survey of local fishers was conducted to assess the scale of incidental by-catch. We recorded 28 complete foraging trips from GPS and GPS-GSM loggers, and 1758 PTT locations. Birds travelled up to 3.3–1067 km from their breeding colony and entered the waters of 10 neighbouring territories. A high percentage of fishers (93% $n=28$) reported catching at least one seabird annually, of which the most common were magnificent frigatebirds and brown boobies *Sula leucogaster*. There are estimated to be at least 1112 vessels in the recreational and artisanal fishing fleets of BVI and its neighbouring islands. Thus, this substantial fishery may have potentially profound effects on seabird populations in the region.

Keywords: Seabird by-catch; entanglement; mono-filament fishing line

Introduction

Globally, seabirds are declining faster than any other avian group and face a range of threats, including alien invasive species at their breeding colonies, pollution, incidental mortality in fisheries etc. (Croxall et al. 2012). Fisheries represent a widespread threat via both competition, e.g. the large-scale harvesting of important prey species in Northern Europe, which is thought to have substantially reduced prey supplies for many seabirds and caused widespread breeding failure (Furness 2003; Frederiksen et al. 2004; Daunt et al. 2008), or incidental mortality (bycatch) of seabirds in fishing nets, lines or

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in collisions with trawl cables (Furness 2003; Sullivan et al. 2006; Watkins et al. 2008; Żydelis et al. 2013). Anderson et al. (2011) estimated that longline fisheries (mainly industrial) caused approximately 320,000 seabird mortalities each year. Certain seabird species appear to be more at risk of bycatch than others, including those that dive to capture their prey, and the more generalist or near shore foragers (Gauthier et al. 2010; Jodice et al. 2011; Bodey et al. 2014). Relatively small-scale, recreational/sports fisheries (defined as fishing for pleasure or competition) or artisanal fisheries (defined as small-scale fisheries for subsistence or local, small markets, generally using traditional fishing techniques and small boats) can also result in significant seabird by-catch (Jahncke et al. 2001; Laneri et al. 2010). Monitoring bycatch of seabirds from such local or small scale operations can be very difficult due to the diffuse and intermittent nature of fishing activities, and lack of independent observers or registering of vessel movements or operations; however, it appears that the impact on local populations of seabirds could be substantial (Sullivan et al. 2006; Salas et al. 2007; Watkins et al. 2008; Żydelis et al. 2013).

As a region, the Caribbean and Bahamas support 25 breeding species of seabirds across 26 island nations. The region does not have substantial large-scale fishing fleets (e.g. longline or trawler fleets) but does support many local recreational and artisanal fishers most of which are minimally regulated or monitored. The interaction between seabirds and these fishing activities is poorly understood but there is evidence that birds may be negatively affected. For example, during several visits to the colony of magnificent frigatebirds (*Fregata magnificens* Mathews, 1914) on the island of Great Tobago, British Virgin Islands (BVI) in 2012, 60 birds were found dead, entangled with monofilament fishing line (Zaluski pers. comm.). BVI hosts only small-scale, local artisanal fisheries, which predominately use fish pots rather than hook and line methods. However, BVI also attracts sports fishers (fishing for competition) from mainland USA, the United States Virgin Islands (USVI) and Puerto Rico, these fishing vessels do use monofilament line to target large game fish species such as Mahi Mahi *Coryphaena hippurus* Linnaeus, 1758, yellow fin tuna *Thunnus albacares* (Bonnaterre, 1788), marlin *Makaira nigricans* Lacepède, 1802, and wahoo *Acanthocybium solandri* (Cuvier, 1832). In addition, the islands support the second largest charter yacht fleet in the world, with a reported 154,000 sailing and motor boat tourists visiting the islands every year (Turner 2014). Approximately, 3000 recreational fishing licenses are issued monthly to tourists every year, thus BVI supports a substantial fishing fleet relative to the small resident population of the islands (28,000 inhabitants).

Magnificent frigatebirds are generalist foragers, feeding predominantly on flying fish (Exocoetidae) and squid (Ommastrephidae) and are frequently reported to kleptoparasitise other seabirds (Le Corre and Jouventin 1997). Interactions between frigatebirds and fishing vessels have also previously been reported (Barbieri 2010; Traversi and Vooren 2010; Wickliffe and Jodice 2010; Carniel and Krul 2012). It appears that a decline in the globally important breeding population of frigatebirds has occurred at the BVI colony, from 3000 pairs reported in 1995 to 925 pairs in 2014 (Zaluski et al. 2018). Although the reasons underlying that decline are unclear, observations of mortality due to entanglement in fishing line, when combined with the rate of decline, suggest that an investigation of the overlap between frigatebirds and fishing activity is warranted. In this study, we use data from GPS, GPS-GSM and GPS-PTT tags to investigate the movements of magnificent frigatebirds nesting on Great Tobago, BVI. These data are combined with analyses of answers provided by fishers to questionnaires, in an effort to

investigate the risk that fishing activity in the BVI and its neighbouring territories may pose to magnificent frigatebirds from BVI. Specifically, our objectives were to (1) determine foraging ranges of breeding frigatebirds, (2) assess recreational fishing activity in the region via surveys of fishers, and (3) examine overlap of foraging ranges with recreational fishing activity to assess spatial risk to frigatebirds.

Methods

Study species and study area

The magnificent frigatebird colony on Great Tobago, BVI (18.45°N, 64.80°E), is one of only four colonies in the North-eastern Caribbean, and the only breeding colony within the Virgin Islands, and supports approximately 900 breeding pairs. The colony is the second largest within the Lesser Antilles and Virgin Islands.

Tracking data

Tracking was conducted on birds breeding on the island of Great Tobago, using three different approaches. IgotU 600 Global Positioning Satellite loggers (GPS) loggers (Mobile Action, Taiwan) were attached to 34 breeding magnificent frigatebirds during the January 2014 and January 2015 breeding seasons, and set to record a position every 70 sec, at this recording frequency. Four GPS-GSM (Global System for Mobile Communication) loggers with solar panels (British Trust for Ornithology, UK) set to record a position every hour, were attached to breeding individuals on 23 February 2015. Loggers were attached to the four central tail feathers using waterproof Tesa tape (Wilson et al. 1997). These devices weighed approximately 20–25 g when packaged, representing between 2 and 3% of bird body weight. In addition, three GPS-PTT (Platform Transmitter Terminal) tags (North Star, Virginia, USA), weighing 22 g were attached to three breeding birds on 14 April 2014. These GPS-PTT tags were set to record a GPS location every four hours for eight hours then switch to a 52 hour “off” cycle. Tags were attached using a leg hoop harness. Logger deployment or retrieval took less than 15 minutes per bird. We attempted to recapture birds with GPS loggers 5 days to 3 weeks after logger deployment (once batteries would have been exhausted). Loggers were only attached to adults which had chicks at the time of tracking to reduce the risk of nest desertion, and birds were only caught at night to reduce the risk of nest predation by conspecifics. Birds were caught at the nest using a net or by hand. Before attaching the data logger we held the bird loosely for a few seconds to allow it to regurgitate any prey to reduce the risk of the bird choking while it was restrained.

For each foraging trip away from the colony, we determined the total and maximum distance (km), and the trip duration recorded from the GPS and GPS-GSM loggers, using ArcMap 10.0 (ESRI Computing, Vienna). However, the GPS-GSM loggers occasionally did not record a fix for several hours at a time, making it difficult to distinguish the start and end of each foraging trip. As such, when analyzing the GPS-GSM data, we only defined complete foraging trips if there was no more than a two-hour gap between fixes. Analysis of GPS-PTT loggers was restricted to the main periods of breeding (October-March in each year), but again the infrequent fixes resulting from the power-saving duty-cycling of these loggers made it difficult to accurately distinguish individual foraging trips. Therefore, we do not attempt to interpolate positions to separate trips but

Table 1. Average foraging trip characteristics (\pm st. dev) of magnificent frigatebirds tracked from the breeding colony at Great Tobago, British Virgin Islands.

ID	Sex	Number of complete trips recorded	Maximum foraging range (km)	Average total trip distance (km)	Average trip duration (h.m)	Logger type	Logger deployment period	Year
1	Female	6	64.5 (\pm 33.3)	284 (\pm 147.7)	15.01 (\pm 3.21)	IgotU	8 days	2014
2	Male	4	111.3 (\pm 45.5)	370.6 (\pm 318.4)	30.9 (\pm 30.4)	IgotU	6 days	2014
3	Female	4	34.6 (\pm 6.3)	146 (\pm 171.6)	10.5 (\pm 8.79)	IgotU	7 days	2015
4	Female	8	39.6 (\pm 42.3)	186.1 (\pm 190.6)	10:46 (\pm 10.44)	IgotU	6 days	2015
5	Female	0	165	n/a	n/a	GPS-GSM	5 days	2015
6	Male	3	197.5 (\pm 21.3)	691.2 (\pm 325.8)	103.0 (\pm 62.2)	GPS-GSM	20 days	2015
7	Female	2	637.5 (\pm 429.2)	2039 (\pm 1383)	497.6 (\pm 512.6)	GPS-GSM	47 days	2015
8	Male	1	25	72	11.00	GPS-GSM	2 days	2015
9	Male	n/a	960	n/a	n/a	PTT tag	182 days	2014/15
10	Male	n/a	1067	n/a	n/a	PTT tag	183 days	2014/15

instead report the maximum distance recorded from the colony for each bird during the breeding season for the birds fitted with the GPS-PTT.

We used the marine IBA script developed by BirdLife International (Lascelles et al. 2016) in R statistical software (R Core Team 2018) to perform kernel density analysis on all complete foraging trips (from the GPS and GPS-GSM loggers). Core foraging areas were defined as areas where 50% of the time spent on each foraging trip was located using h-ref as a smoothing factor (Calenge 2007). A map overlaying core foraging areas of each trip was created in ArcMap 10.0.

The breeding season movements of all tracked birds were overlaid in ArcMap 10.0 with shapefiles representing the Exclusive Economic Zone (EEZ) (downloaded from www.marineregions.org), and the spatial extents of existing and proposed marine protected areas around the BVI (created and supplied by National Parks Trust of the Virgin Islands) and USVI (Pittman et al. 2014).

In addition to the tracking data, a 14-point bespoke questionnaire (Appendix 1) designed to ascertain the extent to which different types of fishers encountered seabirds whilst fishing in local waters (defined as the BVI EEZ). Four fishing sectors were identified; (1) small-scale artisanal fishers operating from BVI (2) sports fishers (3) charter boat operators, and (4) visiting tourists on board yachts. Fishers were targeted in the local community, sport fishers were questioned at fishing tournaments (e.g. at the Marlin Angling Festival, St Thomas), charter boat operators were visited at their shops, and tourists were questioned when landing on the island of Jost Van Dyke, BVI (18.45°N, 64.73°E). Surveys were conducted on an *ad hoc* basis between 2013 and 2014.

Results

Tracking data

Of 34 GPS loggers deployed over two breeding seasons, we successfully retrieved four, these provided 6–8 days of data each; the remainder were not recovered due primarily to the skittish behaviour of the frigatebirds at the colony. The four GPS–GSM data loggers transmitted data for 2–122 days. Two of the three satellite tags provided data throughout the 2014/2015 breeding season (10 October 2014 to 06 April 2015 for bird 9, and 23 September 2014 to 24 March 2015 for bird 10) the third tag stopped transmitting 61 days after deployment and shortly after deployment of the tag the bird left the colony so breeding season foraging movements were not recorded as such, data from this bird was not included in further analysis.

Twenty-eight complete foraging trips were recorded from the GPS and GSM-GPS loggers, and 1758 positions were recorded by the GPS-PTT loggers. All four birds deployed with GPS tags still had chicks at the time of tag retrieval. We were unable to check the nest contents of the birds deployed with GPS-GSM tags of GPS-PTT tags due to financial and logistical difficulties accessing the field site. However it appears as through bird number eight lost her chick during the GPS-GSM logger deployment period given this individual's long absence (35 days) away from the colony before returning. The mean maximum distance travelled from the colony during the breeding period for all GPS and GPS-GSM tracked birds (with the exception of bird eight) was 68.8 km (\pm 61.1) km, with a maximum distance travelled from the colony of 941 km. Trip duration ranged from 20 minutes to 25 hours, and total trip distance ranged from 7.5 to 3010 km (Table 1). Magnificent frigatebirds were recorded in 10 EEZs (Figure 1). The core foraging areas of the birds tracked with GPS and GPS-GSM loggers occurred

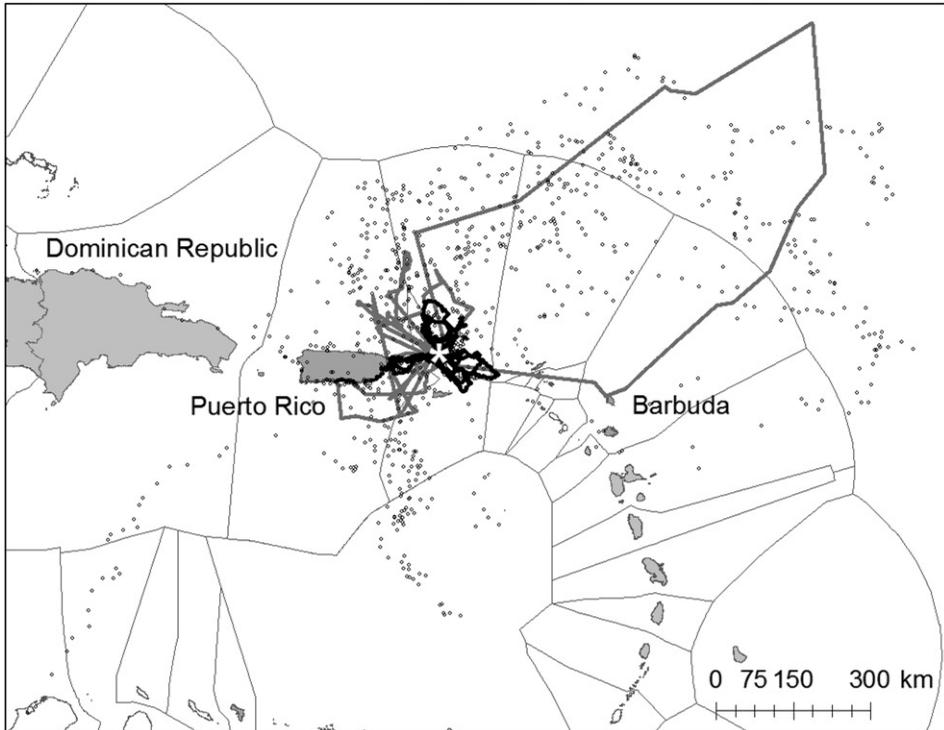


Figure 1. Tracks of magnificent frigatebirds tagged with GPS loggers ($n = 4$ birds), (black line), GPS-GSM loggers ($n = 4$ birds), (grey line), and GPS-PTT loggers ($n = 2$ birds), (grey circles) overlaid on Exclusive Economic Zones. White star indicates the Great Tobago breeding colony, British Virgin Islands.

predominately within the EEZs of the BVI (48%), the USVI (16%) and Puerto Rico (35%) (Figure 2A). Twenty-nine percent, 10% and 28% of locations of the birds tracked using GPS-PTTs were within the EEZs of BVI, USVI and Puerto Rico, respectively. These birds were also recorded in the territories of Anguilla, Dominican Republic, Haiti, Guadeloupe, Antigua & Barbuda, Montserrat, Saint Kitts & Nevis and Saint. Eustatius (Table 2).

Core foraging areas of tracked birds overlapped with marine protected areas in the waters of both BVI and USVI. These areas included the proposed marine parks of Green Cay; The Caves and Indians; the parks surrounding Peter Island, Jost Van Dyke and the Tobago Islands in BVI, and the existing Virgin Islands National Park (St John) and Virgin Islands Coral Reef monument of USVI (Figure 2B).

Questionnaire data

Ninety-three percent of 28 fishers from BVI that completed the questionnaire reported bycatch of seabirds with hook and line rods during their career/experience of fishing in BVI/USVI/Puerto Rican waters; 72% reported incidental catch of at least one seabird per year, and one participant reported capture of 30 seabirds in a single day of fishing (Table 3). Species most frequently reported as bycatch included the magnificent frigatebird and brown booby (Figure 3). A combination of lures and live bait (predominately ballyhoo, *Hemiramphus brasiliensis* (Linnaeus, 1758)) were the most reported bait choices, and most fishers reported the use of J-fishing hooks (25%) or a combination of

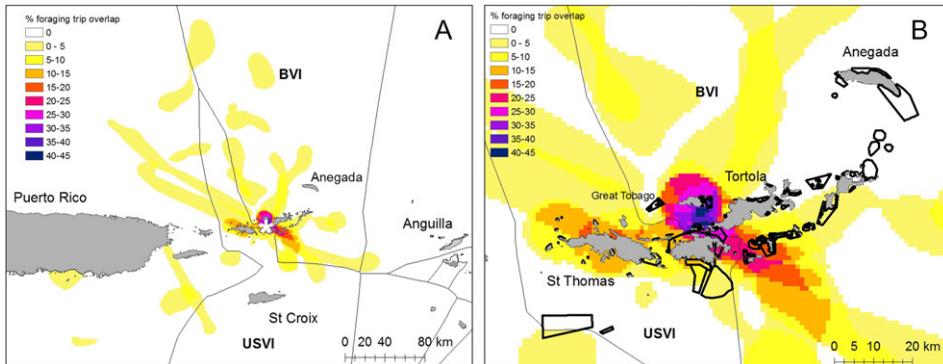


Figure 2. A, Percentage area overlap of the core foraging areas of all foraging trips of magnificent frigatebirds tracked from the breeding colony on Great Tobago, British Virgin Islands, overlaid with Exclusive Economic Zones of British Virgin Islands (BVI) US Virgin Islands (USVI) and neighbouring islands (white star marks the breeding colony). B, Percentage area overlap of core foraging areas overlaid with marine protected areas (existing and proposed in BVI and USVI (black lines)).

Table 2. Relative importance of different Exclusive Economic Zones to foraging magnificent frigate birds breeding in the British Virgin Islands.

Territory	Size of EEZ (km ²)	% of frigatebird core foraging areas that occur in EEZ	% of satellite tag positions that occur in EEZ	Approximate number of fishing licenses issued annually
BVI	90,935	48	29	59 commercial, 3000 monthly recreational*
USVI	39,536	16	10	383**
Puerto Rico	204,132	35	28	670***
Other neighbouring territories	–	0	18	n/a
Outside of territorial waters	–	0	15	n/a

Data supplied by *BVI Government (pers.comm. 2015), **Pittman et al. 2014, *** Matos-Caraballo and Agar 2008.

J and circular hooks (43%). All types of fisher reported incidentally catching seabirds. Of the 25 fishermen that reported incidental by-catch, 72% reported attempting to free a hooked bird when possible (e.g. pulling the bird to the boat, wrapping or covering the birds head, and attempting to remove hooks). However, two fishers reported that they were more likely to cut the line, or that the bird was already dead before they could attempt a rescue (Table 3).

Discussion

Locations were obtained for the tracked birds in this study for a total of 475 days. The maximum foraging range from the breeding colony (1067 km) and the range in foraging trip duration recorded during this study are comparable to previous studies on this

Table 3. Results of a survey conducted to assess issues associated with seabird by-catch in British Virgin Islands.

Type of fisher questioned	% of sample	What type of gear do you use?	% of sample
Charter fishing boat operator	57	Rod and line	86
Sports fishing boat	18	Fly fishing	8
Personal/recreational	18	Rod & line plus trawling	3
Artisanal/commercial	7	Rod & line plus fly fishing	3
How often do you fish?		Nationality of fishers	
1–4 times per year	25	BVI	22
1–2 times per month	11	USVI	21
1–2 days per week	28	Puerto Rico	43
3–7 days per week	36	US (mainland)	14
What type of hook do you use?		What type of bait do you use?	
Fly	7	Fly	7
J hook	25	Lure	21
C hook	14	Lure & live bait	54
Combination of J & C hook	43	Lure & dead bait	4
Combination of treble & C hook	11	Live bait & dead bait	14
How often do you catch a bird?		What species do you catch? (n = 26)	
Never	7	Tern species	14
Rarely (< than one every 5 years)	21	Brown booby	29
Occasionally (1–2 a year)	47	Brown pelican	11
Frequently (3–25 a year)	25	Magnificent frigatebirds	32
		Laughing gull	7
		Other, (e.g. heron species)	7

The survey was distributed to fishers at various locations in British Virgin Islands (number of fishers questioned = 28. Fishers could report more than one species when asked what seabirds they have incidentally caught).

species or closely-related species (De Monte et al. 2012; Gilmour et al. 2012). Frigatebirds in this study foraged in the EEZ of 10 neighbouring islands/territories, with core foraging areas occurring primarily within the waters of BVI, USVI and Puerto Rico. Such cross-territorial use of waters can pose a challenge for conservationists, given the difficulties in developing policy, standardizing data collection protocols, and implementing conservation measures across international borders (Jodice and Suryan 2010; Soanes et al. 2014). Our results also highlight that magnificent frigatebirds breeding in BVI use both existing and proposed marine protected areas in the Virgin Islands.

Our sample of fishers questioned for this study was limited, particularly the sample of commercial fishermen as the majority of local commercial fishers primarily deploy fish pots rather than use hook and line; therefore, our questionnaire was not relevant to this sector. However, of the 28 fishers that used hook and line, 13 reported catching at least 1–2 birds per year in BVI/USVI/Puerto Rican waters. This equates to a total of 13–26 birds caught per year by this very small percentage of fishers sampled, with a

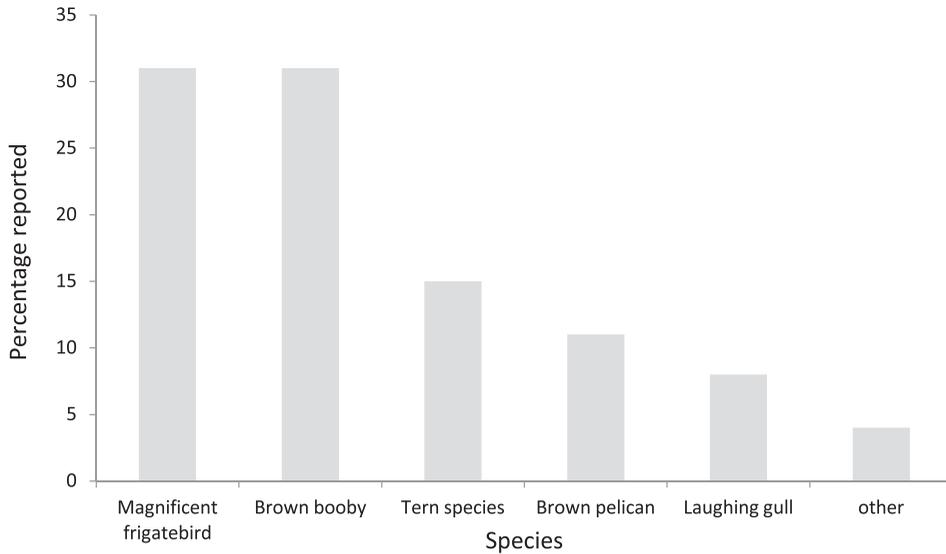


Figure 3. Bird species most frequently reported as by-catch by 26 fishers who reported incidentally catching a seabird whilst fishing, surveyed at various locations throughout the British Virgin Islands. (fishers were asked to identify those species that they had caught in the last 3 years, identified using an ID guide).

further seven participants reporting that they caught at least three birds per year (equating to a further 21 birds per year). Actual numbers are likely to be even higher, as some participants reported the incidental accidental capture of more than 3 and up to 25 per year, and one fisher reporting the capture of 30 birds in one day on a charter fishing vessel (where several lines were set at the same time). There are ca. 59 sport and commercial fishing licenses issued per year in the BVI, and another 36,000 recreational licenses issued to tourists at BVI annually. Our tracking data demonstrate, however, that waters of Puerto Rico and the USVI are also frequented by frigatebirds. The USVI issue approximately 383 commercial fishing licenses annually, with an unknown, but likely substantial number of recreational and unlicensed fishermen (Pittman et al. 2014), and in Puerto Rico, 670 fishing vessels were licensed in 2008, with hook and line being the most common type of fishery accounting for 49% of all landings (Matos-Caraballo and Agar 2008). Although our questionnaire sample is limited in size and geographic scope, additional investigation of bycatch rates is warranted when considering the size of the combined fishing fleet of these three neighbouring territories. Our data suggest that a more thorough examination of fisher experiences and frigatebird mortality events in the region may be warranted, and the levels of by-catch from different sectors of the fishing community should be further investigated. Surveys of the nearest breeding colony of magnificent frigatebirds in Anguilla (167 km away from Great Tobago) report only one bird entangled in fishing line between 2012 and 2015 (Soanes et al. pers. comm.). The Anguillian government reports licensing 105 artisanal small-scale fishers per year, with 41 of these registered as pot/cage fishers, and 59 registered to fish with methods that have a risk of incidental accidental by-catch of seabirds such as hook and lines, long-lines and gill nets. Despite having a larger commercial fishing fleet than BVI, Anguilla supports a relatively small recreational fishing fleet (8 or fewer boats registered per year), and unlike BVI, Anguilla supports a very small charter yacht tourism industry,

and has no marinas suitable to support this sector of tourism (Gumbs et al. 2015). This suggests that by-catch by sports fishers and the charter yacht industry may be the biggest threat facing BVIs frigatebirds.

Seabird bycatch is a global problem, prevalent in many types of fishery, but is particularly reported from the large scale industrial long-line fisheries (Weimerskirch et al. 1997; Inchausti and Weimerskirch 2001; Opper et al. 2018). Bugoni et al. (2008) report that most studies in Brazil and elsewhere focus on such large-scale fisheries, whilst small-scale or artisanal fisheries are often neglected. The authors highlight the potential impacts of such fisheries on seabirds and sea turtles. For example, a small fishing town, composed of 497 vessels up to 14 m long, that use a range of artisanal hook-and-line gears and techniques has no regulation or management by the Brazilian government despite frequent reports of seabird and turtle by-catch. Similarly, Jahncke et al. (2001) estimated that a small scale longline fishery in Peru incidentally caught one to two waved albatross *Phoebastria irrorata* (Salvin, 1883) and Chatham Island albatross *Thalassarche eremita* Murphy, 1930 per 1000 hooks set, equivalent to 2,370–5,610 birds each year, which represents 5–13% of the pooled global populations of these species.

Globally, small scale artisanal and recreational fisheries generally have a limited capability (due to finances and availability of technology) to establish regulations and to implement mitigation measures to prevent fisheries by-catch. However, while technological mitigation in small-scale fisheries may be a challenge (Mangel et al. 2018; Field et al. 2019), education of fishers can be effective (BirdLife International and ACAP 2015). Examples from around the world suggest that public awareness that encourages the implementation of bycatch mitigation measures such as streamer (or tori) lines, night setting, improved line-weighting and the use of fresh rather than frozen bait, has helped to reduce seabird bycatch and bait loss, thus benefiting fishermen and promoting seabird conservation (Melvin et al. 2013; Cortés et al. 2017). For example, Moreno et al. (2006) recommended that seabird bycatch from a local artisanal long-line fishery in northern Chile could be reduced by increasing fishing line weight, which not only improves setting performance but also ensures lines sink faster and hence reduces opportunities for seabirds to retrieve baits from below the surface. Practices used in large-scale fisheries may also be applied if they are also proven to be cost-effective for small-scale fishers.

Locally based non-governmental organizations (NGOs) and the BVI Government have implemented a campaign to educate fishers on both by-catch mitigation and the proper procedure to follow in the event that a seabird is hooked on a fishing line. Posters and fliers are posted at marinas and distributed to charter boat operators which describe what to do if a bird is hooked and safe handling during hook removal. Plans are currently being developed to expand seabird conservation efforts beyond the current reactive education and outreach program. Our results suggest that a proactive bycatch mitigation program developed in consultation with local fishers and charter boat operators that will trial and implement strategies to reduce seabird bycatch and that can be applied to small scale commercial and recreational fishing boats in the region may benefit the species.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 1. Copy of the fisher survey undertaken to determine the fisher interaction with seabirds in the British Virgin Islands

Seabird by-catch survey

“End of the line campaign”

- (1) What type of fishermen are you? (circle all that apply)
Commercial, Recreational (personal use), Recreational Charter Fishermen
Other
- (2) **How many days per week/month do you fish?**
- (3) **What type of gear do you use?**
Rod and reel
Hand line
Other
3a. What type of hook/line do you use?
Test
Treble
C-hook
J-hook
Other
3b. What type of bait do you use?
Lure
Live Bait
Bait
Other
3c. How many lines do you run at one time?
- (4) **How often do seabirds become hooked on the line?**
Every time I fish
Occasionally (1–2 per year)
Rarely (Less than 1 every 2 years)
Never
- (5) **If you answered “yes” on question #4, can you quantify how many times you hook a bird?**
per trip - Only 1 time ever
trips _____ per week/month/year (circle one)
- (6) **What species of seabirds become caught on the line?**
Pelican
Booby
Frigatebird
Gull
Tern
Other
- (7) **If you catch a seabird, describe how you release it.**
- (8) **What type of gear and/or bait were you using when this happened?**
- (9) **Where do you fish (describe or point on map)?**
Shoreline
Near Shore

Off-Shore

- (10) **In your opinion, are there any conditions (sea conditions, weather, type of bait/gear, casting techniques, target fish species) in which more or fewer seabirds are caught?**
- (11) **Do you have any suggestions for reducing birds hitting your bait?**