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Suspicious of illegal, unreported and unregulated fishing in the SIOFA areas through innovative monitoring techniques

Relates to agenda item: 11

Working paper Info paper

Delegation of French Territory

Abstract

Threats to nature becoming increasingly prominent, in order for biodiversity levels to persist, there is a critical need to improve implementation of conservation measures. In the oceans, the surveillance of fisheries is complex and inadequate, such that quantifying and locating non-declared, and illegal fisheries is persistently problematic. Given that these activities can negatively impact oceanic ecosystems, through over-exploitation of fish stocks and bycatch of threatened species, innovative ways to monitor the oceans are urgently required. Here, we describe a new concept of 'Ocean Sentinel' using animals equipped with state-of-the-art loggers which monitor fisheries in remote areas. Albatrosses fitted with loggers detecting and locating the presence of vessels, and transmitting the information immediately to authorities, allowed the first estimation of the proportion of non-declared fishing vessels operating in National and International waters of Southern Ocean. We found that in international waters more than one third of vessels had no Automatic Identification System operating; in national Exclusive Economic Zones (EEZ) this proportion was lower on average, but variable according to EEZ. Ocean Sentinel was also able to provide unprecedented information on the attraction of seabirds to vessels, giving access to crucial information for risk assessment plans of threatened species. This study shows that the development of new technologies offers the potential of implementing conservation policies by using wide-ranging seabirds to patrol oceans.

In conclusion the results suggest that in the south of the SIOFA area potential illegal activities are likely to operate, particularly in the vicinity and within the EEZs, with the potential of jeopardize management effort of fish stocks. In addition, the results clearly suggest that in the SIOFA area a significant proportion of fishing vessels do not use their AIS, reducing the ability to estimate fishing zones and effort.

We also provide information on a killer whale project which suggests that killer whales could be shot by IUU fisheries in the south of the SIOFA area. Most of the results summarized in this document have been recently published in peer-reviewed journals.

Recommendations *(working papers only)*

1. Consider, using new information from 'Ocean Sentinel' project, a re-evaluation of the extent of IUU fisheries in the south Indian Ocean, including SIOFA region.
 2. Consider conducting a risk assessment of these fisheries for endangered species of albatrosses.
 3. Consider conducting a risk assessment on the possible impact of IUU fisheries on cetaceans, through intentional killing of individuals interacting with longline fisheries.
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Suspicious of illegal, unreported and unregulated fishing in the SIOFA areas through innovative monitoring techniques.

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INTRODUCTION

Today conservation studies often focus on increasing the accuracy of information used to prioritise locations for conservation actions, e.g. delimitation of areas of conservation (Knight et al. 2006). Yet, it is increasingly recognised that enforcement of conservation measures at a large spatial scale is often lacking and a major hindrance in global conservation, particularly in international waters (Salafsky et al. 2002).

Thanks to a EU-funded project, we recently developed a new animal-borne logger (XArgos logger), which detects radar emissions of every vessels and provides locations of interactions between seabirds and vessels over vast oceanic sectors (Weimerskirch et al. 2017). Building on this new platform, we have developed a new concept of operational conservation named ‘Ocean Sentinel’ that allowed immediate transmission of vessel locations for improving surveillance and enforcement of fishing activities (Weimerskirch et al. 2020). The ‘Ocean Sentinel’ project aims to provide more accurate information on the distribution of fisheries in any oceanic sector and to provide instantaneous information to authorities, international fisheries agreements or researchers, on the location of fishing vessels (Fig. 1).

This project complement recent efforts made by the international community to improve marine traffic surveillance, through the use of AIS (Automatic Identification System), allowing visualisation, tracking and sharing of data on global fishing activity (<https://globalfishingwatch.org>) (Merten et al. 2016; Dunn et al. 2018). The main limitation of this system is that at any time AIS can be switched off by vessels, which is likely to be particular common in IUU (Illegal, Unreported and Unregulated) fisheries.

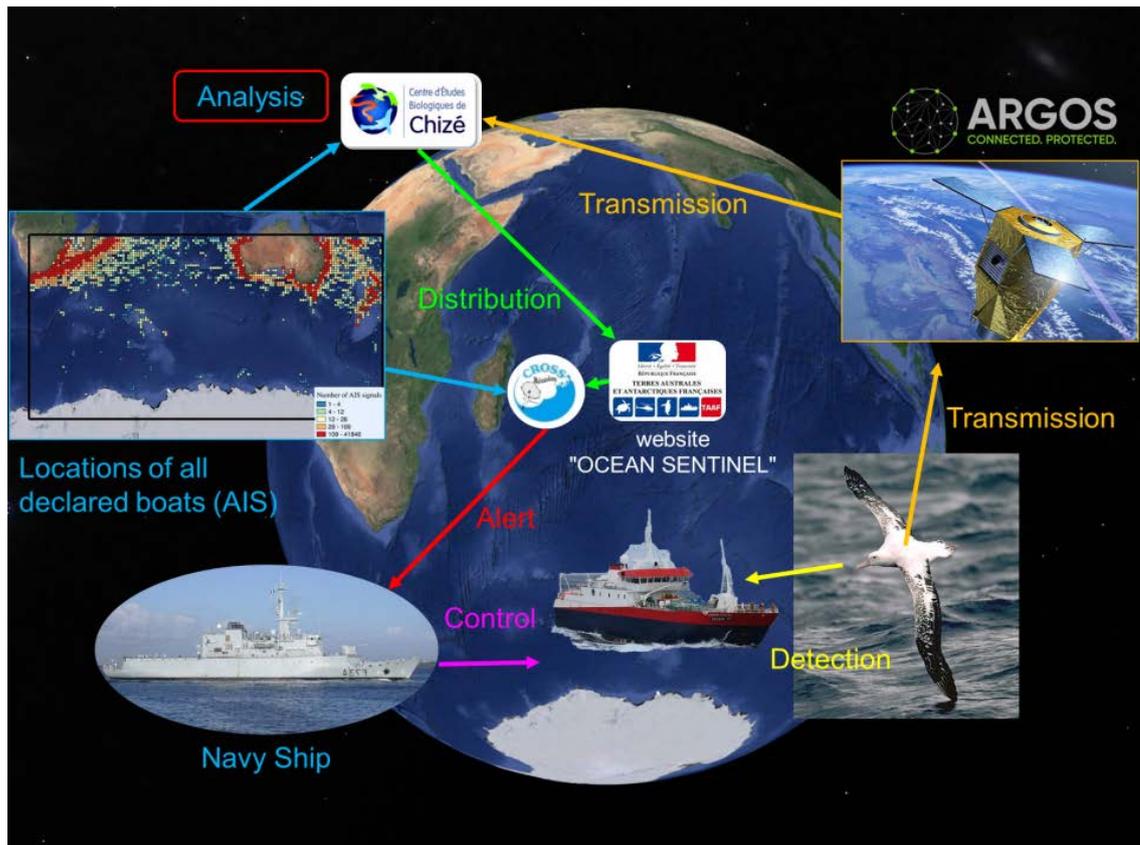


Figure 1 - Schematisation of OCEAN SENTINEL concept: detection by Centurion loggers fitted on foraging albatross, immediate transmission by Argos system, analysis of data, provision of data on the TAAF/OCEAN SENTINEL website, comparison with VMS and AIS data, and alert in case of detection of undeclared activity, with potential control by Navy ship. Source ; Weimerskirch et al. 2020.

Unreported and illegal fisheries can negatively affecting ecosystems through over exploitation of fish stocks and by catch of non-target species (Pauly et al. 2002; Grémillet et al. 2018). Among bycaught species, seabirds such as albatrosses and petrels are particularly threatened. Historically, 100,000s of individuals were killed by longline fisheries every year, before the enforcement of strict conservation measures in the CCAMLR region, for example (Croxall et al. 2012). In the EEZ around Crozet and Kerguelen the fishery is strictly controlled today by authorities using mitigation measure to reduce seabird mortality to very low numbers (Delord et al. 2005; Delord et al. 2010). Despite considerable reduction in seabird mortality in the last decade, there is a need to obtain better information on seabirds-fishery interactions in regions where seabird-oriented fishery regulations are lacking or insufficient (Bodey et al. 2014).

Similarly, whales populations are still recovering for historical over-exploitation and most of them are protected under the International Whaling Commission. Among them, killer whales (*Orcinus orca*) are particularly threatened by IUU demersal longline fisheries because they interact with fishing lines and feed on the target species such as Patagonian toothfish (*Dissostichus eleginoides*) in the Southern Ocean (Tixier et al. 2020). Interactions with fishing gear can have negative effects on killer whales populations by increasing the risks of injuries or bycatch and by

generating lethal responses (use of firearms and explosives on killer whales) from fishermen in IUU fisheries (Poncelet et al. 2010, Guinet et al. 2014).

In the French EEZs of Crozet and Kerguelen Islands, a scientific protocol involving photo-identification and localization of killer whales and fishing vessels interactions was put place since 2005 (Tixier et al. 2010). This monitoring project has provided key information on population dynamic particularly in the Crozet Is. where one of the largest population of killer whales is found (Tixier et al. 2010, Guinet et al. 2014, Tixier et al 2020). More than 90 killer whales individuals have been identified and listed in a photo-ID catalog (Tixier et al. 2017). This catalog allows to track individuals through generations and the composition of killer whales pods through time.

Results from these two monitoring projects ('Ocean sentinel' and 'Killer whales-fisheries interaction') have been published in the scientific literature and some of them suggest potential IUU activities within EEZs or unreported and unregulated fishing activities in the SIOFA area. The main results of these publications are summarized in the "Results" section, and more information can be found in the published papers.

RESULTS

'Ocean Sentinel' project (Weimerskirch et al. 2017, Weimerskirch et al. 2020):

- 77.4% of the number of radar detection events occurred over shelves and shelf edges, with 28.1% being not associated with an AIS within 5 km from the bird. Over oceanic waters, the percentage of radar detections without AIS signal increased, with 39.7% of radar detection events without AIS signal (Fig. 2).
- During the study period, no non-declared fishing vessel was detected in the EEZs of Crozet and Kerguelen, two in the EEZ around Amsterdam, and all detections in the EEZ around the Prince Edward Islands had no AIS.
- In international waters, including the SIOFA area, the percentage of radar detections from XArgos logger with no corresponding AIS signal was 36.9% (higher than in EEZs).
- On the border of the Kerguelen and Crozet EEZ several vessels were detected in operation, with AIS irregularly ON. This concerned several Chinese fishing vessels.
- In International waters, in the SIOFA area, half of the fishing vessels encounters occurred with Asiatic long-liners operating in fleets, and half were not associated with an AIS signals, suggesting that within the fleets, a significant proportion of vessels had no AIS working.

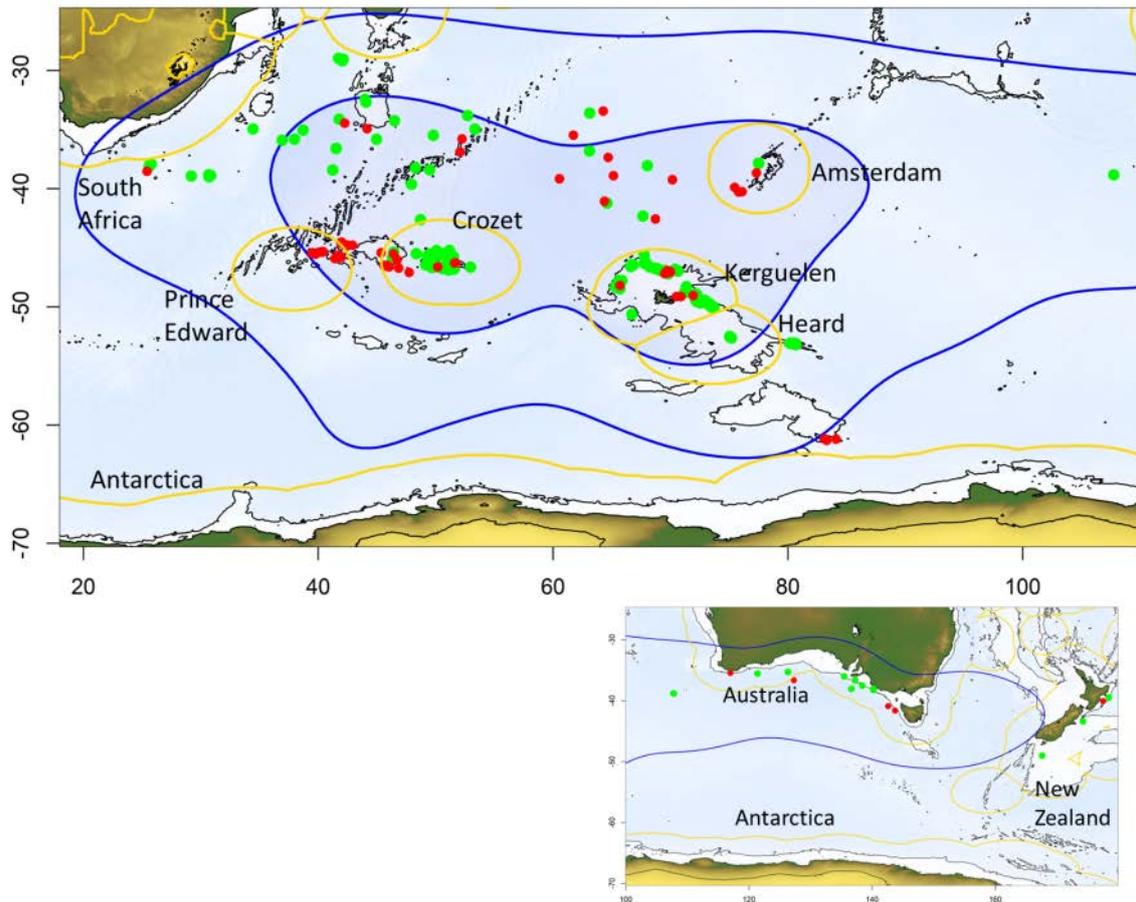


Figure 2 – a) Study area showing the overall range (blue line, kernel 90% of all birds), core area (blue zone, kernel 50%) and the location of radar detection with AIS associated (green dots) and no AIS associated (red dots). Limit of EEZ in yellow. b) eastern part of the range. Source : Weimerskirch et al. 2020.

‘Killer whales-fisheries interaction’ project (Tixier et al. 2017, Busson et al. 2019, Tixier et al. 2020):

- Mortality through lethal interaction with fishermen has strongly decreased since 2008 in the French EEZs through better control of IUU fisheries. Moreover, fishery controllers are onboard every French vessels in the french EEZs of Crozet and Kerguelen Is., where strict conservation measures are enforced (Guinet et al. 2014).
- At Crozet Is., the population growth rate is stable whereas we would expect an increase with the fishery regulation and feeding facilitation through depredation of Patagonian toothfish (Tixier et al. 2017). This result suggests additional mortality outside the French EEZs.
- The photo-ID results, showed that the loss of individuals in killer whales social groups resulted in weaker associations among surviving individuals, which may have modified their fitness during and after the additive mortality event during historical IUU activities (Busson et al. 2019). Lethal response by illegal fisheries have profound and long-lasting impacts on killer whales populations.

- In October 2019, a killer whale known as C216, in the Crozet EEZ photoID catalog, was photographed with a perfect hole, corresponding to the impact of a bullet (Fig. 3, confirmed by the international specialists who were consulted). An analysis of all the photographs concerning this individual was carried out and revealed that this hole was not present in March 16, 2019 but was already present on July 7, 2019. Between these two periods, a Chinese longliner operated west of the Crozet EEZ in early March and north of Crozet in early April. However, nothing indicates that this vessel was responsible for this situation.



Fig 3 – Killer whale C216 showing bullet impact on its fin, off Crozet islands (October 2019).

This killer whale is known for regularly making excursions outside the EEZ of Crozet and in particular on the Del Cano rise. For the history of this group, the majority of individuals (C214, C215, C216, C218, C219, C232 and C233) were photographed interacting for the first time with fishing vessels at Crozet in 2013. Since then, they have been part of the groups most frequently photographed from longliners: 209 observations since 2013.

Together, these results suggest that IUU fishing activities are operating in waters adjacent to the French EEZs of Crozet and Kerguelen Is., including SIOFA waters.

DISCUSSION

Results from the ‘Ocean Sentinel’ program indicate clearly that it is possible to use animals to improve our capacity for surveillance in very isolated oceanic sectors (Weimerskirch et al. 2020). Our study shows that it is possible to use bird-borne loggers to survey fishing activities over large oceanic sectors. The deployment of loggers on 169 individuals during a 6 month period gave a large coverage of the south-western Indian, extending through to New Zealand. The quasi-immediate transmission of more than 5000 radar detections through the Argos system to a web site, accessible to authorities, confirms that using large albatrosses as indicators of the presence of vessels is an

efficient way to survey large areas where direct survey by patrolling vessels is rare and costly. The Ocean Sentinel (OS) concept appears offer a way forward to help develop new tools for surveillance and improved enforcement. First, OS provides researchers or international agreements for Fisheries Management (such as Tuna Commissions, IOTC, CCSBT etc.) or for Conservation (such as CCAMLR), unprecedented information on the distribution of fisheries in remote areas, where conventional methods are not available. We have shown that Ocean Sentinel was able to provide to national and regional authorities direct information about the presence of fishing boats in the region they manage.

The study also allowed us to estimate the proportion of boats operating without AIS i.e. that were operating in EEZ and in international waters without the capacity to be located via standard monitoring systems.

In addition, several vessels were detected with no AIS at the edges of the Kerguelen-Heard EEZ and of the Crozet and Prince Edward EEZ. For at least two cases, some boats had their AIS regularly switched off for long periods. In the CCAMLR zone and in the SIOFA international waters, at least half of the radar detections over several hours, corresponding to typical vessels in fishing operation, had no AIS associated. Most detections occurred in subtropical waters.

This is critical information for regions where surveillance by maritime or aerial patrols is not possible because of their remoteness and/or because of the extensive cost of surveillance. In particular, the results suggest that in the south of the SIOFA area illegal activities are likely to operate in a significant amount in the vicinity and inside EEZ, with the potential of jeopardize management effort of fish stocks. In addition the results clearly suggest that in the SIOFA area a significant proportion of fishing vessels do not use their AIS, reducing the ability to estimate fishing zones and effort.

Killer whales shooting

The observation of the hole made recently in the fin of a killer whale suggest that shooting of killer whale may exist in the south of the SIOFA area. This observation suggests that the abnormally low survival of Crozet's killer whales while the fecundity rate is high (Tixier et al. 2017) could be the result of an excess mortality probably linked to interactions with unauthorized fishing vessels outside and possibly within the Crozet EEZ. It underlines the absolute need to maintain a continuous and sustained effort to monitor EEZs but also to define conservation and protection actions in international waters. Indeed the distribution of the populations of birds and marine mammals does not know the limit of the 200 nautical miles of the EEZs.

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