Agreement on the Conservation of Albatrosses and Petrels

Seventh Meeting of the Seabird Bycatch Working Group

La Serena, Chile, 2 - 4 May 2016

Developing incentive-based bycatch reduction approaches in fisheries

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SUMMARY

In the terrestrial environment the use of economic incentives such as offsets and payments for ecosystem services are increasingly being recognised as valuable conservation tools for reducing the impacts of environmental damage. Despite their growing use on land, such incentive-based mitigation approaches have not been widely applied in the marine setting and many questions regarding their application remain. Bycatch is a leading threat to many marine mega-fauna populations across the globe. Fisheries bycatch reduction approaches have predominantly focused on technical solutions such as modifications to fishing gear. These have resulted in significant reductions in bycatch in some industrial fleets. Yet such top-down input controls driven by fisheries management can often result in poor uptake or degrading efficacy over time, especially in developing countries, through a lack of understanding of, or buy-in to, the mitigation approach from fishers and a feeling of disconnection between fishers and managers. The use of economic incentives to reduce bycatch has yet to be fully explored, and offers the potential to reduce the residual negative impacts of bycatch after other mitigation and avoidance measures have been applied. Here we examine a new conceptual framework for bycatch reduction in the marine context, based on the mitigation hierarchy used to reduce the biodiversity losses from development in terrestrial settings. We discuss the framework's potential application in a case study for minimising seabird bycatch, in order to explore: (1) the contexts in which different levels of the mitigation hierarchy may be effective in reducing bycatch, with the aim of no net loss, or net gain, for the impacted species after mitigation has taken place; and (2) the potential for using other incentive-based approaches to improve compliance with bycatch mitigation measures.

Elaboración de estrategias para reducir la captura secundaria en las pesquerías basadas en incentivos

RESUMEN

El uso de incentivos económicos, como compensaciones y pagos, para los servicios dirigidos al ecosistema en el medio ambiente terrestre cada vez goza de mayor reconocimiento como herramienta de conservación valiosa para reducir los efectos de los daños causados al medio ambiente. A pesar de su creciente uso en lo referido al medio terrestre, estas estrategias de mitigación basadas en incentivos no se han aplicado de manera generalizada en lo que respecta al entorno marítimo, y aún quedan muchas preguntas por responder sobre su aplicación. La captura secundaria es una de las principales amenazas para muchas poblaciones de megafaunas marinas en todo el mundo. Las estrategias para reducir la captura secundaria en las pesquerías se han centrado principalmente en encontrar soluciones técnicas como las modificaciones a los artes de pesca. Ese tipo de soluciones se tradujo en una disminución significativa de la captura secundaria registrada en algunas flotas industriales. Sin embargo, esos controles verticales, de arriba a abajo, de los aportes impulsados por los administradores de pesquerías a menudo pueden derivar, con el tiempo, en una adopción deficitaria o en una eficacia en degradación, especialmente en los países en vías de desarrollo, por no comprender, o por confiar en, la estrategia de mitigación de los pescadores y por un sentimiento de desconexión entre los pescadores y los administradores. El uso de incentivos económicos para reducir la captura secundaria aún tiene que ser explorado por completo y encierra la posibilidad de reducir los efectos negativos residuales de la captura secundaria después de haber aplicado otras medidas de mitigación y prevención. Aquí examinamos un nuevo marco conceptual para reducir la captura secundaria en el contexto marino, a partir la jerarquía de mitigación utilizada para disminuir las pérdidas en biodiversidad de los entornos terrestres. Analizamos la posible aplicación del marco en un caso de estudio para minimizar la captura secundaria de aves marinas a los efectos de explorar: (1) los contextos en que los diferentes niveles de la jerarquía de mitigación pueden ser efectivos para reducir la captura secundaria, con el fin de que no hayan pérdidas netas, o aumentos netos, para las especies afectadas una vez que se produjo la mitigación; y (2) la posibilidad de implementar otras estrategias basadas en incentivos para mejorar la observancia de las medidas de mitigación de captura secundaria.

Élaboration de méthodes incitatives visant à réduire les captures accessoires dans la pêche

RÉSUMÉ

Dans le milieu terrestre, les mesures économiques incitatives, notamment les compensations et les paiements pour des services écosystémiques, sont de plus en plus reconnues comme des outils précieux de conservation en vue de réduire les impacts des atteintes à l'environnement. Malgré leur utilisation croissante sur terre, ces méthodes incitatives ont été peu appliquées au contexte marin et de nombreuses questions concernant leur application demeurent. Les captures accessoires représentent l'une des principales menaces pesant sur de nombreuses populations de la mégafaune marine de la planète. Les méthodes de pêche permettant de réduire les captures accessoires ont principalement été orientées vers des solutions techniques, notamment la modification des engins de pêche. Celles-ci ont permis de réduire de manière significative les captures accessoires de certaines flottes industrielles. Toutefois, il advient régulièrement qu'une gestion de la pêche dans laquelle les moyens de contrôle mis en œuvre sont imposés d'autorité soit peu suivie ou voie l'efficacité de ces moyens se dégrader à long terme. Ceci peut résulter d'une mauvaise compréhension, ou d'un manque d'adhésion à la méthode d'atténuation par les pêcheurs et d'un sentiment de déconnexion entre les pêcheurs et les responsables, en particulier dans les pays en développement. Les incitants économiques visant à réduire les captures accessoires comportent encore de nombreux aspects à explorer. Ils pourraient en effet réduire les impacts négatifs résiduels des captures accessoires après application d'autres mesures d'atténuation ou de prévention. Dans le présent document, nous examinons une nouvelle approche conceptuelle de la réduction des captures accessoires dans le contexte marin. Elle se fonde sur la hiérarchie d'atténuation utilisée pour réduire les pertes de biodiversité causées par le développement dans le cadre terrestre. Nous abordons l'éventuelle application de cette approche dans une étude de cas visant à minimiser les captures accessoires d'oiseaux marins, afin d'examiner : (1) les contextes dans lesquels différents niveaux de la hiérarchie d'atténuation peuvent efficacement réduire les captures accessoires, avec un objectif de perte ou gain nets nuls pour les espèces touchées après l'application des mesures d'atténuation ; et (2) la possibilité d'utiliser d'autres approches incitatives afin que les mesures d'atténuation de captures accessoires soient davantage respectées.

1. INTRODUCTION

The impacts of bycatch on marine mega-fauna, including sharks and rays, marine mammals, seabirds, and marine turtles, is a major conservation issue. For example Anderson *et al.* (2011) estimate that at least 160,000 seabirds are killed annually by pelagic longlines, many of which are from species threatened with extinction. Bycatch is a two-sided issue, also being problematic for the fisheries industry, causing damage to gear, catch reductions, and increasingly, consumer concern resulting in loss of market opportunities. Major strides in reducing bycatch have been made in some industrial fishing fleets, predominantly involving the development and implementation of technologies such as line weighting and bird scaring lines. For example Tori lines can reduce albatross mortality on longlines by up to 98% (Løkkeborg 2003). Yet such top-down input controls driven by fisheries management can often result in limited uptake and poor compliance with rules reducing the efficacy of at-sea technologies. This apparent disconnect between fisheries management and fishers may be due to uncompensated or unrecognised implementation costs, inertia and social norms, or poor communication between stakeholders. Even with properly implemented technologies there is residual damage to bycatch populations that cannot be mitigated by at-sea measures.

Recently, there has been a move away from managing single species in isolation to a more holistic ecosystem-based approach to fishery management. This shift comes with the recognition that sustainable management requires a broader perspective than just targeting species in the geographically and temporally confined area where the fishery operates (Pikitch *et al.* 2004). Interest is also growing in the potential marine applications of incentive-based approaches to conservation which have been widely applied in terrestrial systems, such as biodiversity mitigation, payments for ecosystem services (PES), and insurance schemes (Barr & Mourato 2009, Ferraro & Gjertsen 2009, Bladon *et al.* 2014; Innes *et al.* 2015). Applying these ideas to bycatch mitigation could lead to improvements in the ecological and economic effectiveness of mitigation approaches. Incentivising bycatch mitigation could help to improve the uptake of at-sea measures, catalyse the reduction of uncertainties and the development and adoption of new technologies. System-wide approaches to bycatch mitigation could add new options that enhance the conservation status of vulnerable bycatch species in their broader geographic range and throughout their life history.

2. RECONCEPTUALISING BYCATCH MITIGATION

Bycatch mitigation has primarily been top-down, driven by fisheries management through input (gear and effort constraints) or output (total allowable catch) driven measures (Innes *et al.* 2015). Currently a new conceptual framework for bycatch reduction is being developed with the goal to achieve no net loss, or a net gain, in population viability for the impacted species after mitigation has taken place. The conceptual framework is based on the mitigation hierarchy, used to guide the reduction of biodiversity losses from development in terrestrial settings. The framework combines three levels of impact reduction: avoid (e.g. through time-area closures), mitigate (e.g. technology improvements and improved process for handling of bycaught species), and compensate (e.g. invasive species management at nesting sites) and will allow for the exploration of least-cost approaches to meeting specified bycatch reduction targets.

Biodiversity compensation measures offer the potential to negate the residual impacts from bycatch following application of avoidance and mitigation measures. These measures could include population supplementation of juveniles or invasive species management in nesting areas. There has been some theoretical exploration of the potential benefits from compensation targeting other locations and life stages beyond those targeted by fishing. For example Wilcox and Donlan (2007) suggested that the return on investment of removal of invasive predators at nest sites funded by a bycatch levy was 23x higher than at-sea closures, while Gjertsen *et al.* (2014) modelled the cost-effectiveness of alternatives for leatherback turtle bycatch mitigation, concluding that nesting site protection was highly cost-effective.

Complementing this system-scale approach, we will also investigate the potential for using incentive-based approaches to improve compliance with bycatch mitigation measures within specific case study locations. These approaches could include participatory research carried out by and with fishers, that can reduce uncertainties around whether measures cause loss of catch and are a danger to implement, improved training, transitional payments during adoption, and support for an assurance bonds or an insurance scheme. These approaches can incentivise positive change in fishers by addressing gaps in fisheries management, can facilitate private sector engagement, and could be linked to the generation of more sustainable financing for fisheries management while ensuring accountability is more evenly distributed across the supply chain (Bladon *et al.* 2014).

3. APPLYING THE FRAMEWORK TO SEABIRD BYCATCH

The framework is generalisable, such that it can be applied to various seabird taxa, as well as other marine mega-fauna bycatch including marine mammals, sharks and rays and marine turtles. An example of how the framework could be applied is the Brazilian longline shark and swordfish fishery, where several species of albatross and petrel are vulnerable to mortality from swallowing hooks and line entanglement (Bugoni *et al.* 2008). Options for initial avoidance include time-area closures to avoid catching seasonal visitors and non-breeding birds, and a reduction in fleet size. Both Brazilian law and ICCAT require mitigation measures including Tori lines, line weights and night time fishing (IATTC 2014). Although these measures are extremely effective, the limiting step is persuading fishers to implement them (Cox *et al.* 2007). Measures to improve relationships with fishers and incentivise compliance could include participatory research, transitional subsidies through a PES, training, and support for an insurance scheme. Biodiversity compensation measures for residual impacts could include predator eradication on a local offshore island where one or more of the albatross species prone to capture in the fishery nests.

4. COMMENT

WNSA is a PhD student at University of Oxford (supervised by EJMG and DS). EJMG is Tasso Leventis Professor of Biodiversity, University of Oxford and a PEW Charitable Trust Fellow, DS is Adjunct Professor, NOAA Southwest Fisheries. The development of the bycatch mitigation framework forms part of the PEW Fellowship project of which WNSA's PhD, applying the framework to seabird bycatch, is a sub-component. The authors are currently investigating suitable fisheries and taxa to utilise as a seabird bycatch case study. We seek comments on the proposal and potential case studies from ACAP's SBWG participants.

5. REFERENCES

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