



Cetacean Bycatch Workshop

*New Ways to Monitor & Reduce
Cetacean Bycatch around the UK*

In collaboration with Cefas, ZSL and Defra

DATE: 12 & 13 March 2019

LOCATION: Zoological Society of London, UK

Hauling Up Solutions



Background

The UK government is in the process of developing a coherent and coordinated, stakeholder led approach to tackle cetacean bycatch in UK waters through the implementation of practical and effective risk-based mitigation. Part of this approach involves working with experts and stakeholders to develop innovative monitoring techniques and mitigation measures including a project on monitoring and reducing cetacean bycatch in UK fisheries, led by Cefas.

Workshop Objectives

The objectives of the workshop are to:

1. **Share knowledge:** Share perspectives (from the experience of cetaceans through to the perspective of fishers); and bring together international experts, fishers, supply chain representatives, conservationists, policy-makers and technologists from around the world to share knowledge and experience of bycatch monitoring and mitigation;
2. **Innovate:** Explore practical options to better *monitor and mitigate* cetacean bycatch around the UK including:
 - applying best-practice;
 - modifying solutions used in other sectors/for other species;
 - designing entirely new solutions.
3. **Collaborate:** Build on relationships within different stakeholders and map out means of continued collaboration to ensure all options explored are practical, affordable and effective:
 - Provide a safe space for open and honest discussions;
 - Find common ground on joint objectives and future priorities.
4. **Envision:** Develop strong clear recommendations on future research to monitor and reduce cetacean bycatch in fishing gear in the UK including practical and tangible options that can be trialled in partnership with the fishing industry/fishermen and other partners.

In order to provide a safe space in the workshop where stakeholders can have honest and open discussion, **Chatham House rules** will apply, allowing stakeholders to express their views and although the workshop will be reported on, no comments will be directly attributed unless a quote has been agreed.

Key Questions for the Workshop

Monitoring

1. How can we use new/different methods to complement existing monitoring to create a more complete picture of bycatch in the UK?
2. How can we use monitoring efforts to support evaluation of the effectiveness of mitigation measures?
3. Are there innovative/new monitoring techniques that could be developed given the right investment?

Mitigation

1. How effective is our current toolbox for mitigating bycatch in the UK?
2. How can we build on existing mitigation measures to make them more effective?
3. Are there innovative mitigation measures that could be developed given the right investment?
4. What barriers are there to bringing forward new/additional mitigation?

Workshop team

Catherine Bell – Senior Policy Advisor, Department for Environment, Food & Rural Affairs

Role: Speaker, Chair, Facilitator

Email: Catherine.Bell@defra.gov.uk

Stuart Hetherington - Senior Marine Biologist, Centre for Environment, Fisheries and Aquaculture Science

Role: Speaker, Chair, Facilitator

Email: stuart.hetherington@cefas.co.uk

Rob Deaville – Cetacean Strandings Investigation Programme (CSIP) Project Manager, Zoological Society of London

Role: Speaker, Chair, Facilitator

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Joanna Barker – Marine and Freshwater Conservation Programme Project Manager, Zoological Society of London

Role: Speaker, Chair, Facilitator

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Victoria Bendall – Fish Behaviour Ecologist, Centre for Environment, Fisheries and Aquaculture Science

Role: Chair, Facilitator

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Milly Oakley – Event Manager, Zoological Society of London

Role: Event Manager

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Katrina Ryan – Director, Mindfully Wired Communications

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Role: Rapporteur

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Workshop agenda

DAY 1 • Tuesday 12th March 2019 • Mappin Pavilion			
THEME	TIME	SESSION	SPEAKER
Arrivals	09:00		
Setting the Scene	09:30	Welcome and Introduction	Catherine Bell, DEFRA
		Workshop ethos	Stuart Hetherington, Cefas
	10:00	A Dolphin's 'Sense' of the World	Simon Allen, University of Bristol
		A Fisher's Eye View	Bally Philp, Fisherman
		What Does Bycatch Mean #1	Lorenzo Rojas-Bracho, CONABIO
		What Does Bycatch Mean #2	Allen Kingston, SMRU
		Q&A	
Coffee Break	11:00		
A Common Vision	11:20	Industry Led Research and Stakeholder Engagement #1	Ali Hood, Shark Trust
		Industry Led Research and Stakeholder Engagement #2	Joanna Barker, ZSL
		Bycatch Toolbox Summary	Tim Werner, New England Aquarium
		Q&A	
Lunch	12:00	Optional Porpoise Necropsy or Zoo Tour	
Monitoring: From Space to 'On Deck'	13:30	Satellites	Hannah Cubaynes, University of Cambridge
		Electronic Monitoring	Marije Simiemsma, Marine Science & Communication
		Observers	Jon Elson, Cefas
		Hydrophones	Lindsay Porter, SMRU
		Autonomous Underwater Vehicles	Ursula Verfuss, SMRU Consulting
		Q&A	
		Breakout	
Coffee Break	15:20		
Monitoring: Tools and Strandings	15:30	Apps	David Davies, AST Marine Science
		Apps and Technology	Filip Hnizdo, Octophin Digital
		Tools	Tara Marshall, University of Aberdeen
		Entanglement Monitoring	Ellie MacLennan, Scottish Marine Animal Strandings Scheme
		Strandings	Rob Deaville, CSIP
		Drift Modelling	Vincent Ridoux, University of La Rochelle
		Q&A	
		Breakout	
Wrap Up	17:30-18.00	Day One and Monitoring	

DAY 2 • Wednesday 13th March 2019 • Prince Albert Suite			
THEME	TIME	SESSION	SPEAKER
Setting the Scene	09:00	Welcome and Introduction	Stuart Hetherington, Cefas
Understanding	09:30	Behaviour in Relation to Bycatch	Nick Tregenza, Chelonia
		Challenging Fishing Convention	Gus Caslake, Seafish
Mitigation: When and Where to fish		Space and Time #1	Tara Marshall, University of Aberdeen
		Space and Time #2	Stuart Hetherington, Cefas
		Q&A	
Coffee Break	10:20		
Mitigation	10:40	Breakout	
Lunch	12:00	Optional Porpoise Necropsy or Zoo Tour	
Advances in Mitigation	13:30	Sound	Tim Werner, New England Aquarium
		Light	Nadia Laabs and Dan Watson, SNTech
		Electric Barriers	Tim Werner, New England Aquarium
		Gear	Tim Werner, New England Aquarium
		Q&A	
		Breakout	
Coffee Break	15:30		
Wrap Up	16:00–17:30	Workshop Wrap Up	

SPEAKER BIOGRAPHIES AND ABSTRACTS

Setting the Scene

Catherine Bell, DEFRA

Talk: Welcome and Introduction

Biography

Catherine Bell is a senior policy advisor in the International Fisheries and Marine Species Protection team at Defra and leads on the cetacean and shark portfolios. Cat has worked in policy for 5 years, taking on cetaceans nearly 3 years ago. She works domestically to develop policies for cetaceans in UK waters, as well as internationally on agreements such as the International Whaling Commission and the Convention on the Conservation of Migratory Species.

Stuart Hetherington, Cefas

Talk: Workshop Ethos

Biography

As a senior marine biologist at Cefas, Stuart's current research relates to bycatch, discard survival, movement and distribution of data-deficient species of elasmobranchs (sharks, skates and rays) of both political and conservation interest, such as common skate and spurdog, and cetaceans (harbour porpoise and common dolphin). Rather than the more traditional approaches of fisheries science, Stuart invests his time in collaborative research between fishermen, scientists, Government policy and other stakeholders. Stuart uses novel approaches to monitor elasmobranchs and cetaceans, such as electronic tagging and Electronic Monitoring (EM) to collect information, building a robust evidence base to inform policy and identify bycatch solutions.

Simon Allen, University of Bristol

Talk: How a Dolphin 'Senses' the World

Biography

Simon Allen is recent immigrant (and dual citizen) to the UK from Western Australia, now working as a Senior Research Associate at the University of Bristol. Simon is a Principal Investigator with the Shark Bay Dolphin Research Alliance, studying the behavioural ecology of one of the most complex non-human societies on the globe. Over the last 12 years or so, Simon has also spent considerable time at sea, working with the fishing industry and government management agencies on bycatch monitoring and mitigation, as well as the behaviour, genetic status and abundance of dolphins interacting with fisheries across north-western Australia.

Abstract

Dynamics of dolphin-trawler interactions to inform cetacean bycatch mitigation: cameras and screens, BRDS and genes.

Cetacean bycatch in fisheries can lead to serious injury and death at the individual level, as well as extinction at the population and species levels. Furthermore, bycatch has economic impacts on fishers and decays their social license in much of the western world. As such, bycatch represents an ongoing global conservation and resource management challenge. Using dolphins and an Australian trawl fishery as a case study, this presentation covers: (1) The dynamics of dolphin-trawler interactions; (2) Monitoring with observers and in-net cameras; and (3) How behavioural, photographic and genetic data can inform bycatch mitigation. Summarising: (1) Dolphin motivation to engage in trawler-associated foraging is high, despite the risks; (2) Greater observer/camera coverage yields more robust findings; and (3) Estimating population size and boundaries are crucial to apt conservation management. Also, knowledge of dolphin behaviour and sensory abilities informs decision-making around Bycatch Reduction Device design and/or pinger use. Alas, there's no silver bullet to slay this problem, with variability between fisheries, cetacean 'cultures', bycatch monitoring levels and mitigation device performance. Nevertheless, there exists considerable potential to address knowledge gaps, especially with regard to UK dolphin-fisheries interactions, placing the industry at the forefront of sustainable resource management in a changing marine climate.

Bally Philp, Fisherman

Talk: A Fisher's Eye View

Biography

My name is Alistair Bally Philp I am 46 years old, was brought up on the west coast of the Scottish highlands, from a fishing family. My Grandfather, father and no less than 7 uncles were at the fishing in one form or another. I started full-time fishing on a suction dredger at 15 years old and have fished off and on and in various sectors for much of the last 30 years and have fished my present boat for the last 12 years nephrops creeling around the Isle of Skye. Although a full-time creel fisherman I also work with the Scottish Creel Fishermen's Federation representing static gear fishermen utilising low impact, high value fisheries methods and am a passionate advocate for the reinstatement of the three mile limit on the west coast of Scotland.

Abstract

My Presentation is approximately 10 minutes and is a short introduction to creel fishing in Scotland and the work of the Scottish Creel Fisherman's Federation and our ongoing projects promoting static gear fisheries around Scotland. I will talk a little about entanglement issues in creels and the initiatives we already have implemented to improve the standard and promote best practice within the creel sector. I will also touch on the ambition we have to expand our sector and the recognition we have that we can only do this sustainably if we can seriously raise the bar on reducing entanglement in fishing gear.

Dr Lorenzo Rojas-Bracho, National Commission on Biodiversity, Mexico

Talk: What Does Bycatch Mean

Biography

Dr. Lorenzo Rojas-Bracho is currently on secondment to the National Commission on Biodiversity (CONABIO) in Mexico. He coordinates the research on the critically endangered vaquita. He was joint chief scientist on the 1997, 2008 and 2015 vaquita surveys. He chairs the International Committee for the recovery of the Vaquita (CIRVA), established by the Government of Mexico to recommend measures for the recovery of this species, based on the best available scientific evidence. He is a member of the CMS Scientific Council's Aquatic Mammals Working Group, the IUCN's Cetacean Specialist Group, and The Red List Authority. He chairs IWC's Conservation Committee.

Abstract

Black Markets in China, Bycatch and Vaquita's Plight

Vaquitas have been declining rapidly toward extinction as a result of unsustainable bycatch for many decades. Most of which in recent years has been in the illegal fishery for an endangered fish: *Totoaba macdonaldi*. This highly lucrative fishery is driven by black market demand for totoaba swim bladders in China and Hong Kong where they are prized for traditional medicinal uses and as business gifts. Currently this is vaquita's conservation most pressing challenge. Less than 30 individuals remain, and decline has continued unabated. Here, we report on the actions taken to protect vaquita from bycatch, including the development of alternative fishing gear, acoustic monitoring of the population, the establishment of protected areas, a ban on gillnets and increased enforcement, the removal of derelict and illegal fishing gear, and the ex-situ strategy requested in 2017 by the Mexican government as recommended by CIRVA, the international recovery team.

Allen Kingston, University of St. Andrews

Talk: What Does Bycatch Mean

Biography

Al Kingston is a researcher at the University of St. Andrews. He has carried out research on commercial fish discards, stock identification/assessment, risk assessment, gear selectivity, bycatch assessment/mitigation and the industry/science relationship. Since 2005 he has coordinated the UK Bycatch Programme and designed and implemented trials of an Acoustic Deterrent Device to address cetacean bycatch in UK offshore netting fisheries. He has been a member of the ICES Working Group on Protected Species Bycatch (WGBYC) since 2013 and leads on WGBYC's data sub-group. He has authored numerous reports and papers on bycatch monitoring, assessment and mitigation and regularly provides advice to the UK Government and other relevant organisations.

A Common Vision

Ali Hood, Shark Trust

Talk: Industry and Stakeholder Led Research and Engagement

Biography

Ali Hood is a UK based marine conservation advocate with over 20 years experience. Currently the Director of Conservation for the Shark Trust, Ali has spent the last 17 years developing the Trust's reputation as an effective, pragmatic conservation organisation. Ali represents the Trust as an observer to Atlantic and Mediterranean Fisheries Management Organisations and CITES, and as a cooperating partner to the Convention for Migratory Species (CMS) Ali contributes to a number of expert groups at UK and EU levels, regularly engaging with the European Commission, UK Devolved Administrations and the fishing industry.

Abstract

The Shark Trust engages with commercial and recreational fisheries at domestic, EU and international levels - working on high seas fisheries as an RFMO observer.

The crux of the issue is that not all shark, skate and ray bycatch is unwanted, and much is not illegal. Less than 40% of the 70+ UK shark, skate and ray species are either protected under domestic regulation or Prohibited under the CFP. Only a fraction of UK species are protected as 'Wildlife' as opposed to being viewed as a fisheries resource. And then there's the Landings Obligation...

The only way to address this complicated tapestry of species and fisheries is to work directly with industry. Here, in the UK, the Trust collaborates with Cefas, Defra, the MMO, IFCA and industry. We have engaged for well over a decade on bycatch avoidance and reporting programmes, facilitating industries' shift to improved species identification and species specific reporting. Generally seeking practical solutions to these complex challenges.

At times appearing counter-intuitive. Often [near] impossible to explain in 280 characters on Twitter, and regularly undermined by over simplification by the media and others – the pragmatic solutions we have collaborated to develop have been hard fought, but worth it!

Joanna Barker, Zoological Society of London

Talk: Industry and Stakeholder Led Research and Engagement

Biography

Joanna Barker leads ZSL's elasmobranch work in the East Atlantic, with a particular focus on angel sharks. In 2013, she Co-Founded the Angel Shark Project, a collaborative initiative to secure the future of Critically Endangered angel sharks across their range. Two interlinked projects have developed from this, Angel Shark Project: Canary Islands (set up in 2014) and Angel

Shark Project: Wales (set up in 2018), both of which focus on gathering data and working with stakeholders to improve the status of the Angelshark (*Squatina squatina*). She also leads a project in Cameroon focusing on fish market surveys to identify elasmobranchs.

Abstract

New approaches of working alongside fishers to monitor the Critically Endangered Angelshark

Fishers have vital experience and information on the marine environment; their livelihood depends on knowing where and how to catch different species, interpreting sea conditions and developing detailed understanding of their fishery. This information cannot be easily learnt by scientists as significant time is needed to be spent out at sea. Working alongside fishers (commercial, charter boat and recreational) is vital to the work of the Angel Shark Project: Canary Islands and Angel Shark Project: Wales, especially as we are gathering information on one of the rarest species of shark in Europe, the Critically Endangered Angelshark (*Squatina squatina*). This presentation will highlight the innovative techniques used by both projects to monitor Angelsharks through working with fishing communities and how these approaches could be replicated. Developing trusted working relationships is vital to the success of this work; honesty in how data is going to be used, close feedback of project outputs and building a working relationship through one-to-one meetings is vital to ensure both fisher and scientist get the most out of this collaboration.

Timothy B. Werner, New England Aquarium

Talk: Bycatch Toolbox Summary

Biography

Dr. Werner is a marine zoologist, fisheries scientist, and conservation biologist, whose research currently focuses on identifying bycatch solutions for marine wildlife that also support the livelihoods of fishermen and coastal communities. His appointments include Fisheries Scientist on the U.S. NOAA Pelagic Longline Take Reduction Team, Research Associate at UMASS-Boston, and member of the Expert Panel for the International Whaling Commission's Bycatch Mitigation Initiative. He holds a M.S. in Marine Zoology from the University of Maryland, a M.S. in Business Management from Stanford University, and a PhD from Boston University. His research group also maintains the Global Bycatch Exchange (bycatch.org).

Abstract

Mitigating Marine Mammal Bycatch in Commercial Fisheries and Aquaculture

Preventing and mitigating bycatch (incidental hooking, entanglement, or entrapment) of marine mammals can involve several strategies. These include the establishment of area closures, modifying fishing gear or practices, switching to a different type of gear altogether, reducing fishing effort, facilitating release post-capture, or implementing economic-based approaches

such as product boycotts, financing fishermen to cease fishing, or pursuing industry practices that maximize profits. Only in rare cases have these been shown to reverse bycatch to sustainable levels for highly threatened species, especially across their entire geographic ranges.

Several new policy initiatives exist to support marine mammal bycatch as a priority focus. In 2018, the FAO convened a workshop on the topic that was published and reviewed by COFI, which decided to move forward with developing Technical Guidelines. The U.S. Government issued a Final Rule under

its Marine Mammal Protection Act that establishes marine mammal bycatch criteria for fisheries that export seafood to the U.S. Commercially, the Marine Stewardship Council is showing increasing acknowledgment that in certifying fisheries it needs to put greater weight on bycatch criteria.

Appreciating the body of experience from multiple countries and fisheries in mitigating marine mammal bycatch can help to inform local strategies.

Bycatch Monitoring

Hannah Cubaynes, University of Cambridge

Talk: Satellites

Biography

Since 2003, Hannah has been spending most of her time observing cetaceans in various seas and oceans, including three years as a professional marine mammal observer and acoustic technician to mitigate for the impact of anthropogenic noise. Using all this experience, she is currently working on a joint project, "Whales from Space", with the British Antarctic Survey and the Scott Polar Research Institute, at the University of Cambridge. The aim is to develop a reliable method, using very high resolution satellite imagery to detect and monitor great whales in remote and inaccessible places.

Abstract

Satellites orbiting 600km (approx. 370 miles) away from Earth could potentially provide new and invaluable information for whale conservation. Satellites can access places deemed difficult to reach by boats or planes, however whales might be present in these waters. Some satellites can now provide images with a very high resolution allowing for the detection of large-sized whales. With a team of researchers at the British Antarctic Survey and Scott Polar Research Institute, we are testing the feasibility of using satellite images as a reliable method to study whales in remote locations. We have been using the WorldView-3 satellite, which offers the highest commercially available resolution of 31cm (approx. 1 ft). We showed that four mysticeti species could be detected, including fin whales (*Balaenoptera physalus*), southern right whales (*Eubalaena glacialis*), grey whales (*Eschrichtius robustus*), and humpback whales (*Megaptera novaeangliae*). For some individuals among these four species, we could see their flippers and fluke. Using these results, we are now focusing on automating the detection of fin whales in the Pelagos Sanctuary, in the Mediterranean to help with a European project on reducing ship strikes.

Marije Simiemsma, Marine Science & Communication

Talk: Electronic Monitoring

Biography

Marije Siemensma is a marine biologist with her own company Marine Science & Communication (MS&C) since 2009. MS&C provides marine science and policy advice and works for several organisations and institutes such as the Dutch government, research institutes, NGO's and industry. MS&C acts as an intermediate between key-players involved with the marine environment. MS&C is co-author of a conservation plan for harbour porpoises in Dutch waters commissioned by the Dutch government and also involved in projects requiring close cooperation with the fisheries industry, such as the electronic monitoring study on incidental bycatch of porpoises in Dutch set net fisheries for the government, a trial testing pingers to reduce bycatch and the demonstration of the use of alternative gear, such as fish traps.

Contact: M.siemensma@msandc.nl

Abstract

*Electronic monitoring of incidental bycatch of harbour porpoise (*Phocoena phocoena*) in the Dutch bottom set gillnet fishery (Sep 2013 - Mar 2017)*

This study assessed the bycatch of harbour porpoise (*Phocoena phocoena*) in the Dutch commercial bottom-set gillnet fishery – one of the priorities defined in the Dutch Harbour porpoise conservation plan. In spite of a difficult start of the project - due to concerns by the participating fishermen regarding their privacy data security and technical problems - a successful cooperation between all project partners – the government, fishers and researchers – was achieved. Results show that bycatches occur in both single-walled gillnets (GNS) as well as trammel nets (GTR) and that the average annual bycatch of harbour porpoise for this fleet was 23 (95% C.I. 2-44) during the study period. This translates to an annual mortality of between 0.05 and 0.07% of

the Dutch harbour porpoise population (with a maximum worst-case value of 0.3%). This study did not include mortality caused by other fishing fleets operating in Dutch waters. To determine impacts on the North Sea population level similar studies need to be conducted by all range countries. It is recommended to develop a cost-effective mobile Remote Electronic Monitoring system that could also be applied in the larger context of the Data Collection Framework. One key challenge is the current poor quality of available fishing effort data, in particular for gillnets. Effort data should include reliable and complete information on the number of nets set, the soak time and length of nets, as well as their height and mesh size. It should be collected by all fleets operating in the North Sea, to allow reliable mortality estimates for the North Sea porpoise population.

Contact information

This project was commissioned by the Dutch Ministry of Agriculture, Nature and Food Quality and conducted in partnership between Wageningen Marine Research (former IMARES) and Marine Science & Communication (MS&C), working closely with the voluntarily participating fishermen. For further information on the research, please contact:

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- Meike Scheidat, Wageningen Marine Research (e-mail: meike.scheidat@wur.nl / tel.: +31 317 487 108)

Jon Elson, Cefas

Talk: Observers

Biography

Jon Elson works at Centre for Environment, Fisheries and Aquaculture Science, Cefas. He works in the Applied Fisheries Science and Technology Group and is primarily responsible for the design, implementation and coordination of the English commercial catch sampling programmes, both onshore and offshore. He also has a key role working nationally with colleagues in Welsh Government, Afbi in Northern Ireland and Marine Scotland and internationally with colleagues at marine institutes across Europe to deliver the requirements of EU Data Collection Framework - Regulation 2017/1004 focusing mainly on delivery of fishery dependent and independent data for assessments.

Abstract

The English commercial catch sampling programme – observing on deck

Cefas has been carrying out an observer programme on commercial fishing vessels since the late 1990s. The programme was designed to estimate the component of fishing mortality accounted for by discarded fish for a limited number of stocks. In 2001 the EU introduced a new Data Collection Regulation 1639/2001 that obliged all member states to collect biological data from all catch components, discards and landings, from commercial fisheries. Since 2002 Cefas has implemented an

observer programme to ensure estimates of all removals, landings and discards of fish stocks from English commercial marine fisheries are available for assessments. The key aim of the programme is to collect representative data on the catches of around 60 commercial stocks but all species of finfish and commercial shellfish are sampled. All incidental bycatch of mammals and seabirds are also recorded. The programme design is limited by resources and sampling protocols are optimised to get the most data from the commercial catch and bycatch in the limited time available between hauls. It is not designed to capture the impact of fisheries on cetaceans but small changes to procedures and protocols can provide better information and improve how the data on incidental bycatch is interpreted.

Lindsay Porter, SMRU Hong Kong, University of St. Andrews

Talk: Hydrophones

Biography

Lindsay is the Senior Research Scientist for SMRU Hong Kong, the University of St. Andrews. She has lived and worked in Asia since 1993, where she works on the ecology and conservation of marine mammals and the human communities that share their environment. Lindsay strives to investigate, quantify and mitigate threats to the marine mammal populations that dwell within coastal environments. Lindsay has worked throughout Asia, particularly Hong Kong, China, Taiwan, Malaysia, Sri Lanka, Cambodia and the Maldives. Lindsay's co-chairs the Small Cetacean Committee of the International Whaling Commission and is a member of the IUCN Cetacean Specialist Group.

Abstract

The use of hydrophones as part of a Passive Acoustic Monitoring (PAM) system allows the recording of marine mammals themselves, as well as other sounds which embody the underwater environment. There are a myriad of ways in which PAM technology can be used to study marine mammals and this presentation briefly discusses both the most simple and one of the most sophisticated systems used to investigate and to mitigate the impacts of different fishing techniques on marine mammals. In Hong Kong, collaboration with local fishing communities involve tracking the small-scale fishing fleet and, through the deployment of Soundtraps on gillnets, assessing the overlap of active fishing nets and dolphin occurrence. This is a simple recording system that relies on the co-operation and, ultimately to mitigate risk, the collaboration of individual fishermen. Simple systems, in this case, have led to joint efforts to improve fisheries sustainability. In Malaysia, where illegal explosive fishing practices have led to marine mammal injury, as well as widespread habitat destruction, a real-time and remote PAM system allows the triangulation and immediate notification of illegal fishing activities to management authorities and law enforcement officers, thus facilitating prosecution and potentially providing a deterrent to such illegal fishing activities.

Ursula Verfuss, Sea Mammal Research Unit Consulting

Talk: Autonomous Underwater Vehicles

Biography

I studied biology at the University of Tübingen, Germany, specialised in bioacoustics and investigated the echolocation behaviour of Amazon river dolphins and harbour porpoises. As the porpoise research group team leader at the German Oceanographic Museum, I set up the passive acoustic monitoring scheme for harbour porpoise in the German Baltic Sea. I am currently a Principal scientist at SMRU Consulting, the commercial arm of the University of St Andrews. My main interest is the effect of noise on marine mammals, with a broad interest in any human impact. My recent projects were reviews on low visibility monitoring methods and autonomous vehicles for marine animal monitoring.

Abstract

The presentation gives an overview of autonomous vehicles suitable for marine mammal population, mitigation, and focal animal monitoring, conducted in relation to industrial offshore activities. I will describe the technical requirements on the autonomous vehicle for each of these monitoring types and discuss the operational aspects. The selection of a specific sensor/platform combination depends critically on the target species and its behaviour. The technical specifications of autonomous platforms and sensors also need to be selected based on the surrounding conditions of a particular offshore project, such as the area of interest, the survey requirements and operational constraints. This overview will hopefully give ideas on how autonomous vehicles may serve as tool for monitoring incidental bycatch.

David Davies, AST Marine Sciences Limited

Talk: Apps

AST Marine Sciences Limited (ASTMSL) is a private limited company established in 2008 and part of the AST Group of Companies. It's an independent telemetry company developed from satellite origins providing remote asset management services for fishing authorities, vessel owners and commercial operators of fixed and mobile assets.

We provide a range of advanced satellite/wireless telematics, VMS, catch reporting and remote monitoring solutions in the fisheries, disaster recovery, maritime and land M2M sectors.

AST Marine Sciences iRAMS (intelligent remote asset management system) is a versatile (IoT) application for asset telematics, remote sensor monitoring and remote asset control currently in use on high performance marine vessels to temporary power generators.

www.ast-msl.com

David Davies

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Abstract

ASTMSL support over 1500 commercial fishing vessels in the UK and overseas with a range of satellite and GSM VMS and catch reporting solutions.

With the imminent introduction of iVMS (inshore vessel monitoring) to the UK <12-meter fishing fleet a range of new solar powered, GSM based vessel monitoring solutions including a smart phone tracking App have been developed to meet the unique needs of artisanal or inshore fisheries.

One of the technical challenges has been developing a reliable, high frequency <5-minute reporting solution which can overcome the limitations of offshore GSM coverage and intermittent vessel mains power typically available on board small <10-meter fishing vessels that operate within the 6-mile limit.

These new developments have been combined with innovative range of tailored inshore catch reporting methods using smart phone apps to minimize the disruption for fishers to accurately monitor/report on their catch including bycatch more efficiently.

Filip Hnizdo, Octophin Digital

Talk: Apps and Technology

Biography

Filip Hnizdo is director and co-founder of Octophin Digital, a team specialising in making apps, maps, games, websites and database systems for primarily the wildlife conservation sector. His and Octophin's work includes interactive sightings maps for marine mammals in the Thames and angel sharks in the Canary Islands, bird, fish, coral reef and expedition databases and maps for the Chagos Conservation Trust, a game about sustainable fishing in Greenland, and membership and donation systems for ZSL, Fauna and Flora International and Colchester Zoo. Octophin also support and build features for WILDLABS.NET a community site for conservation technologists.

Abstract

I'll be talking about the crossover between software and conservation, especially the use of the world's greatest publishing and software platform: the world wide web. I'll talk about some of the best apps and tools for data collection, analysis, visualisation and mapping (many of them free). I'll talk through some examples of projects and offer some tips for working with data and tools, whether building something new or making use of something that already exists. I'll discuss places and ways to find people to help with software and hardware projects and some great places for inspiration. I'll aim to show that the world of software, especially open source software, is not as frightening as it often seems to "non-technical people" and how both sides can collaborate and give back to each other.

Tara Marshall, University of Aberdeen

Talk: Tools

Biography

Tara Marshall is a fisheries scientist with a track record of conducting applied research on the problem of discards in Scotland including a review of the effectiveness of real-time closures globally. Her interest in scientific bycatch reduction led her to investigate how real-time reporting was being used in the US and assess the relevance of these systems for Scotland in recent projects funded by Fisheries Innovation Scotland (<https://www.fiscot.org/media/1410/fis011b-revised.pdf>) and Marine Scotland (<https://www2.gov.scot/Topics/marine/science/FISA/201516Prog/Reports/0115interim>). She is currently working with Scottish Fishermen's Organisation to implement real-time reporting in the fisheries on the west coast of Scotland.

Abstract

Scientific bycatch reduction for the west coast of Scotland fisheries using real-time reporting: a work in progress

Real-time reporting (RTR) refers to the rapid, semi-automated collation, processing and dissemination of catch data to benefit tactical decision-making at sea, specifically avoiding locations associated with high catches of unwanted species. For over twenty years RTR has been successfully used in Alaskan and Pacific Northwest groundfish fisheries to meet strict regulatory limits on bycatch. Europe has had a phased introduction of a discard ban for commercial fish species managed through quotas. The full imposition of the Landings Obligation in 2019, combined with extremely low TACs for cod and whiting in 2019, has resulted in an urgent need to reduce unwanted catches these two species for the west of Scotland (WoS) demersal fleet. This has strongly incentivised WoS skippers to participate in the design and deployment of a functional RTR system. Following the worked example of how RTR is deployed in US fisheries we are currently in the process of designing, developing and deploying a RTR system with the participation of WoS skippers who are also contributing to the design. A successful deployment of RTR on WoS fisheries in 2019 will be useful for the wider application of RTR technology in Scotland and Europe.

Ellie MacLennan, Scottish Marine Animal Strandings Scheme

Talk: Entanglement Monitoring

Biography

I work for the Scottish Marine Animal Strandings Scheme (SMASS) and co-ordinate the Scottish Entanglement Alliance (www.scottishentanglement.org), where I lead the fisheries outreach and engagement components of this work. I come from a fishing family and have previous experience working in various marine and fisheries research, conservation and engagement roles both in Scotland and overseas. I am a member of the UK's large whale disentanglement team, and recently returned from the USA and Canada where I spent two months worked closely with fishermen, engineers, policy makers and various fisheries and conservation organisations currently affected by and working to reduce marine animal entanglements.

Abstract

My presentation will give a brief introduction to the Scottish Entanglement Alliance (SEA) which is a two-year EMFF-funded collaboration between six marine industry, research and conservation organisations. The aim of SEA is to bring together the combined expertise of Scottish creel fishermen and partner organisations to better understand the scale and impact of marine animal entanglements in Scottish waters, addressing the impacts of these incidents from a welfare, conservation, economic and human safety perspective. This work was initiated by the inshore creel fishing industry and central to this project is raising awareness of marine animal entanglements amongst them and other marine users, and improving the reporting rates of these events. We are also celebrating the work fishers are already doing to address this problem and providing a platform for them to share their own experiences in and knowledge of marine animal entanglement. By offering opportunities for fishers to become directly involved in entanglement research and disentanglement efforts, SEA hopes to learn from the industry how this issue could be addressed through the development of sustainable, proportional mitigation strategies. I will highlight the invaluable contribution Scottish creel fishermen have already made to SEA, our findings so far, and our upcoming work.

Rob Deaville, CSIP, IOZ

Talk: Strandings

Biography

Rob Deaville is the Project Manager of the UK Cetacean Strandings Investigation Programme (CSIP) and has been in this role since 2006. He coordinates the delivery of the contract objectives across the UK and has over 20 years' experience in strandings response, recovery and investigation, both in the UK and internationally. Rob is also a member of the International Whaling Commissions Expert Panel on Strandings.

Abstract

Monitoring bycatch through strandings investigation

The UK Cetacean Strandings Investigation Programme is contracted by UK government to monitor and investigate strandings of UK cetaceans around the UK coast. Since its inception in 1990, it has recorded data on over 15000 strandings and has recovered and investigated over 4000 at post-mortem. Over that period, bycatch/entanglement has been a consistent finding every year and is the single most common cause of mortality found during post-mortem investigation of UK strandings (n=751, data 1990-2017). Cases of diagnosed bycatch were most prevalent in southwest England, particularly in Cornwall, as evidenced by collaborations with our partners in the region, the Cornwall Wildlife Trust Marine Strandings Network and the University of Exeter. Bycatch was also a particularly frequent finding in stranded short-beaked common dolphins (n=319 or 43% of examined cases) and in harbour porpoises (n=372, or 17% of examined cases) (data 1990-2017). Although the welfare implications of bycatch are apparent from these examinations, the potential conservation impact is less clear. However, it is likely that small, isolated populations of cetaceans are those at most risk of serious conservation impact, such as the inshore population of bottlenose dolphins in Cornwall and the west coast community of killer whales in Scotland.

Vincent Ridoux, University of La Rochelle

Talk: Drift Modelling

Biography

Vincent Ridoux is currently a professor at University of La Rochelle, France. He has been the director of *Centre de Recherche sur les Mammifères Marins*, renamed *Observatoire Pelagis*, from 2000 to 2017, in charge of monitoring marine mammal populations in French waters notably by coordinating the French stranding scheme and by running large scale sighting surveys. His research has been dedicated to top predator ecology and conservation, including the dietary ecology of subantarctic seabirds, habitats use by bottlenose dolphins and grey seals in Brittany, and resource and habitats use by marine mammals in temperate waters.

Abstract

The present work reviews how the drift model MOTHY developed by MétéoFrance can help better interpreting common dolphin stranding data. By simulating the drifts of uniformly distributed carcasses every 10 days over 20 years from the northern North Sea to the southern Bay of Biscay, it was possible to map areas of equal stranding probability and to show how various large stretches of coast can differ in receiving carcasses, in a ratio of 1 to 7. By examining stranding with bycatch marks in the recent decade (2005-2015) corrected by $p_{\text{stranding}}$ and p_{buoyant} , the predicted yearly number of common dolphins killed in fishery over the continental shelf of the Bay of Biscay and western Channel was around 3000 individuals. Recent episodes of multiple stranding were described in Feb-March from 2017-2019, with 700-900 carcasses each year. An analysis of the distributions of mortality origins compared to fishing effort, showed which fisheries were most likely involved in the interaction during the first multiple stranding event of Feb 2017. By disentangling the most important mechanisms that determine the stranding process, it is possible to estimate total removal in an area, determine the distribution of bycatch mortality and its spatial co-occurrence with fishing effort.

Understanding

Nick Tregenza, Chelonia

Talk: Behaviour in Relation to Bycatch

Biography

Nick Tregenza set up and ran the first UK cetacean bycatch observer program that found over 2000 porpoises by-caught in the Celtic Sea per year. He developed the C-POD acoustic monitoring device to illuminate cetacean behaviour around nets. It is now used for EIAs and population trend monitoring as well. He has run observer programs on pinger comparisons, drift net and pelagic trawl bycatch and unobserved studies of discards of marked porpoises. He worked with Fishtek Ltd. on the carrier, acoustics, signal design and testing of the Banana Pinger, aiming to minimise all the pinger issues identified in prior work.

Abstract

Two, out of many, cetacean conservation issues stand out as demonstrably deadly: bio-accumulating pollutants, and bycatch in fishing gear, with local and global species extinctions as actual consequences. Pingers have demonstrated efficacy in actually reducing bycatch by changing cetacean behaviour locally. They are variously described as having alerting and aversive effects, and as having serious effects on cetacean distribution (critical habitat exclusion) and behaviour (herding). Data from published and unpublished studies indicates that aversion, with displacement, is the likely mechanism of action of pingers, that it is not persistent, and that it varies between species, and depends on the acoustic environment, and whether the cetaceans are exploiting the gear. Acoustic studies have proved to be a useful means of monitoring: cetacean prevalence; encounter rates with gear; behavioural responses to gear, to 'acoustic cats eyes', and to pingers; and recent acoustic data shows communication behaviour in porpoises, including during drowning in nets.

Gus Caslake, Cornish Sardine Management Association (CSMA)

Talk: Challenging Fishing Convention

Biography

Gus Caslake, Southwest England Regional Advisor for Seafish and an independent chairman of the Cornish Sardine Management Association (CSMA). The association represents all ring net vessels (15) and processors (4) catching and processing 'Cornish Sardines' in Cornwall & Plymouth. Gus worked as a commercial fisherman prior to joining Seafish in 2000. Seafish work has predominantly involved engagement with the catching sector on projects including discards & bycatch reduction, fuel efficiency, fish quality and gear technology. In my current role as SW regional advisor I engage with & manage a variety of projects in the SW from sea to plate.

Abstract

The 'Cornish Sardine' has MSC certification and has Protected Geographical Indication (PGI) status. The Cornish Sardine Management Association (CSMA) was set up in 2004 to maintain the quality of the catch, protect & manage stocks and to develop the market for Cornish Sardines. The CSMA represents all ring net vessels within the fishery as well as having the key processors as members. Sardine is ICES area VII is a non-quota species although advice is offered by ICES on catch levels there is no management in place to control catch levels. The CSMA have set up a Code of Conduct to manage effort within the fishery and engaged with scientists through Fisheries Science projects to improve stock information and assist in the internal management of the

fishery. All skippers have also engaged with a bycatch observer program where vessels are randomly sampled during the fishing season. The actions undertaken by the members of association will be detailed along with the ongoing work to maintain MSC certification of Cornish Sardine.

Mitigation

Tara Marshall, University of Aberdeen

Talk: Space and Time

See previously for biography and abstract.

Stuart Hetherington, Cefas

Talk: Space and Time

Abstract

Where, When and How much? The Spurdog Bycatch Management Programme

Spurdog (*Squalus acanthias* L.) in the North-east Atlantic is classed as Endangered by the International Union for the Conservation of Nature (IUCN). Under recent EU fisheries legislation, spurdog is classed as a prohibited species, which fully precludes landings. Zero landings does not result in zero take from the stock, as incidental bycatch occurs in mixed fisheries, leading to fishing induced mortality and wasteful discarding of dead fish. The current management of spurdog does not address the continued issue of dead discarding, nor contribute to reducing fishing pressure.

A collaborative research partnership between Government policy advisors, scientists, the fishing industry and an environmental non-governmental organisation informed the development and trial of the near real-time management of spurdog. Through an on-line portal, fishermen self-report their bycatch in near real-time by area. This information is compiled and reported back to fishers using a RAG traffic light system; Red (high risk of spurdog bycatch), Amber (medium risk of significant bycatch) and Green (low risk of significant bycatch), empowering fishers to make informed decisions in real-time, enabling active management of recent bycatch "hotspots".

The combination of electronic tagging studies and the skippers' self-reported data of spurdog is delivering the most complete representation to date of the seasonal movement, distribution, bycatch and discard survival of spurdog in the Celtic Sea.

Timothy B. Werner, New England Aquarium

Talk: Sound

Talk: Electric Barriers

Talk: Gear Entanglement

See previously for biography and abstract.

Nadia Laabs and Dan Watson, SNTECH

Talk: Light

Biographies

Dan is the founder and CEO. Leads a design team in the space industry, helps companies refine their business models and take a more user-centred approach to their product and service offerings. Aran is Chief Engineer. He has worked on an eclectic array of electro-mechanical and green-tech projects for the last 5 years. Nadia is the Business Strategist. With a background in engineering and an MBA from INSEAD, she guides our business strategy. Steve Ogborne is the Principal Mechanical Engineer. He develops and builds our products to make sure they are tested and manufacturable.

Abstract

Different species of fish are affected by lights in different ways. Some are attracted and some are repelled, and it all depends on the type of light you use. Our innovative and affordable product enables users to easily specify the wavelength, intensity, polarization and flash-pattern of the light it emits, to better attract the size and species of fish they are licensed to catch. It is easy to fit, recharge and is designed specifically for the fishing environment. It retrofits to any type of fishing gear and a set of 10 devices and a charger (enough for most vessels) will pay off its own purchase within 1 day of use by fishermen by enabling them to comply with new fishing regulations that reward the use of sustainable gears.

