Detailed SWOT Analysis - Monitoring

Example monitoring options	Strengths	Weaknesses	Opportunities	Threats
Electronic Monitoring (EM) Use of electronic monitoring to measure cetacean bycatch on small scale vessels in the Netherlands. ***Marije Siemensma, Marine Science & Communication***	• Space efficient • Visual confirmation • Captures detailed information	• Trust in data use (science vs compliance) • Analysis capability to interpret data • Lack of privacy • Bulky on small vessels	<u>EM could be used to:</u> • provide proof of sustainability (e.g. premium products) • verify fisher-reporting • check for cetaceans dropping out the net/behaviour in net	• Obstruction or issues with cameras • Unsuccessful if low buy-in from the fishing industry. • Lack of consistent policy commitment
Real-time reporting Use of technology to upload, share and monitor real-time bycatch of salmon in west coast US. ***Tara Marshall, University of Aberdeen***	• Industry led • Real-time information • Preventative measure to avoid bycatch • Saves time & inconvenience of bycatch	• Sharing commercially sensitive information • Requires incentives to work • Requires verification	<u>Real-time reporting could be used to:</u> • Enhance collaboration from the fishing industry	• Lack of incentives: works well where there are incentives or a rights-based management regime in place
Observers SMRU run a dedicated marine mammal bycatch observer scheme ***Allen Kingston, SMRU*** Cefas run a general bycatch observer scheme as mandated by the EU Data Collection Framework (DCF) ***Cefas***	• Programme ongoing • High quality data • Builds relationships with fishermen • Adaptive programme	• Resource intensive • Sub-sample of fishing fleet • Low representation of the inshore fleet • Observer bias • Observer effect	<u>Observers could:</u> • train in bycatch release • interview fishers on experience of by-catch • undertake 6-month intensive programme to validate other monitoring e.g. fisher self-reporting	• Resources: requires continuous investment and training • Limit to what observers can cover in one trip
Apps & Technology Smart phone apps for fisher-reporting (***AST, David Davies***) and open-source software or hardware for recording, analysis & integration (***Octophin Digital***, ***Filip Hnizdo***)	• Low overheads of Apps • Use of photographs to help species identification • Integrate with GSM • Open source software: can be more effective and efficient	• Integrity of data – requires validation	<u>Technology & App dev. could:</u> • involve user in design • reduce duplication of data entry • help to integrate data and link different organisations • promote transparency	• Reluctance to share data • Reluctance to use open source (stipulate in funding criteria that software is open-source?) • Lack of resources to develop
Fisher interviews Information on whale entanglements over the past 10	• Increased information on something that is under-reported • Builds relationship and trust with fishermen	• Resource/time-heavy • Subjective view of interviewee	<u>Fisher interviews could be used to:</u> • Promote best practice • Discuss industry-led solutions • Increase bycatch reporting	• Risk to fishermen of sharing information that can be used negatively • Funding

years has been captured in 90+ interviews in Scotland.	• Easy to replicate		• Lead to development of reporting app	• Low participation could result in false outcomes
Stranding Programme 30-year programme collecting cetacean strandings and conducting necropsies determining cause of death and range of ancillary data. ***Rob Deaville, ZSL***	• Longevity of data set- year round monitoring • Data standards integrated across the EU • Monitors multiple pressures beyond bycatch e.g. shipstrike, pollution etc; and collects ancillary data e.g. stomach contents/life history etc • Supports public engagement	• Resource intensive • Biases in dataset (only subset of mortality and strandings) • Uneven effort across parts of the UK	<u>Strandings data could be:</u> • Integrated with other monitoring streams • Used to validate sightings data • Help increase engagement at a local level	• Need to integrate with other monitoring streams • Consistency of funding • Relies on a small number of individuals in programme
Drift Modelling Models developed for the UK and French coast using strandings data and tagging experiments to estimate bycatch rates and hotspot areas.	• Uses strandings data to estimate bycatch levels and identify fisheries/ areas with high bycatch • Independent from fishing data • Promotes engagement with fishermen through tagging dead bycatch to evaluate the model	• Depends on an existing strandings scheme • Fine tuning needed on correcting factors & drift duration • Limited to certain areas	<u>Drift modelling could:</u> • Be expanded to include other areas • Fine-tuned through more tagging experiments (of bycatch) • Turn a negative into a positive by collecting useful data from accidental capture of a cetacean • Integrate with observer bycatch rates	• Lack of modelling capacity to expand work into new regions • Misinterpretation if correction factors not accurate
Hydrophones Use of hydrophones to monitor interaction between dolphins and porpoises with gill net and purse seine fishing in Hong Kong. ***Lindsey Porter, St Andrews University***	• Passive monitoring • Assesses level of fishing and cetacean overlap • At-source monitoring by fishermen • Understand cetacean behaviour	• Only useful for species that vocalise frequently • Requires validation • Detects presence but not quantity or currently bycatch (unless able to distinguish distress signals)	<u>Hydrophones can be used:</u> • On autonomous vehicles or to validate other monitoring • To gather information on other fish and sources of noise • To develop maps of cetacean presence overlapped with fishing effort that can be shared with fishermen • Potential to project an acoustic signal to deter cetaceans, as well as listen	• Misidentification of species • High upfront costs • Selecting appropriate equipment
Satellites Testing the use of satellites to monitor whales, ***Hannah Cubaynes, Cambridge University***	• Covers large areas • Used to reach inaccessible areas	• Poor weather obscures images • Only visible for large animals: whales • Requires large data processing capability	<u>Satellites could be used:</u> • To complement data on cetacean sightings from ships • Provide automated data on whale distribution	• Competition for satellite time in good weather • Early stages of development

Remote Operating Vehicles (ROVs) Review of how autonomous vehicles can be used in monitoring marine fauna. ***Ursula Verfuss, SMRU Consulting***	• Can reach inaccessible areas • Reduces risks to humans	• Requires large data processing capability • Requires verification • No previous use for monitoring bycatch	<u>ROVs could be used for:</u> • Underwater monitoring: behaviour in nets and reasons for bycatch • Calculating abundance estimates through automated surveys	• Regulations may hinder use if permits for ROVs cannot be secured • Selecting appropriate equipment

Detailed SWOT Analysis - Mitigation

Mitigation Option	Strengths	Weaknesses	Opportunities	Threats
Sound *Acoustic Deterrent Devices (ADD) or Pingers*	• Works well with some species & reduces gear damage • Fits well on nets • Fishers willing to use if they agree it works • Scalability • Technology improving • Cost reducing • Legislative driver is an incentive	• Does not work well for all species (e.g. bottle nose dolphin) • Dinner bell effect for species that depredate • Reduces but does not eliminate bycatch • Requiresmaintenance & enforcement • Can increase bycatch if not deployed correctly • Not applicable to Creel fishery	• Make an alternating acoustic signal so animals don't habituate • Undertake a broad range of trials: different species, populations, habitats, gears & seasons to determine what works best where • Use existing trials to enable decision-making around trials e.g. check list or decision tool • Research into acoustic reflectors • Research into inducing a startled reflex or producing a distress signal.	• Concerns over cumulative noise pollution and habituation
Light *Lights based on species-specific wavelengths*	• Could complement existing methods (e.g. use for bottle nose dolphin together with pingers for other species such as harbour porpoise) • Species specific – targeted • Support from fishermen for trials • If increased target catch could reduce soak time (and therefore cetacean bycatch)	• Need different lights for different species • No current evidence that light reduces cetacean bycatch • Reduced effectiveness in turbid water • Needs maintenance	• Assess how applicable to different gears & species • Chance to influence design as in R&D phase • Assess costs vs pingers	• Concerns this detracts from other measures with a greater evidence base • Unknown cumulative impact • May attract bycatch in certain circumstances
Spatial & Temporal Management *Fixed and non-fixed closures during certain times or places*	• Seasonal & Dynamic (not just MPAs) • Can be flexible (without boundaries) • Adaptable on a case-by-case basis • Public support	• Fixed closed areas (MPAs) not effective for cetacean bycatch • Can displace effort • Difficult to design for highly mobile species	• Fixed closed areas (MPAs) provide opportunities to test new gear • Use within identified hot-spots rather than closing entire fishery • Use with real-time monitoring to make closures targeted and brief	• Relies on good compliance and enforcement or closed areas attract illegal fishing • Relies on large amount of evidence to design well.

	• Can benefit wider ecosystems	• Need to understand species behaviour to design appropriately		
Gear Modifications *Changes to type, design or deployment of gear*	• Modification of gear or its deployment can reduce bycatch • Changes to gear requires no changes to fishers' routines • Potential options: Different strengths and colours of rope, twine and mesh	• Cost implications • Difficulty in changing culture if requires a signfiant change in gear deployment • Other gear types not effective for target catch • Information on alternatives not necessarily reaching fishermen	• Trial using different types of gears in different areas to reduce bycatch • Trial optimal deployment: soak time, location, tension on risers • Involve fishermen in designing innovations • Understand interactions that do not lead to bycatch	• Gear change or modification may impact another species/ecosystem (need to consider the ecosystem as a whole) • Regulatory conflict • Signficant changes to gear without evidence leads to unnecessary burdens on fishermen