Conservation Services Programme

DRAFT

Protected fish medium term research plan 2014

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Conservation Services Programme

Department of Conservation

1. Purpose

The Conservation Services Programme (CSP) undertakes research to understand and address the effects of commercial fishing on protected species, in New Zealand fisheries waters (for further details see the CSP Strategic Statement 2013). Protected fish species are those listed under Schedule 7a of the Wildlife Act 1953 and detailed in Table 1

This CSP protected fish medium term research plan 2014 (CSP fish plan 2014) outlines a five year research programme to deliver on the protected fish population, mitigation and interaction research component of CSP. It has been developed as part of the work of the CSP Research Advisory Group (CSP RAG), and will be used in the development of CSP Annual Plans and any other relevant delivery mechanisms.

Protected fish research that falls outside the scope and mandate of CSP, for example recreation al bycatch, is not included in this plan.

2. Guiding objectives and risk framework

This plan is guided by the relevant objectives of CSP and elements the National Plan of Action for the Conservation and Management of Sharks 2013 (NPOA-Sharks). These are summarised in Table 2.

The risk referred to in the guiding objectives is the risk of commercial fisheries to New Zealand protected fish populations. One objective of the NPOA-Sharks is to undertake a quantitative risk assessment in order to understand the impact of commercial fisheries on shark species. This risk assessment will be expanded to include the two protected teleost species. This risk assessment process is already scheduled, jointly between the Ministry for Primary Industries (MPI) and DOC, and the first phase is due to be completed in December 2014. Once complete the CSP fish plan 2014 will be updated to reflect its results. In the interim, prioritisation will be based principally on the results of the Review of commercial fishery interactions and population information for eight New Zealand protected fish species (Francis and Lyon 2012) alongside any other relevant information.

3. Data requirements

In general there is a paucity of data relating to the population structure of protected fish species. Francis and Lyon 2012 summarise the current state of knowledge for eight of the nine protected fish species (Table 3) and give direction as to where priority research should be focused.

This plan describes a research programme to fill knowledge gaps in order to better understand protected fish species susceptibility to impacts from commercial fisheries and therefore inform and priorities management actions to mitigate these impacts.

A core prerequisite for any research on protected fish is accurate identification of taxon to the most appropriate taxonomic level. Historically a number of shark species have be reported to generic taxa levels by both observers and fishers, this has generally been a result of cryptic morphology between a number of species and limited effort targeted at identifying animals due to conflicting observer priorities. In some cases the ability for fishers to report captures has been hampered by a lack of species specific codes, for example the oceanic white-tip shark.

In order to accurately assess risk of fishing interaction as a function of overlap with commercial fisheries developing accurate species distributions are required. Where applicable these distributions should contain seasonal dimensions. For many, more commonly caught, fish taxa this can be achieved through catch data. However for the seven protected shark species this data will be too sparse therefore where possible should be supplemented with tracking studies.

Sharks can be characterised as having relatively slow growth rates, late sexual maturation and low fecundity. These factors place them at increased risk of impact from commercial fishing bycatch. Understanding the reproductive characteristics of protected sharks in New Zealand allows understanding of the resilience of populations to such fishing impacts. Very little information is available on growth rates or fecundity for either spotted black grouper or giant grouper, however it is generally believed to be low based on the characteristics of other similarly sized grouper species (Francis and Lyon 2012) therefore caution should be applied when dealing with risk form commercial fisheries interaction.

The degree of post-release mortality, in commercial fisheries in not well understood for fish species. Some fishery/ species interactions have higher incidence of live release than others, for example setnet and white pointer sharks and purse seine and spine tailed devil rays. While animals are assessed as being alive at time of release the level of subsequent mortality is poorly understood. Sharks are susceptible to toxic poisoning due to stress and recent studies by Francis and Jones (2014) have shown that post-release mortality of spine-tail devil rays, apparently in good condition on release, can be high (75% based on a very limited sample). This methodology should be applied to other protected fish species in order to refine assessments of mortality.

Other sources of information, particularly around estimation of capture rates in fisheries, is also of great importance in accurately estimating risk. This information is generally best obtained via vessel observation programmes. In effectively planning observer coverage it is

important to balance priorities for all protected taxa including mammals, birds and corals, therefore, while interaction projects have been discussed in this plan, detail of a medium term protected species observer plan will be outlined in a separate document which will deal with all protected taxa..

4. Current risk and uncertainty

While a formalised assessment risk assessment for shark species has not yet been completed a preliminary matrix can be constructed based on known interactions with fisheries. These matrices are presented in Tables 4 and 5, and aid with prioritisation of population, interaction and mitigation research. Data needs are species specific dependant on our understanding of the nature of interactions.

Not all protected fish species have been reliably reported as interacting with commercial fisheries in New Zealand; whale shark, manta rays and giant grouper are tropical species which are not know to occur in New Zealand waters regularly or in high numbers. Therefore these species would be lower priority candidates for research (Francis and Lyon 2012). Basking shark and spine tailed devil rays are the most frequently reported bycatch species followed by white pointer sharks. All protected fish, with the exception of spine tailed devil ray and spotted black grouper[1] are listed as vulnerable under the IUCN Redlist classification system (Table 1).

Observed interactions with spine-tailed devil rays are largely limited to skipjack purse seine fisheries, and over a relatively short season. As this fishery aims for live capture of fish, many of the animals are recorded as caught and released alive (Francis and Lyon 2012) though studies have shown post release mortality occurs even for apparently good condition individuals (Francis 2013). Therefore projects targeted at mitigation, safe release and education and/ awareness could yield reductions in captures and/or increased post-release survival.

Reported basking shark interactions by contrast are the most evenly distributed over time, space and fishery group (Francis and Sutton 2012). It is likely that no single mitigation approach will deal with these interactions. Therefore it will be necessary to better understand the distribution and population dynamics of this species to better understand the impact of commercial fisheries bycatch.

White pointer sharks have been reported captured in both inshore and offshore trawl fisheries but primarily in inshore setnet around Stewart Island, Fiordland and Taranaki. Given the sparse nature of observer coverage in these fisheries it will be important to increase monitoring in order to better understand the nature and extent of these interactions. A number of these shark interactions are reported as resulting in live releases, however it is uncertain as to the level of post release mortality. These data gaps would best be filled through the use of pop-off or survival tags to record the animal's activity following release.

Bycatch of oceanic white-tip sharks has been reported in surface longline fisheries, in northern New Zealand and the Kermadec region. Understanding of the nature and extent of these interactions has been limited by a combination of a lack of species specific reporting codes available to fishers and low (<10%) and patchily distributed observer coverage in the domestic surface longline fisheries (Ramm 2011, 2012, 2013, Rowe 2010). Increased focus on data

[1] Listed as 'Near Threatened'

collection for observers in this fishery along with studies on post release survival would help inform prioritisation of future management or research action.

Improving understanding of life history characteristics of shark species informs assessments of their vulnerability to fisheries related mortality. Collection of biological samples from bycaught animals can be used in the estimation of these life history characteristics for example; growth and longevity, size at sexual maturity, litter size and gestation period (Francis and Lyon 2012).

5. Research plan

Table 3 indicates the knowledge gaps in our understanding of population parameters relevant to meeting CSP and NPOA-Sharks objectives. These will further be informed by the NPOA-Sharks Risk Assessment. This risk assessment is planned to be completed in a series of iterations, in the initial stages a Level 1, expert based, assessment will be made. In parallel a first tranche of species will be run through a Level 2, semi quantitative, process. Each iteration will be reviewed by a technical working group and will identify data gaps which will drive the research direction. With each iteration more species will be added and models will be refined with improved input data.

The information on our understanding of population parameters for protected fish, relevant to NPOA-Sharks and CSP objectives, given Table 3 forms the basis of the CSP research response proposed in Table 6. The CSP research response has been developed to meet the following criteria :

- Method and species specific bycatch mitigation devices developed for each protected fish species known to interact with commercial fisheries.
- Development of live release methods and protocols to maximise post-release survival probability of protected fish species for fisheries where live captures are relatively frequent.
- Where protected fish species are known to be released alive following capture, assess post-release survival and should be assessed to estimate bycatch mortality.
- Population structure should be determined (by genetic analysis) in order to identify both stock structuring within the NZ EEZ and differentiation from worldwide populations. This will inform adequate population level management.
- Improvement of both government observer and commercial fisher identification of protected fish species though training and educational materials to improve catch assessment for protected species. This should be informed by review of historic observer identification and photo logs.

- Optimise sampling of biological materials from protected fish, including collection of vertebrae and gonads to inform New Zealand specific understanding of life history characteristics such as age at maturity and fecundity.

- Tracking studies of highly motile protected fish species to inform estimates of spatial overlap between commercial fisheries and protected fish species. These studies should be designed to be informative on seasonal movements.

In order to plan a five-year research programme to deliver the CSP research response described in Table 6, some further operational principles were developed and used as appropriate:

- studies on highest risk species prioritised for earlier years, as informed by Level 1 and Level 2 risk assessments;

- mitigation, live release and post release survival studies should focus on fisheries with most frequent interactions;

- annual grouping of CSP projects by location across protected species taxa, in order to maximise synergies with other research projects, for example vessel based research in the Auckland Island squid fishery can assist both sea lion and basking shark research;

- planning live release, survival estimation and tracking studies in a complementary manner;

- aim to leverage from existing studies, of both the department and other organisations; and

- prioritise taxonomic and review projects, ensuring data adequate data collection is advanced in early years, as these are relatively low cost and may result in finding current risk estimates are under-estimated for potential new taxa.

- prioritise studies which make better use of existing research platforms such as biological sampling by government observers.

6. References

Francis, M. P., Lyon, W. (2012). Review of Commercial fishery interactions and population information for eight protected fish species. *Report prepared for the Conservation Services Programme.* Available at http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop2011-03-protected-fish-review.pdf

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Ramm, K. C. (2011). Conservation Services Programme Observer Report for the period 1 July 2008 to 30 June 2009. Available at www.doc.govt.nz/documents/science-and-technical/2008-09-csp-observer-report.pdf

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Rowe, S.J. (2010). Conservation Services Programme Observer Report for the period 1 July 2007 to 30 June 2008. DOC Marine Conservation Services Series 4. Department of Conservation, Wellington. 97p

Tables

Table 1. Protected fish species

Common name	Scientific Name	Family	IUCN Threat Ranking
Basking shark	*Cetorhinus maximus*	Centorhinidae	Vulnerable
Deepwater nurse shark	*Odontapsis ferox*	Odontaspididae	Vulnerable (decreasing population)
Oceanic whitetip shark	*Carcharhinus longimanus*	Carcharhinidae	Vulnerable
Whale shark	*Rhincodon typus*	Rhincodontidae	Vulnerable (decreasing population)
White pointer shark	*Carcharodon carcharias*	Lamnidae	Vulnerable
Manta ray	*Manta birostris*	Mobulidae	Vulnerable
Spinetail devil ray	*Mobula japanica*	Mobulidae	Near Threatened
Giant grouper	*Epinephelus lanceolatus*	Serranidae	Vulnerable
Spotted black grouper	*Epinephelus daemelii*	Serranidae	Near Threatened

Table 2. Guiding objectives of the NPOA-Sharks and CSP.

NPOA-Sharks

Goal	Five-year objectives
Biodiversity and long-term viability of shark populations 1. Maintain the biodiversity and long-term viability of New Zealand shark populations based on a risk assessment framework with assessment of stock status, measures to ensure any mortality is at appropriate levels, and protection of critical habitat.	**Objective 1.1** Develop and implement a risk assessment framework to identify the nature and extent of risks to shark populations. **Objective 1.2** Systematically review management categories and protection status to ensure they are appropriate to the status of individual shark species. **Objective 1.3** For shark species managed under the QMS, undertake an assessment to determine the stock size in relation to B_{MSY} or other accepted management targets and on that basis review catch limits to maintain the stock at or above these targets. **Objective 1.4** Mortality of all sharks from fishing is at or below a level that allows for the maintenance at, or recovery to, a favourable stock and/or conservation status giving priority to protected species and high risk species. **Objective 1.5** Identify and conserve habitats critical to shark populations. **Objective 1.6** Ensure adequate monitoring and data collection for all sectors (including commercial, recreational and customary fishers and non-extractive users)) and that all users actively contribute to the management and conservation of shark populations.
Utilisation, waste reduction and the elimination of shark finning 2. Encourage the full use of dead sharks, minimise unutilised incidental catches of sharks, and eliminate shark finning[2] in New Zealand	**Objective 2.1** Review and implement best practice mitigation methods, as required, in all New Zealand fisheries (commercial and non-commercial). **Objective 2.2** Minimise waste by promoting the live release of bycaught shark species, and develop and implement best practice guidelines for handling and release of live sharks. **Objective 2.3** Develop and implement best practice guidelines for non-commercial fishing and handling of sharks. **Objective 2.4** Eliminate shark finning in New Zealand fisheries by 1 October 2016.

[2] Shark finning is defined for the purpose of this NPOA as the removal of the fins from a shark (Class Chondricthyes – excluding Batoidea (rays and skates)) and the disposal of the remainder of the shark at sea. As such, removal of the fins from a shark where the trunk is also retained for processing is not defined as 'shark finning'.

Goal	Five-year objectives
Domestic engagement and partnerships 3. All commercial, recreational and customary fishers, non-extractive users, Maori, and interested members of the New Zealand public know about the need to conserve and sustainably manage shark populations and what New Zealand is doing to achieve this.	**Objective 3.1** Capture and reflect, through meaningful engagement, the social and cultural significance of sharks, including their customary significance to Maori, in their conservation and management. **Objective 3.2** Communication and information sharing between government agencies and stakeholders is effective, with strategies developed and implemented to promote the conservation and sustainable management of shark populations. **Objective 3.3** Encourage compliance with regulations, implementation of best practice (including catch avoidance and correct handling), and cooperation with ongoing research among commercial and non-commercial stakeholders. In particular, encourage reporting of any illegal practices (especially live finning) that may be observed.
Non-fishing threats 4. New Zealand's non-fishing anthropogenic effects do not adversely affect long-term viability of shark populations and environmental effects on shark populations are taken into account	**Objective 4.1** Non-fishing anthropogenic and environmental threats to shark populations are understood and, where appropriate, managed.
International engagement 5. New Zealand actively engages internationally to promote the conservation of sharks, the management of fisheries that impact upon them, and the long-term sustainable utilisation of sharks.	**Objective 5.1** New Zealand ensures that it meets its international obligations and receives positive recognition for its efforts in the conservation, protection and management of sharks through active engagement in international conservation and management agreements relevant to sharks. **Objective 5.2** New Zealand actively investigates and decides whether to become a signatory to the Convention on Migratory Species (CMS) Memorandum of Understanding on the Conservation of Migratory Sharks (MoU) in advance of the next Meeting of Signatories in 2015. **Objective 5.3** New Zealand collaborates with neighbouring countries to better understand the population dynamics of highly migratory sharks, protected sharks and any other shark species of special interest. **Objective 5.4** New Zealand proactively contributes to and advocates for improved data collection and information sharing of commercial catches and incidental bycatch of sharks within relevant Regional Fisheries Management Organisations (RFMOs). **Objective 5.5** New Zealand encourages fishing countries, coastal States, and other regional organisations to develop and implement best practice Plans of Action for conserving and managing sharks, where they have not already done so.
Research and information 6. Continuously improve the information available to conserve sharks and manage fisheries that impact on sharks, with prioritisation guided by the risk assessment framework.	**Objective 6.1** Ensure information collection systems and processes are sufficient to inform management of shark populations **Objective 6.2** Undertake a research programme, guided by the risk assessment framework, to increase understanding of and improve the management of shark populations. **Objective 6.3** Implement research to inform the development of recovery plans appropriate to protected species

CSP Objectives

Objective A: Proven mitigation strategies are in place to avoid or minimise the effects of commercial fishing on protected species across the range of fisheries with known interactions.	Addressing this objective will consist of continued identification of new mitigation methods, application of methods used overseas (including development for New Zealand fisheries), and at-sea testing. Priority will be given to protected species/fisheries interactions for species identified as at high risk from commercial fishing effects.
Objective B: The nature of direct effects of commercial fishing on protected species is described.	This objective will be achieved through the collection and reporting of observational information on captures and other direct interactions of protected species across a representative portion of fishing effort. The protected species involved, the characteristics of the fishing operation, and the nature of each interaction will be determined and recorded.
Objective C: The extent of known direct effects of commercial fishing on protected species is adequately understood.	This objective will be achieved when: • a robust risk assessment can be completed to assess the extent of risk posed by direct effects of commercial fishing; • for species identified at medium or high risk[3], information is available to allow the meaningful monitoring of captures rates over time; and • the extent of commercial fishing effects that allow for the protection and recovery of protected species have been identified. Addressing this objective will require the collection of representative independent information on interaction rates of protected species with commercial fishing, at levels determined through risk analysis.

[3] These risk categories will be determined during the prioritisation phase of the CSP research planning cycle, with reference to relevant risk assessments as detailed in Section 3 and Appendix 4.

Objective D: The nature and extent of indirect effects of commercial fishing are identified and described for protected species that are at particular risk to such effects.	Addressing this objective will involve multi-disciplinary research including ecosystem modelling focussed on identifying and describing the mechanisms of indirect effects from fisheries on protected species. Priority will be given to those relevant protected species/fisheries combinations where existing knowledge or related research programmes exist.
Objective E: Adequate information on population level and susceptibility to fisheries effects exists for protected species populations identified as at medium or higher risk from fisheries.	This information is required in order to inform detailed risk assessment and/or fisheries management. Addressing this objective will involve the collection of data on population trend, demographic parameters and at-sea foraging information for medium to high risk protected species.

Table 3. Summary of the level of population information available for each of eight protected fish species. Species and their score sums which are coloured purple have a moderate–high proportion of their population in New Zealand waters for at least part of the year (Francis and Lyon 2012).

		Stock identification - population unit					Biological information - species productivity					
Species	Proportion of stock in NZ	Genetic stock structure	Movement	World distribution	Habitat	Sum	Growth	Longevity	Maturity	Reproduction	Natural mortality	Sum
Basking shark	High	1	2	3	2	8	1	1	1	1	1	5
White shark	High	3	3	3	3	12	2	1	2	1	1	7
Whale shark	Low	2	2	3	3	10	1	1	1	1	1	5
Deepwater nurse shark	High?	0	0	2	1	3	0	0	1	1	0	2
Spinetail devilray	Moderate	0	1	3	3	7	1	1	2	2	0	6
Manta ray	Low?	1	1	3	2	7	0	1	2	2	0	5
Spotted black grouper	High	1	0	4	3	8	2	2	1	1	2	8
Giant grouper	Low	0	0	3	3	6	0	0	1	0	0	1
Sum		8	9	24	20		7	7	11	9	5	

		Species and fishery distribution - extent of overlap in NZ				Response to exploitation in NZ				
Species	Proportion of stock in NZ	Stock distribution	Fishery distribution	Vulnerable components in commercial fisheries	Sum	Catches and biomass	Size composition	Sum		
Basking shark	High	3	2	> 4 m	5	2	0	2		Information level
White shark	High	3	2	All	5	0	0	0		0 = none
Whale shark	Low	3	4	Not vuln.	7	NA	NA			1 = poor
Deepwater nurse shark	High?	1	1	All	2	0	0	0		2 = moderate
Spinetail devilray	Moderate	3	3	All	6	0	0	0		3 = good
Manta ray	Low?	2	3	Not vuln.	5	NA	NA			4 = excellent
Spotted black grouper	High	3	3	All	6	0	0	0		NA = not applicable
Giant grouper	Low	3	2	Not vuln.	5	NA	NA			
Sum		21	20			2	0			

Table 4.. Frequency of interaction between fishery group and protected fish species in each FMA for the period 1990 to 2011. Taken from the merged data set of fisher and observer reports used in Francis and Lyon 2012

Species/Fishery Group	FMA 1	2	3	4	5	6	7	8	9	Nil	ET	Grand Total
BSK	2	4	112	4	71	76	26	3	4	1	2	305
Deepwater Trawl	1	1							4	1	2	9
Hoki, Hake, Ling, Warehou Trawl		3	101	4	31	30	26	1				196
Inshore Trawl			8		2							10
Pelagic Trawl			1					2				3
Purse Seine	1											1
Scampi Trawl						4						4
Setnet (Rig/ School shark)			1									1
SLL					3							3
Southern blue whiting trawl						2						2
Squid Trawl			1		35	40						76
GGP	1			1								2
Hoki, Hake, Ling, Warehou Trawl				1								1
SLL	1											1
MJA	104								4		4	112
Purse Seine	99								3		4	106
SLL	5								1			6
ODO		3										3
Hoki, Hake, Ling, Warehou Trawl		1										1
Scampi Trawl		2										2
SBG	4	1							1			6
Deepwater Trawl									1			1
Setnet (Butterfish)	1											1
Setnet (other)	1	1										2
Setnet (Rig/ School shark)	2											2
WPS	12	1	5		20	11	18	1	2		2	72
Deepwater BLL	2											2
Hoki, Hake, Ling, Warehou Trawl			2		3		16					21
Inshore BLL (Snapper)			1		2							3
Inshore Trawl (Snapper)									1			1
Pelagic Trawl							1	1				2
Setnet (Elephant fish)					1							1
Setnet (other)	8	1	1		3						1	14
Setnet (Rig/ School shark)	1		1									2
SLL	1				1		1		1		1	5
Squid Trawl					10	11						21
Grand Total	123	9	117	5	91	87	44	4	11	1	8	500

Table 5. Aggregated protected fish interactions by fishery and FMA for the period 1999 to 2011 Taken from the merged data set of fisher and observer reports used in Francis and Lyon 2012.

Fishery Group	1	2	3	4	5	6	7	8	9	Nil	ET	Grand Total
Deepwater BLL	2											2
Deepwater Trawl	1	1							5	1	2	10
Hoki, Hake, Ling, Warehou Trawl		4	103	5	34	30	42	1				219
Inshore BLL (Snapper)			1		2							3
Inshore Trawl			8		2							10
Inshore Trawl (Snapper)									1			1
Pelagic Trawl			1				1	3				5
Purse Seine	100								3		4	107
Scampi Trawl		2				4						6
Setnet (Butterfish)	1											1
Setnet (Elephant fish)					1							1
Setnet (other)	9	2	1		3						1	16
Setnet (Rig/ School shark)	3		2									5
SLL	7				4		1		2		1	15
Southern blue whiting trawl						2						2
Squid Trawl			1		45	51						97
Grand Total	**123**	**9**	**117**	**5**	**91**	**87**	**44**	**4**	**11**	**1**	**8**	500

Table 6 CSP Research response over the next 5 years: SURV= Post release survival estimate; TRACK= Tracking Studies; BIO Biological Sampling of specimens; L1RA= inclusion into Level1 Risk Assessment; L2RA= Inclusion into Level 2 Risk Assessment; MIT= .Mitigation Research; LIVE= Live release research; GEN= Genetic analysis.

		Year				
Species	Research	2014/15	2015/16	2016/17	2017/18	2018/19
Basking shark	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
Deepwater nurse shark	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
Oceanic whitetip shark	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
Whale shark	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
White pointer shark	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
Manta ray	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
Spinetail devil ray	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
Giant grouper	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					
Spotted black grouper	L1RA L2RA MIT SURV LIVE TRACK BIO GEN					