THE SOUTH AFRICAN HAKE LONGLINE FISHERY CONSERVATION PROJECT

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FINAL REPORT 30.08.2016

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Acknowledgements

This report was compiled by the WWF-SA, SAHLLA, and CapMarine.

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1. Introduction

The South African hake longline fishery targets two South African species of hake, deep-water (*Merluccius paradoxus*) and shallow-water (*Merluccius capensis*) hake, using a demersal longline technique with weighted lines and baited hooks. The Cape hakes are the most commercially valuable fish species in South Africa. While the hake trawl fishery has been established since the 1930s, the demersal longline sector began experimentally in 1983 targeting kingklip (*Genypterus capensis*) (DAFF 2005). The fishery was subsequently closed in 1989 due to concerns over the impact the fishery was having on kingklip stocks.

A few years later in the early 1990s, renewed pressure was placed on DAFF to test longlining as a hake-directed fishery. Subsequently from 1994, for a period of two years, the fishery was re-opened as an experimental fishery targeting hakes only (Japp & Wissema, 1999). During the experimental period, the effort levels and number of boats were strictly controlled. Following the conclusion of the experiment, a chaotic period in the fishery coincided with political change in South Africa and the allocation of "medium term" fishing rights. At this time, hake longlining was introduced "formally" but was subjected to frequent litigation that resulted in erratic fishing. It was only from 1998 with the issue of medium term fishing rights, that some order prevailed in the fishery and it was in fact formalized as a legitimate commercial fishery. Critically, the fishery was seen as opportunity to allow many smaller rights holders and previously disadvantaged groups to access the hake fishery as a large number of fishers were granted rights but with relatively small allocations. The fishery currently operates out of Saldanha, Cape Town, Mossel Bay, Port St Francis and Port Elizabeth. Fishing typically occurs along the western and southern coasts in depths of 100m to 600m, with trips of around six days duration (Japp & Wissema 1999). For the fishing season 2016, the global South African TAC for hakes was 147,500t (DAFF 2015), of which the hake longline sector received 9,735t (approximately 6.6%).

The hake longline fishery is one of South Africa's most lucrative with annual revenue estimated at R280 million in 2005 (DEAT 2005). Although the fishery lands fewer hake than the trawl fishery, the industry lands predominantly "prime quality[1]" hake for export to Europe with a greater estimated value per hake than the trawl fishery. Historical figures are that the fishery supports the employment of approximately 3600 permanent jobs and a further 3200 part-time jobs, with historically disadvantaged persons occupying more than 90% of these jobs. SAHLLA intends to commission a study update of these economic and employment statistics for the sector.

By the end of 2012, the sustainability profile of this fishery was not positive. The fishery's three principal seafood products – the two hake species and kingklip – were up for a re-assessment under WWF-SA's Southern African Sustainable Seafood Initiative (WWF-SASSI) and were likely to retain the Orange-list, "think twice," rating that the fishery received in 2010. The key areas of concern identified in the WWF-SASSI assessments undertaken in 2010, and revised in 2012, were (i) negative interactions with endangered seabird species, (ii) unknown bycatches of fish and shark species, and (iii) limited management interventions addressed to these and other ecosystem impacts.

The South African Hake Longline Association (SAHLLA) approached WWF-SA with the support of WWF-SASSI retail partners to see how the fishery could improve its sustainability status. The parties discussed

embarking together on a Fisheries Conservation Project (FCP). To ensure the FCP was grounded in sound scientific principles of fisheries sustainability, the parties contracted Capricorn Marine Environmental (Pty) Ltd (CapMarine), a South African company with expertise in the Marine Stewardship Council (MSC) standard of wildcapture fisheries certification. The fishery was then assessed against 23 different criteria within the three MSC principles of (i) sustainable target stock status and harvest strategy, (ii) bycatch and ecosystem effects, and (iii) effective fisheries management. As a result of this assessment, a time-bound workplan was developed to improve the sustainability of the fishery that, if successfully completed, should have enabled the fishery to meet the MSC standard for wild-capture fisheries certification at the conclusion of the FCP. The fishery, however, decided not to pursue MSC certification. In any case, the objectives of the workplan in terms of improvements required remained largely unchanged.

[1]This has changed in recent years – with the general global economic downturn, South African longline hake are now also sold locally with fewer Prime Quality exports than historically.

2. The **WWF-SA - SAHLLA FCP** Project

Project overview

The FCP officially began in 2013 with the FCP workplan guiding the actions of the parties. The workplan included 16 separate actions for SAHLLA, DAFF or WWF-SA to complete over a 2-year period (see workplan, attached as Appendix 1). The workplan actions were largely completed, however, there were six workplan actions that were not complete by the end of the FCP (see final progress report, attached as Appendix 2). Of these incomplete actions, four are anticipated to be completed by the end of calendar year 2016. One incomplete action without an estimated completion date is a complete report of compliance events for the sector from DAFF. Should the sector decide to seek MSC certification, it is anticipated that the information could be obtained from DAFF. The other incomplete action without an estimated completion date is the incorporation of the hake longline CPUE into the hake stock assessment model. Due to staff shortages and other pressing priorities, it is unknown when DAFF scientific staff will have an opportunity to complete this work.

The FCP Project workplan was composed of actions corresponding to the three MSC principles under MSC Fishery Standard, version 1.1 (MSC 2010). The first MSC principle concerns the stock status of the target fish species, in this case, the two hake species. The fishery benefited substantially in this principle from the existing MSC-certification of the SA hake trawl fishery for its hake products. As a result, many of the Principle 1 issues were already addressed by DAFF. However, there were five issues from Principle 1 that the fishery was required to address and these principally concerned incorporating scientific data from the hake longline sector into existing hake assessment models and related scientific analyses.

The second MSC principle concerns the ecological impacts of the fishery. This principle instructed that "fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends" (MSC, 2010). This principle is focused on the non-target species and marine habitats that are impacted by fishing.

A key prerequisite to appropriate management of the ecological impacts is data. It is not possible to design an appropriate management system to address ecological impacts if the proportions of retained species, discards, and endangered, threatened and protected (ETP) species relative to the target species are not known. Several of the eight workplan actions identified under this principle concerned the gathering and/or analysis of data on ecological impacts.

The third MSC principle is focused on the fishery-specific management system. This principle seeks confirmation that an effective management system exists that respects domestic and international laws and standards, and that has the appropriate frameworks to allow for responsible and sustainable use of marine resources (MSC 2010). The three workplan action items listed under this principle concerned developing a better understanding the compliance history, a fishery management plan, and a code of conduct.

Principle 1: The "target" species

The five FCP workplan actions under Principle 1 were as follows:

1. Develop a standardised longline CPUE index for use in the hake stock assessment model;
2. Correct the proportions of the two hake species in catches (if necessary) after analysing available data;
3. Analyse the available Offshore Resources Observer Programme (OROP) data and provide catch/age-at-length data for use in the hake stock assessment, and, improve data collection protocols;
4. Quantify or estimate loss of hake on lines through the SAHLLA-CapMarine observer programme, and;
5. Incorporate longline commercial CPUE and catch-at-length data into the hake stock assessment model, and consider the use of a harvest control rule for the fishery.

DAFF manages South African hake resources pursuant to an Operational Management Procedure (OMP) framework (de Moor et al., 2015). The OMP is a quantitative management tool that relies upon several different types of stock-related data. A detailed stock assessment is conducted every two years as part of the OMP, which guides development of the total allowable catch (TAC) for hake in South Africa (Intertek 2015). While the OMP itself is revised every four years following an in-depth stock assessment of both species of hake, in the interim years a routine update of the base case assessment will take place to ensure the resource is behaving within the predicted bounds of the model. During 2014, the four year review of the OMP took place and incorporated any changes to the stock, fishery or management that may have occurred in the prior four year period.

A key component of the FCP was to better incorporate data from the hake longline fishery into the development of the hake stock assessments. DAFF Fisheries Research and Development (FRD) scientists completed workplan actions 1, 2, 3, and in part, action 5. The scientists quantified the catch-at-length of, and the proportion of females in, hake catches from the hake longline sector over the period 2000 to 2010 (Somhlaba & Leslie, 2014). The Department scientists also developed standardized catch-per-unit-effort (CPUE) indices for the hake longline fishery using commercial data over the period 1994 to 2010; observer data was also largely available from 2000 to 2010 (Somhlaba, Leslie & Butterworth 2013). The CPUE indices were developed in preparation for the update of the OMP, however, the indices were not incorporated into the OMP 2014 (Somhlaba, pers. comm.)[2].

While commercial and at-sea observer data were both used, only the at-sea observer data provided both length and sex information from the period 2000 to 2010. The results are presented in DAFF Demersal Scientific Working Group Document 38 from August 2014 (Somhlaba & Leslie, 2014). Workplan action number 5 was only partially completed over the course of the FCP because the hake longline CPUE is not yet incorporated into the stock assessment model (S. Somhlaba, pers. comm.).

Workplan action number 4 regarding the loss of hake on lines, or the amount of hake subject to depredation events, was completed and is reported more fully below under Principle 2 in connection with the results from the SAHLLA-CapMarine observer programme.

[2] Noting that the incorporation of hake longline CPUE indices into the hake modelling is ongoing and that currently there is a task team reviewing the hake longline CPUE aspects (Japp, pers. comm.).

Principle 2: Ecosystem-related actions and improvements

The eight FCP workplan actions under Principle 2 were as follows:

1. Quantify retained and discarded species from OROP, vessel logbook and landings data sets;
2. Initiate a new at-sea scientific observation programme – the SAHLLA-CapMarine data collection programme;
3. Review of SAHLLA-CapMarine data collection programme to determine if knowledge gaps have been addressed;
4. Monitor interactions with ETP species and vessel compliance to existing mitigation measures, and evaluate the effectiveness of those measures;
5. Report on a review of models and existing data on likely ecosystem impacts of hake longline fishery on the ecosystem;
6. Identify benthic organisms fouled on line and consider whether logbook changes or responsible fisheries training would assist in the accurate recording of gear losses;
7. Determine the longline footprint relative to the substrate type;
8. Participation of principal fishers from each participating vessel in responsible fisheries training.

1. Quantify retained and discarded species from OROP, vessel logbook and landings data sets (P2 Workplan Action 1).

DAFF FRD scientists have been analyzing data available from the OROP programme, along with commercial data. While the catch-at-length data for hake have been analysed (see report back of Principle 1 actions above), a quantification of retained and discarded species has not yet been completed. DAFF has stated an intention to complete the work and it is anticipated to be presented to the DAFF Demersal Scientific Working Group within the 2016 calendar year (S. Somhlaba, pers. comm.).

2. The SAHLLA At-Sea Observer Programme (P2 Workplan actions 2, 3, 4 & 6).

The starting point for unpacking the ecosystem impacts of the fishery was gathering relevant data. Prior to the start of the FCP, the South African Hake Longline sector was regarded as one of the most under-researched South African fisheries sectors. Therefore, in order to determine the fishery's impact on the ecosystem as well as to assess the compliance status of the fishery, an at-sea observer programme was needed to better understand impacts.

A government-run at-sea observer programme was active in South African commercial fisheries from 1995 to 2000, 2002 to 2006, and 2007 to 2011. There has not been a government-funded observer programme relevant to the hake longline sector since 2011. In the absence of a government-run observer programme, SAHLLA was responsible for ensuring that there was an at-sea data collection programme, as per the FCP workplan (Appendix 1). SAHLLA contracted CapMarine Ltd to conduct and manage the SAHLLA FCP observer programme. An Observer Program Report (Appendix 3) containing the relevant findings of the observer programme was produced by CapMarine (Ngcongo, 2015).

At-sea observations of fishing activities were monitored through the SAHLLA-CapMarine data collection programme, which ran from October 2013 to September 2014. This observer programme amount to 98 at-sea observer days on 17 vessels with approximately 1,185,980 hooks observed (Ngcongo 2015). The fishing activity for this fishing season occurred nearly exclusively on the West Coast due to poor fishing on the South Coast during the year of observations. Future observation activities are required east of 20®E along the south coast to obtain a comprehensive understanding of fishery impacts on the South Coast.

The methodology used to undertake the observations is provided in Appendix 3.

The at-sea observation programme's objectives were to provide information on the length-frequency of hake catches, the catch composition (including non-target species and discards), interactions with ETP species, and loss of hake due to depredation events (Ngcongo, 2015).

A. Length-frequency of Hake Catches.

The lengths of all retained species (hake and by-catch) were measured for determination of the length frequencies of catches. A total of 17 100 fish were measured. There was a higher proportion of deep-water *hake M. paradoxus* (12 970 samples) relative to the shallow water hake *M. capensis* (2 088 samples) because 83% of the sampling effort occurred in waters deeper than 350 m. All *M. paradoxus* samples were taken exclusively on the west coast, while *M. capensis* samples were taken from both the west (743 samples) and south coasts (1 345 samples).

Figure 1 shows the length frequency data for the shallow water hake *M. capensis* for both the west and south coasts. Figure 2 shows the length frequency data of west coast deep water hake, *M. paradoxus*.

The proportion of juvenile hake landed was approximately 33% of the total hake landings (both *Merluccius* species combined). This was based on the estimation that the two hake species reach 50% of maturity at the lengths of 42cm for *M. paradoxus* and 54cm for *M. capensis* (Singh et al. 2011).

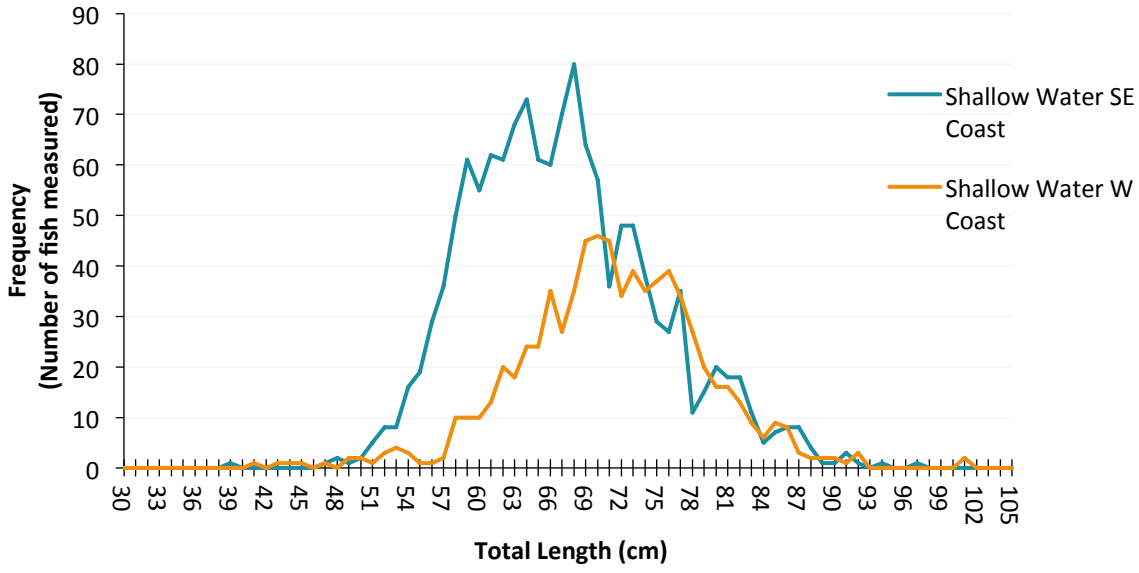


Figure 1: Shallow water hake *M. capensis* longline length frequency (n = 2 088) for the south coast and west coast of South Africa as recorded by observers from October 2013 to September 2014 (Ngcongo, 2015).

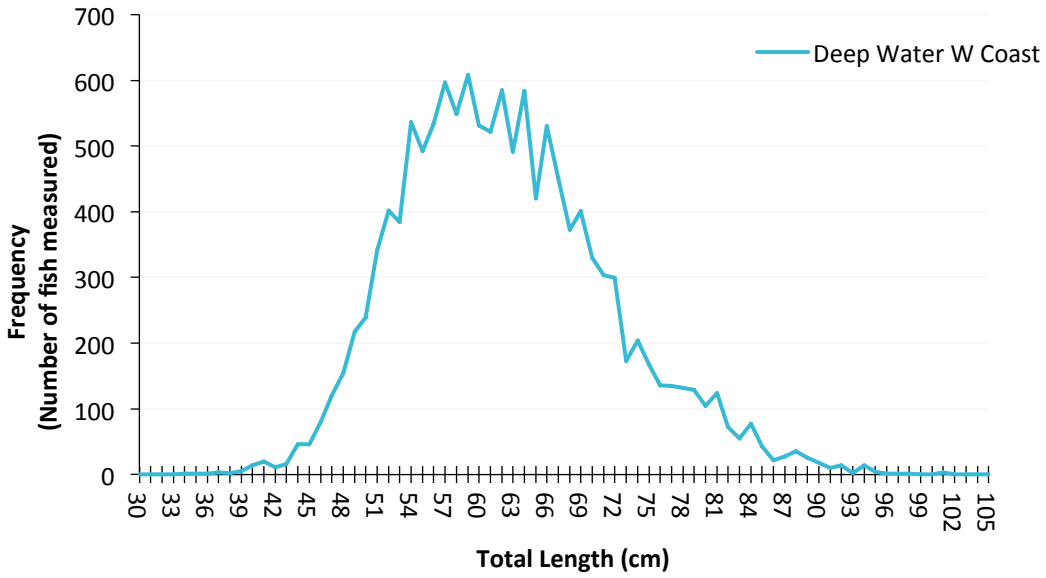


Figure 2: Deep water hake *M. paradoxus* longline length frequency (n = 12 970) for the west coast of South Africa as recorded by observers from October 2013 to September 2014 (Ngcongo, 2015).

B. Catch Composition.

The observers took a record of everything that came up on the line, i.e. fish species and benthic fauna (Ngcongo 2015, Figs. 1 & 2). The catch was categorized and recorded based on the "fate" of the fish on the line (retained, released or discarded). Hake longline gear is known for selectively targeting larger hake (Japp, 1995) as well as small, yet significant, amounts of bycatch of non-target species (Japp, 2010).

Figure 3 shows the catch composition of both the west and south coast combined. Hake comprised more than 90% of the catch (Figure 3), and kingklip (Genypterus *capensis*) was the principal by-catch species (3.43% of the total catch). All other by-catch species combined approximated 5.65% of the total catch. A total of 2.86% of the total catch from this period was discarded. Table 1 below gives the breakdown of the discarded species.

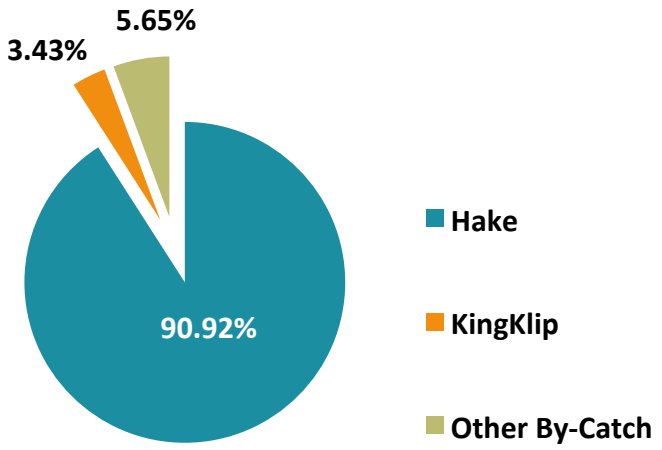


Figure 3: Total observed catch composition (208 686 kg) of the hake longline operations for both the west and south coast during the FCP (Ngcongo, 2015).

Table 1: SAHLLA discarded by-catch species from the FCP observer programme (Ngcongo, 2015).

Common Name	Species Name	Weight (kg)	Proportion of total catch
Conger Eel	*Conger spp*	1 871	0.87%
Jacopever	*Helicolenus dactylopterus*	1 502	0.70%
Dogfish	*Squalidae spp*	1 033	0.48%
Cape Cod	*Lepidion capensis*	790	0.37%
Panga	*Pterogymnus laniarius*	370	0.17%
Rays and Skates	*Rajidae*	328	0.15%
Blue Shark	*Prionace glauca*	62	0.03%
Thresher shark	*Alopias spp*	60	0.03%
Sharks (unidentified)	*Selachimorpha (Pleurotremata)*	59	0.03%
Swordfish	*Xiphias gladius*	20	0.01%
Izak Catshark	*Holohalaelurus regani*	18	0.01%
Ribbonfish	*Lepidopus caudatus*	8	0.00%
Cape Dory	*Zeus capensis*	7	0.00%
Oilfish	*Ruvettus pretiosus*	6	0.00%
Rattails and Grenadiers	*Macrouridae spp*	5	0.00%
Wreckfish	*Polyprion americanus*	3	0.00%
Alfonsinos nei	*Beryx spp*	1	0.00%
	TOTAL	**6 143**	2.86%
Total Chondrichtyans	*Squalidae spp*; *Rajidae*; *Prionace glauca; Alopias spp; Selachimorpha (Pleurotremata); Holohalaelurus regani*	**1 560**	0.73%

C. ETP species interactions.

Interactions with seabirds and marine mammals were monitored in connection with the SAHLLA-CapMarine observer programme (Fig. 4; Ngcongo, 2015). The catch rate for seabird mortality identified through the observer programme was 0.0017 per 1000 hooks. This result was due to two seabirds (white chinned petrel *Procellaria aequinoctiallis*) caught out of 1 185 980 hooks deployed.

The National Plan of Action (NPOA) for seabirds (DEAT, 2008) provides an interim target of seabird mortality of less than 0.05 per 1000 hooks. Based on the data collected on the SAHLLA FCP programme, the fishery appears to be well below the target.

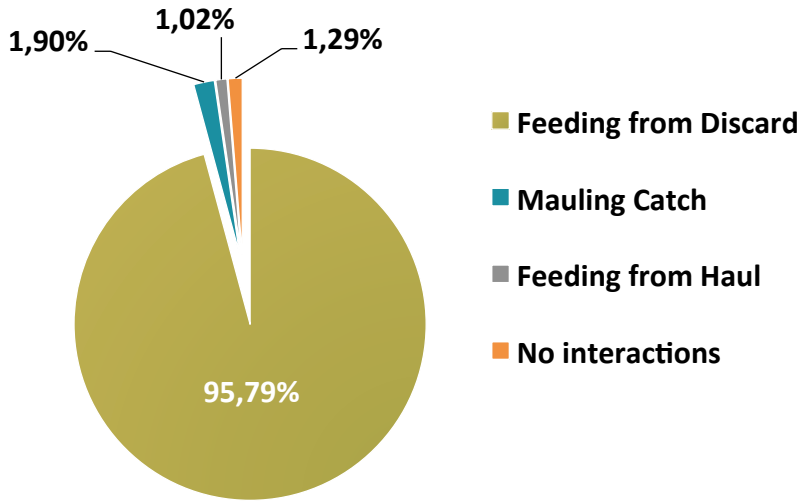


Figure 4: Observed seabird and marine mammal interactions with the longline fishing vessels (132 sets monitored) (Ngcongo 2015).

BirdLife International Sector Work on Seabird Interactions for the Hake Longline Sector
content provided by Bokamoso Lebepe of BirdLife International

It is a permit condition in this fishery to use Bird-scaring or "tori" lines to mitigate seabird interactions. In addition to the CapMarine monitoring of interactions with seabirds by SAHLLA vessels, BirdLife has also undertaken at-sea observation on the vessels.

At-sea observations

BirdLife has collected data on 3 demersal Hake Longline fishing vessels during 5 fishing trips in 2015. The following data were collected during the BirdLife observations: seabird bycatch information (species, number and status), gear (e.g. number of hooks, length of branchlines etc.), operational information (time of set, position etc.) and mitigation measures (bird-scaring line specification, offal discard etc.). BirdLife also tested different configurations of bird-scaring lines to determine a design that provides sufficient protection for seabirds and is also easy for fishers to use.

The catch rate for seabird mortality identified through the at-sea observations undertaken by BirdLife was 0.0 per 1000 hooks as there were no seabirds caught during the period of observations. This result was due to the Bird-scaring lines being used on all observed sets during which baited hooks were deployed.

Bird-scaring lines

Bird-scaring lines are the most commonly prescribed mitigation measures for longline fisheries and are regarded as one of the most effective known mitigation measures. Bird-scaring lines consist of lengths of rope with brightly colored streamers towed behind longline vessels during line setting to deter seabirds from attacking baited hooks. Bird-scaring lines are cheap, simple to use and do not require modification of the fishing gear. When deployed properly under suitable conditions, bird-scaring lines can be very effective at reducing seabird mortality.

During the course of the FCP, it was observed that some hake longline vessels had difficulty complying with the existing bird-scaring line requirements in the permit conditions because the specifications of the tori lines were based on the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) recommendations. The CCAMLR recommendations were designed for steel-hull demersal longline vessels, which are bigger than the average size of the domestic hake longline vessels, and which are mostly made out of wooden hulls. It was also noted that the bird-scaring lines on some of the fishing vessels did not meet the required minimum specifications to sufficiently protect seabirds during the setting period. During the FCP, it was recommended that SAHLLA consult with Birdlife to conduct a study and make suitable recommendations on seabird bycatch mitigation measures.

BirdLife engaged with the fishing sector to determine if the tori line could be shortened to make deployments easier. A bird-scaring line of 100m length was tested with and without a cone towed. The configuration with the towed cone gave the best aerial extension but was harder to retrieve for as there was a lot of tension on the bird-scaring line because of the towed cone. The configuration without the towed cone did not give sufficient aerial extension to protect seabirds during the setting period. More tests need to be conducted on the different configuration to find the optimal configuration.

Any changes to the bird-scaring line specifications in the permits must comply with the Agreement for the Conservation of Albatrosses and Petrels (ACAP), to which South Africa is a party. BirdLife is assisting the sector in engaging on this process. In the meantime, BirdLife has encouraged the sector to comply with existing tori line requirements and is investigating a spooling system, which has successfully assisted fishers in Brazil, to easily deploy tori lines. More tests need to be conducted to find the optimal configuration and to obtain data on sink-rates in order to find the optimum length for bird-scaring lines. Once this work is completed, BirdLife intends to make a recommendation to change the current ACAP and local permit regulations regarding bird-scaring line specification.

Offal discarding

On two of the three Demersal Hake longline vessels observed by BirdLife, offal was discarded on the same side as hauling. The discarding of offal on the same side as hauling increases the chances of birds interacting with hooks that are being hauled. When offal was discarded on the opposite side as hauling, the seabirds were congregated opposite to the side where the hooks were being hauled and thereby decreased the chances of the birds interacting with the hooks.

It is recommend that wherever possible, offal be discarded opposite to the side that the hooks are being hauled. This will reduce the number of birds being hooked during hauling and increase the efficiency of the fishing operations as more time will be spent on fishing operations rather than unhooking seabirds from hooks.

D. Hake depredation, gear losses and fouling of benthic organisms.

Observers conducted hook observations as the hooks were hauled on board for 15.7% of lines – a total of 96 276 observed hooks. These observations were used to better understand hake "lost" on the lines, gear losses and the fouling of benthic organisms on hooks. The amount of hake lost on lines or "depredated" by other animals is necessary to obtain an accurate measure of total hake mortality related to the fishing activity. More detail on the methodology is available in Appendix 3.

There were six different possibilities in terms of how hooks were observed:

- Hooks with fish
- Hooks with benthos
- Hooks with bait
- Hooks with nothing (i.e. clean)
- Hooks that had fish that was observed to be lost from the hook at time of hauling
- No hook

The largest category observed, at 41.38%, were "clean" hooks– i.e. nothing on the hook upon hauling (Fig. 5). Hooks observed with fish, benthos or bait, totaled 47.32%, with those with benthos amounting to just 0.17%. The observers recorded all the mauled fish (0.004% of hake caught) and examined the bites to determine the predator. Hooks that were directly observed to lose fish at the time of hauling amounted to 0.89%, and fishing lines with no hooks amounted to 10.94%. From time to time seals were reported feeding on the hake with no direct observation of fish being snatched from the lines by these predators.

This information can be interpreted in the following way: It is unlikely that depredation events occurred on approximately 47.1% of hooks – those observed with fish (excluding the mauled fish), with benthos, or with bait; it is unknown whether depredation occurred on 52.1% (clean hooks or no hooks), and depredation events did occur on 0.8% of hooks.

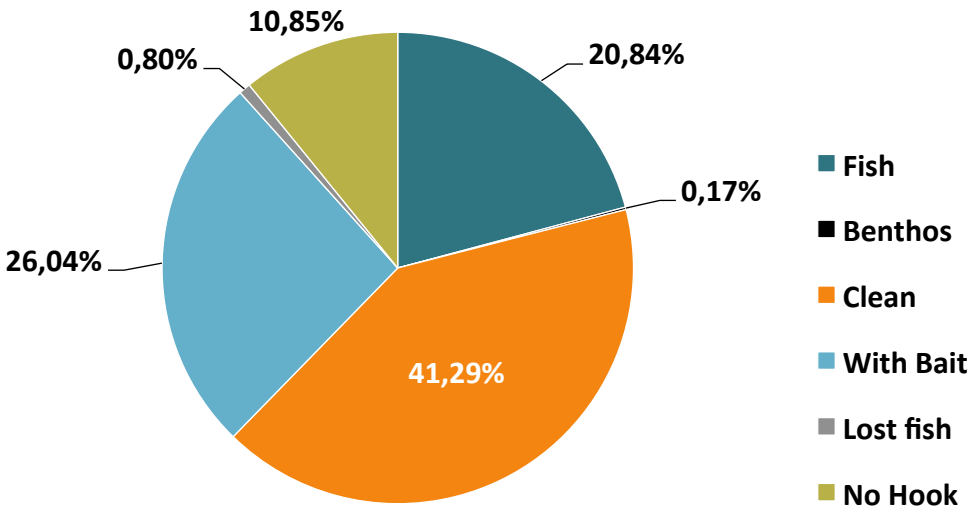


Figure 5: Proportion of observed hook "fates" for 15.7% of the hauled sets (96 276 hooks) (Ngcongo 2015).

With regards to gear losses, there was concern that skippers are not recording gear losses appropriately in the logbooks. It was discussed that the logbooks presently asked to record how many hooks are lost, which invites errors due to subjectivity in reporting the hooks lost in fish heads. The logbook could be modified to ask rather how much of the line was lost during fishing. It was further noted that fishers perceive loss of gear due to conflicts with the trawl sector, and if there were an opportunity to identify the cause of the loss with corroborating information such as a photograph, date, vessel position, reporting may increase. There was also a suggestion put forward by BirdLife to improve the recording of seabirds caught on hooks (see Table 2 below).

Table 2. Table recommended by BirdLife International to replace the current "Observed Daily Seabird Mortality" table found within the Hake Longline logbooks.

Time	Common / Species name	Dead / Alive	Number

3. Ecological modelling and the fishery footprint (P2 Workplan Actions 5 & 7).

A review of existing ecological models and data on the ecosystem impacts of the hake longline fishery was undertaken. The MSC certification report for the hake trawl fishery provided insight on existing information. Specifically, section 6.5 of the 2015 Certification Report identifies ecosystem interactions (Intertek 2015). The report references the ecosystem modelling reported in three papers: Gasche et al. (2012); Shannon et al. (2000); and Travers-Trolet et al. (2014). Intertek concluded that the outcome demonstrates that "there is a good understanding of the main components and elements of the Benguela current ecosystem, as well as an understanding of how these different components and elements may interact with one another."

The modelling suggests that if heavy fishing of hake were to occur for five years, hake biomass would be reduced and hake prey species would increase in abundance. These prey species may compete with mesopelagic species like horse mackerel for food and therefore horse mackerel biomass may decline. While these reports do not specifically analyse impacts of the hake longline sector alone, they do analyse impacts of the hake fishery as a whole. If this analysis was sufficient for the hake trawl sector to merit MSC certification, it follows that it is likely to be sufficient for the hake longline sector to obtain MSC certification.

Although the modelling was focused predominantly on ecological impacts due to hake fishing, the FCP undertook at-sea observations to quantify bycatch and discards. As reported above, the fishery has relatively few interactions with ETP species, low discards and a low bycatch proportion. Thus, the work undertaken suggests that the ecosystem impacts of the hake longline fishery will remain within reasonable limits so long as hake are not overfished.

WWF-SA commissioned a study to determine the hake longline footprint relative to the substrate type, which was undertaken by CapMarine in 2015 (see Massie, Wilkinson & Japp 2015, attached hereto as Appendix 4). The study examined fishing activities spatially for the years 2002 to 2012. It was reported that the hake longline footprint extends down from approximately 150km offshore of Port Nolloth on the west coast to just south of Port Elizabeth on the South Coast (see Figure 6 below).

This buffered footprint interacts with 30 of the 136 benthic habitats defined by the South Africa National Biodiversity Institute. However, there is substantial overlap (30% interception or greater) with only 7 different habitats (see Table 3 below). The vulnerability of these benthic habitats in regards to the impacts of the South African demersal long-line fishing technique is currently unknown and would require further research and/or a review of international literature.

It has been noted, however, that historical work found that longlines do not generally damage substrate, although there can be localised seabed damage (Sink et al., 2012). In the reported literature, sections of cold-water coral and sometimes rock are occasionally hauled up, but the extent of this is considered to be low (Japp, 2010). This historical conclusion was also supported by the SAHLLA-CapMarine observer programme, which found that only 0.17% of observed hooks had benthos (Ngcongo 2015).

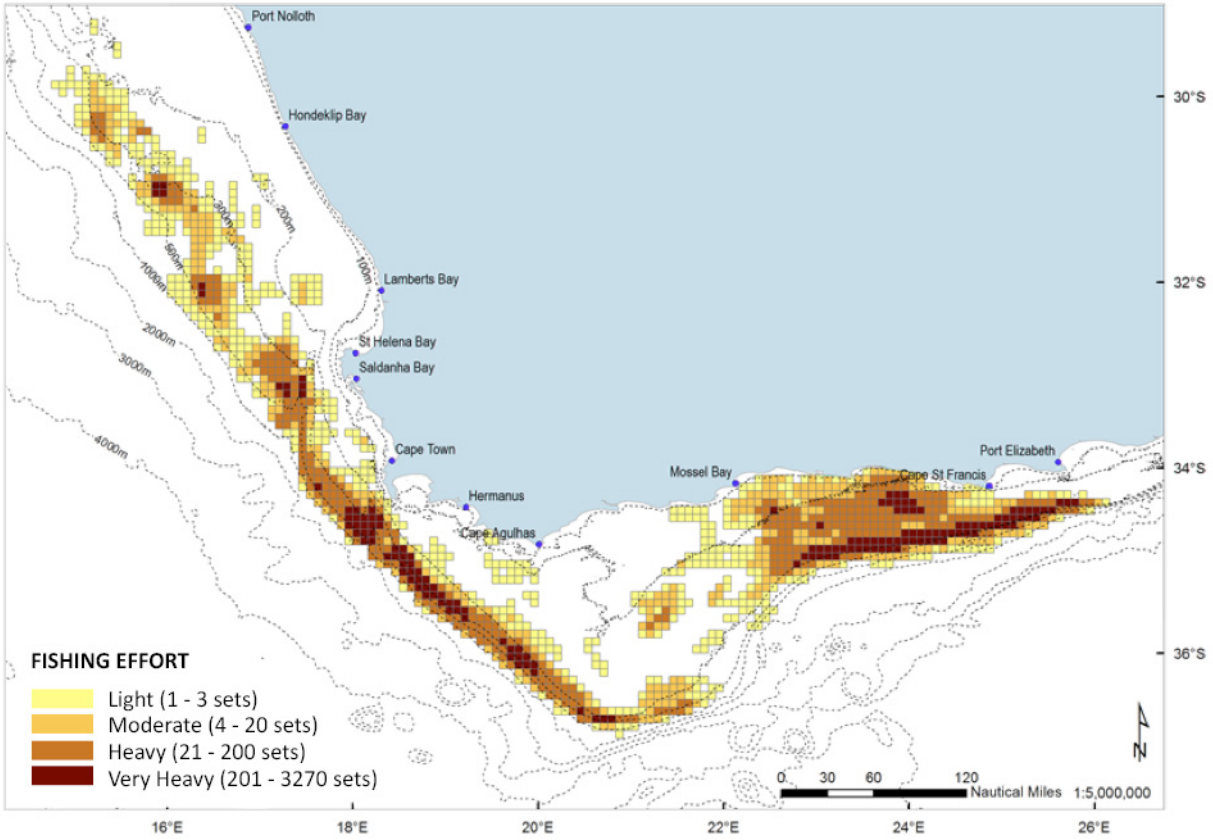


Figure 6: National overview of the spatial footprint and fishing effort of the demersal longline sector for the period 2002 to 2012 displayed at a 5'x5' grid resolution
(Massie, Wilkinson & Japp 2015).

Table 3: Habitat types in order of decreasing proportion of overlap with the 15" buffered South African Hake Longline footprint. Habitat extent and proportion of total habitat type extent within the footprint is also shown.

HABITAT NAME	TOTAL AREA (km^2)	INTERCEPT AREA (km^2)	INTERCEPT PROPORTION (%)
Southern Benguela Canyon	785.93	611.94	77.86
Southern Benguela Hard Shelf Edge	4 531.98	2 695.44	59.48
Southern Benguela Outer Shelf Reef	1.57	0.78	50.00
Southern Benguela Gravel Outer Shelf	433.37	214.77	49.56
Agulhas Mixed Sediment Outer Shelf	1 308.18	627.20	47.94
Agulhas Mixed Sediment Inner Shelf	627.47	240.63	38.35
Agulhas Hard Outer Shelf	11 537.37	3 917.40	33.95
Agulhas Sandy Shelf Edge	4 067.46	1 352.18	33.24
Agulhas gravel Outer Shelf	1 481.10	472.89	31.93

(Massie, Wilkinson & Japp 2015).

4. Fishery training in the ecosystem and the ecosystem approach to fisheries (P2 Workplan Action 8).

Fishers from each vessel participating in the FCP underwent responsible fisheries training (see picture below). Representatives from 30 SAHLLA member vessels attended Responsible Fisheries Alliance (RFA) training. The RFA training consists of four modules taught over two days. The objective is to capacitate fishers with the understanding and skills to implement an ecosystem approach to fisheries (EAF).

The modules include an overview of South Africa's marine life, the legal frameworks, marine ecosystem, impacts of fishing, fisheries management and the market-based sustainability initiatives.

More information on the programme is available at the Responsible Fisheries Alliance website (**www.rfalliance.org.za**).

SAHLLA MEMBERS

Figure 7. SAHLLA members, crew, and trainers pause for a break during Responsible Fisheries Training workshop in 2015.

Principle 3: Management-related actions

The three workplan actions under Principle 3 were as follows:

1. Revision of DAFF Fishery Management Plan (integrated into overall hake plan);
2. Development of a Code of Conduct for the hake longline fishery;
3. Assessment of historical compliance and current status of the fishery.

Effective fisheries management depends upon both effective short-term management and long-term planning. The FAO Code of Conduct instructs: "Long-term management objectives should be translated into management actions, formulated as a fishery management plan or other management framework." The applicable MSC standard further advised that management must include institutional and operational frameworks capable of implementing Principles 1 and 2 and which are appropriate to the size and scale of the fishery (MSC 2010).

The three workplan actions identified in the FCP sought to establish long-term fishery management objectives through a fishery management plan and a code of conduct. The historical compliance and current status of the fishery were to provide data points to better inform what the key management challenges are. SAHLLA and WWF-SA representatives contacted DAFF Monitoring Control and Surveillance (MCS) staff on numerous occasions by telephone, email and in person. While information was received from MCS, it was not clear whether the information was complete – i.e. all infractions related to the hake longline fishery over a given time period. Thus, while some general observations can be made, they are of limited value until it can be confirmed that the information is complete.

With those caveats in mind, observations are that the following have been compliance concerns in the sector:

- Concerns over all sector participants landing fish at designated landing points and with the required notification;
- Staying within the kingklip bycatch limit provided in permit conditions; and
- Turning on the vessel monitoring system (VMS).

The development of a fishery code of conduct was designed in part to address these issues. SAHLLA developed a code of conduct using the template provided by the RFA (see Appendix 5). The aim was to ensure compliance with relevant laws and regulations pertaining to the fishery, encourage collaboration between fishing crew and management, encourage responsible fishing practices, and further support an ecosystem based approach to fisheries management (RFA 2014).

The SAHLLA code of conduct further provides helpful tips to reduce bycatch and ecosystem impacts caused by the fishery (Fig. 7). The skippers of SAHLLA member vessels are required to read and sign the Code of Conduct prior to operating hake longline vessels. SAHLLA also maintains a database of vessels that have committed to sustainable fishing practices and this is made available to interested parties seeking to secure sustainable seafood products.

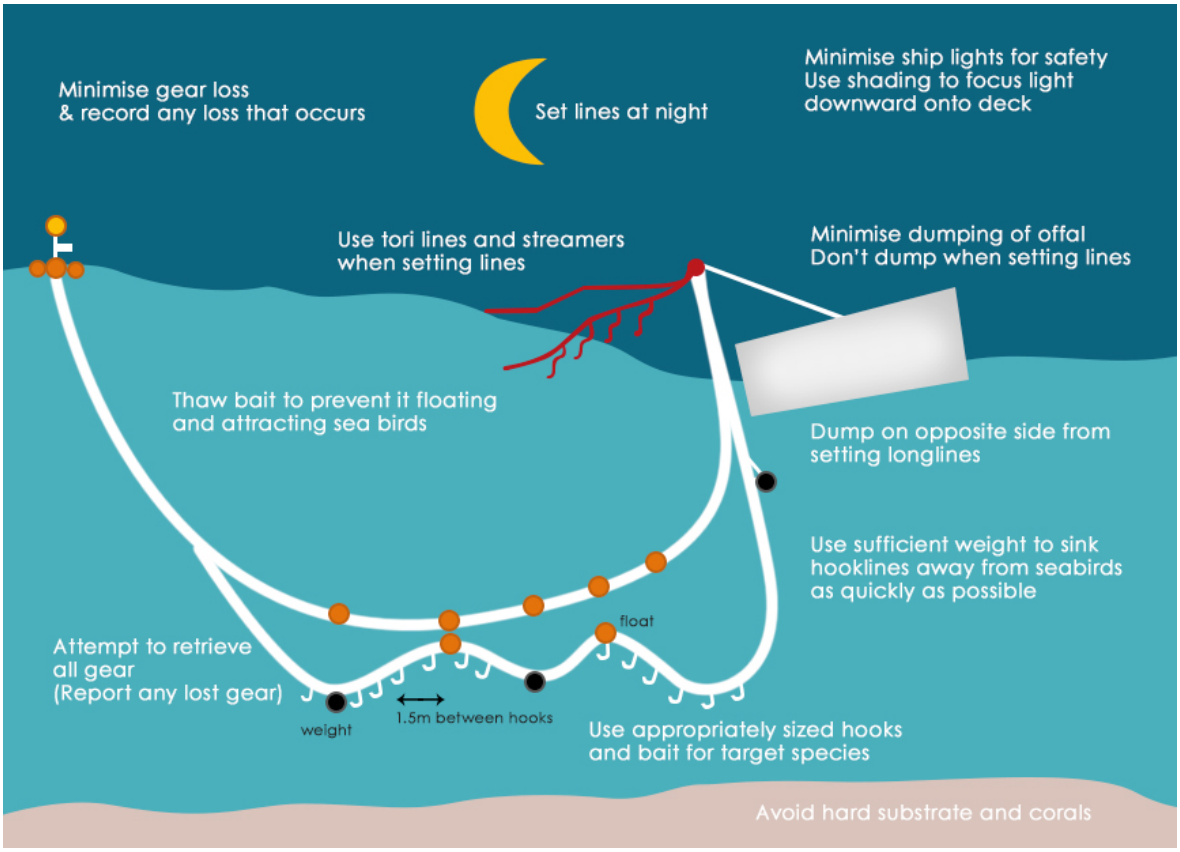
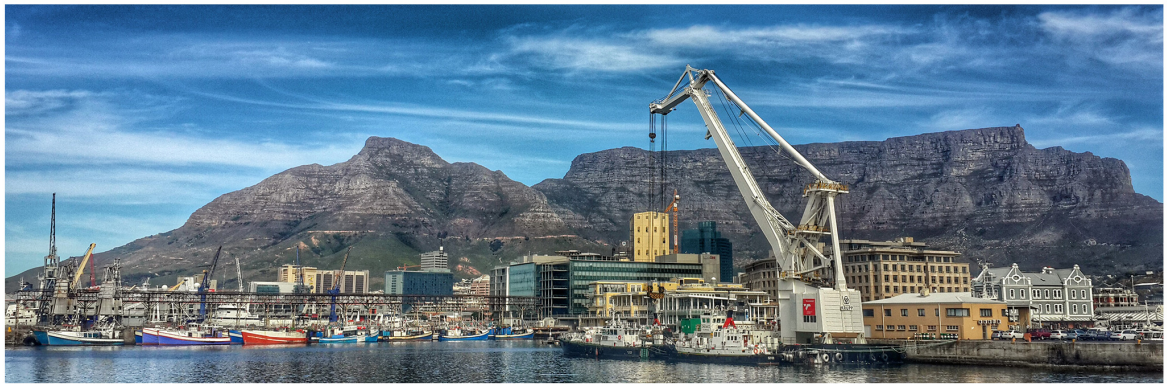


Figure 8. Diagram contained in the SAHLLA code of conduct that identifies several mitigation measures that fishers can take to minimise harmful ecosystem impacts.

DAFF does not presently have a fishery management plan for hake. While there is an Operational Management Procedure (OMP) that governs the scientific process to set the Total Allowable Catch for hake to achieve sustainability, this is not a comprehensive fishery management plan that addresses EAF-related issues.

The FCP stakeholders did review a draft hake management plan prepared previously by the DAFF Demersal Scientific Working Group (DSWG), but this draft plan spanned all hake fishing sectors and would require substantial resources to complete -- with expertise required beyond the scope of the FCP participants.

For these reasons, the FCP participants decided in lieu of developing a hake fishery management plan, it would be a contribution if the FCP stakeholders developed a list of "five-year" fishery management objectives for the hake longline sector. This practice of identifying management objectives that are not formally collated into an FMP is generally recognised (Die in Cochrane & Garcia, 2009). These objectives are identified below in Section 3 of this report.



3. Key recommendations and suggested follow-up work

Principle 1: Target species recommendations

The two target hake species are well-managed in South Africa, with the hake landed from the trawl sector being MSC certified. There are a few remaining issues, however, that are recommended for improvement. Specifically, it is recommended that:

- Annual updates to the hake longline CPUE and catch-at-length be undertaken and documented in scientific papers that are reviewed by the DSWG, and that these data be routinely incorporated into the hake stock assessments;
- Reference points relevant to the hake longline CPUE be developed to which a harvest control rule can be applied.

Principle 2: Ecosystem impacts recommendations

The FCP added much insight into the ecological impacts of hake longline fishing in South Africa. The SAHLLA-CapMarine at-sea observation programme gathered data that supports a view that the hake longline sector does not significantly negatively impact the surrounding ecosystem. However, as noted above, the fishing on the south coast of South Africa (east of 20®E) was unusually reduced during the fishing year observed. Thus, it is important that future at-sea observations occur on fishing activities along the South Coast as well as the West Coast. The following recommendations are further provided to DAFF scientists and fishery managers:

- An important component to understanding the ecological impacts of the sector is obtaining more insight on historical fishing practices as observed by the DAFF OROP programme. The DAFF DSWG has yet to present a detailed analysis of the OROP data as it relates to the Hake Longline sector. It is recommended that such a presentation be made within the calendar year 2016, and that the presentation include discussion on the proportion of retained bycatch species landed, ETP interactions, proportions of discards, composition of discards and coverage of observers. This will facilitate comparisons between historical data and the data collected in connection with this FCP and future at-sea observation programmes.
- A government-funded and managed at-sea observation programme resume as soon as possible. Failing this, SAHLLA commits to resuming at-sea observation coverage of a representative proportion (not less than 10%) of the sector's fishing effort for the fishing year 2017. This will allow data from such a programme to be incorporated in the WWF-SASSI re-assessments for the sector anticipated to occur in the year 2018.
- Completion of the tori-line re-design that BirdLife began in 2014. As noted above, the existing permits are based on a tori line design for steel-hulled vessels, rather than the wooden-hulled vessels used in the domestic fleet. Revision of the permit conditions in line with a re-design for local vessels is required. In addition, effort is needed for the sector to demonstrate its compliance to the re-design.
- There are a handful of SAHLLA members whose crews have not yet participated in responsible fisheries training. SAHLLA has committed to having undertaking this training within the calendar year 2016.
- There are a handful of management recommendations that would improve the sustainability profile of the sector that are awaiting final decision from DAFF Marine Resource Management,

including the following: (i) effort management scheme for the sector, (ii) traceability measures, which include improvements to landing declarations, and (iii) improved monitoring of vessel landings at quay-side.

Principle 3: Development of five-year fishery management objectives

In lieu of a hake fishery management plan, the FCP recommends that the following five-year hake longline sector management objectives be adopted and pursued:

- Prevent overfishing of the target stock
    - Maintain the OMP framework for the setting of the TACs for the hake resource. Specifically, fishing effort and sector catches of hake are consistent with the scientific advice on levels necessary to maintain or rebuild stocks to a biomass capable of delivering the MSY.
    - Incorporate HLL-specific data (catch-at-length and CPUE) into hake stock assessments.
    - Develop sector reference points relevant to the HLL sector.
- Undertake at-sea observations of fishing activity, including impacts to non-target species;
- Manage incidental catch and reduce bycatch and waste;
- Minimise impacts to seabirds – revise tori-line design appropriate for sector vessels and discard offal opposite the vessel side of hauling;
- Improve data quality, monitoring and enforcement.

4. Conclusion

The FCP embarked in 2013 with an ambitious task of meeting the 23 criteria under the existing MSC standard for fisheries certification by the end of a two-year period. The FCP stakeholders diligently undertook work on a number of different projects over this period to satisfy these criteria. The results have been positive.

At the start of the FCP in 2013, the sector's WWF-SA SASSI assessments were "think twice" due to (i) negative interactions with endangered seabird species, (ii) unknown bycatches of fish and shark species, and (iii) limited management interventions addressed to these and other ecosystem impacts. By 2015, analyses of the FCP observer data indicated that the fishery did not significantly impact endangered, threatened, protected and vulnerable (ETP) bird species; the fishery generally has a relatively small proportion of non-target (bycatch) species catches, and discards are generally low.

Further, Birdlife SA continues to work closely with SAHLLA to modify the design of the bird scaring lines (tori lines) to reduce even further the interactions with sensitive seabird species. The WWF-SASSI thereby felt it appropriate to conduct a reassessment in 2015 of the fishery's three principal seafood products – the two hake species and kingklip. The WWF-SASSI re-assessments gave a measure of the success of the FCP and the results were favourable. All three assessments indicated substantial improvements in the key areas of concern, which resulted in all three species moving from the WWF-SASSI Orange list to the WWF-SASSI Green list. As a bycatch species, kingklip was not the main focus of the FCP but it reflects the positive impact that an FCP can have on non-target species also caught within the sector. Overall the FCP was a success and it further highlighted the commitment of industry towards sustainable fishing practices.

A key component of the project's success was the dedication of representatives from SAHLLA, WWF-SA and CapMarine that worked within their respective organisations and at DAFF to drive the completion of the FCP workplan actions. These parties met on a quarterly basis during the FCP and after its formal conclusion. The use of Quarterly Reports that tracked actions against the Workplan were found to be invaluable tool to keep the parties focused and remain accountable.

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