Compendium for the report on: *“Innovation and Accountability in Commercial Fisheries”*

The case for reform of harvest and management practices for Australia’s SESSF and related fisheries

Note, this compendium should be accompanied by Wayne’s final report, which is available on the Nuffield International website, under reports.

A report for

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Shark Fishery

Overview

Shark fishing in southern Australia was first recorded in 1927 with fishers targeting mainly School shark using longlines. By the early 1970s the industry had mostly transitioned to monofilament gillnets which proved more successful in targeting Gummy shark (Knuckey, et al., 2014).

Wilson, *et al.* (2009) reported that the long history of fishing School sharks left the population severely depleted[1] and therefore it is now considered conservation dependant under the Environment Protection Biodiversity Conservation Act 1999, and based on this information the species is now under a stock rebuilding strategy. As such, an incidental TAC of 215 tonnes is set that covers only unavoidable bycatch during targeted fishing operations for other species. As of May 1st 2015 it is a condition on all SESSF fishing concessions that all School shark caught alive are to be released (AFMA, 2017a).

Automatic Longlines

Automatic Longline (ALL) is an automated version of longline fishing whereby hooks are "shot" and baited by a mechanised device called an auto-baiter that also cuts the bait to a specified size. Upon retrieval, captured fish are de-hooked by passing through a "de-hooker" while a mechanical device cleans excess bait from the hooks and places the hooks on rails or "magazines" ready to be re-shot again. The primary advantages of ALL are that much higher numbers of hooks can be set per fishing day and it is less labour intensive than MLL.

While ALL is now an approved option within the shark fishery, the capital cost associated with equipping a vessel make it cost prohibitive for many small business operators. Additionally, the ALL systems that are currently being manufactured are designed to target fish that aggregate in greater numbers than Gummy shark are known to. As such the hook spacing and

[1] Severely depleted being below the reference limit of 20% of unfished biomass.

snood length of existing ALL systems result in too many hooks being baited over too short of a distance and bait inputs can become cost prohibitive.

There has been industry concern in Australia that increased mortality amongst juvenile and larger breeding stock from ALL may result in TAC reductions which could affect the gillnet sector. Given the TAC setting is considerably dependent upon the size selectivity of gillnets, such concerns are not unfounded.

Mitigating Marine Mammal Interactions in international gillnet fisheries

Procedural mitigation measures

AFMA (2014a), in their Dolphin Strategy to Minimise Gillnet Bycatch, recommends best practice mitigation measures for reducing dolphin bycatch with gillnets (Table 1). Similar measures were reported by other fishers encountered through the course of this study with little variation.

Recommendation	**Benefits**
Use of large anchors	• Increases horizontal tension • Reduces gear movement • Increases sink rate of net • Reduces likelihood of net folding over
Increase head rope flotation	• Increases vertical tension • Reduces likelihood of net folding over
Set with tide	• Increases horizontal tension • Reduces likelihood of gear twisting • Maintain selectivity characteristics of net mesh
Minimum 300g/m footrope weighting	• Increases vertical and horizontal tension • Increases sink rate
Use of additional weights	• Increases vertical and horizontal tension • Increases sink rate
Maintain gear condition	• Maintain selectivity characteristics of net mesh
Shoot gear in multiple fleets	• Increase sink rate

	• Reduce likelihood of gear twisting

Table 1: AFMA Dolphin Strategy measures for mitigating bycatch with gillnets (AFMA, 2014a)

Seabird Mitigation

Seabird foraging zones and commercial longline fisheries naturally overlap resulting in seabirds associating fishing vessels as a food source. During the setting of longlines, large numbers of seabirds often congregate at the rear of the vessel in order to dive on the baited hooks with the intent of removing the bait. The removal of the bait renders the hook useless for fishing; comes at an economic cost to the vessel; and birds can become hooked and dragged below the surface causing mortalities. In different locations around the world longline fisheries have decimated some rare seabird populations, however much work is being done globally on mitigating these interactions (Birdlife International, 2014).

Setting times and offal management

Available information suggests that seabirds are most active during the day and identify food sources at close range by sight (BirdLife International, 2014). Given this, setting longlines at night effectively conceals hooks from visual sight and has proven effective in mitigating seabird interactions, especially on overcast or dark nights.

Pierre, *et al.* (2014) assessed the effectiveness of seabird mitigation devices in the SEESF trawl sector and noted through on board observation that out of 115 fishing activities, there were 203 albatross interactions recorded, ranging between light contact with fishing equipment, and no subsequent harm, to drownings caused by seabirds becoming entangled in warp wires. Of these 203 interactions, only 2 occurred at night, supporting the theory that seabird activity is reduced in the hours of darkness.

As part of any fishing vessel's standard operations, offal or waste that is produced and discarded over the side can be subsequently foraged upon by seabirds. By retaining offal onboard and only discarding it in batches at night or when setting or retrieval of hooks is not being undertaken, has shown to minimise seabird activity around fishing vessels and reduces subsequent interactions.

SeaBird Saver™ and Marine Avian Dissuader

The SeaBird Saver™ is a device that emits a visual and acoustic stimulus that deters seabirds from engaging with baited lines. The system consists of a mounted unit on the rear of the vessel that directs a laser beam along the angle at which baited longline enter the water. Seabirds feel threatened by the physical presence of the laser beam and their natural response is to avoid contact and move away.

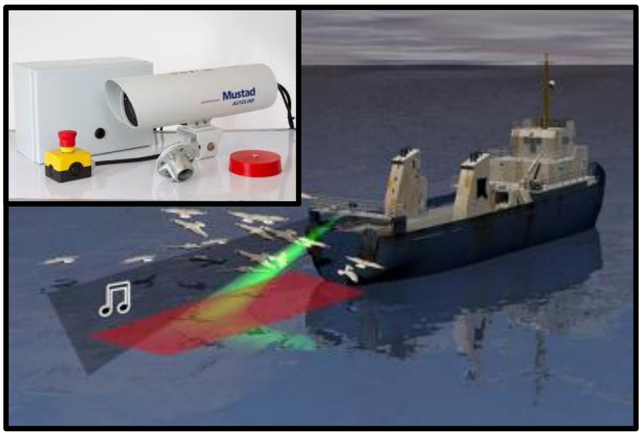

Figure 1: Image of a SeaBird Saver showing the laser and range of acoustic deterrent. (Mustad, 2017)

In addition to the visual laser, the SeaBird Saver™ can be equipped with a targeted acoustic deterrent. The acoustic sounds emitted have been developed with marine biologists and can simply be played through the device from an iPod.

In September 2014 trials were conducted in Australia aboard the fishing vessel *Diana* using a Mustad autoline system and the SeaBird Saver™. Offal was discharged from the vessel in order to encourage seabirds to forage. During a night-time trial it was noted that once the laser was activated all birds feeding on the offal stream or sitting on the water would take flight, cease to feed, and at no point did a single bird cross the laser beam. However, during daylight trials the laser appeared to have no effect on the foraging habits of the birds (AFMA, 2014b).

Fiskevegn, a Norwegian based fisheries technology company, has also launched an integrated laser/acoustic bird-deterring device called the Marine Avian Dissuader (MAD). Fiskevegn's current inhouse trials suggest that the acoustic component is as, or more, effective than the laser, especially when used during daylight hours (Fiskevegn, 2017).

Further trials conducted in Norway have also shown that if a water spray or mist is created in the area where the laser is activated during daylight hours, then the laser reflects off the water particles and proves more effective in deterring birds from the area.

Tori Lines

Tori Lines form a physical and visual barrier that deters seabirds from accessing the hook setting zone and subsequently becoming caught by the baited hooks. They consist of a line with a series of streamers and a buoy attached to the end to create a drag effect that keeps the Tori Line taut. They are towed from a high point at the rear of the vessel where baited hooks are deployed from and have proved effective in mitigating seabird interactions by creating a no-fly zone behind a vessel deploying longlines.

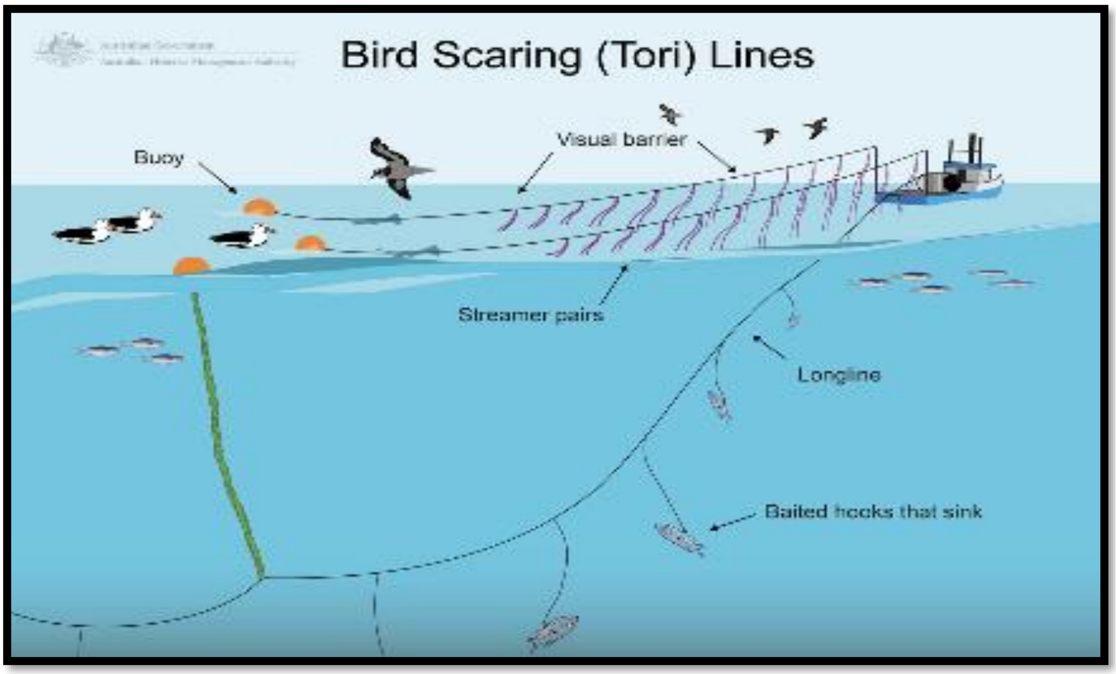

Figure 2: Tori Lines (AFMA, 2017c)

Alternative Fishing Methods

Longline system requirements to target Gummy Shark

When considering the use of longlines to target Gummy Shark there are a number of factors that should be taken into consideration from an operational point of view. While some longline fisheries rely heavily on being able to set and retrieve as many hooks per fishing day as possible the widely dispersed nature of Gummy Shark may not make this an effective fishing strategy.

The nature of the fishing grounds that Gummy Shark are caught over mean that many kilometres of area may need to be covered before a productive location is found on any given fishing trip. This means that while looking for an area with a high abundance of fish an operator may wish to space their hooks a long distance apart to cover as larger area as possible. Once an area with a reasonable abundance of fish has been located then in order to fish more effectively they would reduce their hook spacing and concentrate their fishing effort over the more productive location. Therefore having the ability to vary hook/snood spacing along the mainline would be of great benefit.

While Gummy Shark can be caught at any time of the day or night they are known to be more active feeders at particular times. Tide changes, sunrise, sunset, moonrise and moonset seem to be when the most shark are caught on hooks. Based on this information the ability to quickly deploy and retrieve a smaller quantity of hooks multiple times per day over a productive area may result in a higher CPUE than setting a larger number of hooks for a longer period over a greater distance.

Gummy Shark do not “bite” the bait like many other species of fish do but instead will most often pick a bait up in their mouth and swim away with it while they slowly swallow or break it apart in their jaw. For this reason short snoods fixed tightly to a mainline are unlikely to be as affective as a longer snood that provides less resistance and allows freer movement for the shark to pick up the bait. Therefore in any longline system designed to target Gummy Shark longer snoods and the ability for the snood to freely run for a distance along the mainline, rather than being fixed in place, would prove more effective.

Two different baits are known to be more selective in catching Gummy Shark than using the standard longline baits of squid, mackerel or Australian salmon, they are Conga or Silver Eel (T. VanBoon, pers. comm. 2014 and P. Ingram, pers. comm. 2016) and small crustaceans such as sand or hermit crabs. While eel would likely work in an auto-baiting machine crustaceans would pose a problem.

Unlike many finfish species caught on longlines, Gummy Shark do not suffer barotrauma and generally offer strong fighting resistance against a mainline and snood when fishing gear is being retrieved. By contrast species such as Pink Ling (which do suffer barotrauma) are relatively inert by the time they get to the boat. It is at the time the fish is closest to the boat that the snood has the greatest chance of breaking off and given Gummy Shark often thrash around violently at this time weak snoods would result in significant fish losses.

Longline fishing internationally

Chile

Chile has a significant longline fishing industry that operates on an industrial and artisanal scale. The demersal species targeted include Patagonian toothfish, Ling, Corvina, Hake, Barracouta, Blue Eye trevalla, varied reef fish and shark.

Chile's artisanal fishing fleet consists of an estimated 75,000 fishers with vessels ranging in size from 5 to 18 meters, uses quite basic technology, MLL systems and is relatively unregulated (C.A. Moreno, pers. comm. May 9th 2014). By contrast, the country's industrial fleet is using some of the world's leading technology, are renowned for innovative practices and is well regulated.

One example of technological innovation in Chile's longline fisheries is in their Patagonian toothfish fishery that until 2006 was experiencing unacceptable levels of seabird mortality, particularly of the Black Browed Albatross found on the Antarctic Peninsula. Using traditional ALL systems was resulting in high seabird interactions and there was significant work being done by researchers and industry to address this issue.

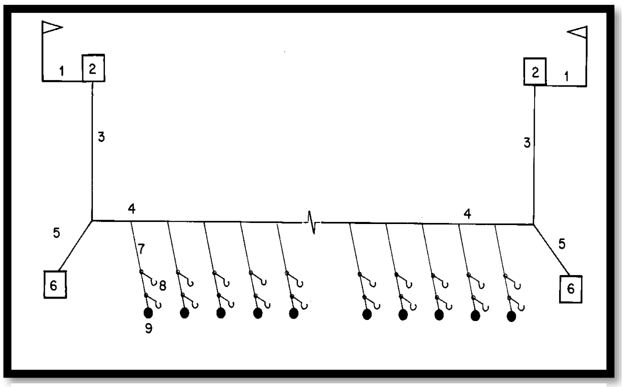

Figure 3: Artisanal Chilean Longline (Moreno, 2014)

Professor Carlos A. Moreno from the University of Valdivia observed a MLL technique that was being used by artisanal fisherman to stop seabirds taking the bait from their hooks. Instead of clipping individual snoods with one hook onto a mainline, the fishers were using a snood with multiple hooks that was weighted at the bottom (Figure 3). The result was that the sink rate of the baited hooks increased by over 100% thus removing the opportunity for seabirds to attack the baited hooks.

In response to witnessing this technique it was organised to have scientific observers placed on board the artisanal fishing vessels to monitor seabird interactions. Over the course of twenty seven million hook sets, only one seabird mortality was recorded (pers. comm. C.A. Moreno, May 9th 2014).

Although this system in itself would not solve all the issues faced by Chile's industrial fleet work was soon done to adapt this MLL system for larger scale use. The result is what has become known as Chilean Longlines or *Cachalotera's*.

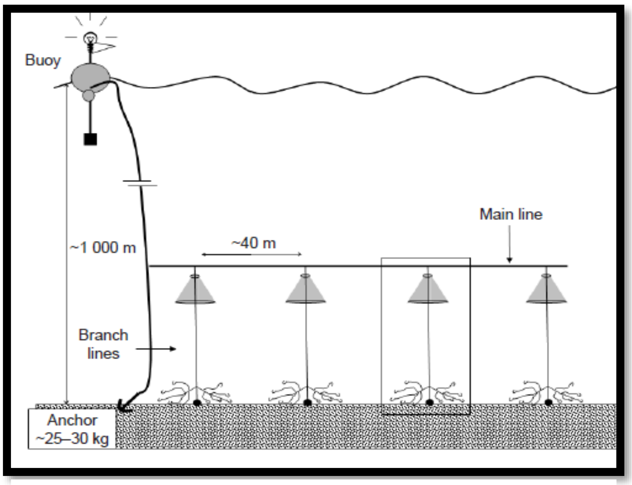

Figure 4: Design of a Chilean longline (Arangio, 2012)

The Chilean Longline is now used by industrial vessels targeting Toothfish (Figures 4 and 5). In this system, baited hooks are grouped together on one large snood or "dropper" that is weighted in order to increase the sink rate of the hooks. The buoyant net seen above the baited hooks (Figure 4) are a further innovation designed to mitigate against significant whale depredation[2] which was a serious issue in this fishery at the time.

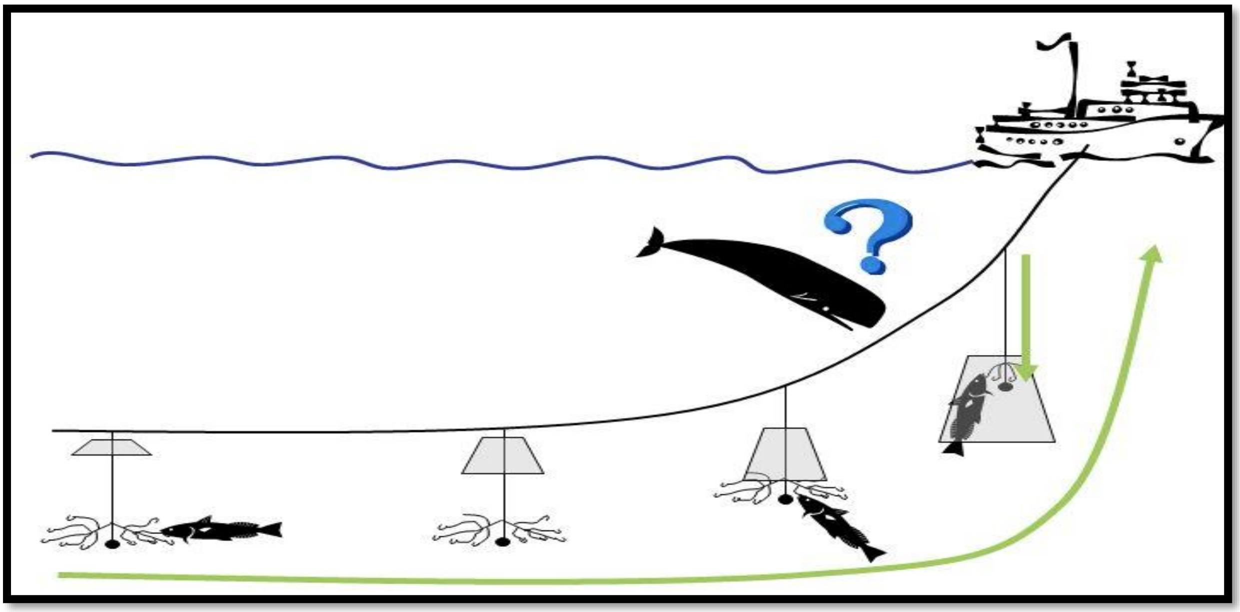

Figure 5: Chilean Longline showing mainline, snoods with multiple hooks and encapsulating netting (Arangio, 2012).

When set, the buoyancy of the nets keeps them above the baited hooks allowing the fish to freely forage and become hooked underneath. Once the hauling of the longline commences the force of the line being dragged through the water column pulls the

[2] In commercial fisheries depredation refers to the removal from or damage to fish caught in fishing equipment by other marine species such as sharks, marine mammals or sea lice.

net sleeve down over the hooks and captured Toothfish (Figure 5), thus making it significantly harder for whales to predate upon the captured fish (Arangio, 2012).

By integrating these two techniques, Sperm whale depredation was all but eradicated in Chile's industrial Toothfish fisheries, Killer whale depredation was significantly reduced, and seabird interactions were reduced to zero. Robertson, *et al*. (2013) linked an increased abundance amongst the Black Browed Albatross population with a decreased mortality from interactions with longline vessels.

In addition to decreased whale depredation and achieving zero seabird mortality there is evidence to suggest that the increased localised density of bait, resulting from having multiple hooks on a single snood, provides a greater attractant to fish which has resulted in an increased CPUE when compared with conventional longlines (C.A. Moreno, pers. comm., May 9th 2014).

Another thing reported by artisanal fisherman in Punta Arenas, Chile, was that the use of a swivel at both the hook and clip end of longline snoods greatly increased retained catch (I. Marcelo, pers. comm., May 1st 2014).

Existing Automatic Longline Systems

Deep Sea and Coastal systems

Mustad Autoline introduced mechanisation of longline fishing to the commercial market in 1979. ALL systems were designed to increase the efficiency of fishing operations and have proved successful in many fisheries worldwide. The most common type of ALL system used in fisheries today are usually called deep sea or coastal longline systems, some of which are capable of setting and retrieving up to 65,000 hooks per day.

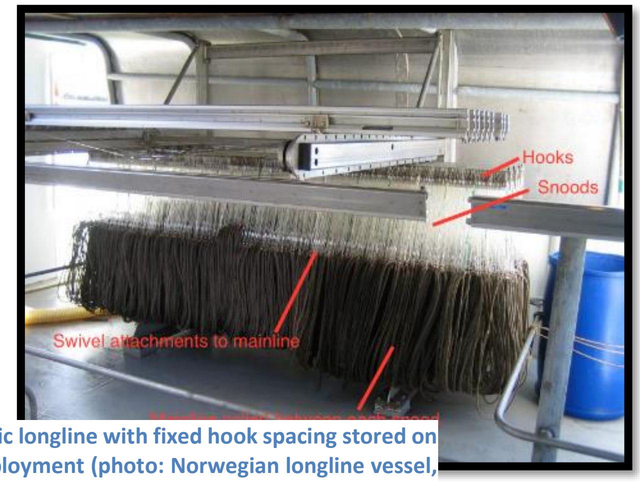

Figure 6: Automatic longline with fixed hook spacing stored on magazines for deployment (photo: Norwegian longline vessel, 31/10/2014)

These types of ALL systems are custom built for vessels by a number of manufacturers worldwide. The snoods are attached to the mainline at pre-set intervals that usually range from 1.2 – 1.5 meters apart. Figure 11 shows part of an ALL system and displays how fishing gear is stored on magazines prior to being deployed.

While such systems could be designed and constructed to have hook spacings at longer intervals than what is presently being manufactured this would result in either the mainline between the snoods hanging too low and becoming an entanglement issue on the deck of a vessel or that the magazines would have to be stored so high above deck level as to become impractical. Even if a system was constructed like this with longer hook/snood spacings, the fixed nature of them would decrease the ability for the fisher to set a higher number of hooks over a small region known to be productive thereby decreasing the efficiency of their fishing.

Artificial Baits

In New Zealand's ALL fisheries approximately 1,000 kg of bait is required to produce 1,000 kg of consumable fish fillets (S. Boag. pers. comm. 05 March 2015). Given this high bait to product ratio and considering that studies have shown up to 80% of longline hooks are rejected by fish (T. Inge Kvernevik, pers. comm. 28th Oct. 2014) there are many companies around the world attempting to develop hybrid or synthetic baits for commercial fisheries to the negate the need to harvest forage fish to catch consumable fish. Fiskevegn is currently engaged in a long term collaborative R&D effort with a consortium of four Norwegian companies to develop a form of synthetic bait so that food sources can be better utilised in the future. The Research Council of Norway is supporting these collaborative efforts.

Trials have been previously conducted using reconstituted offal from longline vessels that process fish onboard however it was discovered that some compounds in reconstituted baits act as a deterrent (T. Inge Kvernevik, pers. comm. 28th Oct 2014).

Figure 7: Synthetic baits (Kvernevik, 2014)

Attempts to develop a viable synthetic alternative have identified four primary factors that must me met; smell; sight; taste; and touch. Given zooplankton emit light to attract predators to the smaller fish that pose a threat to them the importance of bioluminescence in any artificial bait for deep-sea fishing is only just beginning to be realised. Incorporating this into a synthetic bait that achieves 100% efficiency in a baiting machine, is a slow release scent attractant, is free of toxins, biodegradable, can be commercially produced in a cost effective manner and is non-hazardous for fish to ingest and digest has so far posed significant challenges to manufacturers, however technology is improving is this field at a rapid rate.

Size selectivity in longline systems

Existing correlation between six-inch gillnet and longline trials in Gummy shark fishery

Concerns have been raised by some gillnet fishers within Australia that a move to hook based fishing methods would result in higher mortalities of juveniles and higher catches of larger breeding female sharks than what is experienced in the gillnet fishery.

During the ALL trials conducted by Knuckey *et al*. (2014) it was shown that although there is a slight variance in the size selectivity between six-inch gillnet and the ALL systems trialled, the overall difference was minimal. Figure 8 shows the catch compositions of various gillnet mesh sizes (the curves within the graph) compared to the fish caught during the ALL trials (the coloured bars) indicating that longlines and 6 inch gillnet effectively catch a similar size range of fish.

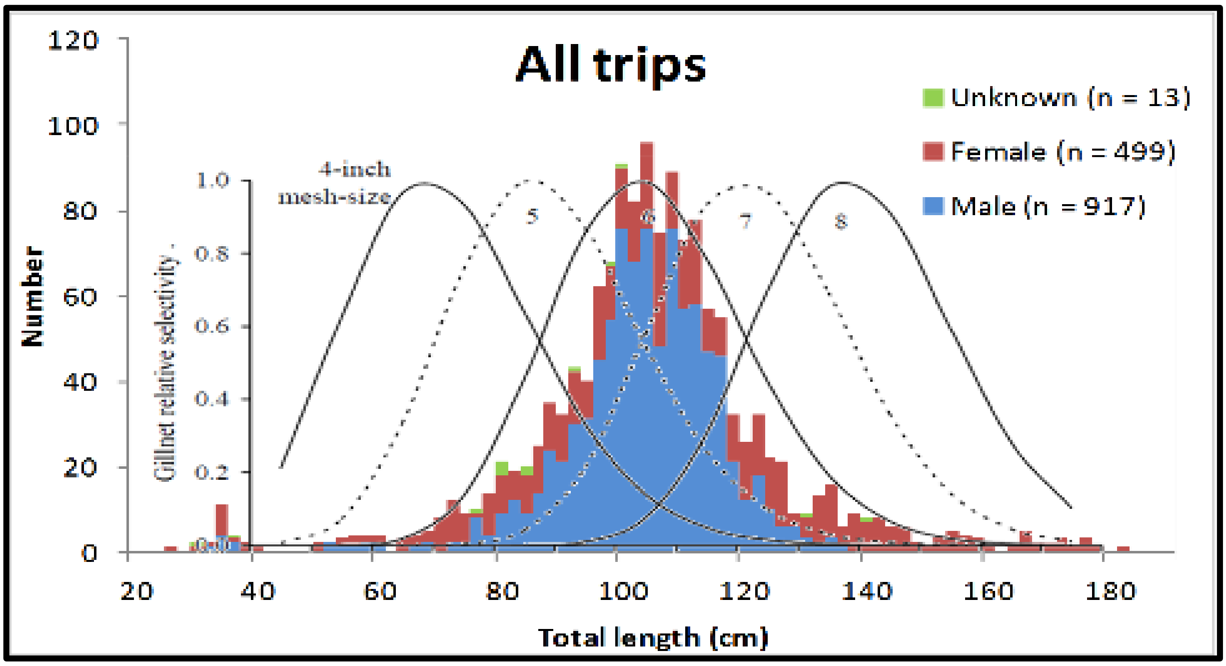

Figure 8: Catch size composition between 6 inch gillnet and longline (Source: Knuckey, et al, 2014)

Size of hooks in fishing selectivity

Some published data exists on the correlation between longline hook sizes and fish size selectivity. Erzini, *et al*. (1996) reports that catch size distributions are highly overlapping, that during their study few or no undersize fish were caught but that CPUE generally decreased with an increased hook size. This position is supported by Moreno in his observations of the Chilean Patagonian toothfish fishery. Ekanayake (1999) by contrast reports that varying hook sizes did not affect fish caught per 100 hooks but that the average size of fish retained was greater with larger hooks. However, all authors note that the shape of the hook and regional locality also have a role in size composition of catch.

Throughout the course of this study, longline fishers in all countries visited reported using a particular hook size and shape relative to the species and size of fish targeted. All fishers interviewed were of the opinion that larger hook sizes did retain a larger average sized fish, reduced incidental catch and decreased the mortality of juveniles.

Fisheries management

What is Fisheries Management?

Fisheries management uses information provided by fisheries science, industry and public stakeholders to best manage fishery resources so sustainable exploitation is possible. Fisheries management must address environmental, economic and social considerations when making decisions on how best to utilize what are public resources. It is a complex and interlinked process that uses many different mechanisms and tools to meet its objectives.

Early management models tended to focus on input controls that stipulated how much fishing effort was permitted in a fishery. This was done through vessel licensing, limitations on the type or quantity of fishing equipment used, the number of days a vessel could work or seasonal closures. As fisheries science evolved, management slowly moved towards individual stock management models whereby the biomass of fish stocks were scientifically assessed and output controls (TACs), or quotas, were put in place to ensure the resource was not harvested beyond its Maximum Sustainable Yield (MSY). Other management tools commonly used to ensure stability of fish stocks are MPAs and spatial closures that are put in place for conservation purposes in areas of particular ecological importance or to protect spawning aggregations of fish.

From a scientific point of view quotas have mostly been effective in managing fish stocks given that when they are set correctly only a naturally renewable portion of the total biomass can be harvested. Studies have shown the effectiveness of quota management in ensuring stability of and/or increasing the biomass of fish stocks (Costello, C., *et al*, 2008). Criticisms that quota management fails to fully address ecosystem impacts of fishing and that it can lead to socio-economic inequalities, given that large percentages of quota rights can wind up in the hands of very few people, do at times have merit (Soliman, 2014).

Increasingly, management authorities are beginning to implement a more ecosystem-based approach to managing fish stocks. The basic tenants of an ecosystem approach are:

- That management should be holistic, risk averse and adaptive
- Maintaining a broad “old growth” structure within fish stocks to ensure mature breeding females are not overexploited
- Identify the natural spatial structure of fish stocks so that management boundaries can reflect this
- Monitor and maintain seafloor habitats
- Maintain resilient ecosystems
- Identify and maintain critical food web connections
- Adapt to ecosystem changes through time
- Account for evolutionary changes caused by fishing
- Include all actions of humans and their social and economic systems in equations

(National Marine Fisheries Service, 2009).

It is also important to recognise that although fisheries science, management and compliance are interconnected they are quite different and serve distinctive purposes. Fisheries science provides scientific information upon which managers and other stakeholders (including industry and public stakeholders) use to make regulatory decisions about how best to manage fish stocks and associated marine ecosystems. The role of compliance is to ensure that all stakeholders adhere to those regulations. A flow chart depicting this interconnected relationship can be seen in Figure 9.

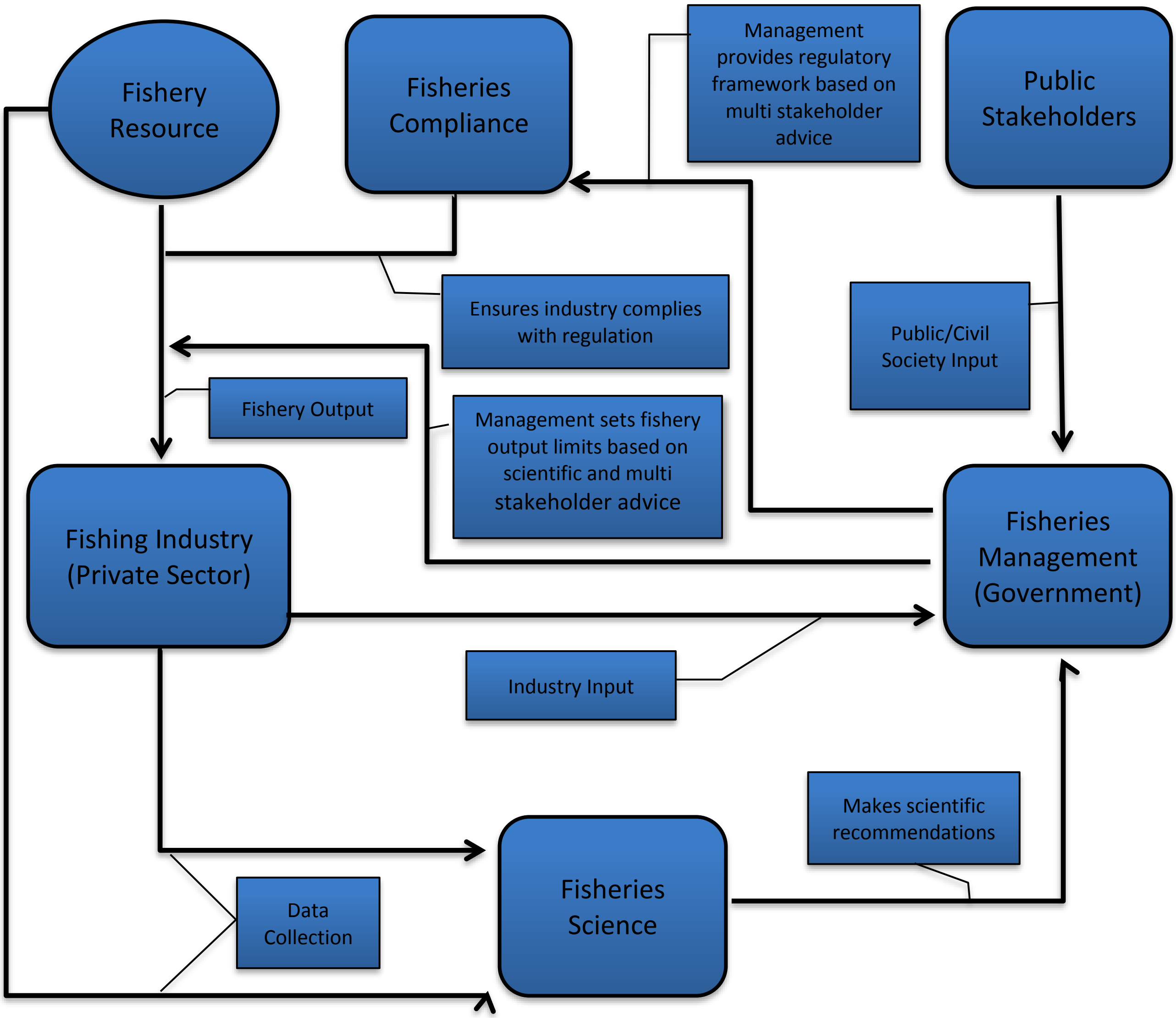

Figure 9: Flow chart depicting the interconnected relationship of fisheries science, management and private and public stakeholders

Due to this interlinked relationship it is imperative that accurate data on the state of fisheries be collected so informed decisions can be made. Unfortunately not all fishers have historically provided accurate information on catch sizes, composition or MMIs. This has led to fisheries scientists and management authorities being forced to make precautionary recommendations and decisions that have negatively affected industry. The situation is further complicated in

Australia by the crossover jurisdictional boundaries and species management between the Commonwealth and State governments as previously mentioned in the introduction to this report given that data collection is not uniform or always accurate.

Discussion and Conclusions

Fishing Practices and Technologies

Evidence suggests that seabird interactions can be mitigated through a combination of offal management, tori lines and laser and acoustic technology as used in the SeabirdSaver™ and MAD to allow for multiple hook sets per day when longline fishing.

The use of Chilean longlines or longlines with weighted snoods containing multiple hooks in the GHaT to target Gummy shark has not been seriously looked at. Given depredation is not an issue in the GHaT there would be no requirement for this system to include the enclosing net that eliminates whale depredation should trials be conducted.

Based on the requirements for an effective ALL system to target Gummy shark in southern Australia it seems nothing is presently being manufactured internationally to fit the specific needs of the fishery. While SelectFish™ has some potential to be adapted for Australia's shark fishery it would have some way to go, particularly with snood breaking strains, durability of clips and use of larger hooks.

References

AFMA (2014a). *Dolphin Strategy, Minimising Gillnet Bycatch*.

AFMA (2014b). Observer Cruise Report for the Vessel, DIANA . GHaT, Trip Number OB14/187

AFMA (2017a). Southern and Eastern Scalefish and Shark Fishery, Management Arrangements Booklet 2017, Australian Fisheries Management Authority. Canberra, Australia.

AFMA (2017b). Accessed 10th May 2017 from http://www.afma.gov.au/tori-lines/

Arangio, R. (2012). Minimising whale depredation on longline fishing, Nuffield Australia Project 1201.

Boag, S. (March 2015). Personal communication, CEO, South East Trawl Fishing Industry Association, Lakes Entrance, Australia

Costello, C., Gaines, S.D., Lynham, J. (2008). Can Catch Shares Prevent Fisheries Collapse. *Science 321, 1678 (2008)*. DOI: 10.1126.science. 1159478

Ekanayake, E.M.A.B. (1999). *The Effect of Hook Size and Bait Type on the Fishing Selectivity of Longline Gear*. United Nation University – Fisheries Training Program.

Erzini, K., Goncalves, J.M.S., Bentes, L., Lino, P.G., and Cruz, J. (1996). Species and size selectivity in a Portuguese multispecies artisanal longline fishery. *ICES Journal of Marine Science, 53*: 811-819

Erzini, K., Goncalves, J.M.S., Bentes, L., Lino, P.G., and Ribeiro, J. (1999). Catch Composition, Catch Rates and Size Selectivity of three longline methods in the Algarve (Southern Portugal). *Bol. Inst. Esp. Oceanogr*. 15 (1-4). 1999: 313-323

Fiskevegn (2017). accessed 10th November 2016 from http://www.fiskevegn.no/fishery/longlining/marine-avian-dissuader-mad/marine-avian-dissuader-mad-laseracoustic-seabird-deterrent-a139656l1655

Heiss, K. (6th June 2014). Personal Communication, Vancouver Aquarium, Vancouver, Canada

Ingram, P. (March 2015). Personal Communication, OM, Commercial Catamarans, Darwin, Australia

Knuckey, I., Ciconte, A., Koopman, M., and Rogers, P. (2014). Trials of Longlines to target Gummy Shark in SESSF Waters off South Australia. FRDC Project 2011/068. Fishwell Consulting: 105.

Kvernevik, T. (2014, 2015, 2016). Personal Communication, MD, Fiskevegn, Norway

Moreno, C. (1991). Hook Selectivity in the Longline Fishery of *Dissostichus eleginoides* (Nototheniidae) off the Chilean Coast. WG-FSA-91/11

Moreno, C. (9th May 2014). Personal Communication, University Valdivia, Valdivia, Chile

National Marine Fisheries Science (2009). Report to Congress: The State of Science to Support an Ecosystem Approach to Regional Fishery Management. US Dep. Commerce, NOAA Tech. NMFS-F/SPO-96: 24.

Pierre, J., Gerner, M., Penrose, L., (2014). JPEC Ltd, AFMA; ABARES, *Assessing the Effectiveness of Seabird Mitigation Devices in the trawl sectors of the South Eastern Scalefish and Shark Fishery in Australia.*

Robertson, G., Moreno, C., Arata, J.A., Candy, S.G., Lawton, K., Valencia, J., Wienecke, B., Kirkwood, R., Taylor, P., and Suazo, C.G. (2014). Black-browed albatross numbers in Chile increase in reponse to reduced mortality in fisheries. *Biological Conservation 169 (2014)*: 319-333.

Soliman, Adam (2014). Using individual transferable quotas (ITQs) to achieve social policy objectives: A proposed intervention, *Marine Policy*, 45C: 76–81.

VanBoon, T. (2014). Personal Communication, Bass Strait shark and trawl fisher, San Remo, Australia

Wilson, D., Curtotti, R., Beggs, G., and Phillips, K., (eds). (2009). *Fishery Status Reports 2008*, Department of Agriculture, Fisheries and Forestry, Bureau of Rural Sciences and Australian Bureau of Agricultural and Resource Economics, Canberra.