

# DISCARDS AND FISHING DEBRIS OF THE TUNA FISHERIES IN THE SOUTH WEST PACIFIC AND INDIAN OCEANS

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## ABSTRACT

A main focus in fisheries research is to reduce the quantity of by-catch discarded. If these live fish are handled with extreme care, they can survive when returned to the marine environment. Most by-catch species are discarded live but a high number of dead discards are returned to the ocean to pollute the marine environment. The rate and amount of discards varies among species, operations, and gears. For instance, there are hardly any discards in the purse seine fishery. One significant reason for discarding catch is that they are juveniles or at a stage of their life cycle when their retention is illegal. Marine plastic debris is a worldwide problem. Plastics do not break down easily and therefore, they create problems when not managed properly. Due to the concern generated by the environmental effects of sea dumping, the British Government sponsored a United Nations Convention on the Prevention of Marine Pollution by dumping of Waste and Other Matter. It is now three decades since the London Convention and the effectiveness of the policy regarding the dumping of waste, fishing debris, at sea is still doubtful. With particular reference to the high seas, fishing debris is still being dumped and continues to pollute marine life. The prohibition of dumping wastes at sea has to be properly enforced by all nations, since the marine environment is of utmost importance as a supporter of human life.

**KEYWORDS:** Tuna, discards, by-catch, debris, pollution

## INTRODUCTION

The marine environment is a critical, important aspect of fisheries management which has not been adequately considered in the past. In the past fishery management assumed fish populations are within a stable environment, but this view changed gradually in the 1970s. It has been recognised that fluctuations in the environment affect fishing success, fish populations and their ecosystems (FAO, 1994). Therefore, Tuna fishing cannot take place without it having an impact on the environment, hence the conservation of the marine environment should be an integral part of any tuna fisheries management program. This study reviews the environmental impact of the tuna fishery with regards to its effects on discards and fishing debris. The impact of the tuna longline fisheries on incidental catch (which is sometimes referred to as discards) is examined in detail because of the high mortality rates of these species on the longlines. The effect of tuna fishing debris in relation to fisheries management is discussed.

## Discards

Some by-catch are valuable or edible and are kept, while others are discarded. Saila (1983) defined "discards" or discard fish as the part of catch (excluding offal of retained catch, which might also be thrown aboard) not used, but thrown back into the waters as whole fish or whole organisms (invertebrates, amphibians, reptiles or mammals). Mammals and birds caught in monofilament

gillnets are referred to as "incidental catch" and are thrown back into the sea (Stephens, 1991) as discards. A main focus in fisheries research is to reduce the quantity of by-catch discarded. This is to be achieved by finding ways to reduce the amount of by-catch caught or by making better use of by-catch (Newton, 1995). "High grading" is the discard of commercial, saleable fish in favour of better quality or more valuable fish of the same species (Truelove, 1997), for example, the discard of Albacore on vessels targeting either Southern Bluefin or Yellowfin Tuna when the freezer hold is full, to make room for more valuable Southern Bluefin or Yellowfin Tuna.

Half to three-quarters of fish brought aboard longliners are live fish (Anon. 1994). If these live fish are handled with extreme care, they can survive when returned to the marine environment. Most by-catch species are discarded live but a high number of dead discards are returned to the ocean to pollute the marine environment. Small or less valuable commercial species may also be discarded, for example, small Southern Bluefin Tuna may be discarded due to size regulation and individual vessel catch limits (Anon. 1994). Saila (1983) observed that discarding rates varies among species, operations, gears and in response to market conditions, expected prices and from year to year. One significant reason for discarding catch is that they are juveniles or at a stage of their life cycle when their retention is illegal. Alverson et al. (1994) observed that the bulk of the world's discarded fish are juveniles of commercial importance which, if left to mature, would produce much more than the current production levels. Kennelly (1995) considers that some fish species already have high natural mortality and that whether the fish were caught and discarded, or not caught, had very little impact on the levels of the stock. However discard mortality can prevent species from maintaining sufficient biomass and reproductive capacity, particularly when large quantities of juveniles are killed. This may affect the accuracy and efficacy of stock assessments and the management decisions taken based on those assessments. Discarding target species for which there is a ready market is wasteful of resources, both money and protein (Truelove, 1997).

There are hardly any discards in the purse seine fishery, though a small amount of the catch is entangled in the net folds and damaged when the net passes through the hauling gear. However, there have been occasions when school sets are too large and the net splits, leading to large number of fish killed and lost. It has also been noted that when quotas are exceeded, as in the case of the Southern Bluefin Tuna, the excess may be discarded. When by-catch limits (50% per set or 2% per month) of Yellow fin or Big eye Tuna are

exceeded, it has been assumed that the excess is discarded (Anon. 1994). There are no discards in the pole-and-line fishery since the by-catch species are marketable commercial species (Anon. 1994).

On the foreign (Japanese) tuna long line vessels during the 1990-91 season, it was observed (Observer Reports, 1992) that fish species which were not retained were landed, relieved of the hook and dumped into the sea, usually dead or badly damaged but most do not survive. When the shark supplement law was implemented, and this required that the body of sharks be retained after the fins have been removed. This led to very few Blue Whaler Sharks being landed; they were 'jerked' off hooks prior to landing to avoid problems and minimize data recording. Trash fish such as Lancet fish and Rays Bream were discarded prior to landing, but no records were kept. It was observed that 1,816 Blue Whaler Sharks were recorded caught, and over 30% were cut free or released alive (Observer Reports, 1993). During the 1992-93 season more than 6,600 Blue Whaler Sharks were discarded without processing. Crews often tried to 'jerk' the hook out of the Blue Whaler Sharks prior to landing if possible (Observer Reports, 1994).

### Fishing Debris

Until a few years ago it was a legitimate practice to dump wastes, from old cars to radioactive wastes, at sea (Brown et al. 1994). Increasing marine debris has been of interest to scientists for decades and increasing research has been carried out since the 1970s. Well managed fisheries are also expected to follow the principles of ecologically sustainable development by minimizing the impact of fishing on the marine environment (Jones, 1994a).

Marine plastic debris is a worldwide problem. Plastics are in use because they are durable, inexpensive and lightweight. They do not break down easily and therefore, they create problems when not managed properly. Plastics accumulate in the marine environment much faster than they break down, because it takes three-five years or more before they disintegrate. Tides, winds, storms and currents carry plastic litter all over the world before depositing it on sea beds and ocean coastlines. Marine wildlife are sensitive to plastic debris. The ability of animals ingesting or entangled in marine debris to catch food, travel or avoid predators could be drastically reduced. Feeding could also be reduced by the digestive tract being blocked or damaged (Jones, 1995). It has been recognised as the cause of death of a significant number of marine mammals (Fowler, 1987; Laist, 1994; Jones, 1994a; Pemberton, 1995).

Jones (1994a; 1995) and Zann (1995) reported that the main sources of fishing debris are fishing gears such as gillnets, demersal trawl nets, monofilament lines, ropes and plastic packaging bands (from tuna longline vessels and pole-and-line tuna vessels). In 1975, the International Maritime Organisation observed that approximately 150,000 tonnes of fishing gear were dumped in the oceans globally (Zann, 1995). For example, on Sable Island, a remote Canadian island east of Nova Scotia, an estimated eight tonnes of debris are washed up each year with 92% of this being plastic litter (Environment Canada, 1995). In a study on Laysan Albatross chicks, 90% of the chicks had plastic litter in their guts (Robards et al., 1994), with an

average weight of 35.7 grams. Most of these chicks tend to die before attaining maturity. The cause of death might be the plastic litter in their diet. From the Green peace Australia reports, Zann (1995) reported that out of 141 dead seabirds, about 12 died from gear entanglements. Two turtles out of the 11 reported dead were entangled. One dolphin out of four dead dolphins was entangled in a gill net. A Pygmy Sperm Whale examined was found to have died from ingesting a plastic bag that blocked its oesophagus. A juvenile False Killer Whale was found on Botany Bay in 1986 entangled in packaging tape (Zann, 1995).

The concern regarding the amount of marine debris in the ocean led to the development of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) (Arnould and Croxall, 1995). Annex 5 (Regulations for the Prevention of Pollution by Garbage from Ships) of MARPOL was specifically set up to prevent the problems that arise from dumping waste at sea. However, the main source of pollution at sea is fishing vessels with their nets, long lines and plastics of fishing vessels. Many fishers were not aware of MARPOL in the 1990's. Much of the research undertaken (Day and Shaw, 1987; Laist, 1987; Pruter, 1987; Fowler, 1988) indicates that MARPOL was not enforced or made known to fishers, or there was some loss in communication.

In the year 1972, due to the concern generated by the environmental effects of sea dumping, the British Government sponsored a United Nations Convention on the Prevention of Marine Pollution by dumping of Waste and Other Matter. This led to the 1975 London Dumping Convention, providing a regulatory regime for the control of sea dumping. The London Dumping Convention (known as the 'London Convention') specifies three annexes of substances:

**Annex I-** substances that are prohibited from dumping at sea.

**Annex II-** substances that can only be dumped subject to special conditions.

**Annex III-** substances that can only be dumped subject to routine assessment and permission.

It is now three decades since the London Convention and the effectiveness of the policy regarding the dumping of waste, fishing debris, at sea is still doubtful. With particular reference to the high seas, fishing debris is still being dumped and pollutes marine life. The question of the effectiveness of MARPOL with regards to dumping waste at sea needs to be examined.

During the 1990-91 tuna season, observers (Observer Reports, 1992) noted that most foreign fishing vessels made no attempt to retain rubbish aboard and those that did, did so only as long as an observer was on board. It was observed that all waste (including discarded fishing materials) were collected and dumped overboard. An observer attempted to cut a tangled line in small pieces prior to crew discarding. The observer asked a Japanese Captain if he had heard of, or recognised the word 'MARPOL' and he said, "Ha, yes this is a very good American cigarette!" This particular observer noticed that all waste, plastic strapping, plastic covering

from bait boxes and an estimated 36 kilometres of nylon monofilament were disposed overboard on the last days of fishing. Considering that about 20 vessels were finishing their fishing campaigns, therefore about 720 kilometres of monofilament line was dumped. The observer estimated that a total of about 2,580 kilometres is dumped within a season. This estimate could be low as it does not include other materials such as plastic wrappings and straps on bait boxes discarded at sea. During that same season, only one observed vessel stowed its rubbish to dispose of at port (Observer Reports, 1992).

The adherence to MARPOL by foreign fishing vessels is minimal, with vessels claiming ignorance of the policy even with an observer on board. Most vessels had to be legally induced to comply (Observer Reports, 1992). Yet during the 1991-92 tuna season, most observed vessels attempted to comply with MARPOL when observers were on board (Observer Reports, 1993). However, during the 1992-93 tuna season, all but three of the observed vessels had incinerators onboard, though some vessels did not make use of the incinerators. Some vessels fully complied with MARPOL, disposing of only food and processing rubbish overboard, retaining all other waste (including line), either for storage and disposal ashore, or for burning in the onboard incinerator. Most vessels discarded their waste including fishing lines and plastics overboard, some even with an observer onboard (Observer Reports, 1994). Observers recorded three sharks with fishing gear collars, two with bait box straps and one with a section of netting were captured in 1993-94 (Observer Reports, 1994).

During the 1993-94 season, only one vessel of the 69 Observer cruises carried out was unaware of MARPOL guidelines. This vessel threw plastics overboard. Eight vessels were aware of MARPOL but did not abide by it, discarding monofilament line and other plastics into the sea. However, 28 vessels complied with MARPOL, discarding only food scraps into the sea. All but two vessels had incinerators, and most used them regularly (Observer Reports, 1995). However nylon and bait-packing tapes were still being discarded on a regular basis. During the 1993-94 season, three sharks were caught with packaging straps around them, and cutting into their bodies. Two Southern Bluefin Tuna caught had plastic in their stomachs; another Southern Bluefin Tuna disgorged a plastic chicken bag (Observer Reports, 1995). On Alaskan beaches, the bulk of manufactured bottles found were of US and East Asian origin, while the fishing gear was also predominantly US and Asian based (Johnson, 1993).

During the 1995-96 season, not all vessel crews were fully aware of MARPOL. For instance, one vessel's Captain thought MARPOL regulations were only in relation to plastics and he thought metal cans could be dumped overboard. One observer also noted bits of mono line, worn gloves and a bait box strap were disposed of into the sea. All waste onboard vessels were either burnt, or stored aside for disposal at port. However, the air pollution due to burning plastics was also a source of concern and observers did not believe that burning plastics onboard complied with MARPOL regulations (Observer Reports, 1997). A Southern Bluefin Tuna was landed with a yellow bait band embedded about six mm deep in the tissue of the fish, under the operculum this had obviously been around the fish for a long

time as four long stalk barnacles were attached to the band. Two Blue Whaler and a Mako shark were landed with a bait box strap collars and an intact bait band which had been in the sea for some time (evidenced by growth of seaweed on it). Another shark was landed wound up in nylon; the hook was removed and tossed back to sea still wound up in nylon, but would probably not have survived. An Observer reported a situation in which the vessel was fully aware of MARPOL but discarded galley rubbish such as plastic bottles, noodle containers and wrappers. Even a bucket containing oily water and plastic bait-straps was discarded (including the bucket) into the ocean (Observer Reports, 1997). Bait box straps are supposed to be cut into pieces to avoid entanglement but evidently some vessels still discard plastic into the sea.

It was clear that some vessels did not comply when observers were absent because of the small quantities of stored waste (non-burnable under MARPOL) onboard some vessels, indicating the short period of waste retention. Most vessels had incinerators but the toxic fumes emitted during burning plastics at low temperature, apart from being a health risk to crew onboard, is also an environmental hazard. Few vessels stored large quantities of nylon cords to dispose off ashore, and most vessels dumped it into the sea regularly, except when halted by an observer (Observer Reports, 1992-97). Observers recommended that MARPOL guidelines should include incinerator design and operating location on the vessel (Observer Reports, 1994).

Maritime litter from fishing vessels, such as fishing gear, bait boxes, nets, lines, and floats, are all sources of fishing debris that affect marine life within and beyond the AFZ (Zann, 1995). Operational discharges from ships and spills of oils and hazardous chemicals from accidents at sea are also significant threats to marine life. The disposal of plastics into the sea (Jones, 1994 a & b; 1995; Zann, 1995), including fishing gear such as nets, rope, lines and strapping bands are prohibited under Australian law (*Protection of the Sea (Prevention of Pollution from Ships) Act, 1983*). This law implements the International Convention for the Prevention of Pollution from Ships. The International Marine Pollution Convention (MARPOL) regulates the dumping of waste at sea, with a ban on the dumping of all types of plastics (Zann, 1995). Galgani et al. (1995) observed that 77% of debris collected were plastics of which 92.8% were bags on the continental shelf of the Northwestern Mediterranean Sea. Despite MARPOL, there are still dumping of fishing debris on remote islands (Zann, 1995). It is estimated that about 50% of Japanese tuna longlining vessels complied with MARPOL in 1992 and 1993 (Zann, 1995). Arnould and Croxall (1995) concluded that there has been significant reduction in entanglements in South Georgia fur seals since 1989/1990 indicating increased MARPOL compliance in some oceans.

More stringent measures along those currently in force are required to stop massive threat to the oceans and its environment. It is just not enough to develop policies and guidelines to follow; education and enforcement of legislation is essential. There is a need for every member of the society to be educated about marine pollution and its effect on the environment. From the Observer Reports, it indicates that not all foreign fishing masters were aware of MARPOL and the effects of dumping waste in the oceans.

It could be assumed that Australian fishers would not dump rubbish into the sea because it is their "backyard". Yet this belief is erroneous because from personal experience on local fishing vessels, aluminium cans were discarded. Apparently not all Australian fishers were fully aware of MARPOL in relation to dumping waste at sea.

In the North Pacific Ocean, it has been observed that the rates of loss and discard of net fragments is on the decline. This has been attributed to international law, increased public awareness and the presence of observers on board vessels (Johnson, 1993). Johnson (1993) also stated that on Alaskan beaches most plastic debris (49-65%) was fishing related with bottles, gill-net floats, and caps/lids making up 75%. He concluded that the deposition and accumulation of plastics and entanglement debris on beaches is a dynamic process that differs by location and year. Continuous beach surveys will determine whether the present legislation on refuse dumping at sea is effective.

Marine debris invariably leads to fishing vessel breakdown, lost fishing opportunities and rising insurance claims all of which cost the fishing industry time and money. A solution to the problem of marine debris is to reduce the amount of debris released into the marine environment by providing recycling and waste disposal facilities at marinas, wharves and beaches. This is because most fishing vessels do not have adequate garbage storage capacities. The amount of trash generated on fishing vessels should also be reduced such that waste on board can be dumped at ports and not at sea. Fishermen should be encouraged to use reusable plastics instead of disposable ones (Environment Canada, 1995). Therefore, the effectiveness of MARPOL should be reviewed and the threat to the animals reduced. The prohibition of dumping wastes at sea has to be properly enforced by all nations, since the marine environment is of utmost importance as a supporter of human life. In the United States, authorities demand to see the ashes of all burnt and unburned wastes, in port and during spot checks at sea (Observer Reports, 1997). This would certainly ensure that all vessels complied with MARPOL whether an observer is onboard or not and even on the high seas.

## CONCLUSION

Several gear changes have been developed to reduce incidental catch and discards in tuna fishing. One of such devices is the use of dehooking tool to remove sharks caught on the long lines, thus minimizing shark discards. Improvement in technology such as electronic and satellite navigation aids, sonar, and net sounders also helps in targeting specific species while keeping discards to a minimum. Tuna are highly valuable species economically, and this has led to its heavy exploitation. At the same time, most coastal and island countries depend solely on fish as their protein source. Conservation and management plans to the marine ecosystem should consider the various approaches, before results or changes can be seen in the marine environment. The various approaches used to conserve marine resources should solve immediate problems and radiate secondary benefits through the ecosystem and not create other problems.

With the increased compliance to MARPOL by tuna fishing vessels, invariably the level of marine pollution will be

reduced. This will therefore reduce the number of birds and other marine animals accidentally killed due to tuna fishing operations. There may also be an increase in tuna available to the fishery. Marine pollution in the marine ecosystem has led to habitat degradation and heavy exploitation of renewable living marine resources like tuna. However, in conclusion the impact of fishing seems to outweigh that of any pollution in the marine environment.

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