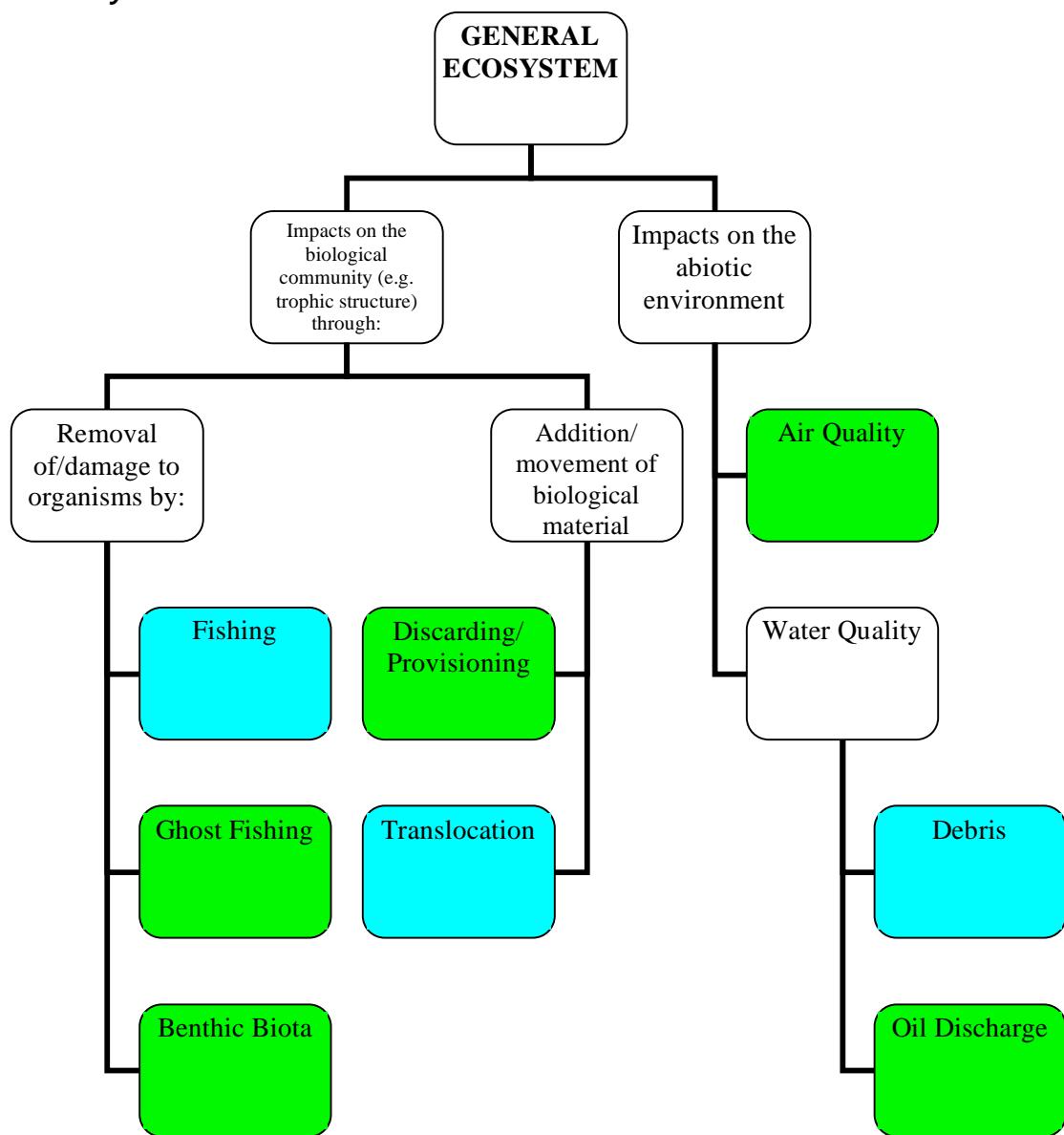


General Ecosystem

Component Tree for General Ecosystem Impacts in the L4/L5 Line Fishery



Trophic Level Interactions

Removal of/ damage to organisms by fishing

Spanish mackerel are the predominant species taken in the fishery. The species has a relatively wide diet of fish, squid and prawns. In turn, sharks and larger pelagic species (including dolphins) prey on mackerel. The predator-prey relationships between these species and mackerel are size dependent and no species is the exclusive predator or prey of Spanish mackerel. The Workshop considered that no individual species or trophic groups would be seriously disadvantaged by the removal or capture

related injury of that part of the fishable Spanish mackerel stock affected at the current harvesting levels (i.e. about 150 tonnes per year in the Queensland fishery). It was therefore concluded that that this species does not play a keystone role within the Gulf marine ecosystem and that it was possible only minor changes to the abundance of other ecosystem components could be expected at the current rate of its removal.

ERA Risk Rating: Impact on the Ecosystem (C1 L4 Low)

Proposed Management Actions

DPI&F would encourage research efforts into detection of fishery impacts on the trophic structure of the Gulf marine ecosystem. However, no specific management actions are proposed.

Removal of/ damage to organisms by ghost fishing

A limited number of fishers operate in the fishery. Twenty-four boats reported line-caught Spanish mackerel in the Queensland Gulf in 2000 (McPherson and Williams 2002). Though a small amount of gear is lost, this is usually from shark bite-offs. Minimal or no bottom fishing occurs. The potential for ghost fishing is limited to lost lines and hooks. There is some potential for species such as turtles and sea birds to become entangled, but this is considered to be minimal as the gear lost includes small rope fragments and very thick (viz. whipper snipper line thickness) fishing line that doesn't twist or knot easily. Much of the discarded fishing gear found on Gulf beaches is of foreign origin and not generated by this fishery.

Given these factors, it does not appear likely that ghost fishing by L4/L5 line gear is posing more than a negligible risk to the maintenance of the populations of target and non-target species in the Gulf marine ecosystem.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No further specific management actions are proposed at this time.

Removal of/ damage to benthic biota

Spanish mackerel fishing is essentially trolling with lines. With almost no demersal fishing, hence there is no interaction with the bottom. Boats drift offshore but inshore, fishers sometimes use temporary moorings that causes minimal disturbance to the seabed. Anchorages may also be used for protection depending on the weather conditions. Some minor disturbance of sediments is possible, but impact is considered transient and localised to anchor divots in relatively soft sediments.

The Workshop considered that given the limited number of boats in the fishery, (27 reported catch in 2003 DPI&F 2005a), the predominantly pelagic nature of trolling and temporary impact of anchor imprints over sandy and muddy substrates with relatively little sedentary epifauna compared to hard substrates, the fishery does not pose an unacceptable impact to benthic biota. When major disturbance of the seabed by strong mixing of the water column due to regular tropical storms which occur in the region is considered, the impact of the fishery on benthic biota was regarded as negligible.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Addition/ movement of biological material

Discards Provisioning

Most of what is captured is kept. Discards represent approximately 30% of the total take for the fishery (i.e. about 50 t /year). Mackerel frames discarded during processing are likely consumed by sharks, dolphins and crabs. Some seasonal provisioning of seabirds may also occur. The Workshop considered that this level of discarding may create some localised enhanced feeding opportunities for some marine predators, and scavengers, however, over a large fishery area spanning seven degrees of latitude and over four degrees of longitude (about 50,000 km²), it is likely to be a negligible addition to food resources for Queensland Gulf populations of these species.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Translocation

It is unlikely that long distance translocation of biological material occurs as most boats in this fishery operate and remain within Gulf waters. The Workshop therefore considered the risk of translocating organisms outside their natural distributions was low.

ERA Risk Rating: Impact on the Ecosystem (C1 L3 Low)

Proposed Management Actions

No further specific management actions are proposed at this time.

Impacts on the abiotic environment

Air Quality

The Workshop considered that alone the Queensland Gulf commercial fisheries are likely to have a negligible impact upon local air quality. Given the relatively small size and power requirements of commercial fishing vessels, exhaust emissions are considered to be no greater than for shipping or coastal vessel traffic.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Debris

Pollution of the marine environment by ships of all types, including fishing vessels, is strictly controlled by the International Convention for the Prevention of Pollution

from Ships (known as MARPOL 73/78). Australia is a signatory to this convention, which is now enforced in over 100 countries. The Australian Maritime Safety Authority (AMSA) applies the Convention in Australian waters. Its regulations are implemented through Commonwealth and State/NT legislation (AMSA 2005).

Marine animals (including target fish species) can die as a result of becoming entangled in or ingesting discarded plastic packing straps; netting of all kinds; monofilament line; nylon rope; plastic and polyweave bags and sheeting; bait holders and foam items. Plastics which shatter into smaller fragments are mistaken for food or ingested accidentally (AMSA 2005).

Fishing vessels unable to incinerate their rubbish need sufficient storage space and equipment (e.g. cans, drums, bags or other containers) to retain all plastics for disposal ashore. If operating within 12 nautical miles of land, all garbage must be retained for disposal ashore (AMSA 2005).

Under the Queensland *Transport Operations (Marine Pollution) Act 1995*, it is an offence to deliberately discharge garbage into Queensland coastal waters (inshore of 3 nm) irrespective of the size of the vessel. Severe penalties apply (MSQ 2005).

No bait packaging bands are generated and discarded in the fishery. Fishers catch and use their own bait locally. Solid waste is disposed of in port at Karumba or Weipa. In addition, the Workshop considered that the impact of dumping biodegradable material at sea was considered to be localised and not measurable at the scale of the total fishery area.

ERA Risk Rating: Impact on the Ecosystem (C1 L3 Low)

Proposed Management Actions

No further specific management actions are proposed at this time.

Oil Discharge

MARPOL regulations apply to all the Queensland Gulf fisheries that prohibit the discharge of oily mixtures into the sea in Australian waters (AMSA 2005). Within 3nm of the coastline the *Transport Operations (Marine Pollution) Act 1995* and regulations protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal waters. It is an offence to deliberately discharge garbage, oil and chemicals into the marine environment and severe penalties apply (MSQ 2005).

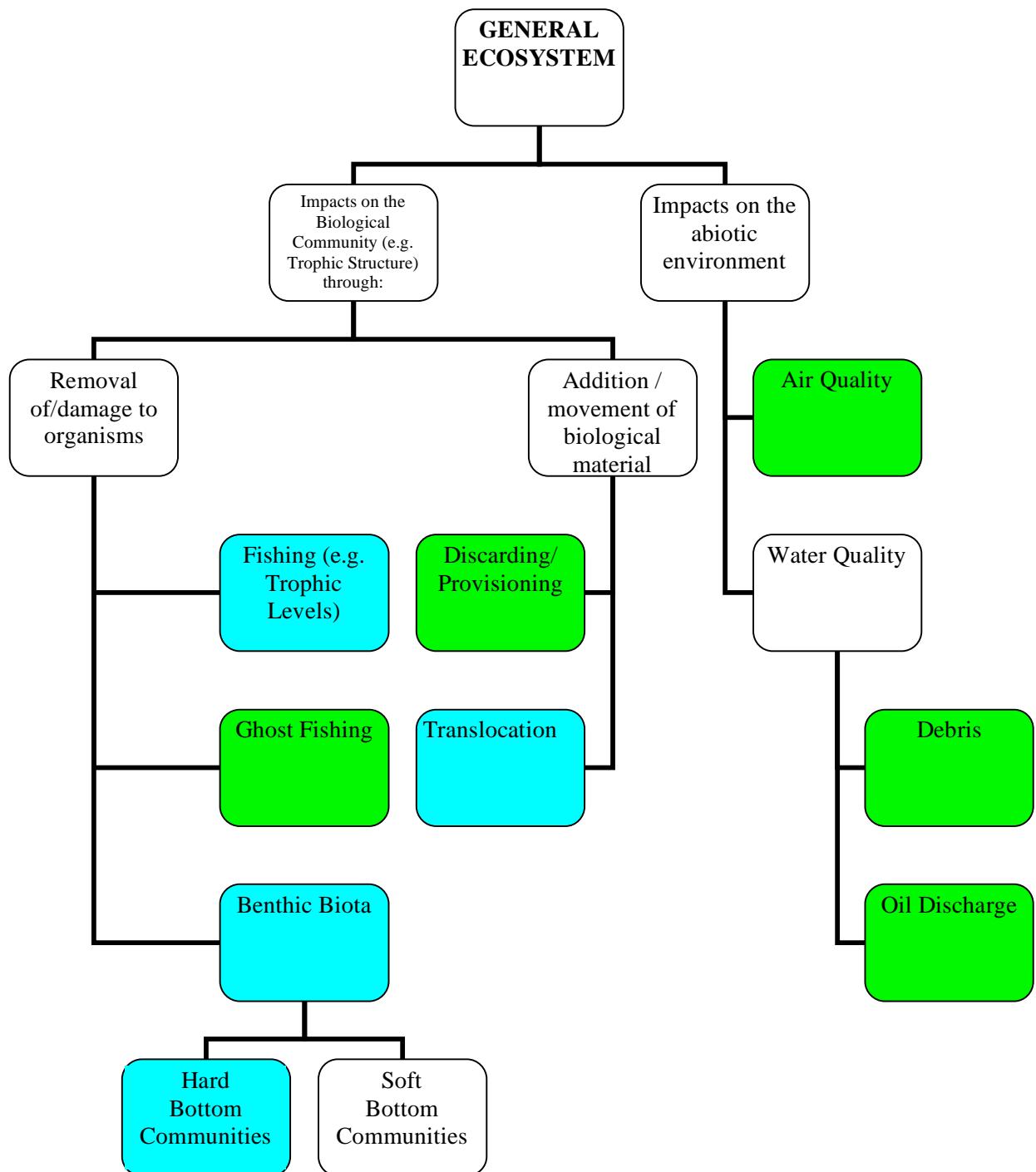
The Workshop considered oil pollution not to be a significant problem in the fishery. Waste oil and oily water generated during fishing operations is managed appropriately onboard in accordance with the respective Commonwealth and Queensland laws. Vessels discharge in ports with facilities designed to receive this waste, e.g. Weipa and Karumba.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No further specific management actions are proposed at this time.

Component Tree for General Ecosystem impacts in the Fish Trawl Fishery



Trophic Level Interactions

Removal of/ damage to organisms by fishing

Tropical snappers and emperors are the major retained species in the fishery. These species are consumers in the middle trophic levels and are prey in the diets of larger fish (e.g.. sharks and cod). Fish trawling does not normally come into heavy contact with the seabed. It is relatively specific for large and semi-pelagic species (Poiner *et al.* 1998), compared to prawn trawling which takes a higher proportion of benthic species. It is therefore likely to cause minimal removal of or damage to benthic fish and invertebrates, although some detachment of larger sessile benthic fauna has been reported in other tropical finfish trawl fisheries (e.g. Stephenson *et al.* 2005) and may be expected to occur in this fishery.

Compared to other northern Australian fish trawl fisheries, the GOCDFTF is considered to have lower impact on the trophic structure of the ecosystem. This is based on an a comparative assessment of the fishery catch and effort estimates with that of the Western Australian Pilbara Finfish Trawl Fishery (WAPFTF), where the effect of the WAPFTF on the food chain of the North West Shelf was recently reported to be at an acceptable level (Stephenson *et al.* 2005).

While the composition of the retained species caught in the WAPFTF and the GOCDFTF are similar, the catches in the former fishery are either about the same or exceed those of the latter fishery by up to four times, depending on the species. The Northern Territory Finfish Trawl Fishery also takes substantially more of the major retained species than the GOCDFTF (Appendix 4). In addition, effort levels in the WAPFTF (four vessels) are higher and probably twice that in the GOCDFTF (two vessels), although the GOCDFTF is about 20% larger in area.

Discards are estimated to be about one-quarter of the catch in the GOCDFTF, about 110 t/ year. Annual discards in the WAPFTF are in excess of 1,000 t, but the level of impact on the bycatch species is considered to be low (Stephenson *et al.* 2005). With only two operators currently active in the fishery and a relatively small Total Allowable Catch of the major retained species²³, the level of discarding is not considered to be a major cause for concern and impact on the ecosystem from their removal is considered to be minor.

Given that the removal of benthic biota in the GOCDFTF is likely to be relatively low compared to the overall impact of the NPF prawn trawling, that effort, retained species and bycatch in the GOCDFTF are at levels well below those considered by Stephenson *et al* (2005) to be acceptable for the sustainability of the ecosystem in other major tropical finfish trawl fisheries, the Workshop considered the GOCDFTF was unlikely to cause measurable change in ecosystem components and that only minor changes in relative abundance of other species dependent on species in the catch were expected. Consequently, the fishery is considered to pose a low risk to the functioning of the ecosystem.

ERA Risk Rating: Impact on the Ecosystem (C1 L3 Low)

²³ In 2005, the Total Allowable Catch for all species retained in the fishery was a total of 1250 t, made up of individual catch quotas of 750 t, 250 t and 250 t. One 250 t quota is currently inactive.

Proposed Management Actions

No further specific management actions are proposed at this time.

Removal of/ damage to organisms by ghost fishing

Fishing nets abandoned at sea may cause entanglement and the subsequent death or crippling of marine life. Incidence of net loss is very low in the fin trawl fishery. Only one net has been known lost in the Gulf in 15 years of fishing. It has been assumed the net would sink to the sea floor and not continue to fish. Trawl uses large mesh net with stiff, thick diameter (3-4 mm) line. Few species are likely to be meshed in this material. The fishery trawls up significant amounts of gear lost from other fishing operations (W. Passey, Finfish Trawl Operator, *pers. comm.*, 2004). Most abandoned fishing gear found in northern Australian waters is of south east Asian origin (DEH 2004).

Given the prevalence of discarded foreign fishing nets, low participation in the fishery (only two operators are currently active) and therefore a limited potential for net loss, the low reported incidence of actual net loss in the fishery and the relatively common incidence of recovery of nets from other sources, the Workshop considered that on the rare occasion a net was lost in the fishery, it was unlikely that impact on populations of susceptible species within the fishery area would be significant.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Benthic Biota

Since the workshop met, new data from seabed surveys has been collected which identifies isolated patches of hard coral reef in the southern Gulf (Peter Harvis, Geoscience Australia, 2005). Reefs also occur on depth soundings near Cape Keer Weer (approximately 14°S lat) and some may be subjected to trawl impacts (Jason Stapley, DPI&F Observer, unpublished, 2005). Only two boats are currently permitted to operate in the fishery using semi-pelagic trawls. About 50% of the eastern Gulf can potentially be trawled. In a year, about 25% of the total fishery area is trawled. An estimated 10% of the eastern Gulf would have been fished to date and flexible sled-type BRDs are being tested by at least one operator (W. Passey, Finfish Trawl Operator, *pers. comm.*, 2004). Similar to the WAPFTF, the main benthic impact appears to be on large sponges brought up in the trawls (see section on removal of/ damage to organisms by fishing).

Given that effort in the GOCDFTF is lower compared to the WAPFTF²⁴, the Workshop considered that the impact of benthic habitat would also be lower. The fishery was therefore assessed to have only a minor impact on benthic habitat within the fishery area (see section on removal of/ damage to organisms by fishing).

ERA Risk Rating: Impact on the Ecosystem (*Low*)

²⁴ Stephenson *et al.* 2005 reported the WAPFTF as having a moderate level impact on benthic habitat

Proposed Management Actions

- Monitor the spatial arrangements of where trawling is occurring to ensure that there is no serial depletion to benthos (especially sponges) and target species.
- Assess the effectiveness of BRDs (e.g. flexible sleds) upon their introduction.
- Monitor the frequency of heavy ground gear use in the fishery.
- Support research proposals for seabed biodiversity mapping in the Gulf
- Consider whether the current review event for bycatch is appropriate.

Addition/movement of biological material

Discards Provisioning

Trawl fisheries typically discard bycatch that are consumed by a variety of predatory and scavenging species. Discards in the fishery are mainly finfish, but also include some cephalopods, crustaceans and elasmobranchs. The total discard rate in the fishery is estimated to be about 100t/year. This is an order of magnitude lower than discarding in the WAPFTF, estimated to be about 1,000 t annually. At this level of discarding, the WAPFTF is considered to have an acceptable level of impact upon the marine food chain of the North West Shelf (Stephenson *et al.* 2005). Consequently, the GOCDFTF is likely to have a relatively low impact on trophic interactions involving bycatch species.

About 70% of the bycatch is thought to be returned to the water dead where it is consumed by sharks, dolphins and sea birds (mostly likely terns and boobies: Poiner *et al.* 1998). Research into the feeding behaviour of Moreton Bay bottlenose dolphins (Chilvers and Corkeron 2001), indicates that populations may be segregated into sub-groups that do, and sub-groups that do not, consume trawl discards and this may be related to the proximity of their ranging behaviour to trawling. If similar dolphin social structuring occurs in the Gulf, it may be expected that only a sub-group of the total dolphin population will demonstrate behavioural modification to the extent of adopting feeding strategies associated with trawling.

The Workshop considered that although there may be some localised benefit to these species from additional food availability, it would be unlikely that a change at the population level would be measurable against the background variability that is likely to exist from year-to-year. The impact of discard provisioning upon the ecosystem was therefore considered to be negligible.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

Introduction of hoppers is proposed to improve bycatch survival rates. Increased investment in the fishery to upgrade to the use of hoppers will be a condition of more secure access to the resource when management of the fishery is reviewed and formalised.

Translocation

Movement of biological material from one place to another (translocation) probably occurs within fishing grounds but is unlikely to result in successful establishment of

most species over greater distances or outside their range. In the GOCDFTF, there are only two vessels operating. One vessel operates on other trawl grounds across northern Australia. The other vessel moves seasonally between the Queensland east coast and the Gulf. At the scale of annual movements taken in and out of the fishery area by these two vessels, the risk of translocating species outside of their natural distribution is considered to be low compared to other higher effort trawl fisheries.

For example, in 2004 there were 510 trawlers in the Queensland East Coast Otter Trawl Fishery (ECOTF). Vessels in the ECOTF may seasonally change their fishing location to target alternate species, potentially navigating nearly 18° of latitude or about 1,000 nm (i.e. the whole Queensland east coast). Over these large distances, it is expected that only a few species resistant to desiccation could remain viable and be capable of colonising a site outside of their distribution. Coles *et al.* (1987) suggested that temporary establishment of some species (e.g. seagrass) may occur as a result of being carried on trawl ground tackle. However, for a species to persist at a new site, environmental conditions must be favourable. There are no data to suggest that this occurs even in larger trawl fisheries like the ECOTF, which has many more boats actively fishing and therefore a much greater number of opportunities for species to be moved considerable distances and possibly on occasions too locations outside their native range.

On the basis of the information given above, the Workshop considered that while it was likely that most species would not translocate over large distances and persist in the environment outside their native range, there was some indication that at least on a temporary basis, species could occasionally be established outside their native range but that an inability to adapt to altered environmental conditions would cause the decline of these species in the long term. Consequently it was considered that there was only a remote likelihood that translocation in this fishery was facilitating the occurrence of new species outside their historical range.

ERA Risk Rating: Impact on the Ecosystem (C3 L1 Low)

Proposed Management Actions

No further specific management actions are proposed at this time.

Impacts on the abiotic environment

Air Quality

The Workshop considered that compared to the total number of commercial non-fishing vessels (including ships, barges, dredges and launches) and recreational vessels (including speedboats and personal watercraft) plying Gulf coastal waters, Queensland Gulf fisheries in general would have a negligible impact upon local air quality.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No further specific management actions are proposed at this time.

Debris

Pollution by deliberately disposing of solid non-degradable waste in Australian marine waters is strictly controlled by the International Convention for the Prevention of Pollution from Ships (known as MARPOL 73/78) and in Queensland coastal waters by the Queensland *Transport Operations (Marine Pollution) Act 1995* (see General Ecosystem Impacts in the L4/L5 Line fishery assessment for details).

All solid non-degradable waste is stowed and disposed of in port at Karumba or Weipa. Given the penalty provision that apply to offences under both Commonwealth and Queensland legislation, the Workshop considered that in view of the substantial penalty provisions for non-compliance, compliance was likely to be high. In addition, the Workshop considered that the impact of dumping biodegradable material at sea was considered to be localised and not measurable at the scale of the total fishery area.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Oil Discharge

MARPOL regulations apply to all the Queensland Gulf fisheries that prohibit the discharge of oily mixtures into the sea in Australian waters (AMSA 2005). Within 3nm of the coastline the *Transport Operations (Marine Pollution) Act 1995* and regulations protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal waters. It is an offence to deliberately discharge garbage, oil and chemicals into the marine environment and severe penalties apply (MSQ 2005).

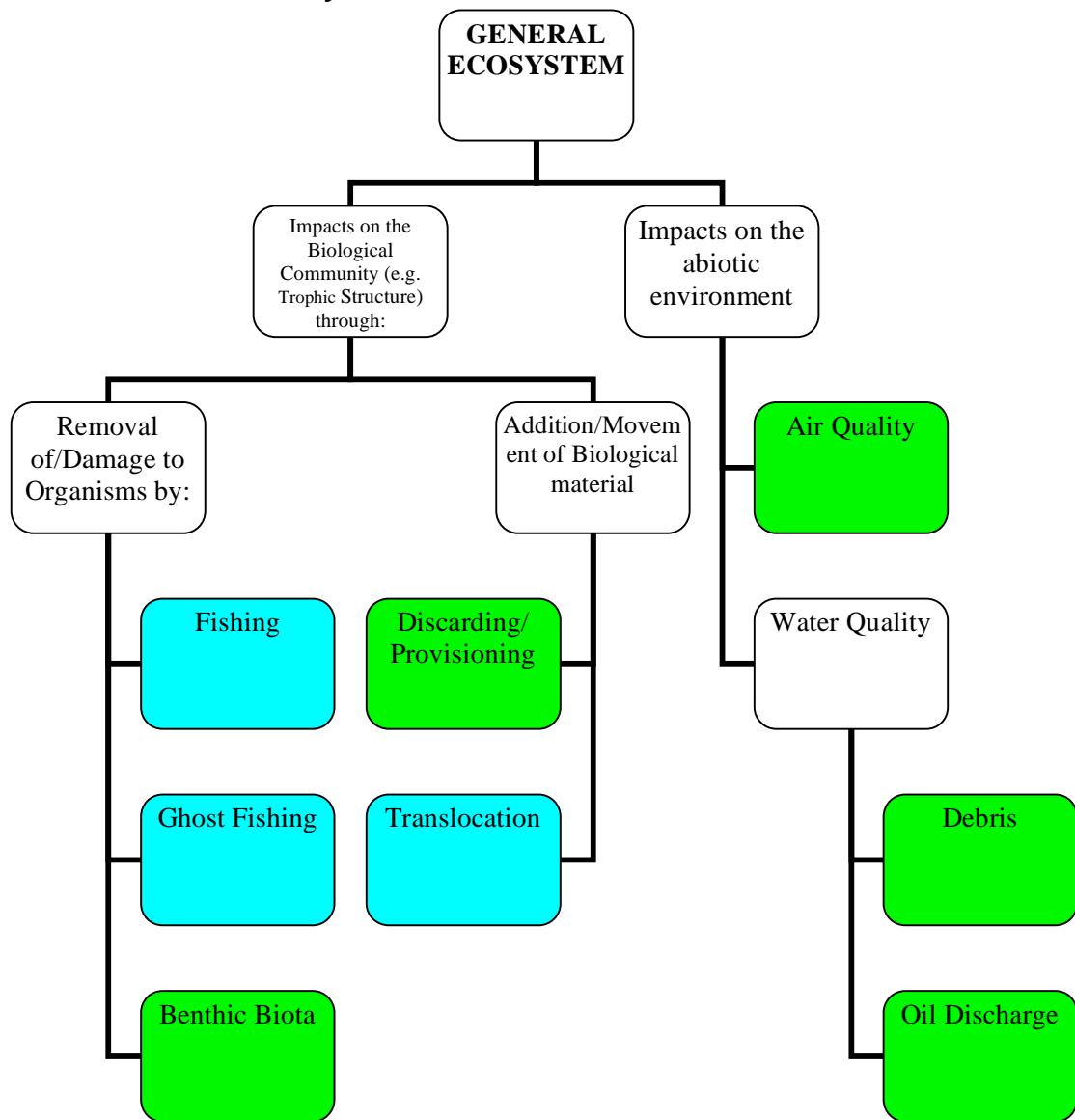
The Workshop considered oil pollution not to be a significant problem in the fishery. Waste oil and oily water generated during fishing operations is managed appropriately onboard in accordance with the respective Commonwealth and Queensland laws. Vessels discharge in ports with facilities designed to receive this waste, e.g. Weipa and Karumba.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Component Tree for General Ecosystem impacts in the N9 Offshore Net Fishery



Trophic Level Interactions

Removal of/ damage to organisms by fishing

The total average annual catch of shark, grey mackerel and other species in the N9 fishery was about 650 t in 2001/02. The harvested catch is made up of about 90% shark and grey mackerel in approximately equal amounts and 10% of other species mainly other mackerel species, trevally and snappers (Roelofs 2003). The Workshop considered that overall the relative impact on the ecosystem was low and either at or below risk levels for these species in similar northern Australian commercial fisheries (for details see below).

ERA Risk Rating: Impact on the Ecosystem (C1 L3 Low)

Sharks

In comparison to other northern Australian fisheries targeting shark, the N9 fishery harvest is somewhat lower.²⁵ However, when combined with the shark catch from the N3 fishery, the Queensland Gulf shark catch is at a level similar to that of other lower catch shark fisheries. For example in 2002/03 the Western Australian North Coast Shark Fishery and the Western Australian managed part of the Joint Authority Northern Shark Fishery had a combined shark catch of similar species of about 470 tonnes.²⁶

Based on the similar characteristics of the Queensland Gulf and northern Western Australian shark fisheries in terms of catch level and the species landed, it is considered that impacts on the ecosystem of the Queensland Gulf net fisheries with respect to sharks will also be similar. Gaughan *et al.* (2005) reported that the northern Western Australian shark fisheries take a relatively small amount of catch. The catch is spread across a large number of species, each of which has a wide diet. Therefore the fishery is considered to be having only a negligible effect on trophic interactions within the region. Based on this analogy, the Queensland Gulf net fisheries are likely to be having a similar level of impact, consequently it is considered the N9 and N3 combined are having a negligible impact on trophic interactions within the Queensland Gulf region.

In addition, recreational and indigenous shark catches in the Gulf are uncertain based on the available data,²⁷ but when considered together their combined removals may comprise a significant part of the shark harvest.

Grey Mackerel

In comparison to other commercial northern Australian fisheries reporting grey mackerel landings, the N9 fishery harvest (about 370 t in 2003)²⁸ is considerably lower than the Northern Territory catch (about 770 tonnes in 2003, up from 480 tonnes in 2002)²⁹ but higher than Western Australian commercial fishery landings of only 30 t/ year (Penn *et al.* 2005). Using the Western Australian fisheries taking grey mackerel as reference points, it appears that there is a negligible to low risk to the sustainability of the ecosystems supporting grey mackerel catches in these fisheries (Mackie and Kennedy 2005; Gaughan *et al.* 2005).

Other species

Other mackerel (Scombridae), trevally (Carangidae) and snappers (Lutjanidae) make up almost all the byproduct species in the N9 harvest (Roelofs 2003). In 2003, Queensland Gulf net catches for these species were in the order of 20 t of Spanish mackerel (*Scomberomorus commerson*) and negligible quantities of trevally and snappers (DPI&F 2005a). Compared to the L4/L5 fishery, the Spanish mackerel catch in the Gulf net fishery is negligible (only about 10% of the L4/L5 Spanish mackerel

²⁵ The Northern Territory shark catch in 2003 was 898 tonnes (McKey and Buckworth 2004)

²⁶ The combined N3 and N9 shark catch in 2003 was 420 t (Gribble *et al.* 2004)

²⁷ Catch data reported in Lyle *et al.* 2003 and in Coleman *et al.* 2003

²⁸ Total Queensland Gulf commercial net harvest (DPIF 2005a)

²⁹ Catches in both years were higher than historical levels (McKey and Buckworth 2004)

catch). Higher quantities of this species removed from by the L4/L5 fishery, are not expected to have a significant impact on the ecosystem (for details see the assessment of General Ecosystem Impacts in the L4/L5 Line Fishery).

Bycatch

With the exception of sawfishes and bottlenose dolphins, the N9 fishery is having only a negligible impact on bycatch species populations (for details see the assessment of Non-Retained Species in this fishery). Where the fishery impact on bycatch populations is negligible, it follows that the level of impact on the trophic interactions involving these species should also be negligible.

While the Workshop considered the fishery impact on sawfish was currently low risk to their sustainability, the levels of impact on the ecosystem due to their removal in terms of trophic interactions is more uncertain. Information received subsequent to the Workshop, in a risk assessment of sawfish catches in the north Western Australian mesh net fishery (Newman and Harvey 2005), indicates sawfish are at low risk at low levels of net fishing effort. However, the effort in the Queensland Gulf net fishery appears to be substantially higher than in the Western Australian fishery, suggesting that consideration be given to reviewing the risk rating attributed to N9 fishery impacts on sawfish populations and thus the trophic interactions involving sawfish.

Proposed Management Actions

Since the Workshop, advice has been received that the risk ratings for interactions with sharks, grey mackerel and sawfish in the N9 fishery may need to be reassessed (Dr. S. Griffith, CSIRO, *pers. comm.*, 2005). As part of the impending review of the fishery management arrangements under the *Fisheries (Gulf of Carpentaria Inshore Finfish) Management Plan 1999*, the DPI&F will consider reviewing the risk ratings attributed to N9 fishery impacts on these species and thus the trophic interactions involving these species.

Removal of/ damage to organisms by ghost fishing

Nets are lost occasionally in the N9 fishery, particularly during adverse weather conditions. Some fishers have recently started using bigger floats to enhance the chance of finding lost nets. Most of the net found on Gulf beaches is from foreign fishing fleets and cannot be attributed to abandonment in this fishery (see the assessment of General Ecosystem Impacts in the Fish Trawl Fishery for details).

Notwithstanding the prevalence of discarded foreign fishing nets, the Workshop considered:

- the higher participation in the fishery compared to the GOCDFTF, and hence higher potential for net loss than in the N9 fishery and
- a potential for mesh nets to catch more fish when fishing passively than trawl nets,

and concluded that the impact on the structure and functioning of the ecosystem from net loss in the N9 fishery could be more significant than might occur from net loss in the GOCDFTF. However, the greater level of impact on the ecosystem was no more than a remote possibility due to fisher intervention in making nets more visible and recoverable by the attachment of bigger floats. The risk of net loss in the N9 fishery to the ecosystem is therefore considered to be low and at a similar risk level to net loss in

the GOCDFTF (see the assessment of General Ecosystem Impacts in the Fish Trawl Fishery for details).

ERA Risk Rating: Impact on the Ecosystem (C1 L4 Low)

Proposed Management Actions

No further specific management actions are proposed at this time.

Removal of/ damage to benthic biota

Nets are surface set and anchored to a mud bottom. Nets only interact with seabed biota in depths less than 12 metres (the maximum drop of nets used in the fishery). Offshore waters reach about 50 m in depth. Only a small percentage of nets set would have contact with the seabed in areas inshore of the inshore (7 nm from the coast) boundary of the fishery. The Workshop considered within the whole N9 fishery area, it was unlikely that mesh nets were having a significant impact on benthic habitats or populations of benthic species. Consequently the risk to the ecosystem was considered to be negligible.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No further specific management actions are proposed at this time.

Addition/ movement of biological material

Discards Provisioning

Discards make up about 10-15% of the total catch by number or 5% of the catch by weight (about 32 t/ year). Relatively small quantities such as this discarded in remote offshore areas are not considered to provide an additional food source to many species with the exception of sharks and dolphins. The Workshop considered that the relatively low discarding rate in the N9 fishery compared to other Gulf fisheries (see assessments of General Ecosystem Impacts for the other fisheries for details), was unlikely to have a measurable impact on the populations of species consuming the discards over the background variability expected in the abundance of these species. Consequently the risk to the ecosystem was considered to be negligible.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No further specific management actions are proposed at this time.

Translocation

It is unlikely that long distance translocation of biological material exists in the fishery. Almost all N9 vessels operate and remain within Gulf waters during and in between fishing operations. While translocation may cause the incidence of species outside their historical range, given the strong tendency for N9 vessels to remain within the fishery area, the Workshop considered that there was only a remote likelihood this would occur in the N9 fishery and consequently the risk to the integrity of the ecosystem was considered to be low.

ERA Risk Rating: Impact on the Ecosystem (C3 L1 Low)

Proposed Management Actions

No specific management actions are proposed.

Impacts on the abiotic environment

Air Quality

The Workshop considered that compared to the total number of commercial non-fishing vessels (including ships, barges, dredges and launches) and recreational vessels (including speedboats and personal watercraft) plying Gulf coastal waters, Queensland Gulf fisheries in general would have a negligible impact upon local air quality.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Debris

Pollution by deliberately disposing of solid non-degradable waste in Australian marine waters is strictly controlled by the International Convention for the Prevention of Pollution from Ships (known as MARPOL 73/78) and in Queensland coastal waters by the Queensland *Transport Operations (Marine Pollution) Act 1995* (see General Ecosystem Impacts in the L4/L5 Line fishery assessment for details).

All solid non-degradable waste is stowed and disposed of in port at Karumba or Weipa. Given the penalty provision that apply to offences under both Commonwealth and Queensland legislation, the Workshop considered that in view of the substantial penalty provisions for non-compliance, compliance was likely to be high. In addition, the Workshop considered that the impact of dumping biodegradable material at sea was considered to be localised and not measurable at the scale of the total fishery area.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No further specific management actions are proposed at this time.

Oil Discharge

MARPOL regulations apply to all the Queensland Gulf fisheries that prohibit the discharge of oily mixtures into the sea in Australian waters (AMSA 2005). Within 3nm of the coastline the *Transport Operations (Marine Pollution) Act 1995* and regulations protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal waters. It is an offence to deliberately discharge garbage, oil and chemicals into the marine environment and severe penalties apply (MSQ 2005).

The Workshop considered oil pollution not to be a significant problem in the fishery. Waste oil and oily water generated during fishing operations is managed appropriately onboard in accordance with the respective Commonwealth and Queensland laws.

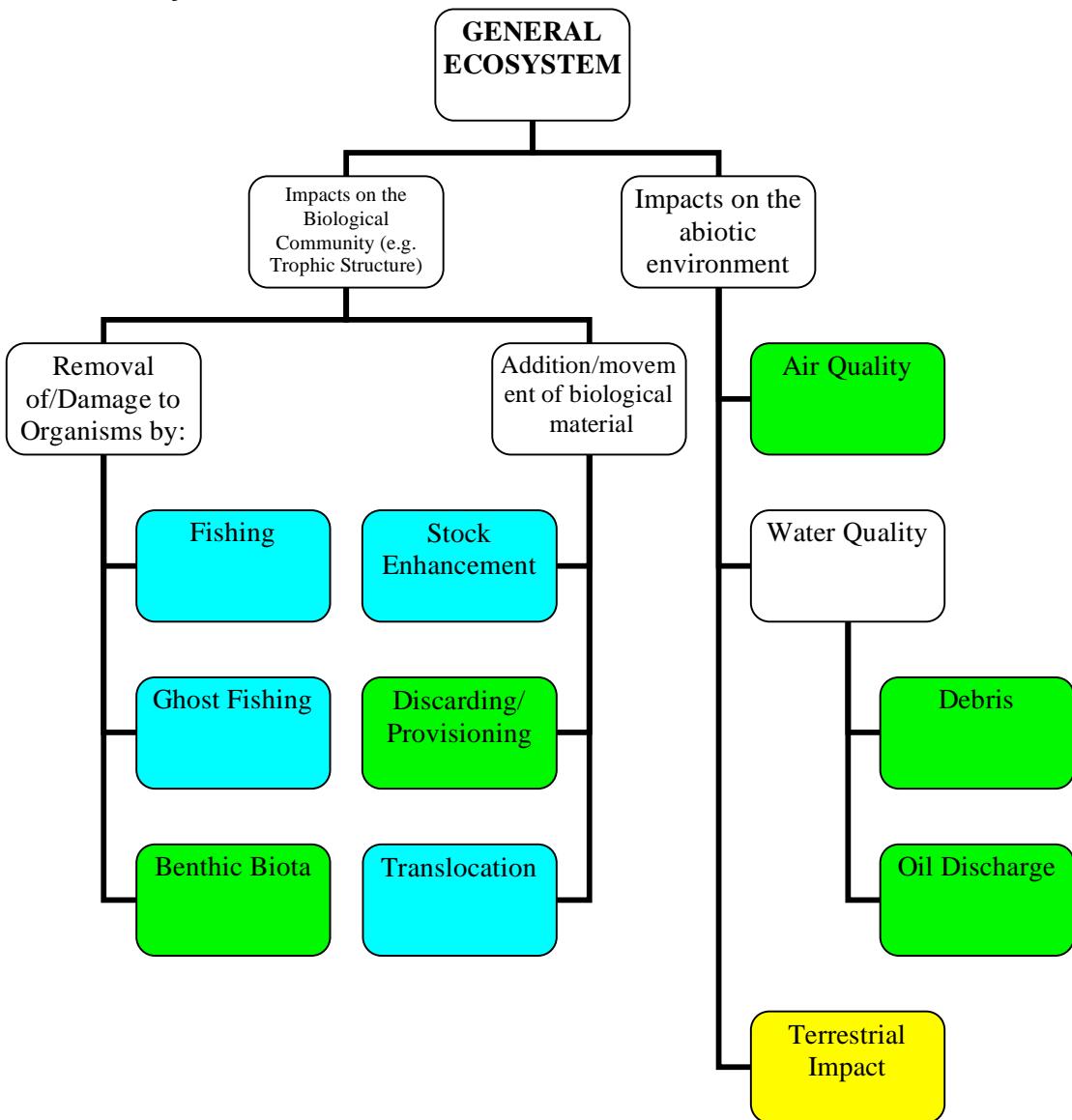
Vessels discharge in ports with facilities designed to receive this waste, e.g. Weipa and Karumba.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No specific management actions are proposed.

Component Tree for General Ecosystem impacts in the N3 Inshore Net Fishery



Trophic Level Interactions

Removal of/ damage to organisms by fishing

Given that current and proposed management of N3 fishery retained species is commensurate with the relative risk to their sustainability after all fishery related impacts within their northern Australian distributions are taken into account, the Workshop considered that overall, the effect of the N3 fishery on its retained species was relatively low and that it was only possible that harvesting at current levels was causing changes to the relative abundance of these and dependent or competing species. Similar to retained species, the Workshop considered that the low level of bycatch in the fishery was also unlikely to cause a major change in their relative abundance (for details see below).

ERA Risk Rating: Impact on the Ecosystem (C1 L4 Low)

Retained Species

The annual N3 fishery harvest is about 1,500 tonnes (Roelofs, 2003). In 2003, the harvest of the major retained species appears to have increased slightly, to about 1,700 tonnes (DPI&F 2005a). Estimated indicative annual landings from the N3 fishery and landings of these species in other northern Australian commercial fisheries are summarised in Table 4. These data demonstrate that the N3 fishery landings of retained species are at or below the harvest levels of these species in other northern Australian fisheries. The level of ecological impact is likely to be commensurate with the level of their removal of these species.

For example, the 2003 commercial barramundi harvest from the Northern Territory was about one-quarter higher than the Queensland Gulf barramundi harvest. The Northern Territory fishery is regarded to be well within its estimated range of overall sustainable harvest levels (O'Grady and de Lestang 2004). The Workshop noted that Queensland Gulf barramundi stocks are currently being harvested at sustainable levels. It is therefore likely that current management is effective in ensuring that long-term recruitment and natural dynamics of the Gulf barramundi stock (e.g. seasonal flood-cued spawning) are largely unaffected by the fishery (see assessment of Retained Species in the N3 Inshore Net Fishery). While the fishery harvest of barramundi remains at sustainable levels the effect of their removal³⁰ from the ecosystem is also considered to be sustainable.

For retained species with substantial harvests occurring in the N3 fishery and other northern Australian commercial fisheries (e.g. sharks, guitarfish and rays, grey mackerel and threadfins), the possibility of a significant ecological impact due to their removal is reflected in the risk levels assigned these species at the Workshop (see the respective N3 and N9 retained species assessments for risk levels associated with the harvest of these species).

Other retained species taken in minor quantities in the N3 fishery, but in much higher quantities in other northern Australian commercial fisheries, for example, black jewfish (Table 4), are considered to have a low risk to their sustainability within the Queensland Gulf, and therefore are unlikely to cause ecosystem dysfunction by their removal at current harvesting levels in the N3 fishery.

For other N3 retained species with emerging information indicating that stocks may need an increasing management focus (e.g. grunters and queenfish), the DPI&F proposes to consider the issues relevant to each species and ascertain whether the current risk rating needs to be reviewed and further management considered.

³⁰ Controlled by appropriate minimum and maximum legal lengths, recreational bag limits and seasonal spawning closures

Table. Indicative annual commercial landings (tonnes) of major species retained in the fishery, 2002 - 2003

Species	N3/Qld Gulf* (incl. N9 landings)	Northern Territory**	Western Aust.***
Barramundi	500/500	700	50
Threadfins	400/400	450	150
Sharks, guitarfish, Sawfish and rays	200/400	900	500
Grunter	20/40	?	10
Grey mackerel	80/500	800	25
Jewelfish and black jewfish	50/50	150	5
Queenfish	20/20	?	1
Spanish mackerel	20/200	350	500

Data sources: * DPI 2005a; ** Northern Territory Fishery Status Reports 2003 at <http://www.fisheries.nt.gov.au>; *** Penn *et al.* 2005

There are a number of species retained species in the N3 fishery ecosystem with similar dietary requirements of fish and prawns. There appears to be considerable predator redundancy among the higher trophic levels of the N3 fishery ecosystem and strong interspecific competition for prey. Juveniles of the retained species are consumed by other predatory fish, birds and crocodiles, so maintenance of their relative abundance is largely mediated during early ontogenetic development by non-fishery drivers. The current management arrangements for these species each seek to minimise the negative effects of fishing on the respective breeding adult stocks, ultimately ensuring that fish populations are sustainable and that trophic relationships among the retained and non-retained species in the fishery ecosystem are maintained.

Non-Retained Species

The Workshop considered that for turtles, whales, dolphins and seabirds the N3 fishery is having only a negligible impact on bycatch species populations (for details see the assessment of Non-Retained Species in this fishery). Where the fishery impact on non-retained populations is negligible, it follows that the level of impact on the trophic interactions involving these species should also be negligible. The Workshop also considered that there was only a slightly greater risk to the sustainability of dugong and crocodiles and other finfish bycatch in the N3 fishery (see assessment of Non-Retained Species in this fishery).

It concluded that due to the relatively low levels of interaction and the unique trophic status of dugong and crocodiles (i.e. grazing herbivore and top order predator) there was no more than only a possibility that the fishery was causing more than minor changes in the relative abundance of other ecosystem components. Similarly, it was

concluded that due to the relatively low bycatch of non-retained finfish species in the fishery (see assessment of Non-Retained Species in this fishery), there was no more than only a possibility that the fishery was causing more than minor changes in the relative abundance of other dependent species and competing species.

Overall, given the management actions proposed to address sustainability issues for lower risk non-retained species and for sawfishes and speartooth sharks (see assessment of Non-Retained Species in this fishery), the impact of the current level of interaction with the fishery was unlikely to cause a major change in ecosystem function.

Proposed Management Actions

Management actions are as proposed (for details see the assessment of Non-Retained Species in this fishery).

An interesting theory was put forward at the Workshop regarding possible predatory release of catfish populations due to barramundi removal. Since the Workshop, there has been no subsequent validation of this supposed relationship by the proponent. Further follow up at the expense of managing higher risk issues in the fishery (see assessments of Retained and Non-Retained Species) in the short to medium term would appear unlikely.

Removal of/ damage to organisms by ghost fishing

The impact of lost nets depends on where they are lost. In offshore waters, nets will fish for a short time before either being rolled up by water currents or they get destroyed by predators. Nets lost in inshore waters tend to beach themselves and become entangled in mangroves. All lost nets will fish for a time, but the loss of nets is uncommon in the N3 fishery. Problems associated with washed up nets used by foreign fleets is widely recognised throughout northern Australia and has been the focus of a recent NHT funded project to locate and remove derelict fishing gear from Gulf beaches. Discarded nets from the N3 fishery pose only a minor consequence of localised depletion - not a stock level depletion.

The Workshop considered that derelict fishing nets were not a serious threat, to the extent that there was no more than only a possibility that the fishery was having more than a minor effect on the relative abundance of ecosystem components.

ERA Risk Rating: Impact on the Ecosystem (C1 L4 Low)

Proposed Management Actions

An issue of other sectors using lost nets is a separate issue and may need to be assessed in an appropriate manner by the relevant levels of government.

Removal of/ damage to benthic biota

N3 nets are top set, with minimal impact on the seabed. Some minor impact to mangroves may occur through the practice of tying off net ends and boats used to manage the net. The Workshop considered the impact of these activities and netting operations in general were unlikely to have anything other than a negligible impact on benthic biota and marine habitats.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No specific management actions are proposed.

Addition/ movement of biological material

Stock Enhancement

An estimated 100,000 fingerlings are released each year into Queensland tropical rivers, including streams emptying into the Gulf. Broodstock are sourced from the same rivers as those to be stocked. Expert guidance in the selection of the stocking sites is provided by DPI&F scientific staff. About 60% of fingerlings are put into rivers and 40% into impoundments. Fish are not marked as artificially reared.

Queensland east coast trials suggest 1 in 10-20 barramundi caught may be stocked (R. Garrett, DPI&F, *pers. comm.* 2004). This can be a significant contribution to the total catch, recognising the numbers stocked. Gulf stocked fish are probably making a lower contribution to the catch than on the east coast. Stocking by local groups is undertaken according to their stocking schedule/management plans. There is no indication that wild barramundi stocks have declined in stocked rivers.

The Workshop considered that given the rigorous DPI&F field trials to assess stock suitability and current safeguards regarding appropriate genetic stock selection and release sites, it was expected that only in exceptional circumstances would the ecosystem be altered to the extent that stocking may cause a disease outbreak among wild populations or genetic variant to displace the native stock.

ERA Risk Rating: Impact on the Ecosystem (C3 L2 Low)

Proposed Management Actions

DPI&F will ensure that hatchery and stocking management protocols currently in place will be maintained to minimise genetic distortion and disease risks to wild fish stocks.

Discards Provisioning

The N3 fishery is similar to N9 offshore fishery in terms of the relatively low quantity of bycatch discarded (see assessment of General Ecosystem Impacts for the N9 fishery for details). About 170 t (or 13% by number) of the catch is discarded (Halliday *et al.* 2001). Most discards are consumed by catfish, crocodiles, sharks and other marine predators.

Because the discarding rate is quite low, the Workshop considered that the N3 fishery was unlikely to have a measurable impact on the populations of species consuming the discards over the background variability expected in the abundance of these species. Consequently the risk to the ecosystem was considered to be negligible.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No specific management actions are proposed.

Translocation

Little likelihood of long distance translocation of biological material exists in the N3 fishery. Almost all N3 vessels operate and remain within Gulf waters during and in between fishing operations. While translocation may cause the incidence of species outside their historical range, given the strong tendency for N3 vessels to remain within the fishery area, the Workshop considered that there was only a remote likelihood this would occur and consequently the risk to the integrity of the ecosystem was considered to be low.

ERA Risk Rating: Impact on the Ecosystem (C3 L1 Low)

Proposed Management Actions

No specific management actions are proposed.

Impacts on the abiotic environment

Air Quality

The Workshop considered that compared to the total number of commercial non-fishing vessels (including ships, barges, dredges and launches) and recreational vessels (including speedboats and personal watercraft) plying Gulf coastal waters, Queensland Gulf fisheries in general would have a negligible impact upon local air quality.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No specific management actions are proposed.

Debris

Pollution by deliberately disposing of solid non-degradable waste in Australian marine waters is strictly controlled by the International Convention for the Prevention of Pollution from Ships (known as MARPOL 73/78) and in Queensland coastal waters by the Queensland *Transport Operations (Marine Pollution) Act 1995* (see General Ecosystem Impacts in the L4/L5 Line fishery assessment for details).

All solid non-degradable waste is stowed and disposed of in port at Karumba or Weipa. Given the penalty provision that apply to offences under both Commonwealth and Queensland legislation, the Workshop considered that in view of the substantial penalty provisions for non-compliance, compliance was likely to be high. In addition, the Workshop considered that the impact of dumping biodegradable material at sea was considered to be particularly localised and not measurable at the scale of the total fishery area.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No specific management actions are proposed.

Oil Discharge

MARPOL regulations apply to all the Queensland Gulf fisheries that prohibit the discharge of oily mixtures into the sea in Australian waters (AMSA 2005). Within 3nm of the coastline the *Transport Operations (Marine Pollution) Act 1995* and regulations protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal waters. It is an offence to deliberately discharge garbage, oil and chemicals into the marine environment and severe penalties apply (MSQ 2005).

The Workshop considered oil pollution not to be a significant problem in the fishery. Waste oil and oily water generated during fishing operations is managed appropriately onboard in accordance with the respective Commonwealth and Queensland laws. Vessels discharge in ports with facilities designed to receive this waste, e.g. Weipa and Karumba.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No specific management actions are proposed.

Terrestrial Impact

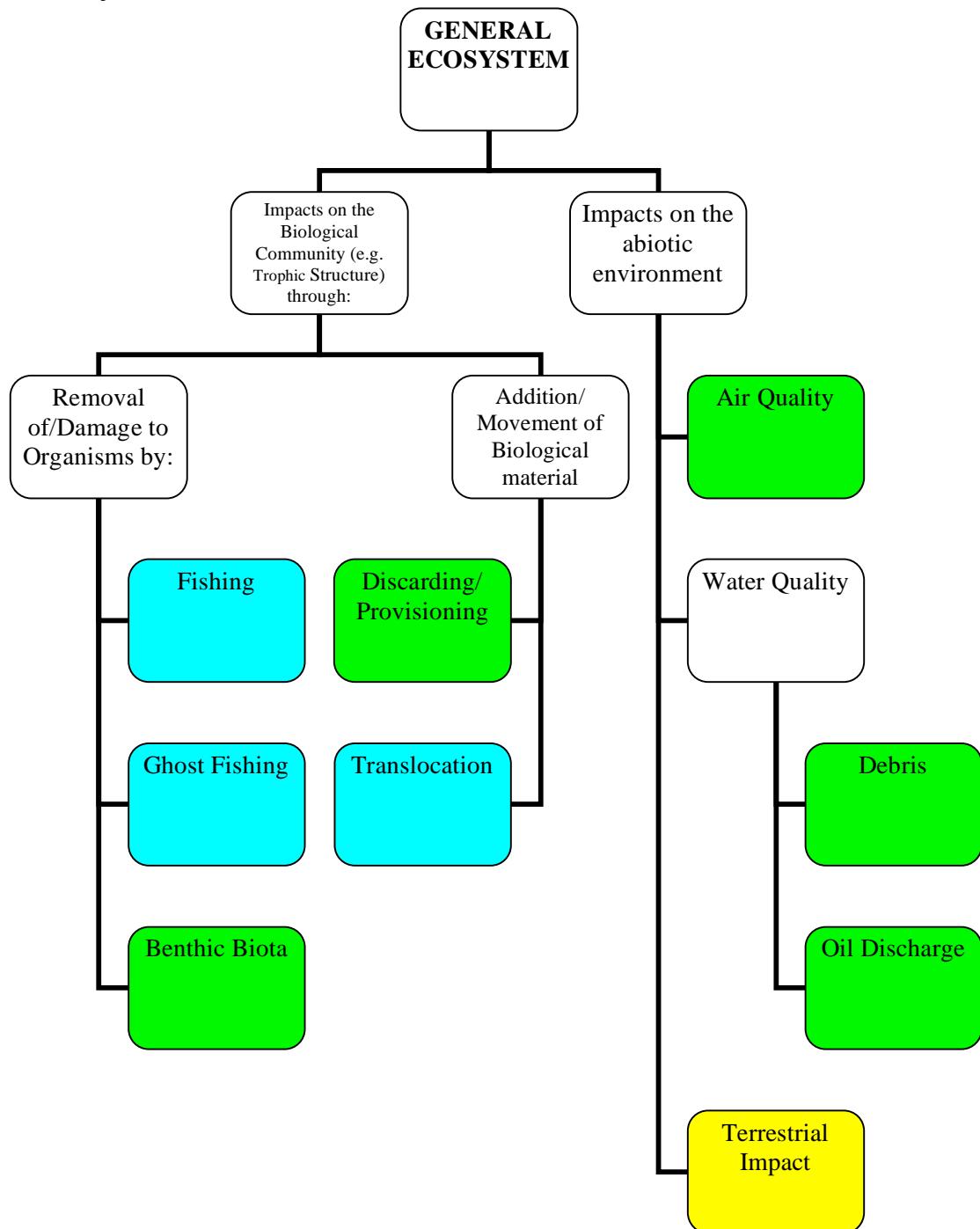
Some land camps used by N3 fishers are well maintained and some are not. This is a visual amenity consequence rather than an ecological one, but has been included in this assessment as it generated some concern at the Workshop. It was argued that at least within the local environs, there could be measurable changes to ecosystem components due to human impact. The Workshop agreed there was adequate anecdotal information to suggest that a moderate risk rating on this issue was appropriate.

ERA Risk Rating: Impact on the Ecosystem (C3 L3 Moderate)

Proposed Management Actions

This issue is not managed by the DPI&F. No specific fishery management actions are proposed.

Component Tree for General Ecosystem impacts in the Crab Pot Fishery



Trophic Level Interactions

Removal of/ damage to organisms by fishing

At least 75% of the Queensland mud crab population is not harvested (M. Doohan, DPI&F, *pers. comm.*, 2004). Assuming an even gender ratio and that all female crabs and all crabs below the legal carapace width (LCW) are returned to the water alive, only half of one half of the available fishable stock (i.e. only males at or above the LCW) are harvested. The Workshop considered that displacement of, or damage to the major part of the catch returned to the water, was likely to be minimal with only minor changes in the relative abundance of predator, dependent or competing species expected.

ERA Risk Rating: Impact on the Ecosystem (C1 L3 Low)

Proposed Management Actions

No specific management actions are proposed.

Removal of/ damage to organisms by ghost fishing

Based on research into ghost fishing in the Queensland blue swimmer crab fishery, there is a risk that crab pots retain incidental catch after being lost although the bait may have been eaten (Sumpton *et. al.* 2003). However, fishers report that few pots are lost in the commercial fishery. The incidence of lost pots in the recreational fishery is unknown and needs assessment. The Workshop considered that due to the reported low rate of pot loss in the fishery, there was only a slight possibility that lost pots in the commercial fishery were having anything more than a minor impact on the relative abundance of captured species or other associated ecosystem components.

ERA Risk Rating: Impact on the Ecosystem (C1 L4 Low)

Proposed Management Actions

The Workshop identified the following information needs to better define the extent of mud crab pot loss and ghost fishing in the Queensland Gulf:

- assess the level of the recreational pot loss and
- ascertain the relative incidence of pot loss compared to pot theft.

The Workshop also considered incorporating technological improvements to pot design (e.g. a biodegradable exit panel), that would minimise fishing efficiency of unattended pots over the long-term.

Removal of/ damage to benthic biota

Benthic impacts in the Queensland Gulf mud crab fishery was not discussed at the Workshop, but crab pots are static fishing gear and are not considered by DPI&F to have a significant impact on typically muddy bottom estuaries. The physical impact of a pot resting temporarily on estuarine sediments upon the ecosystem is considered to be negligible.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No specific management actions are proposed.

Addition/ movement of biological material

Discards Provisioning

Mud crabs are detritivores, one of a number of such species processing organic matter in mangrove-dominated tropical estuarine communities. Mud crabs are preyed on by large predatory fishes (notably sharks), which are significant components of the N3 and N9 fishery catches. There is some spatial separation between inshore and offshore shark species that prey on mud crabs. Therefore their removal is more likely to affect the inshore species and less likely to impact upon shark species retained only in the N9 offshore net fishery.

Given that three-quarters of the mud crab catch is returned to the water alive (see assessment of Removal of/ damage to organisms by fishing in this fishery), the impact of removal of one-quarter of the fishable stock upon inshore sharks (which are themselves removed by the N3 fishery), was considered by the Workshop to be insignificant and not measurable against natural variability in their populations.

Uneaten bait discarded from crab pots is consumed by marine scavengers and detritivores (including mud crabs, fish and prawns). Live undersized and female crabs are discarded into generally shallow turbid water, where their ability to hide from most predators and survival is expected to be high. The Workshop considered that the impact on the ecosystem of discarding this part of the catch to the water alive soon after capture, was likely to be negligible.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No specific management actions are proposed.

Translocation

Little likelihood exists of long distance translocation of biological material outside its native distribution within the fishery area. Most boats operate and remain within Gulf waters, with harvest product being air or road freighted to southern markets. Some crabbers are based on the Queensland east coast and move live crabs to market in Cairns. This may increase slightly the possibility of mud crab translocations to the east coast. For other species incidentally brought onboard during a pot lift, under normal operating conditions the likelihood of successful translocation would seem to be remote because of the long distances and transit times involved and the expected low potential of translocated species to withstand desiccation within stowed crab pots and then successfully adapt to new environmental conditions if pots were then deployed on the east coast.

The Workshop considered that it was only a remote possibility that translocation of viable biological material from Gulf pot captures would lead to permanent establishment of a species on the east coast and outside its native range.³¹

ERA Risk Rating: Impact on the Ecosystem (C3 L1 Low)

Proposed Management Actions

No specific management actions are proposed.

Impacts on the abiotic environment

Air Quality

The Workshop considered that compared to the total number of commercial non-fishing vessels (including ships, barges, dredges and launches) and recreational vessels (including speedboats and personal watercraft) plying Gulf coastal waters, Queensland Gulf fisheries in general would have a negligible impact upon local air quality.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No specific management actions are proposed.

Debris

Pollution by deliberately disposing of solid non-degradable waste in Australian marine waters is strictly controlled by the International Convention for the Prevention of Pollution from Ships (known as MARPOL 73/78) and in Queensland coastal waters by the Queensland *Transport Operations (Marine Pollution) Act 1995* (see General Ecosystem Impacts in the L4/L5 Line fishery assessment for details).

All solid non-degradable waste is stowed and disposed of in port at Karumba or Weipa. Given the penalty provision that apply to offences under both Commonwealth and Queensland legislation, the Workshop considered that in view of the substantial penalty provisions for non-compliance, compliance was likely to be high. In addition, the Workshop considered that the impact of dumping biodegradable material at sea was considered to be reasonably localised and not measurable at the scale of the total fishery area.

ERA Risk Rating: Impact on the Ecosystem (Negligible)

Proposed Management Actions

No specific management actions are proposed.

³¹ It is expected that a high proportion of Gulf species would have a natural range that extends to the tropical north east coast of Queensland

Oil Discharge

MARPOL regulations apply to all the Queensland Gulf fisheries that prohibit the discharge of oily mixtures into the sea in Australian waters (AMSA 2005). Within 3nm of the coastline the *Transport Operations (Marine Pollution) Act 1995* and regulations protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal waters. It is an offence to deliberately discharge garbage, oil and chemicals into the marine environment and severe penalties apply (MSQ 2005).

The Workshop considered oil pollution not to be a significant problem in the fishery. Waste oil and oily water generated during fishing operations is managed appropriately onboard in accordance with the respective Commonwealth and Queensland laws. Vessels discharge in ports with facilities designed to receive this waste, e.g. Weipa and Karumba.

ERA Risk Rating: Impact on the Ecosystem (*Negligible*)

Proposed Management Actions

No specific management actions are proposed.

Terrestrial Impact

Some land camps used by N3 fishers are well maintained and some are not. This is a visual amenity consequence rather than an ecological one, but has been included in this assessment as it generated some concern at the Workshop. It was argued that at least within the local environs, there could be measurable changes to ecosystem components due to human impact. The Workshop agreed there was adequate anecdotal information to suggest that a moderate risk rating on this issue was appropriate.

ERA Risk Rating: Impact on the Ecosystem (*C3 L3 Moderate*)

Proposed Management Actions

No specific management actions are proposed.