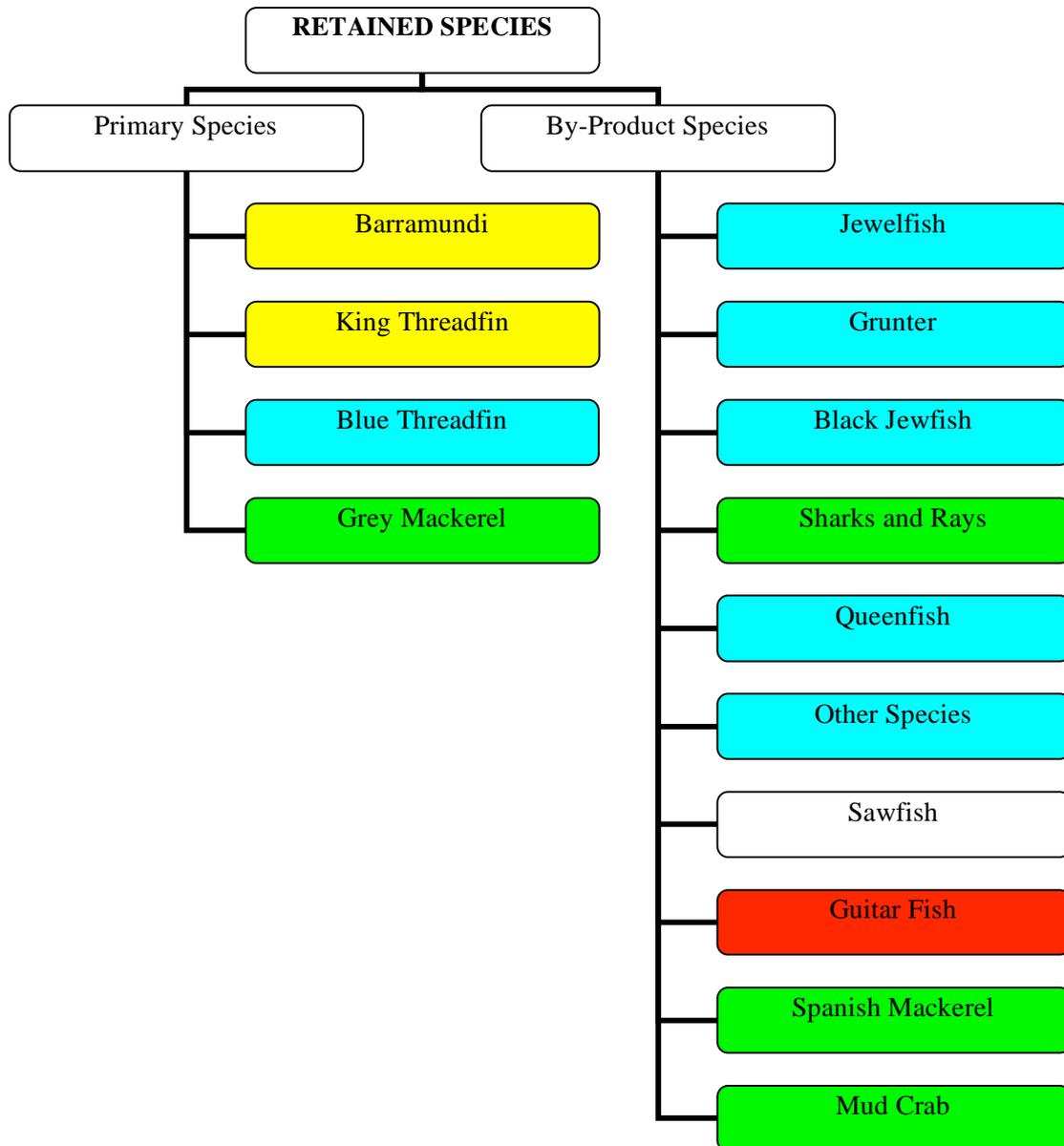


*Component Tree for Retained Species in the N3 Inshore Net Fishery*



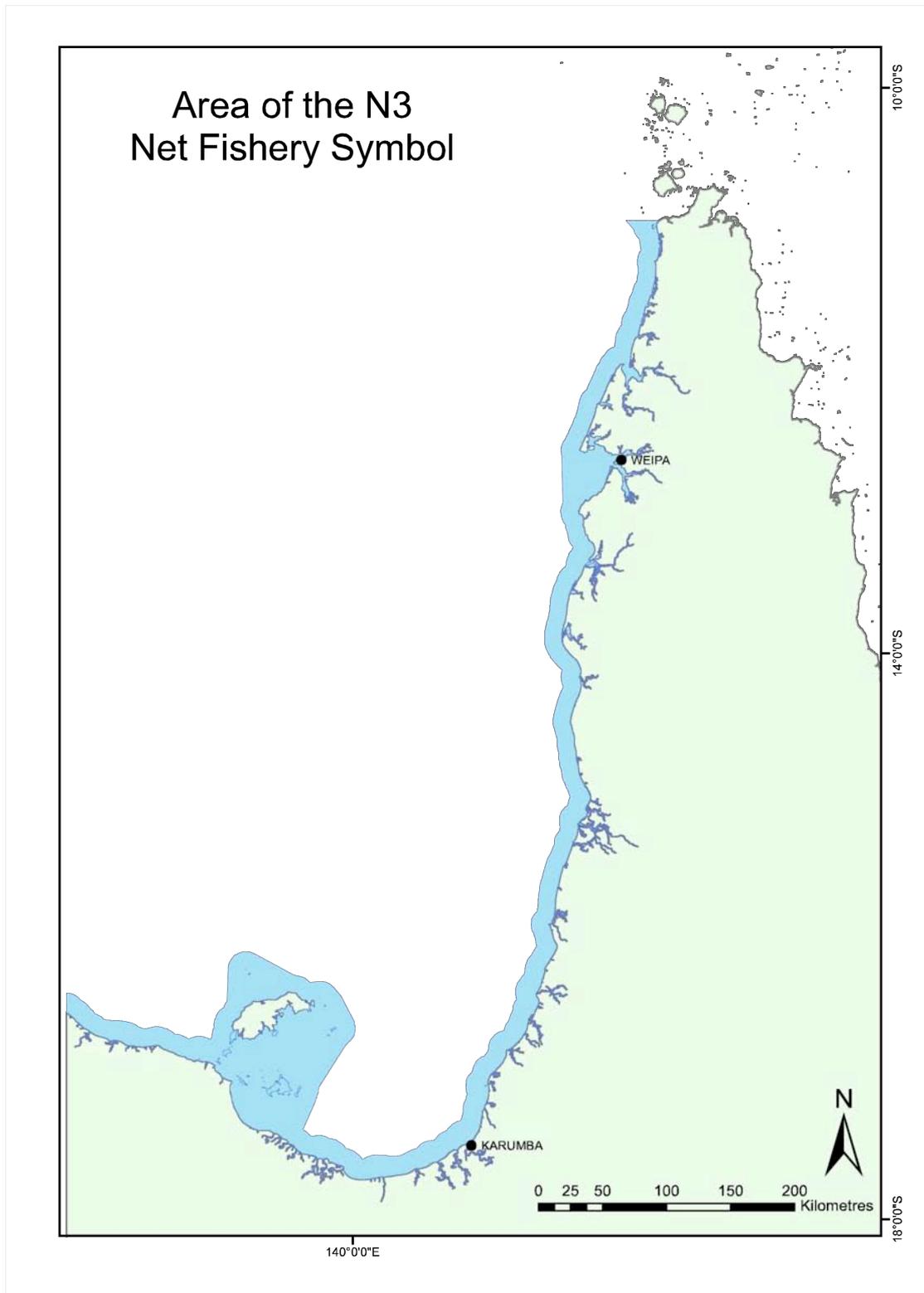
*Primary Species*

**Barramundi (*Lates calcarifer*)**

Barramundi are distributed widely throughout the west Indo-Pacific region, including rivers, lagoons, swamps and estuaries across northern Australia from the Noosa River in Queensland to the Ashburton River in Western Australia (Kailola *et al.* 1993).

Barramundi are targeted by commercial, recreational and indigenous fishers throughout their Australian range including the Gulf of Carpentaria; the extent of this

fishery in Gulf waters is displayed in Figure 6. The total Australian commercial barramundi catch in 2003/4 was 1600 t (ABARE 2005).



**Figure 6** Map displaying the geographical range of the N3 Net fishery

Queensland has the highest commercial barramundi catch of the Australian jurisdictions that occur within its range (Table 3). The average Queensland

commercial harvest, comprising of 60% from the Gulf and 40% from the east coast, is approximately 900t annually and (Garrett and Williams 2002). From 1998 to 2003, the Queensland Gulf commercial harvest ranged between about 500 t and 700 t (L. Williams, DPI&F, *unpub. data*, 2005). The Gulf recreational barramundi harvest is estimated to be 10% of the Queensland commercial harvest (Roelofs 2003) however, the indigenous harvest of this species in the eastern Gulf is uncertain.

**Table. Australian commercial barramundi harvest**

	<b>Annual Harvest (t)</b>	<b>Average Harvest (t)</b>
Queensland	923*	911**
Northern Territory	701*	780**
Western Australia	45#	40 #

\* 2003/4 harvest reported in ABARE 2005

\*\* 2001/2 – 2003/4 reported harvest in ABARE 2005

# 2003 reported harvest in Newman & Harvey. 2005

The Workshop noted that Queensland Gulf and East Coast barramundi stocks are currently being harvested at sustainable levels (Garrett and Williams 2002; Roelofs 2003). It is therefore likely that current management is effective in ensuring long-term recruitment and natural dynamics of the Gulf barramundi stock (e.g. seasonal flood-cued spawning) are largely unaffected by the fishery.

**ERA Risk Rating: Impact on breeding stock (C2 L6 Moderate)**

*Proposed Management Actions*

The Queensland Government is undertaking and will continue fishery independent monitoring of this species in key Gulf rivers that support commercial barramundi fishing (i.e. the Mitchell, Archer and Staaten Rivers).

**King Threadfin (*Polydactylus macrochir*)**

Within its northern Australian distribution, king threadfin are taken by commercial, recreational and indigenous fishers. The average commercial catch in the Queensland net fisheries is about 400 t /year (DPI&F 2005a). An estimated 300 t is harvested annually in Queensland-managed waters of the Gulf of Carpentaria<sup>8</sup> and 100 t on the Queensland east coast. Similar quantities of king threadfin are taken in the commercial net fisheries managed by the Northern Territory (ABARE 2005). Western Australia also reports significant commercial catches of threadfins. In 2003, the combined blue and king threadfin catch reported in the Kimberley Gillnet and Barramundi Fishery was about 90 t (Newman and Harvey 2005). Based on DPI&F 2002 recreational fishing survey catch data and other anecdotal information from the GoC fishers (Steve Parker *pers coms.* 2006), conservative estimate of the Queensland Gulf recreational combined king and blue threadfin catch is around 15t/year. Recreational and indigenous fishers account for 90% and 10% respectively of the non-commercial threadfin catch in Northern Australia (Lyle *et al.* 2003).

The status of this species is uncertain, but commercial catches in the Gulf have been increasing steadily since 1994 while fishing effort has remained relatively stable

<sup>8</sup> N3 and N9 catches combined

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(Roelofs *et al.* 2003). Although catch and catch rate analysis indicate the Gulf stock is not under any immediate threat from current fishing levels (Welch *et al.* 2002), the species is heavily fished across its entire inshore Australian distribution. From a precautionary viewpoint, the Workshop considered the possibility that together, commercial, recreational and indigenous fisheries could be having an effect on king threadfin recruitment levels.

**ERA Risk Rating: Impact on breeding stock (C3 L4 Moderate)**

*Proposed Management Actions*

Notwithstanding recent DPI&F research efforts (e.g. Welch *et al.* 2002), information about king threadfin biology is limited compared to other major Gulf net harvested species (e.g. barramundi). A research funding proposal to investigate the structure of Queensland- and Northern Territory-managed stock/s and their aggregations in the Gulf is currently up for consideration with FRDC. However, there are no other specific management actions proposed for this species.

**Blue Threadfin (*Eleutheronema tetradactylum*)**

Similar to king threadfin, blue threadfin are harvested by all fishing sectors across northern Australia. The average commercial catch in the Queensland net fisheries is about 190 t/year (DPI&F 2005a). On average an estimated 120 t is harvested annually in Queensland-managed net fisheries of the Gulf of Carpentaria<sup>9</sup> and 70 t from the Queensland east coast net fishery. Inshore net fisheries of the Northern Territory and northern Western Australia also report commercial catches of blue threadfin. The quantities taken in these jurisdictions are uncertain, but based on available information, when combined could be similar in quantity to the Queensland Gulf catch.

The species is targeted only occasionally in the Queensland-managed Gulf net fisheries and market demand influences the size of the harvest. Due to limited storage capacity, spoilage of the catch can sometimes be a problem, potentially reducing the quantity of blue threadfin that can safely be marketed.

The Workshop concluded that it was unlikely that long term recruitment of blue threadfin was being adversely affected at current exploitation rates in the N3 and N9 fisheries.

**ERA Risk Rating: Impact on breeding stock (C2 L3 Low)**

*Proposed Management Actions*

The FRDC application for research funding into the stock structure for Gulf king threadfin includes a proposal for similar work on blue threadfin, however, there is no specific management actions proposed for this species.

**Grey Mackerel (*Scomberomerus semifasciatus*)**

Grey mackerel are primarily a pelagic, oceanic species that numerically makes up not more than about 5% of the inshore N3 net fishery catch (Halliday *et al.* 2001; Roelofs

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<sup>9</sup> N3 and N9 catches combined

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2003). This species is a major target species in the N9 offshore net fishery (see the *Retained Species* section in the N9 fishery assessment for details). The Workshop concluded that the impact of the N3 fishery was unlikely to be measurable against background natural variability in the Gulf grey mackerel stock.

**ERA Risk Rating: Impact on breeding stock (*Negligible Risk*)**

*Proposed Management Actions*

There are no proposed management actions for this species in the fishery.

### *Byproduct Species*

#### *Jewelfish (*Nibea squamosa*)*

Jewelfish are not specifically targeted in the N3 fishery. An average annual commercial catch of approximately 50t/year is taken in the eastern Gulf or 2% of the N3 harvest (Roelofs 2003). The Workshop considered fishery impact to be equivalent to blue threadfin in terms of risk to the sustainability of this species.

**ERA Risk Rating: Impact on breeding stock (*C2 L3 Low*)**

*Proposed Management Actions*

There are no specific management actions for this species in the fishery.

#### *Grunter (*Pomadasys kaakan*, *Pomadasys argenteus*)*

Grunter is not specifically targeted by commercial fishers in the eastern Gulf. The main commercial catch occurs in the N3 fishery. Commercial harvesting has increased in recent years from 20 t/year during the mid-1990's to an average of 30 t/year from 2001 – 2003 (DPI&F 2005a). Grunter is a popular recreational species in the eastern Gulf where their harvest is estimated at 40-50 t/yr. Because they inhabit inshore waters and estuaries, grunter are also likely to be caught by indigenous fishers. *P. kaakan* has been reported in the Gulf Finfish Trawl Fishery bycatch (Roelofs and Stapley 2004). Stobutzki *et al.* 2001 reported *P. kaakan* and *P. argenteus* juveniles in the NPF bycatch; they assessed that there might be a moderate risk to the sustainability of both species.

There are anecdotal reports that this species is also heavily targeted by recreational fishers in some areas (e.g. in the south east Gulf). Concerns over local depletion in areas readily accessible to recreational fishers have not been supported by the available tag/recapture data from tagging studies done at these locations.

The Workshop concluded that the N3 fishery may be having a detectable but minimal impact on the population size grunter stocks, but due to the regionalised genetic pools of *P. kaakan* stocks and possibly *P. argenteus* stocks in the Gulf (Garrett 2002), the additional impact from the recreational and indigenous fisheries might require closer management.

**ERA Risk Rating: Impact on breeding stock (*C1 L5 Low*)**

*Proposed Management Actions*

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Recent concerns over the sustainability of this species from inshore and offshore fishing are acknowledged by the Queensland Government. Further measures to obtain better data to inform sustainable management of grunter in the Gulf are being considered including changes to the DPI&F LTM program to include monitoring of grunter stocks and development of regional scale recreational fishing surveys to provide improved data for future stock assessment.

### **Black Jewfish (*Protonibea diacanthus*)**

Harvested in significant quantities in the Northern Territory Coastal Line Fishery (Phelan and Hay 2004) but only in limited quantities (approximately five tonne per year) in northern Western Australian inshore net fisheries (Penn *et al.* 2005). In the Queensland Gulf net fisheries, the black jewfish forms only an occasional (<5 t/year) part of the N3 fishery catch (DPI&F 2005a). Together with other sciaenid fishes (excluding jewfish: see above), black jewfish make up about 1% of the catch retained in the N3 fishery. Stobutzki *et al.* 2001 reported juveniles of this species in the NPF bycatch and assessed that there might be a moderate risk from that fishery to its sustainability.

The Workshop considered that the take and area of capture by the N3 fishery is small compared the known area of black jewfish distribution across the whole of tropical northern Australia. The impact of the N3 fishery upon the known stock is therefore considered to be minor.

#### **ERA Risk Rating: Impact on breeding stock (C1 L3 Low)**

##### *Proposed Management Actions*

There are no proposed management actions for this species in the fishery.

### **Sharks and Rays (Lamniformes and Rajiformes)**

An annual harvest of about 350 t of sharks and 10 t of rays are taken in the Qld Gulf net fishery (DPI&F 2005a). The relative risk to the sustainability of shark and ray species captured in the N3 fishery has recently been assessed (Gribble *et al.* 2004). A few carcharhinid shark species (*Carcharhinus cautus*, *C. leucas*, *C. amboinensis* and the Great Hammerhead, (*Sphyrna mokarran*) appear to be the most at risk from inshore net fishing (*op. cit.*). Several other carcharhinids including *C. macroti*, *Hemigaleus microstoma* and *Negaprion acutidens*, the hammerheads (*S. lewini* and *Eusphyra blochii*) and the ray, *Aetobatus marinari* have been assessed to be at moderate risk. Shark species considered to be at relatively low risk from the N3 fishery are *C. amblyrhynchoides*, *C. limbatus*, *Rhizoprionodon taylori* and *R. oligolinx* (*op. cit.*).

#### **ERA Risk Rating: Impact on breeding stock (see Gribble *et al.* 2004 for risk ratings of individual species)**

##### *Proposed Management Actions*

Gribble *et al.* (2004) proposes the following measures to address the sustainability of high risk species in the fishery:

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- collaborative management of Indonesian, PNG and Australian tropical shark fisheries because these fisheries access stocks shared between these jurisdictions;
  - urgent acquisition of data on catch composition, stock structure, biology and optimal harvesting of high risk Gulf shark species (especially *Carcharhinus leucas*, *Sphyrna mokarran* and *Stegostoma fasciatum*);
  - development of effort standardisation to measure effort creep in Gulf net and line fisheries throughout the catch/effort data series;
  - a further review of the sustainability of Gulf sharks in April 2006.

### Queenfish (*Scomberoides commersonianus*)

Queenfish are not specifically targeted in the N3 fishery, but the annual harvest since 2000 appears to be increasing. Queenfish is a target species in the Northern Territory Coastal Net fishery harvesting a combined species average annual catch of about 35 t.<sup>10</sup> (Phelan 2004). Negligible commercial landings, < 1 t/year, from Western Australia (Penn *et al.* 2005) and small incidental catches of juvenile fish in the Northern Prawn Fishery (Stobutzki *et al.* 2001) have also been reported.

About 25 t of queenfish are harvested commercially each year in the Queensland Gulf net fisheries (L. Williams, DPI&F, *in prep.*, 2005). Commercial net catches of queenfish on the Queensland east coast were steady at about 45t/yr between 1996 and 2000 before increasing. Higher catches are taken in the N3 than in the N9 fishery. There is a high level of queenfish discarding when large numbers are caught simultaneously. About 20 t are caught by Gulf recreational fishers each year.

The Workshop considered that based upon the catches in the Queensland Gulf net fisheries compared to the total reported landings from all sources, that the N3 and N9 fisheries may have a detectable but minimal impact on the queenfish population size.

#### **ERA Risk Rating: Impact on breeding stock (C1 L5 Low)**

##### *Proposed Management Actions*

Annual monitoring of N3 catch composition is proposed to detect trends in the commercial catch of this and other species. Since the Workshop, research indicates that queenfish may be subject to growth overfishing in the Gulf (Dr. S. Griffiths, CSIRO, *unpub. data*). DPI&F will assess queenfish catch data from each of the fishing sectors and other relevant information and determine whether the current risk rating needs to be reviewed and further management considered.

### Other Species

Relatively small amounts of a number of estuarine species including golden catfish (*Arius thalassinus*), snub-nosed dart (*Trachinotus blochii*) and steelback (*Leptobramma muelleri*) (Halliday *et al.* 2001) are also harvested in the N3 fishery (making up a total annual harvest of about 15 tonnes).

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<sup>10</sup> Estimated total landings made up of 40 species

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The Workshop considered that the capture areas of these species in the N3 fishery represent only a small part of their known distributions (Froese and Pauly 2005). It was concluded that impacts from the small catches of this group of fishes in the N3 fishery was unlikely to be detectable at the stock level, therefore the risk to the sustainability of these species was considered to be relatively low.

**ERA Risk Rating: Impact on breeding stock (C1 L3 Low)**

*Proposed Management Actions*

Annual monitoring of catch composition to detect changes in commercial catch of these species.

### Sawfish (Pristidae)

Several tonnes of sawfish are reported in the annual commercial catches of Western Australian fisheries (Penn *et al.* 2005). Sawfish have also been reported in the NPF catch and their relative sustainability assessed among other elasmobranchs captured in that fishery (Stobutzki *et al.* 2002). Small quantities of the wide sawfish (*Pristis microdon*) were retained in the N3 fishery in the past, but this has ceased since its listing under the EPBC Act 1999. Most sawfish are now released upon capture. Gribble *et al.* (2004) have undertaken a more detailed assessment of the risk to sustainability of sawfish in the Queensland Gulf fisheries (see the N3 Fishery Non-Retained Listed Species assessment and the N9 Retained Species assessment for further details).

**ERA Risk Rating: Impact on breeding stock (C1 L3 Low)**

*Proposed Management Actions*

Please see Proposed Management Actions for Pristidae in the previous N9 section for details.

### Guitarfish (*Rhynchobatus*)

Guitarfishes (*Rhynchobatus* spp.) make up about 5% of the shark catch in the N3 fishery (Gribble *et al.* 2004). It is a moderately productive species in terms of its size at maturity and maximum size (moderate regeneration time and moderate vulnerability to over-exploitation). There is however, a high degree of uncertainty regarding its natural mortality, age at maturity and fecundity, making existing sustainability estimates for the species precautionary in nature (Gribble *et al.* 2004). It appears to be moderately susceptible to capture in the N3 and N9 fisheries relative to other northern Australian commercial fisheries. Sustainability of this species is potentially at risk (*op. cit.*).

**ERA Risk Rating: Impact on breeding stock (Moderate to High Risk)**

*Proposed Management Actions*

Guitarfish have been assessed by Gribble *et al.* (2004) to be at relatively high sustainability risk in the east coast commercial fisheries. The assessment concluded that management intervention be considered for east coast guitarfish. Any future management changes for this species on the east coast will also be considered in the context of sustainable management of guitarfish in the Gulf. Gribble *et al.* (2004)

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have pointed out stocks of some shark species captured in Queensland's Gulf net fisheries are shared with other jurisdictions. Consequently any efforts to sustainably manage the stocks should be conducted jointly among Queensland, Northern Territory and Western Australia governments. In order to achieve this, information is urgently required on the catch composition, stock structure, growth and reproduction and optimal harvesting of Gulf shark species.

To progress this agenda, DPI&F is addressing the taxonomic uncertainty over guitarfishes captured in the Gulf net fisheries. Genetic material has been compiled and a project proposed to investigate taxonomic uncertainties within this group. A taxonomic review of guitarfishes is planned for 2006 (Jenny Ovenden DPI&F Geneticist *pers. comm.* 2005).

### Spanish Mackerel (*Scomberomerus commerson*)

The N3 and N9 fisheries have a combined annual catch of Spanish mackerel of about 10% of the Gulf line fishery catch. Management of this species is therefore directed primarily at the Line Fishery (see the *L4/L5 Line Fishery Retained Species* assessment for details). By comparison the impact of the net fishery catch on the stock is considered to be negligible.

#### **ERA Risk Rating: Impact on breeding stock (*Negligible Risk*)**

##### *Proposed Management Actions*

There are no proposed management arrangements for this species in the N3 fishery.

### Mud Crabs (*Scylla serrata*)

The total annual Queensland mud crab fishery harvest is about 1000 t (Ryan *et al.* 2003). Approximately 15% of the harvest is taken from the Gulf and 85% from the east coast (DPI&F 2005a). The N3 fishery has an average mud crab harvest of only one tonne /yr (DPI&F 2005a). Management of this species is therefore directed primarily at the Gulf Pot Fishery (see the *Mud Crab Pot Fishery Retained Species* assessment for details).

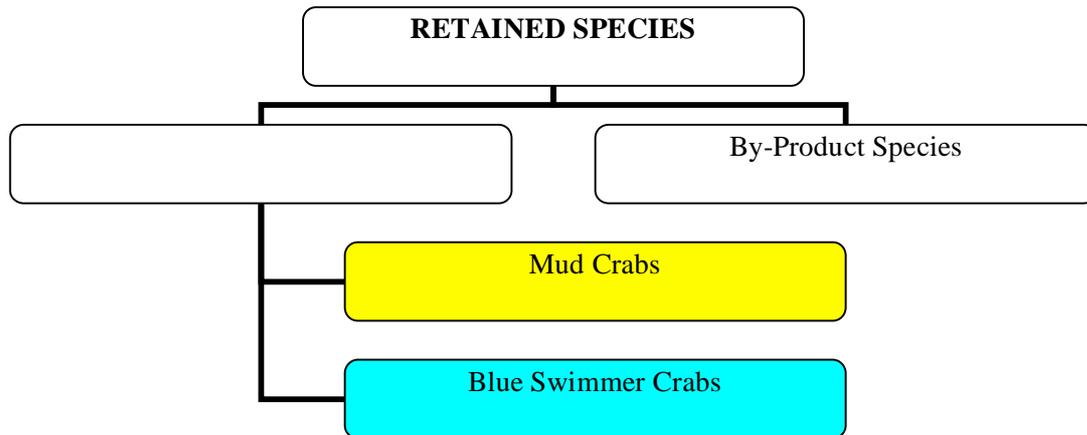
#### **ERA Risk Rating: Impact on breeding stock (*Negligible Risk*)**

##### *Proposed Management Actions*

There are no proposed additional management arrangements for this species in the N3 fishery.

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## Component Tree for Retained Species in the C1 Crab Pot Fishery



### Primary Species

#### Mud Crabs (*Scylla serrata*)

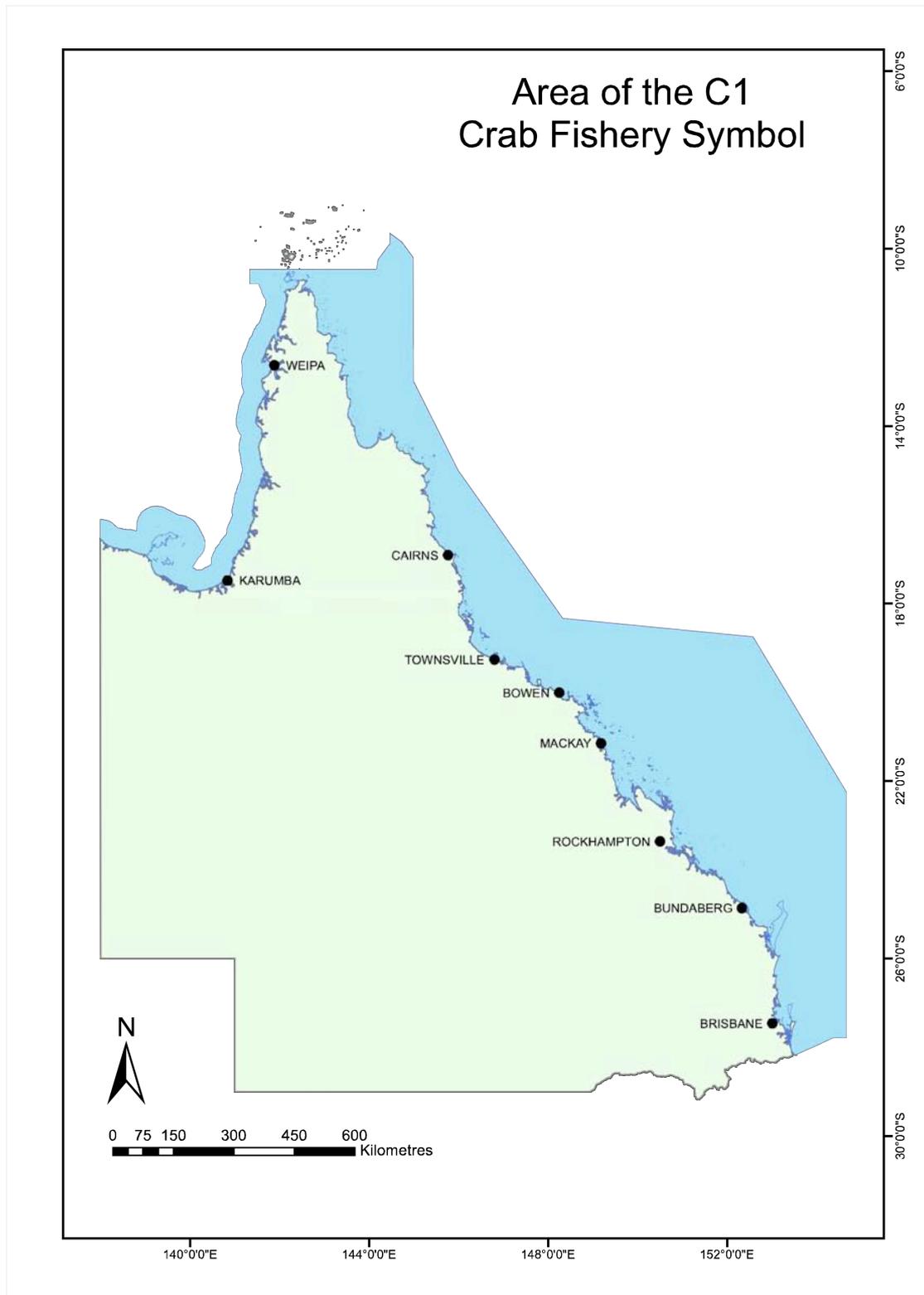
Three mud crab species are recognised inhabiting the Gulf. Only 2 species are landed and retained in the C1 mud crab fishery. Nearly all crab caught are *Scylla serrata*. The other species, *Scylla olivacea*, has a limited distribution in brackish estuaries of the North east Gulf (Ryan *et al.* 2003) and rarely attain 15 cm carapace width, the current minimum legal size (MLS). Commercial effort is largely concentrated from Weipa to Karumba, the fishery area is displayed in Figure 5. The fishery is therefore managed as a *S. serrata* fishery. The commercial harvest by the C1 fishery in the Gulf is about 150 t.

In Queensland, mud crabs are targeted by commercial and recreational fishers and taken by indigenous fishers. In 1996 the commercial catch was about 500 t, increasing to about 1,000 t in 2002. Catches in the Gulf net fisheries are low (see the *N3 Retained Species* risk assessment). The annual commercial harvest in Northern Territory and NSW is about 400 t and 200 t respectively. The Northern Territory commercial Gulf mud crab harvest is about 300 t. Mud crabs are only a very minor part of the commercial estuarine catch in Western Australia, about two tonne/ yr (Anon. 2003).

The total Queensland recreational mud crab harvest is estimated to be about 70% of the national recreational harvest (Lyle *et al.* 2003) however, the recreational catch specifically for the Gulf has not been defined in this report. A need exists for refining estimates of total recreational mud crab (and other species) catch in the Gulf. Anecdotal information suggests recreational catches have been poor in the last few years in some areas. The Queensland Gulf indigenous catch is uncertain, based on rough calculations from the catch estimates of Coleman *et al.* (2003) it may be in the vicinity of 5 t/ year.<sup>11</sup>

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<sup>11</sup> The estimated indigenous mud crab catch for northern Australia is about 100 t/year (Coleman *et al.* 2003)



**Figure 7** Map displaying the geographical range of the C1 Crab Pot fishery

Different management arrangements apply between Queensland and Northern Territory mud crab fisheries. Specifically, a different MLS applies in each jurisdiction and only males can be taken legally in Queensland, while both sexes may be taken in the Northern Territory.

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Recent, anecdotal reports suggest there may be increasing levels of parasitism among mud crabs in the Gulf. Mud crabs are considered a highly robust species and not prone to overfishing. The Workshop considered that the existing MLS regulations and ban on taking females in Queensland are adequate measures to ensure that the stock, if fully exploited, will be protected without adversely affecting long term recruitment to the fishery. It was also noted that there is no current indication the fishery may be having an adverse effect on the stock. However, commercial effort in the fishery is increasing and catch levels have stabilised in recent years. When viewed in the context of a significant commercial mud crab harvest in the Northern Territory Gulf and probably a significant Gulf recreational mud crab catch, a moderate risk rating has been assigned to ensure appropriate action is taken to sustainably manage the stock.

**ERA Risk Rating: Impact on breeding stock (C2 L4 Moderate)**

*Proposed Management Actions*

Removal of latent effort in the mud crab fishery (Gulf and East Coast) is proposed. The impact of the fishery licence and fee changes to be implemented for July 2006 on latent effort will be monitored and additional management actions amended if required. Long-term monitoring of catch rates is currently underway to address concerns about reduced mud crab catches around Weipa. Future assessment of the Gulf mud crab fishery stocks should consider the possible influence of localised depletion, recruitment failure, evidence of parasitism and seasonal/annual variability relating to environmental variability, in driving changes in catch levels.

**Blue Swimmer Crabs (*Portunus pelagicus*)**

Blue swimmer crabs are harvested in all mainland Australian State waters excluding Victoria. Australian commercial fisheries harvest about 1500 t/yr (Kumar 1997) and appear to have the potential to increase harvesting levels further (Sumpton *et al.* 2003). They are a highly robust species not prone to overfishing. Commercial, recreational and indigenous fisheries exist in Queensland. Blue swimmers crabs are targeted by commercial and recreational pot or dilly fishers or are harvested as byproduct in Queensland east coast otter and beam trawl fisheries. The total Queensland commercial catch was about 450 t in 1996 increasing to about 850 t in 1999. The estimated commercial harvest in 2000 was 630 t and the recreational harvest is about one-third of that (Sumpton and Williams 2002). The Western Australian commercial catch for this species was 1,000 t in 2002/03 (Penn *et al.* 2005).

Only about 200 kg of blue swimmer crabs are reported annually in the commercial Gulf Mud Crab Pot Fishery. The Gulf recreational harvest is also thought to be extremely low. Catches appear to be increasing slightly in the N3 net fishery over past few years and though a market exists for the species, the resource is not exploited by the Queensland Gulf net fisheries. Catches in the N9 net fishery are discarded. A significant catch occurs in Queensland east coast commercial pot and trawl and recreational pot fisheries –approximately 1000 t/yr.

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Given the relatively small area of the Gulf Mud Crab Pot Fishery with respect to the extensive range of blue swimmer crabs, and the extremely low catch level in this fishery compared to other commercial and recreational fisheries, the Workshop considered the fishery was likely to have an insignificant impact on the population of this species. Any impact from this fishery was unlikely to be measurable against background variability in the blue swimmer crab population.

**ERA Risk Rating: Impact on breeding stock (*Negligible Risk*)**

*Proposed Management Actions*

Continue to monitor the annual catch of this species in the Gulf Mud Crab Pot and N3 Net Fisheries.

*Byproduct Species*

There is no recognised byproduct species caught in the fishery.