

Monitoring of Coastal Sea Turtles: Gap Analysis

4. Olive ridley turtle, *Lepidochelys olivacea*, in the Port Curtis and Port Alma region

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Background

This study has been undertaken to provide a review and summary of available scientific literature and data on marine turtles in Central Queensland, particularly the Port Curtis and Port Alma region, and if required, expand the extent to consider turtle information for Queensland:

- Identify and update baseline data for suitable turtle habitat in the Port Curtis and Port Alma region at a distance of 500km north of Port Alma and south of Port Curtis
- Assess whether the available historical survey data are sufficiently robust to permit trend analyses. If so, undertake a trend analysis; undertake a formal power analysis of the reviewed data, if appropriate;
- Conduct a quantitative analysis of the historical trends in marine turtle numbers for the Port Curtis and Port Alma region; and
- Identify the migratory links between resident foraging turtles in the Port Curtis and Port Alma region and their nesting areas.

The olive ridley turtle, *Lepidochelys olivacea* (Figure 1), has a global distribution, occurring in all oceans. The biology and conservation status of olive ridley turtles has been reviewed at a global scale by Plotkin (2007) and Reichart (1993) and in Australia by Limpus (2008).

This is the most abundant marine turtle in the world, with particularly large nesting populations in the eastern Pacific Ocean (Mexico and Costa Rica) and in the northern Indian Ocean (India). The nesting populations in Australia are modest in size and genetically distinct from populations nesting in other countries (Jensen *et al.* in press)

Status

Within Australia, the olive ridley turtle is scheduled as an endangered species under both the Queensland and Federal conservation legislation and associated regulations, *Nature Conservation Act 1992* and *Environment Protection and Biodiversity Conservation Act 1999*, respectively.

Data sources

This gap analysis has drawn on information available in the published literature and in the two primary computerised data bases with the Queensland Department of Environment and Heritage Protection (EHP).

Queensland Turtle Conservation (QTC) database

EHP maintains a database that incorporates all tagging records for Queensland, incidental sighting records, nesting distribution and migration data for marine turtles in Queensland.

StrandNet

EHP maintains a database collating reports of sick, injured and dead marine wildlife (Cetaceans, dugong, turtles, threatened sharks and grouper) in Queensland (Biddle and Limpus, 2011). This data base includes turtle mortality from the Queensland Shark Safety Program.

These data sets have been supplemented with data sets managed by Dr Limpus which summarise international nesting and migration.

Index study sites

Nesting:

There is no index nesting beach for monitoring olive ridley turtle breeding in eastern Australia.

Foraging

There is no index foraging area for monitoring olive ridley populations in eastern Australia.

Nesting population

There has been no recorded breeding by olive ridley turtles in eastern Australia (Figure 2). In addition, there has been no recorded breeding by olive ridley turtles around the rim of the Coral Sea. Olive ridley turtle nesting has been recorded rarely within the island nations of the central and western Pacific Ocean.

The Australian nesting is mostly restricted to Western Cape York Peninsula, Arnhem Land and adjacent islands.

Stock identification

The species is wide spread as a foraging population through out the Great Barrier Reef and south to Moreton Bay (Robins and Mayer, 1998). However, there has been no analysis of foraging olive ridley turtles in eastern Australian to determine their genetic relationship to olive ridley turtle breeding aggregations (genetic stocks) in Australasia or the broader Pacific Ocean (Holder and Holder, 2007; Jensen *et al.* in press).

Migration

There are no flipper tag recoveries or satellite telemetry tracking data for olive ridley turtles foraging in eastern Australia to link them to distant nesting beaches.

Foraging population

The occurrence of olive ridley turtles foraging within eastern Australian waters was first recognised in 1974 (Limpus, 1975).

Lepidochelys olivacea is wide spread and regularly encountered with otter trawl fisheries over soft bottom habitats along the east Australian coast inside the Great Barrier Reef from south Queensland northward to Cape York (estimated annual catch rate during 1991-1996 = low hundreds/yr) and through Torres Strait (estimated annual catch rate during 1991-1996 = tens/yr) (Robins and Mayer, 1998). The species was most frequently captured at 6–35 m depth within the Queensland east coast trawl fishery (Robins and Mayer, 1998). The majority of the trawl captures of olive ridley turtles occurred in the tiger prawn fisheries of north Queensland (Robins and Mayer, 1998). During August 1982 – September 1984, twenty olive ridley turtles were tagged following their captured in prawn trawls in the Townsville area. No other attempt to systematically tag olive ridley turtles has been implemented in eastern Australia.

In contrast, except for a single capture of an immature olive ridley turtle in Port Dennison, Bowen, olive ridley turtles are not normally encountered foraging over inter-tidal seagrass pastures or the immediately adjacent sub-tidal habitats of coastal Queensland that have been index sites for marine turtle tagging-recapture studies (Limpus and Reed, 1985a; Limpus *et al.* 1994, 2005). Similarly, olive ridley turtles have not been recorded in coral reef habitats (Limpus and Reed, 1985b; Limpus *et al.* 2009).

While the species has been only rarely reported from within Port Alma and Port Curtis, olive ridley turtles have been recorded throughout the broader area of interest (500km radius) with respect to Port Alma and Port Curtis (Figure 3). Within the Mackay to Moreton Bay broader area of interest, the vast majority of olive ridley turtle records are from Hervey Bay southwards, i.e. south of the Great Barrier Reef.

When olive ridley data from all sources in the QTC database are pooled, olive ridley turtles recorded from the east coast of Queensland within Great Barrier Reef waters are significantly larger than olive ridley turtle from Queensland waters south of the GBR (Table 1. 1-way ANOV: $F_{1,78} = 16.98$, $p < 0.001$. Figure 4).

The olive ridley turtles recorded from south of the Great Barrier Reef are of a similar size structure to the post-hatchling pelagic foraging turtles entangled in ghost nets that wash ashore on western Cape York Peninsula (Table1; Figure 4). In addition, the majority of olive ridley turtle records from south of the Great Barrier Reef are of stranded debilitated and or dead turtles (= beach-washed turtles, Figure 3). There is a distinct possibility that a large proportion of the olive ridley turtle records from south of the Great Barrier Reef may originate from turtles in poor health washing ashore from the East Australian Current which flows closest to the mainland coast south of the Great Barrier Reef. This hypothesis is further supported by two of these turtles carrying long line hooks characteristic of a fishery operating in pelagic oceanic waters. An undetermined abundance of olive ridley turtles forages within the post-hatchling oceanic pelagic dispersal life history phase within the Coral Sea – Tasman Sea region of the south western Pacific Ocean (Robins *et al.* 2002). This aspect of the recruitment of olive ridley turtles from pelagic dispersal within the Coral Sea – Tasman Sea region to benthic foraging in eastern Australian coastal waters warrants further investigation, particularly because in the eastern Pacific Ocean, some olive ridley turtles utilise oceanic pelagic waters during their entire post-hatchling, immature and adult life history phases (Plotkin, 2003; Bolten, 2003).

The cause of death for the beach-washed olive ridley turtles in central and southeast Queensland is poorly understood, except for the externally obvious causes of death from human related causes (Table 2). The reported frequency of mortality from human related activities on the east coast of Queensland is low (0.09 olive ridley turtles/year) during the 23 years, 1990-2012. Given the mean reported mortality in prawn trawls prior to introduction of turtle excluder devices (TEDs) in the east coast trawl fishery during six years, 1991-1996, was 3.33 olive ridley turtles/year (Robins and Mayer, 1998), it is apparent that there has been an under reporting of human related mortality of olive ridley turtles in recent decades. It is expected that olive ridley turtle mortality in prawn trawls in eastern Queensland will have reduced to a very low level since the compulsory introduction use of TEDs in this fishery since 2001 (Limpus, 2008). Determination of the cause of death of the more frequently occurring beach-washed immature olive ridley turtles in south Queensland will require veterinary pathology assessment.

Diet

There has been no detailed study of the diet of olive ridley turtles in eastern Australia. Within the neritic habitats of northern Australia, adult and large immature olive ridley turtles are carnivorous, feeding principally on benthic gastropod molluscs and small crabs (Conway, 1994; unpublished data, EHP QTC Project).

GPS satellite telemetry combined with temperature-depth data logging of dive profiles could be used to determine the extent to which the olive ridley turtles of south Queensland coastal waters are benthic foraging or foraging in the pelagic surface layers.

Population dynamics

There have been no studies in Queensland to quantify key demographic parameters such as:

- Growth and age at maturity of wild olive ridley turtles.
Based on overseas studies, the ridley turtles appear to have the youngest age at first breeding – possibly less than 15 years of age (Chaloupka and Zug, 1997; Plotkin, 2007; Schmid and Witzell, 1997).
- Recruitment and annual survivorship with respect to any life history phase for the species.
These parameters are traditionally measured using long term tagging-recapture studies. Limpus and Whiting (2009) developed an alternate method for quantifying recruitment to the adult breeding population using gonad examination via laparoscopy to identify presence/absence of corpora albicantia with olive ridley turtles nesting in the Tiwi Islands, Northern Territory. Caillouet et al. (1995) has quantified survivorship for immature kemp's ridley turtle, *Lepidochelys kempii*, based on tagging-recapture studies in the Gulf of Mexico.
- Sex ratio, maturity ratio and adult breeding frequency.
These parameters can be assessed in foraging populations using gonad examination using laparoscopy (Limpus et al. 2005).
- Age (size) structure of the population
- Foraging area site fidelity and home range
These data can be quantified using GPS satellite telemetry of foraging olive ridley turtles foraging in eastern Queensland waters. This methodology would also allow for assessment of whether or not the immature olive ridley turtles of south Queensland were temporary residents of our coastal waters before move out to rejoin the oceanic pelagic dispersal phase in the Coral Sea – Tasman Sea.

In the absence of stock (management unit) identification for the olive ridley turtles foraging in eastern Queensland coastal waters, no assessment can be made regarding the sustainability of the population(s).

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A. Adult sized olive ridley turtle caught in a shark net at Cairns, 1974.



B. Hatchling olive ridley turtle from Mapoon, 2011

Figure 1. Olive ridley turtle, *Lepidochelys olivacea*, in northern Australia.

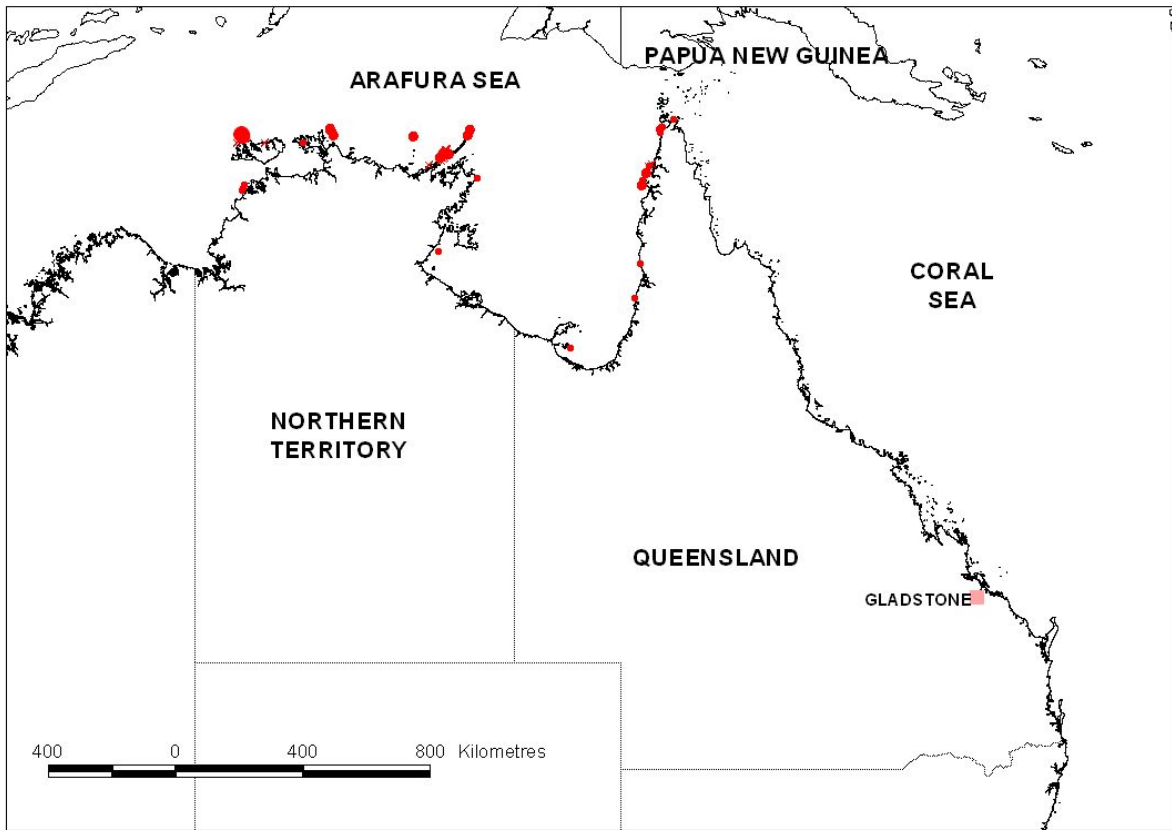


Figure 2. Olive ridley turtle, *Lepidochelys olivacea*, nesting distribution in eastern and northern Australia. Red dots denote recorded nesting localities.

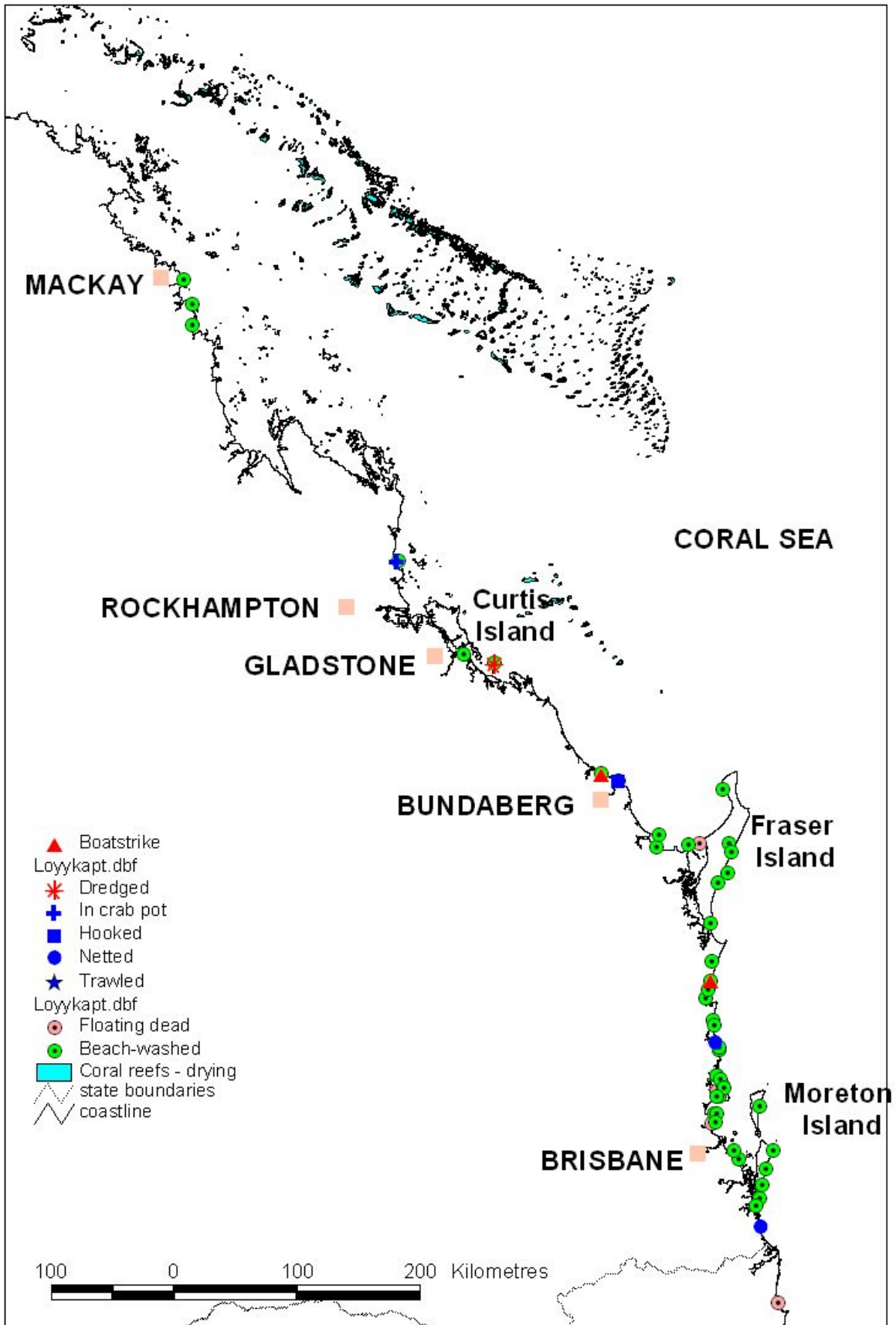


Figure 3. Records of non-nesting (presumed foraging) olive ridley turtles, *Lepidochelys olivacea* in south and central Queensland. Data derived from EHP Queensland Turtle Conservation data base and StrandNet.

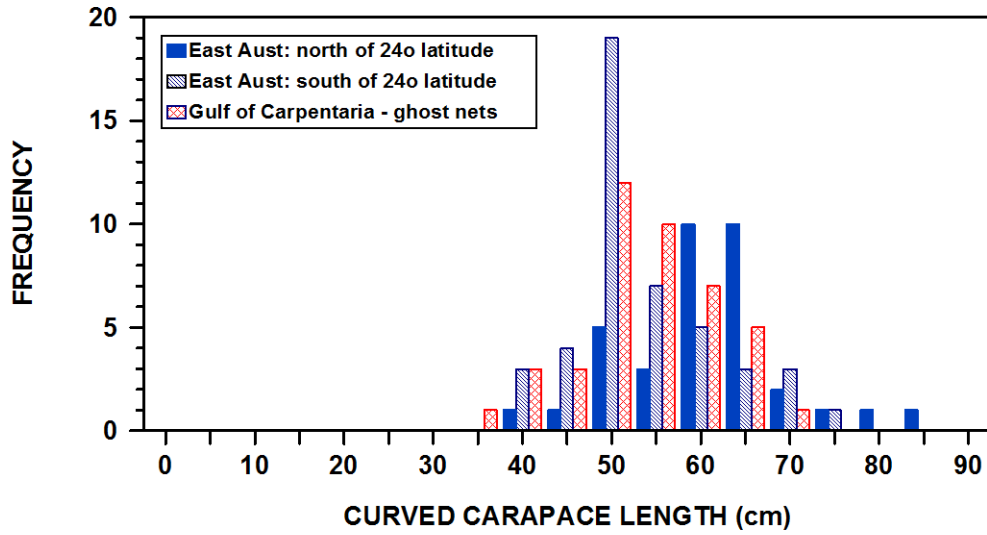


Figure 4. Size class distribution of *Lepidochelys olivacea* from three sources:

- east Australia south of the Great Barrier Reef (~24°S);
- east Australia within Great Barrier Reef waters;
- from ghost net entanglement in the Gulf of Carpentaria.

Table 1. Size of olive ridley turtles, *Lepidochelys olivacea*, from different geographical regions of Queensland. Data derived from QTC data base.

Sample	Curved carapace length (cm)			
	Mean	SD	Range	N
East coast of Queensland				
• Great Barrier Reef waters (nth of 24°S)	63.12	8.7598	40.0-85.0	35
• South of Great Barrier Reef (sth of 24°S)	55.51	7.7225	43.5-76.5	45
Gulf of Carpentaria – west Cape York Pen.				
• Pelagic foraging tangled in ghost nets	56.25	7.369	38.0-73.3	42

Table 2. Frequency of recorded olive ridley turtle, *Lepidochelys olivacea*, mortality from anthropogenic sources in south east Queensland waters by year and cause of death (StrandNet data).

Year	Source of mortality				
	Entangled in crabbing gear	Hooked on long-line	Tangled in fishing line	Boat strike	Dredging
1990					
1991					
1992					
1993				1	
1994					
1995					
1996					
1997			1	1	
1998					
1999		1		2	
2000				2	
2001					
2002					
2003					
2004				1	
2005		1			
2006				1	
2007			1		
2008					
2009					
2010	1				
2011					1
2012					
TOTAL	1	2	2	8	1
<i>L. olivacea</i> mortality/yr	0.04	0.09	0.09	0.34	0.04