

MARINE TURTLE POPULATIONS OF THE WESTERN AUSTRALIAN REGION

FLAGSHIP FAUNA/SPECIES - mention

IN THIS SEMINAR I WANT TO:

SHOW HOW THE KNOWLEDGE OF THE WESTERN AUSTRALIAN REGION MARINE TURTLE POPULATIONS HAS BEEN GREATLY EXPANDED TO FILL MAJOR GAPS INDICATED IN THE REVIEW PAPER 'THE STATUS OF AUSTRALIAN SEA TURTLE POPULATIONS' PRESENTED BY COL LIMPUS TO THE WORLD CONFERENCE ON SEA TURTLE CONSERVATION IN NOVEMBER 1979.

IN DOING THIS I WANT TO

1) POINT TO SOME OF THE VARIED PROBLEMS PRESENTED IN TRYING TO ADDRESS THE QUESTION OF IDENTIFYING AND DEFINING THE REGIONAL BREEDING POPULATIONS AND THE CURRENT STATUS AND TRENDS FOR EACH OF THE SPECIES GROUPS PRESENT.

2) PRESENT SOME OF THE DATA THAT WE HAVE OBTAINED THAT HELPS IN BETTER UNDERSTANDING OF THESE POPULATIONS AND THEIR CONSERVATION PROBLEMS.

and,

3) SUGGEST WHAT MUST BE DONE NEXT TO ENSURE THAT THE EFFORT ALREADY INVESTED IS NOT DISSIPATED.

THE TURTLES

Modern marine turtles are the living representatives of a lineage extending some 90 million years from the Age of Reptiles to the present. They are grouped in two families within the Sub-Order Cryptodira of the reptile Order Testudines (Chelonia).

TO REFRESH YOUR MEMORY, THERE ARE CONSERVATIVELY SEVEN SPECIES OF MARINE TURTLES WORLDWIDE: SIX OF THESE (in 5 genera) HAVE HARD, BONY BACKS (CARAPACES) = **F. Cheloniidae**: THE SEVENTH IS THE DISTINCTIVE LEATHERBACK, IN WHICH THE BONY LATERAL EXPANSION OF THE RIBS WHICH FORMS THE CARAPACE OF THE OTHER TURTLES IS REDUCED, AND REPLACED BY SECONDARY DERMAL OSSIFICATIONS STRENGTHENING AN OTHERWISE FLEXIBLE BODY WALL = **F. Dermochelyidae**.

The leatherback turtle, *Dermochelys coriacea*, is the only representative of the F. Dermochelyidae. The six species within the five recognized genera of the F. Cheloniidae are: the green turtle, *Chelonia mydas*; the hawksbill turtle, *Eretmochelys imbricata*; the loggerhead turtle, *Caretta caretta*; the flatback turtle, *Natator depressus*; and the olive (*Lepidochelys olivacea*) and Kemp's (*L. kempfi*) ridley turtles. The general phylogenetic relationships within this family group have been investigated using mitochondrial (mt) DNA analyses (Bowen *et al.* 1994). Their results are generally in accord with the accepted taxonomy at generic and specific level. The genetic basis for sub-species groupings is perhaps not so clear.

TWO OF THE BONY SHELLED TURTLES HAVE RESTRICTED DISTRIBUTIONS - KEMP'S RIDLEY (*Lepidochelys kempfi*) IS RESTRICTED TO THE TROPICAL ATLANTIC OCEAN. POPULATIONS OF THIS SPECIES HAVE BEEN SERIOUSLY DEPLETED.

THE FLATBACK TURTLE (*Natator depressus*) IS ENDEMIC TO THE AUSTRALIAN REGION, WITH ALL THE KNOWN BREEDING LOCATIONS WITHIN AUSTRALIAN TERRITORY. UNLIKE ALL OTHER SPECIES OF MARINE TURTLES, THE FLATBACK APPEARS TO LACK ANY PELAGIC POST-HATCHLING DISPERSAL AND GROWTH STAGE.

ALONG WITH THE FLATBACK, THE OTHER FIVE SPECIES ARE FOUND IN WESTERN AUSTRALIAN TERRITORIAL WATERS. THESE ARE THE GREEN TURTLE (*Chelonia mydas*), THE HAWKSBILL TURTLE (*Eretmochelys imbricata*), THE LOGGERHEAD TURTLE (*Caretta caretta*), THE OLIVE (=PACIFIC) RIDLEY (*Lepidochelys olivacea*), AND THE LEATHERBACK (*Dermochelys coriacea*).

THERE IS NO RECORDED BREEDING PRESENCE OF THE OLIVE RIDLEY, OR LEATHERBACK. THE OTHER FOUR SPECIES DO USE BREEDING SITES WITHIN WESTERN AUSTRALIAN TERRITORIAL WATERS.

LEGAL STATUS

THE LEATHERBACK AND LOGGERHEAD ARE CURRENTLY INCLUDED ON THE WESTERN AUSTRALIAN *THREATENED FAUNA* LIST: THE LEATHERBACK FOR MANY YEARS (HISTORIC REASONS, NOW MORE VALID), THE LOGGERHEAD AS A RESULT OF WAMTP WORK, NOTING ADDITIONAL DATA FROM THE LONGER TERM QUEENSLAND PROJECT OF Col Limpus

Internationally, the IUCN Amphibia-Reptilia Red Data Book Part 1 (Groombridge 1982) listed the leatherback, olive ridley, hawksbill and green turtles as 'Endangered' and the loggerhead turtle as 'Vulnerable' (to extinction). The Australian nesting and regional endemic species, the flatback turtle, was not considered threatened, but it clearly is of prime conservation responsibility for Australian authorities.

Presently, the official Australian view (*Endangered Species Protection Act 1992* (No. 194); [ESP Act 1992]) is that the loggerhead turtle should be regarded as 'Endangered' (ESP Act 1992 Schedule 1, Part 1 Listed Species), and that the leatherback turtle, a non-nesting species, but regular visitor in apparently small numbers to Australian waters, the olive (=Pacific) ridley, the hawksbill, and the green turtle should be regarded as 'Vulnerable' (ESP Act 1992 Schedule 1, Part 2 Listed Species). In Western Australia, the leatherback turtle was historically the only marine turtle included in the schedule of 'endangered or rare' species pursuant to provisions of the Wildlife Conservation Act 1950 (as amended). The leatherback turtle listing has been maintained and the loggerhead turtle has now been added in the most recent review (Western Australia: Government Gazette, 8 April 1994).

Problems with application to marine turtle populations of the standard IUCN 'Status' categories were recognized in compiling the 1982 listings, as noted in the more recent treatment of Groombridge and Luxmoore (1989). In this report, sponsored by the CITES Secretariat and focussed on the green and hawksbill turtles, the authors note however that exploitation and commercial trade have been major factors affecting populations of these two species. Historically, marine turtles have proven extremely vulnerable to sustained heavy intentional or unintentional exploitation worldwide. All species of marine turtles are presently listed on CITES Appendix I. Although some proposals for down-listing have been promoted in recent times, none have been approved (see Crouse 1993).

There is some inconsistency between the international and Australian national perceptions of the status of these marine turtles.

Some of the reasons for different perceptions of the status and state of knowledge of Australian region marine turtle populations are found in the fact that these populations have generally not in historic times, or previously, been subject to high levels of human contact and consequent exploitation. Potential impact of harvests such as that taken from green turtle populations in Western Australian waters to 1972 has yet to be properly assessed, however.

IMPORTANCE OF AUSTRALIAN MARINE TURTLE POPULATIONS

From a world perspective, the northern Australian region is practically unique, having extensive reef and coastal shallow water areas with comparatively very low levels of sustained impact of human usage, even in recent times.

Consequences are twofold; firstly, direct knowledge of the prior history and current status of the existing marine turtles resources of the area is limited at best, but, secondly, those populations of turtles that do inhabit these waters are perhaps the closest to an essentially pristine condition, despite the recent aberration of permitted commercial harvest.

KNOWLEDGE FOR CONSERVATION: why do the job?

Total information available on biology and life history of the marine turtles suggests that the present status of the adult populations reflects recruitment and mortality patterns extending back two or three decades or more in time, and that the effects of current processes affecting these populations will have a long lag-time before any particular consequences might be detected. Understanding of the nature and mode of operation of impacts of any such processes that might prove detrimental to particular marine turtle populations in the future will be preempted by any waiting for detection of substantial decline in abundance before implementing research.

Interpretation of any naturally incomplete and unstructured observations that might be available at this point will be practically impossible. Essential information on connectivity between nesting (rookery) sites and living areas (feeding grounds) of the adult turtles will also be unavailable.

Australian region marine turtle stocks are of prime international significance. Australian national and state conservation agencies thus have major responsibility for maintaining these populations. The general scope of the work still needed to make this possible was discussed at the AMTC workshop in late 1990, and is outlined in James (1994).

SO, FOR WA REGION, HOW APPROACH THE JOB in the first place?

THE FIRST PROBLEM - TROPICAL REMOTE LOCATIONS, WITH ATTENDANT SUMMER WEATHER RISKS - THE NESTING SEASON, WHEN AT LEAST FEMALE TURTLES WILL COME TO THE RESEARCHERS.

SECOND - NO GOOD DATA TO PLAN WORK, BUT GENERAL EXPECTATION THAT GREENS FINDABLE IN NUMBERS, AND SEASONAL NESTING FOCUSSED OK.

SO, WE WANT TO UNDERSTAND POPULATIONS, AND SPECIES - THIS POSES DIFFERENT SETS OF PROBLEMS: BROAD SURVEYS vs MORE INTENSIVE FOCUSSED LONGITUDINAL STUDY, but WE DO NOT KNOW THE NATURE OF THE POPULATION UNITS PRESENT. THE PROCESS WILL HAVE TO ADDRESS THIS QUESTION

A STRATEGY THAT COULD WORK - SEQUENTIAL DEVELOPMENT OF PARALLEL SPECIES POPULATION PROGRAM SEGMENTS. OK, GO THIS WAY FOR MAJOR PROJECT. THE SOONER START IS MADE THE BETTER (noting life history expectations).

USING NESTING FEMALES: NESTING LOCATIONS **info**, MAPS, AND ASSESSMENTS OF RANK EVENTUALLY NEEDED. DISPERSAL PATTERNS, GENETIC VARIATION, APPROPRIATE SCALE.

DISPERSAL FROM POINT SOURCES: - NEED MORE THAN ONE RELEASE POINT PER SPECIES! USE NORTH SOUTH SEPARATION WA COAST LOCATIONS. OTHER IMMEDIATE INVESTIGATIONS? LONG TERM CONSEQUENCES OF DECISIONS?

WHY NOT BLOW IMMEDIATE BUDGETS ON BROAD SCALE SURVEYS? PRACTICAL PROBLEMS OF SCALE, GROUND TRUTHING, AND ASYNCHRONY OF USE BY DIFFERENT SPECIES, APART FROM THE DIRECTIONS KNOWLEDGE TO PLAN. THERE ARE OTHER WAYS TO APPROACH IN LONGER TIME FRAME - NETWORKING, PIGGY BACK, etc.

THERE IS ALSO NEED TO ACQUIRE KNOWLEDGE OF REPRESENTATIVE POPULATION GROUPS - THIS REQUIRES INDIVIDUAL IDENTIFICATION, LARGE NUMBERS OF INDIVIDUALS PER GROUP, AND CONTINUITY. BETWEEN YEARS VARIABILITY, etc. LABOUR AND MATERIALS REQUIREMENTS.?

USER GROUPS? - ABORIGINAL HARVEST! OTHER? TOURIST CONTACT.

DECISIONS MADE, WORK IN PROGRESS: NOW FOR RESULTS.

IT SUFFICES TO SAY AT THIS POINT THAT LARGE NUMBERS OF TURTLES HAVE BEEN MARKED FOR INDIVIDUAL IDENTIFICATION IN COURSE OF THE WORK IN HAND. THIS HAS REQUIRED QUITE A FEW TAGS (at \$2.50 to \$2.90 each), AND THE LABOUR OF MANY PEOPLE OVER EXTENDED PERIODS, WITHIN AND BETWEEN YEARS (in excess of 750 VOLUNTEER work days per season in recent times, PLUS CALM staff inputs). *HOWEVER*, IT SHOULD BE FAIRLY CLEAR THAT **THE WORK WE ARE DISCUSSING IS NOT A PROJECT TO TAG TURTLES**, although this is a necessary task for part of THE WORK BEING DONE.

ROOKERIES: List, **Maps** - discuss GAPS, QUESTIONS, SIGNIFICANCE - this latter includes use assessments!

Table A. Summary Assessment of Results from Rookery Work Segments of the Western Australian Marine Turtle Project 1986 through 1994.

LOCATION	SPECIES PRESENT (1)	ROOKERY RANK (2)	STUDY DURATION (3)	INTENSITY OF WORK (4)	COVER RATING (5)
Lacepede Islands	F	5	*	.	B
	G	1-2	8	S2	
	H	6	*	.	
Barrow Island	F	4	5	SeB	C
	G	2-3	4 + 4	SeA + SeB	B / C ⁻
	H	6	*	.	
	L	6	*	.	
Muiron Islands	F	6	*	.	B ⁻
	G	3-4	4	Is 8-10	
	H	5	*	.	
	L	4-5	4	Ip 8-10	
North West Cape	G	3-4	1 + 5	Ip 8-10	B ⁺
	H	5	*	.	
	L	5	*	.	
Varanus Island (Lowendals)	F	5	*	.	B
	G	4-6	*	.	
	H	5	8	SeAA	
	L	6	*	.	
Rosemary Island (Dampier Archipelago)	F	4	*	.	C ⁺
	G	3-4	*	.	
	H	4	2 + 2	S1 + SeA	
	L	6	*	.	
Cape Thouin (Mundabullangana)	F	4	3 + 3	S1 - S3	C ⁺
Dirk Hartog Island	L	3	1	S2	B

Key: (1) G = Green, F = Flatback, H = Hawksbill, L = Loggerhead; (2) 1 = >1 000 per night peak observed, 2 = >200 per night peak observed, 3 = >100 per night peak observed, 4 = >25 per night peak observed, 5 = small numbers regularly observed, 6 = occasional only; (3) Rookery work for species targeted over 'n' nesting seasons, * = incidental to work on target species; (4) S'n' = Sampling over 'n' weeks within season, Se = extended sampling through season @ rating 'AA' substantial effort full season, rating 'A' major effort peak season, and rating 'B' limited intermittent effort peak season, Ip 'n' = intensive work through peak season for priority species over 'n' weeks, Is 'n' = intensive work through peak season for secondary target species over 'n' weeks; (5) Rating for project segment result relative to desirable target outcome for that job.

[Pt B, 14 August, 2007 10:37 hrs]

SPECIES POPULATIONS - DISPERSAL.

- GENETIC MARKERS.

Maps of *each*

LO, G, H, F, ??

What might this mean? eg, SOURCE OF REPORTS, GAPS IN DATA.

OTHER LIFE HISTORY DATA?

ADULTS: REPRODUCTIVE STRATEGIES AS PER REMIGRATION INTERVALS, CLUTCH SIZE.

REMIGRANT TURTLE OBSERVATIONS: LACEPEDE ISLAND GREENS

Season Tagged	Number Tagged	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	6 YEAR	7 YEAR	TOTALS
1986/87	420	-	-	17 (3)	5	37	15 (3)	5	79 (3)
1987/88	1 117	-	2 (1)	4 (3)	100	74 (1)	26 (3)	x	206 (4)
1988/89	927	-	-	53	29	23	x		105
1989/90	695	-	-	30	9	x			39
1990/91	212	-	-	6	x				6
1991/92	526	-	-	x					-
1992/93	555	-	x						-
1993/94	315	x							x
TOTALS	4 767	-	2 (1)	110 (6)	143	134 (1)	41 (6)	5	435 (7)

() = MULTIPLE REMIGRANT DATA

Average Remigrant Intervals Calculated for Different Tag-Year Groups.

Lacepede Islands Greens

1986/87	4.69 (4.82)	n = 85 (79 singles)
1987/88	4.52 (4.58)	n = 214 (206 singles)
1988/89	3.71	n = 105 singles
1989/90	3.23	n = 39 singles
1990/91	3.00	n = 6 singles
1991/92		N/a
1992/93		N/a

REMIGRANT TURTLE OBSERVATIONS: BARROW ISLAND GREENS

Season Tagged	Number Tagged	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	6 YEAR	7 YEAR	TOTALS
1986/87	322 124	-	-	2	-	5	1	3	11
1987/88	394 237	-	-	1	9	1	-	x	11
1988/89	559 49	-	-	-	-	1	x		1
1989/90	290	-	-	-	2	x			2
1990/91	5	-	-	-	x				-
1991/92	227	-	-	x					-
1992/93	49	-	x						-
1993/94	81	x							x
TOTALS	1 927 410	-	-	3	11	7	1	3	25

NNN = ADDITIONAL ANIMALS TAGGED IN WATER

REMIGRANT TURTLE OBSERVATIONS: NWC & MUIRON ISLAND GREENS

Season Tagged	Number Tagged	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	6 YEAR	7 YEAR	TOTALS
1986/87	4	-	-	-	-	-	-	-	-
	30	-	-	-	-	3	1	1	5
1987/88	2	-	-	-	-	-	-	x	-
	21	-	-	-	1	1			2
1988/89	554	-	-	-	1	1	x		2
	99	-	-	-	-	-			-
1989/90	450	-	1	3	12	x			16
	30	-	-	-	-				-
1990/91	8	1	-	-	x				1
	3	-	-	-					-
1991/92	457	-	-	x					-
	227	-	-						-
1992/93	620	1	x						1
	126	-							-
1993/94	181	x							x
	121								
TOTALS	1 927	2	1	3	13	1	-	-	20
	410	-	-	-	1	4	1	1	7

REMIGRANT TURTLE OBSERVATIONS: VARANUS ISLAND HAWKSBILLS

Season Tagged	Number Tagged	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	6 YEAR	7 YEAR	TOTALS
1986/87	18	-	-	1	1	1	2	-	5
1987/88	32	-	- (1)	2 (2)	3 (1)	4 (2)	4	x	13 (3)
1988/89	102	-	- (1)	4	14 (1)	3	x		21 (1)
1989/90	32	-	-	5	3	x			8
1990/91	29	-	1	4	x				5
1991/92	25	-	2	x					2
1992/93	38	-	x						-
1993/94	20	x							x
TOTALS	295	-	- (2)	3 (2)	11 (2)	7 (2)	1	3	57 (4)

() = MULTIPLE REMIGRANT DATA

Single turtle tagged 1985/86 remigrant at 5 years.

Average Remigrant Intervals Calculated for Different Tag-Year Groups.

Varanus Island Hawksbills

1985/86	5.00	n = 1 single
1986/87	4.80	n = 5 singles
1987/88	4.10 (4.77)	n = 19 (13 singles)
1988/89	3.78 (3.95)	n = 23 (21 singles)
1989/90	3.38	n = 8 single
1990/91	2.80	n = 5 singles
1991/92	2.00	n = 2 single

REMIGRANT TURTLE OBSERVATIONS: MUNDA & VARANUS ISLAND FLATBACKS

Season Tagged	Number Tagged	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	6 YEAR	7 YEAR	TOTALS
1986/87	6 11	- 1*	- 1	- -*	1 1*	- 1*	- -	- -*	1 4*
1987/88	0 10	- 1	- -*	- -	- 1*	- -	- 1	x	- 3*
1988/89	26 9	1 -	-* -	1* -	1 ² -	- -	x		3 ² -
1989/90	37 4	2 -	5* 1	-* 1	1 1	x			8* 3
1990/91	45 4	7* 1	4* -	4 -	x				15* 1
1991/92	177 4	18 ³ -	18 ³ 3	x					36 ³ 3
1992/93	110 6	9 -	x						9 -
1993/94	88 23	x							x
TOTALS	489 73	37 ⁴ 3*	27 ⁶ 5*	5 ² 1*	3 ² 3 ²	- 1*	- 1	- -*	57 ⁷ 14 ²

(^s; ^s) = MULTIPLE REMIGRANTS DATA

Average Remigrant Intervals Calculated for Different Tag-Year Groups.

Munda & Varanus Island Flatbacks

1986/87	4.00	n = 1 single;	2.11 (3.00)	9 (4 s)
1987/88	N/a	n = 0	3.00 (3.66)	5 (3 s)
1988/89	2.71 (2.67)	n = 7 (3 singles)	N/a	
1989/90	1.70 (1.75)	n = 10 (8 singles)	3.00	3 s
1990/91	1.71 (1.80)	n = 17 (15 singles)	1.00	1 s
1991/92	1.43 (1.50)	n = 42 (36 singles)	2.00	3 s
1992/93	1.00	n = 9 singles	N/a	

REMIGRANT TURTLE OBSERVATIONS: NWC & MUIRON ISLAND LOGGERHEADS

Season Tagged	Number Tagged	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	6 YEAR	7 YEAR	TOTALS
1986/87	0	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	1	-	1
1987/88	0	-	-	-	-	-	-	x	-
	3	-	-	-	-	-	-	-	-
1988/89	5	-	-	-*	1	-*	x		1*
	6	-	-	-	-	1			1
1989/90	18	-	2	1	1	x			4
	2	-	-*	-	1*				1*
1990/91	22	-	-	-	x				-
	28	-	3	2					5
1991/92	13	-	-	x					-
	124	3*	21*						24*
1992/93	5	-	x						-
	246	2							2
1993/94	16	x							x
	174								
TOTALS	79	-	2	1*	2	-*	-	-	5*
	590	5*	24 ²	2	1*	1	1	-	34 ³

(^s; ^s) = MULTIPLE REMIGRANTS DATA

Average Remigrant Intervals Calculated for Different Tag-Year Groups.

NWC & **Muiron Island** Loggerheads

1986/87	N/a	n = 1 single;	6.00	1 single
1987/88	N/a	n = 0	N/a	
1988/89	3.00 (4.00)	n = 3 (1 single)	5.00	1 single
1989/90	2.75	n = 4 singles	2.67 (4.00)	3 (1 s)
1990/91	N/a		2.40	5 single
1991/92	N/a		1.80 (1.88)	26 (24 s)
1992/93	N/a		1.00	2 single

POPULATION CONSEQUENCES? IS RECRUITMENT CONTINUOUS, OR WITH GAPS? HOW IS THIS HAPPENING? Speculative!

MODELING ANALYSIS FOR PROBLEM SOLVING.

THE LATEST CROWDER et al. (1994). GROWTH STUDIES? DEFICIENCY IN OURS - EXMOUTH ONLY POSSIBLE CURRENT.

POST-POPULATION DEPLETION AND RECOVERY - RELEVANCE TO EXMOUTH cf THE PAST FISHERY -TIME SERIES DATA, PATTERN EXPECTED. CAN WE TELL WHAT IS GOING ON?

WHAT ABOUT NORTHERN SPECIES GROUPS? GREENS, WA, northern AUSTRALIA, INDONESIA. BROWSE rookery, ETC. THE HAWKSBILL enigma. WHAT ABOUT OUR LOGGERHEADS? FISHERIES BY-CATCH, PRESENT, PAST?

NON-NESTING SPECIES: LEATHERBACK - IS ACCESSIBLE. DATA BEING ACQUIRED. GENETICS.

OLIVE RIDLEY - IS INTRACTABLE CURRENT, POSSIBLY NOT MAJOR OCCURRENCE, ALTHOUGH ONE CARCASE SALVAGED QUESTIONABLE LOCALITY.

WHERE DO WE GO NOW?! WHAT SHOULD WE BE DOING?!

NONE OF THE DATA WE HAVE ACQUIRED SHOW THAT ANY PARTICULAR SPECIES POPULATION IS CONFINED TO WA JURISDICTION, ALTHOUGH THERE ARE ALMOST CERTAINLY POPULATION SEGMENTS THAT ARE eg, LOGGERHEADS IN PERTH REGION, SOME OF THE FLATBACKS, GREENS, AND HAWKSBILL.

ON THE OTHER HAND, IT IS QUITE CLEAR THAT ALL THE LEATHERBACKS ARE MIGRATORY, ALONG WITH SOME OF THE LOGGERHEADS AND GREENS; ALSO OLIVE RIDLEYS MIGRATORY. HAWKSBILLS???

OF THE MIGRANTS: LEATHERBACKS = INTERNATIONAL; GREENS and LOGGERHEADS, NATIONAL AND INTERNATIONAL COMPONENTS. HAWKSBILLS AND FLATBACKS UNKNOWN STATUS.

SHOULD WE ARGUE JURISDICTION/RESPONSIBILITY? I THINK ANZECC HAS RECOGNIZED NATIONAL RESPONSIBILITY FOCUS. SO, QUESTION - HAS THIS BEEN PUT ON FIRM FOOTING?

I THOUGHT ± SO AFTER 1990, BUT NOTHING FORMALIZED. NOW SEEMS TO HAVE FALLEN APART/ COL LIMPUS ANCA?

SO, WE HAVE SOME VERY IMPORTANT REGIONAL SPECIES ROOKERIES WITH PARTIAL DATA FOR SOME SPECIES POPULATION UNITS - OF THESE, THE MOST IMPORTANT STRATEGICALLY ARE THE LACEPEDE ISLANDS (Greens), VARANUS ISLAND and ROSEMARY ISLAND (Hawksbills), MUIRON ISLANDS and DIRK HARTOG ISLAND (Loggerheads).

MUNDABULLANGANA IS FOCALLY IMPORTANT FOR FLATBACK/PUBLIC CONTACT.

NORTH WEST CAPE PRIMARILY GREEN/PUBLIC CONTACT.

CURRENT MANAGEMENT DEVELOPMENT plus CONTINUING ECOTOUR - LIMITED CARRYING CAPACITY MOST YEARS ON EVIDENCE!

OUR DATA - USE, FURTHER ANALYSIS.