

Proceedings of the Inaugural Southern Queensland Elasmobranch Research Forum



**Thursday 28th April 2005
Moreton Bay Research Station
North Stradbroke Island, Queensland**

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& Michael B. Bennett**



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AUSTRALIA

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Cover photo: Zebra shark *Stegostoma fasciatum* (photo by Richard Pillans).

CONTENTS

Acknowledgements	<i>i</i>
Introduction	<i>iii</i>
Programme	<i>iv</i>
Abstracts	1
Participants & Research Interests	14
Checklist of Chondrichthyes of the southeast Queensland region, Western Central Pacific	23

INTRODUCTION

The inaugural Southern Queensland Elasmobranch Research Forum (SQERF) was held at the University of Queensland's Moreton Bay Research Station on North Stradbroke Island in April 2005. This forum was designed to highlight research into the biology, physiology and ecology of elasmobranchs in southeast Queensland with a strong focus on postgraduate students. The elasmobranchs consist of the sharks and batoids (or rays) and are represented in southern Queensland by 111 species from 36 families, equating to approximately 10% of the global fauna and around 70% of the total number of species known from Queensland. In recent years, the profile and intensity of elasmobranch research has rapidly increased globally, largely due to a heightened awareness of the vulnerability of this group to population depletion from human activities, to which their conservative biological characteristics predispose them. Many, if not most, sharks and rays grow slowly, mature at relatively late ages, have a small number of young and low levels of natural mortality. These characteristics result in very low rates of potential population increase with little capacity to recover from overexploitation. Despite these biological characteristics and increasing commercial interest in this group, baseline biological information such as growth rates, age at maturity, fecundity, dietary information and assessment of population status are lacking for most elasmobranch species.

A parallel increase in elasmobranch research interest and activity has followed in southern Queensland and hence SQERF was convened to create a better understanding of current elasmobranch research and expertise between research groups and institutions with an interest in the diverse elasmobranch fauna of southern Queensland; to define future research needs and objectives, facilitating, where appropriate and where possible, collaboration between research groups and institutions; and, to facilitate better coordination and exchange between research groups of elasmobranch material for research purposes. The forum was attended by researchers, students, managers, policy-makers, aquarists and commercial fishers, all with an active interest in elasmobranch biology, fisheries, conservation, management or public display. A keynote address was presented by Dr John Stevens of CSIRO Marine Research, Hobart who discussed the history of Australian elasmobranch research and future research needs.

The focus of the day, however, was on postgraduate research with 21 presentations (oral and posters) from students studying at Queensland, Griffith and Macquarie Universities. Presentations were presented on a wide array of research topics including general biology and ecology, physiology, sensory biology, biogeography, biomedical science, phylogeography, parasitology, conservation biology and population ecology. The forum highlighted the need to incorporate postgraduate research results into the management and decision-making process in order to better inform fisheries management and conservation objectives. It is hoped that SQERF will become an annual event, aimed at showcasing postgraduate research by new and continuing students with an interest in the sharks and rays of the region.

PROGRAMME

Session 1 – Introduction to SQERF and Keynote Address

Time	Speaker & Institution	Title
9:00-9:05am	Mike Bennett University of Queensland	Welcome and introduction to SQERF.
9:05-9:50am	John Stevens CSIRO Marine Hobart	Chondrichthyan research in Australia: its history, CMAR involvement and future directions.
9:50-10:15am	Peter Kyne University of Queensland	The chondrichthyan fauna of southern Queensland.
10:15-10:30am	Morning Tea	

Session 2 – Overview Talks

Chairperson: Mike Bennett

10:30-10:45am	Jeff Johnson QLD Museum	Queensland Museum Ichthyological Collection and the role of collections in research.
10:45-11:00am	Craig Bohm/Patty Zenonos Australian Marine Conservation Society	Killing sharks - should we? An overview of the AMCS National Fisheries Campaign.
11:00-11:15am	John Salini CSIRO Marine Cleveland	An overview of the ACIAR Indonesian Sharks and Rays, and the FRDC Sustainability of Northern Australian Sharks & Rays projects.
11:15-11:30am	Wayne Sumpton QLD Department of Primary Industries & Fisheries	Current research initiatives in the Queensland Shark Safety Program.
11:30-11:45am	Ilze Brieze EPA	The QLD Environmental Protection Agency and shark conservation.
11:45-12:00pm	Jenny Ovenden QLD Department of Primary Industries & Fisheries	Genetic population subdivision in commercial shark resources in northern Australia and Indonesia.
12:00-1:00pm	Lunch	

Session 3 – Student Talks

Chairperson: Tracey Scott-Holland

1:00-1:12am	Richard Pillans CSIRO/Uni QLD	Physiological ecology of bull sharks in the Brisbane River and Moreton Bay.
1:13-1:25pm	Tom Lisney University of Queensland	The brain and sensory ecology in elasmobranchs.
1:26-1:38pm	Carley Bansemer QPWS	Biology, distribution, dispersal and conservation requirements of the grey nurse shark.
1:39-1:51pm	Vera Schluessel University of Queensland	The biology of <i>Aetobatus narinari</i> , with specific emphasis on the olfactory system in comparison to other elasmobranchs.
1:51-2:03pm	Clint Chapman Griffith University	The epaulette shark and the fight against cellular suicide in low oxygen conditions.
2:04-2:16pm	Bree Tillett University of Queensland	Prey discrimination and foraging behaviour of the blue-spotted maskray <i>Dasyatis kuhlii</i> in Moreton Bay.
2:17-2:30pm	Stephen Taylor University of Queensland	Biogeography of sharks in the shallow water habitats within Moreton Bay.
2:30-2:45pm	Afternoon Tea	

Session 4 – Student Talks

Chairperson: Peter Kyne

2:45-2:57pm	Christine Dudgeon University of Queensland	The ecology of the leopard shark <i>Stegostoma fasciatum</i> in southern Queensland.
2:58-3:10pm	Blake Harahush University of Queensland	The development of the visual system of <i>Chiloscyllium punctatum</i> .
3:11-3:23pm	Tom Kashiwagi University of Queensland	Comparative study to test the effect of agility on intraspecific phylogeography of sharks and rays.
3:24-3:36pm	Susan Theiss University of Queensland	Colour vision in the blue-spotted stingray <i>Dasyatis kuhlii</i> .
3:37-3:49pm	Tanya Huon Griffith University	Epaulette shark population survey on the reef flats of Heron Island.
3:50-4:05pm	Lenore Litherland University of Queensland	Visual biology and critical habitat of the sandbar shark <i>Carcharhinus plumbeus</i> .

4:05-5:00pm **Session 5 – Discussion Session** **Chairperson: Richard Pillans**

5:00-6:00pm **Session 6 – Poster Session**

Poster Titles:

Scott Cutmore University of Queensland	Metazoan parasites of Australian elasmobranchs.
Jade Hinner University of Queensland	Colour vision in the giant shovelnose ray <i>Rhinobatos typus</i> .
Charlie Huveneers Macquarie University	Chondrichthyan research within Macquarie University.
Ian Jacobsen University of Queensland	A taxonomic and biological review of <i>Gymnura australis</i> (Ramsay & Ogilby, 1885) and the Gymnuridae.
Simon Pierce University of Queensland	Conservation biology of the estuary stingray <i>Dasyatis fluviorum</i> Ogilby, 1908.
Jeremy Smith University of Queensland	Initial observations on the taxonomy and biology of <i>Rhynchobatus</i> spp., commercially important elasmobranchs on the east coast of Australia.
Joanna Stead University of Queensland	The biology and ecology of <i>Chiloscyllium cf punctatum</i> Müller & Henle, 1938 and orectolobid sharks in southeast Queensland.
Jonathan Werry Griffith University	Sharks as cleaners of the ocean? Feeding strategies and habitat associations of sharks in Queensland waters.
Barbara Wueringer University of Queensland	Electroreception of shovelnose rays.

ABSTRACTS

Keynote Address:

Shark research in Australia: its history and future directions

John Stevens

CSIRO Marine and Atmospheric Research

The Aborigines were the first people to record sharks in Australia, illustrating them in rock carvings. The first white people to mention sharks were the early Dutch voyagers, such as Carstenszoon in 1623 and Willem de Vlamingh in 1697, followed by the English explorer and naturalist William Dampier in 1699. The first specimens and drawings of Australian sharks were taken back to England or Europe as a result of Cook's voyages. Sir Joseph Banks made specimens, notes and drawings available to many naturalists of the time so that many Australian sharks were named by foreigners. As a result of voyages during the 19th Century many sharks were named by naturalists such as Peron, Le Suer, Quoy and Gaimard, Dumeril, Müller and Henle, Peters, Klunzinger, Günther and Gill. More recently Regan, Fowler and Garman in particular have added to the subject. The first Australian elasmobranch worker, and probably the first native-born Australian ichthyologist, was E.C. Hobson of Victoria, who provided an excellent description of the elephant shark for the Tasmanian Journal in 1842.

In more recent times, the impetus for shark research has usually been commercial fisheries or shark attack. In America and South Africa, shark attack funded or triggered a considerable amount of research while in Australia this has not been the case and apart from the work of Coppleson it has received little attention. During the 1980s, almost all Australian shark research was carried out either by Victorian or Western Australian State fisheries, or by CSIRO; very little research was carried out at the Universities. This situation has certainly changed in the last 5-7 years with other agencies and many Universities now involved in shark research.

Shark work at CSIRO has involved assessment work (northern and southern fisheries), systematic and biodiversity studies, work on bycatch and endangered species, and risk assessments. Future shark work at fisheries agencies is likely to have a strong focus on ecosystem studies, spatial dynamics and behaviour through electronic tagging, and risk assessments. Particular groups needing attention are high-seas and slope stocks, and batoids.

Biology, distribution, dispersal and conservation requirements of the grey nurse shark, *Carcharias taurus* (Rafinesque, 1810)

Carley Bansemer

Queensland Parks and Wildlife Service & University of Queensland

The grey nurse shark is one of Australia's most threatened marine species. It is estimated that there are less than 500 individuals remaining on Australia's east coast. Since the 1800s this species has been hunted for its oil, flesh, skin and fins. Historically, due to their fierce appearance and being mistaken for other sharks that pose a danger to humans, large numbers of grey nurse sharks were killed by recreational spear and line fishers and in shark control programs. Current threats to the recovery of grey nurse sharks include incidental capture by commercial and recreational fisheries, shark control activities and tourism. It is thought that fishing activity, particularly recreational line fishing, is impacting severely on the existing grey nurse shark population. The species has one of the lowest reproductive rates known amongst elasmobranchs. Currently, little is known about grey nurse shark home ranges, nursery grounds, local movement corridors, migration routes, other sites and how these differ between the sex, pregnancy status and age of grey nurse sharks.

This research will generate information on movements of grey nurse sharks over various spatial scales to better understand their biology and population status, both of which will assist in the

effective management of the species. This will be achieved through non-invasive mark-recapture models, long- and short-term tracking of individuals, DNA analysis and behavioural experiments aimed to determine the extent to which divers can impact on grey nurse shark behaviour. Results from this research will be used to provide management agencies with the conservation actions necessary to effectively manage the Australian east coast population from key threats to ensure this population is protected from extinction.

Killing sharks - should we? An overview of the AMCS National Fisheries Campaign

Craig Bohm

Australian Marine Conservation Society

Australian Marine Conservation Society (AMCS) is Australia's national marine conservation organisation. Our Sharks and Rays campaign focuses on raising the profile of elasmobranchs, their vulnerabilities and threats, and on improving their conservation. Our basic premise is that Australia's sharks should be protected like whales and dolphins and not killed for commercial or recreational exploitation. For more information visit: www.amcs.org.au

The Queensland Environmental Protection Agency and elasmobranch conservation

Ilze Brieze

Queensland Environmental Protection Agency

The Environmental Protection Agency (EPA) is the agency responsible for nature conservation in Queensland. As such, it administers a range of state-based legislation including the Nature Conservation and Marine Parks Acts, which may be applied to the conservation of marine and freshwater species. The EPA has used these Acts in recent years to increase protection of the grey nurse shark. This species was listed as “endangered” under the Nature Conservation Act and, in collaboration with the Department of Primary Industries and Fisheries, new diving laws were introduced in Moreton Bay Marine Park, and new fishing laws in Moreton Bay Marine Park and at Wolf Rock, in order to protect the grey nurse shark and its habitat. Other species of shark and sawfish have also been nominated and recommended for listing; these potential listings are awaiting Ministerial approval, while other nominations are in the pipeline. The EPA is currently undertaking a state-wide species prioritisation project to provide ongoing strategic direction for the conservation and recovery of species that occur in Queensland. This process will lead to the identification of elasmobranch species of concern and the implementation of subsequent research and management actions. The EPA’s focus is on management-oriented research, much of which is conducted by external agencies, and the Agency is involved in priority activities such as grey nurse shark monitoring. Other activities of the EPA that are relevant to elasmobranchs include the inclusion of both Commonwealth and State listed species in the Agency’s state-wide stranding program, and the compilation of species information in the Agency’s corporate wildlife information system.

Anoxia induced apoptosis in the anoxia tolerant epaulette shark *Hemiscyllium ocellatum* and the hypoxia intolerant grey carpet shark *Chiloscyllium punctatum*

Clint Chapman

Griffith University

Oxygen availability not only limits survival in extreme environments but also in biomedical settings during myocardial infarction and stroke. Few vertebrates can respond to low oxygen (hypoxia) or zero oxygen (anoxia) in order to prolong the survival of vital organs such as the heart and brain. We have previously reported that the epaulette shark is a unique anoxia tolerant model within tropical waters (exposed to 27°C), possessing many strategies for surviving cyclic

exposure to severe hypoxic and anoxic stress in their natural environment while maintaining all/some level of activity.

During hypoxic or anoxic stress the epaulette shark activates protective mechanisms to conserve cellular homeostasis and avoid necrotic cell death. However following anoxic stress, during reperfusion, a second cell death pathway may be activated known as programmed cell death or apoptosis. Knowledge of apoptotic cell death within elasmobranchs is currently extremely limited, however has been described by Renshaw to be minimal in the epaulette shark brain following hypoxic insult. Therefore this study aims to characterise the apoptotic cell death pathway in response to anoxia and reperfusion stress in the anoxia tolerant epaulette shark and the hypoxia intolerant grey carpet shark.

Apoptotic cell death will be measured in real time in the heart and tissue slices of the brain using Annexin V with FITC attached fluorescent marker to examine the activation, progression, location and quantity of apoptotic cell death within the tissue during reperfusion following anoxic stress. Pro-apoptotic and anti-apoptotic components will also be measured using Western Blotting and real time PCR to determine if elasmobranchs have conserved this apoptotic system and if the anoxia tolerant epaulette shark possesses any unique protective strategies against apoptotic cell death. Thereby offering key insight into the cellular physiological strategies of an anoxia tolerant (*H. ocellatum*) and intolerant (*C. punctatum*) elasmobranch in response to anoxic stress and activation of apoptosis.

Metazoan parasites of Australian elasmobranchs

Scott C. Cutmore, Tracey B. Scott-Holland, Thomas H. Cribb and Michael B. Bennett
University of Queensland

Australian waters are inhabited by a diverse shark and ray fauna. Associated with these elasmobranchs is an even more diverse array of metazoan parasites with representatives from six phyla. Members of the Mollusca, Acanthocephala, Annelida, Nematoda, Arthropoda and Platyhelminthes have all been recorded as parasites of elasmobranchs. This project is a collaborative effort between elasmobranch biologists and ecologists and several parasitology research groups with research focussed largely on the Cestoda, Digenea and Copepoda. As the parasite fauna of the vast majority of Australian elasmobranchs is unknown our research involves taxonomic studies, aimed at identifying species on different hosts and describing any new species, and investigations into aspects of their ecology.

The ecology of the leopard shark *Stegostoma fasciatum*

Christine Dudgeon
University of Queensland

This project investigates the ecology and population dynamics of the leopard shark *Stegostoma fasciatum* with particular emphasis on a temporal aggregation in southern Queensland (QLD). Leopard sharks aggregate annually in shallow coastal waters of southern QLD over the austral summer and to date, there is very little information on this species in the wild and the function and duration of this aggregation is unknown. A multi-technique approach is used to investigate the aggregation including: 1. A direct observational mark-recapture study using visual tags and photo-identification to quantify the abundance, sex ratio and size distribution of leopard sharks in southern QLD; 2. Acoustic telemetry to investigate the seasonality and site-fidelity of leopard sharks visiting the primary aggregation site; 3. Kinship genetics to investigate the genetic relatedness of leopard shark within the southern QLD aggregation; and, 4. Population genetics and phylogeography to investigate the broad scale distribution of leopard sharks within Australasian waters.

The development of the visual system in *Chiloscyllium punctatum*

Blake K. Harahush, Nathan S. Hart and Shaun P. Collin

University of Queensland

Elasmobranchs possess a battery of well-developed sensory systems, including the visual system, which, contrary to traditional beliefs, is extremely important. The development of this system varies widely between vertebrate species showing different reproductive strategies. *Chiloscyllium punctatum* is an oviparous elasmobranch, which displays no parental care and whose yolk reserve is completely absorbed prior to hatching. The growth of 16 *C. punctatum* was monitored through a window cleared in the egg case as well as *in vitro* and the development of the retina was monitored using light and electron microscopy. Eyecup formation begins early (25 days post deposition, dpd) in *C. punctatum* and retinal cell differentiation begins around 57 dpd with the development of ganglion and Müller cells. The retinal interneurons follow, with the amacrine (81 dpd), horizontal (101 dpd) and bipolar (101 dpd) cells. The photoreceptors (124 dpd) are the last to differentiate. By the end of retinal differentiation, cells are smaller and more tightly-packed as retinal thickness decreases due to stretching of the continually growing retina. *Chiloscyllium punctatum* shows a different retinal differentiation order to the teleost species observed. Based on the appearance of synapse formation along the visual pathway, captive bred *C. punctatum* have functional vision by 124 dpd, and therefore, prior to hatching (around 160 dpd).

Colour vision in the giant shovelnose ray *Rhinobatos typus*

Jade Hinner

University of Queensland

Elasmobranchs are one of the most diverse and oldest surviving taxa of marine animals in the world's oceans. Many of them are apex predators and their visual system is important for many social and environmental interactions. Sharks and rays have been of great interest to humans for centuries, which makes it unusual as to why we know so little about their visual ecology.

The giant shovelnose ray *Rhinobatos typus* is known to inhabit coral reefs in waters around the northern half of Australia. This species has been the subject of a microspectrophotometric (MSP) study, and there is physiological evidence showing that *R. typus* has multiple cone types in the retina - which makes this particular species of ray a suitable candidate for a behavioural colour vision study. Rays were to be subjected to behavioural tests allowing them to make a choice between a broad spectrum white light and a light of yellow pigment. However, due to some unexpected events the experiments were cut short and no data was obtained. However, this is not to say that it will not be continued in the near future.

Chondrichthyan research within Macquarie University

Charlie Huvneers, Luciano Beheregaray, Shannon Corrigan, Rob Harcourt, Adam Stow and Vic Peddemors

Macquarie University

Chondrichthyan research has recently increased within Macquarie University in several departments, including the Graduate School of the Environment and the Department of Biology. Current projects include: 1. The impact of NSW targeted fishery on wobbegong sharks (Orectolobidae). The project aims to assess the impact of fishing in NSW through investigation of taxonomic issues in NSW, analysis of catch data, collection of life-history information and determination of age and growth. These will provide the basis for using demographic models to assess wobbegong resilience to current fishing pressure; 2. Conservation genetics of wobbegong sharks in Australian waters. The project aims to analyse the population genetic structure and dispersal of wobbegongs. Specifically a molecular approach will elucidate current and historical

patterns of population genetic structure, document dispersal patterns for the group and describe their mating systems; 3. Conservation management of grey nurse shark (*Carcharias taurus*). The project is using genetic analysis to differentiate the East Coast population of the grey nurse shark from other populations throughout its distribution range, assess dispersal among the known aggregation sites and develop an understanding of the grey nurse shark's mating system and in particular, effective population size; and, 4. Forensic methods of identifying white sharks (*Carcharodon carcharias*). This project is developing molecular approaches to species identification using tissue samples in order to detect the presence of white sharks and potentially other species of conservation concern in products imported into and exported from Australia.

A taxonomic and biological review of *Gymnura australis* (Ramsay & Ogilby, 1885) and the Gymnuridae

Ian Jacobsen

University of Queensland

The current Gymnuridae taxonomic review will include 80-90 head, fin and body measurements and will be based on the collection of new specimens and those in registered fish collections throughout the Indo-Pacific region. This morphological analysis aims to clarify the taxonomic status of this group of fishes with particular emphasis on *G. australis*. When completed, a 'user friendly' guide to the Indo-Pacific Gymnuridae species will be developed to assist in the long-term monitoring of the various species by marine park authorities, fisheries and the wider community. The study into the biology of *G. australis* will be the first detailed analysis of any gymnurid species and will include growth and ageing, diet and reproduction. An opportunistic analysis of their associated parasites will also be included. Growth rates, ageing studies and knowledge of a species reproductive biology are necessary to understand the effects increased fishing pressures and/or habitat modification may have on regional gymnurid populations. Vertebral ring analysis, ring margin increments, size/mass graphs, size at maturity, fecundity, reproductive seasons, time of mating, pupping, and dietary analysis including the Index of Relative Importance (IRI) for prey items, will all be employed during the current analysis. The dietary analysis will also indicate the range of prey items taken by *G. australis*, which will permit inferences about its foraging strategies; possible resource partitioning and/or niche overlap with other benthic elasmobranch species.

Queensland Museum Ichthyological Collection – role of museum collections in research

Jeff Johnson

Queensland Museum

Museum collections act as a repository for type specimens, and are best known as a resource for taxonomic and other morphological research. They are widely used as a reference to aid in and standardise identifications, and to house species and locality records. There are currently 355 primary types and about 37,000 lots of fishes in the Queensland Museum (QM). Most specimens were fixed in formalin and subsequently preserved in ethanol. Alcohol-fixed tissue samples are few, but a growth area in museum collections. QM collections have been accumulated from 1880 to the present and often have multiple lots of species, to represent intraspecific and geographic variation. A collection database is maintained, containing a variety of detailed information on the specimens. Both specimens and the associated database are regularly accessed and utilised for various purposes by a wide spectrum of researchers for projects as diverse as systematics, biogeography, conservation management, archaeology, invasive species, population dynamics and parasitology. Researchers are encouraged to utilise the collection and to lodge specimens collected in the course of their research projects with the museum. Preference is given to sustainable, non-destructive research. Specimens intended for lodgement with the museum should be accompanied by detailed collection data, especially GPS co-ordinates, date and habitat details.

Comparative study to test the effect of vagility on intraspecific phylogeography of sharks and rays

Tom Kashiwagi

University of Queensland

Dispersal, population connectivities and population structure are particular interest of fisheries scientists, conservationists and biologists. Molecular approach of the investigation provides novel empirical insights which integrate information from ecology, natural history, ethology, and geology. My current project aims to investigate genetic population subdivision within various shark and ray species within Indo-Australian Archipelago and aims to test hypothesis that species with low vagility are more genetically subdivided than ones with high vagility, with phylogeographic analysis of over 25 species of sharks and rays using mtDNA markers (control region and CO1 gene). Preliminary results for sharks indicated that the level of genetic subdivisions within this region are generally not high but are present in some species such as *Carcharhinus sorrah*, *Rhizoprionodon acutus* and *Hemigaleus microstoma*. Investigations into ray species are underway.

The chondrichthyan fauna of southeast Queensland: overview and conservation status

Peter M. Kyne^{a,b} and Rachel D. Cavanagh^b

^aUniversity of Queensland; ^bIUCN Shark Specialist Group

The class Chondrichthyes, comprised of the sharks, batoids (rays) and chimaeras, is represented in the southeast Queensland (SEQ) region (defined here as the area south of Sandy Cape, Fraser Island to the Queensland/New South Wales border and extending seaward to the edge of the Australian Fishing Zone, i.e. 200 nautical miles) by 37 families totalling 115 species (four chimaeras, 68 sharks and 43 batoids; refer to species checklist on page 23 of these proceedings), equalling ~10% of the global total and ~66% of the Queensland total. The most speciose groups are the requiem sharks (family Carcharhinidae) with 23 recorded species and the whiptail stingrays (family Dasyatidae) with 12 recorded species. SEQ represents an important area of chondrichthyan diversity and is well represented by both temperate and tropical species-assemblages with several species approaching either the northern or southern extent of their range within the region.

The IUCN-World Conservation Union's Shark Specialist Group has a global programme underway to assess the conservation status of the world's chondrichthyan fauna for the *IUCN Red List of Threatened Species*TM. The Red List is widely recognised as the most comprehensive source of information on the global conservation status of plant and animal species. To date, Red List assessments have been undertaken for 82% of chondrichthyan species occurring in SEQ, a region subject to considerable human pressure through commercial and recreational fishing, habitat degradation and loss, and expanding tourism. SEQ is a significant region for the Critically Endangered Australian east coast population of the grey nurse shark *Carcharias taurus*, and is important for several globally threatened species such as the zebra shark *Stegostoma fasciatum*. However, the region is also home to several lesser known threatened species and future conservation and management decisions within SEQ may be vital in ensuring the viability of these species. These include Colclough's shark *Heteroscyllium colcloughi*, a rare endemic to northern NSW and southern Qld whose centre of abundance is SEQ, particularly Moreton Bay, and whose habitat is subject to heavy fishing pressure, particularly by trawling; the estuary stingray *Dasyatis fluviorum*, which has undergone significant declines in population size and range on the Australian east coast, however Moreton Bay and Hervey Bay continue to support strong populations, the monitoring of which will be vital to the species' long-term survival; and, the purple eagle ray *Myliobatis hamlyni*, an extremely rare east coast Australian species occurring on the outer continental shelf and upper slope, known from only a handful of specimens mostly collected from heavily trawled areas. One species of chondrichthyan, the green sawfish *Pristis zijsron*, has become locally extirpated from the region. The last SEQ specimen of this species was taken in 1935 off Southport and photographs confirm the presence

of the species within the region up until the 1960's while anecdotal reports continued into the early 1980's.

In summary, SEQ is an important region for the global diversity of chondrichthyan fishes and while one species appears to have become locally extinct, the area supports populations of several other globally threatened species. Even the most basic life-history data are lacking on these and other species within the region and there is an urgent need to address these gaps in order to feed this information in the management and decision-making process.

The brain and sensory ecology in elasmobranchs

Tom Lisney

University of Queensland

The elasmobranchs are recognised as having a highly sophisticated battery of sense organs, many of which are extremely sensitive. These sensory systems form the interface between an elasmobranch and its environment and have played a vital role in the evolutionary and ecological success of these fishes. However, very little information exists on the relative 'importance' or 'role' of the various sensory systems, especially in relation differences in ecology. As the organization of the brain reflects habitat and lifestyle, the relative volume of four sensory brain areas, the olfactory bulbs, optic tectum, anterior lateral line lobes (ALLs) and posterior lateral line lobes (PLLs), that receive primary projections from the olfactory epithelium, the eye, the electroreceptors (ampullae of Lorenzini) and the lateral line, respectively, were assessed in 29 species of elasmobranch, representing a range of different lifestyles and inhabiting a number of habitats. This analysis suggests that elasmobranchs employ a range of sensory strategies. The differences in relative sensory brain area size between sharks and batoids were not statistically significant except that mean relative optic tectum size was significantly larger in sharks, suggesting that vision is more important in sharks than in batoids. Larger than average optic tecta were found in active reef-associated and pelagic sharks, as opposed to benthic sharks, large predatory sharks and hammerhead sharks. In skates and rays, olfaction was the most important sense in the majority of species, although some relied more heavily on vision, electroreception and the lateral line system. Generally, well-developed ALLs and PLLs were associated with enlarged optic tecta, rather than enlarged olfactory bulbs.

Visual biology and critical habitat of the sandbar shark *Carcharhinus plumbeus*

Lenore Litherland

University of Queensland

Sandbar sharks are targeted by fisheries globally and are a popular species of shark maintained in captivity in public aquaria. This shark is a coastal species with worldwide distribution inhabiting a diverse range of habitats. There is, however, limited knowledge about this species' biology, distribution, migratory habits and habitat utilisation. The overall aim of this PhD project is to provide insight into the sandbar shark's basic biology, sensory capabilities and habitat preferences. Access to a study population in both the United States and Australia provides a rare opportunity to examine the biology and distribution of a targeted fishery species on an international scale. The project aims to use telemetry tagging techniques to identify movement patterns, habitat preferences and nursery areas of the sandbar shark, and use anatomical and physiological analysis of the visual system to determine the relative contribution of vision to the species habitat selection, foraging success, movement patterns and behaviour.

Genetic subdivision in school sharks (*Carcharhinus tilstoni* and *C. sorrah*)

Jenny Ovenden^a, Raewyn Street^a, Damien Broderick^a and John Salini^b

^aQueensland Department of Primary Industries and Fisheries; ^bCSIRO Marine and Atmospheric Research

Genetic markers, such as mitochondrial DNA and microsatellites are used to identify subpopulations and cryptic species by making assumptions about micro-evolutionary processes such as natural selection, gene flow, mutation and genetic drift. Information on the genetic structure of populations and species is essential for the sustainable management of harvested animal species. School sharks (*Carcharhinus tilstoni* and *C. sorrah*) were expected to have subdivided populations across their range in northern Australia due to their low fecundity (1-8 pups per year), slow sexual maturation (2-4 years) and low vagility. Most recaptures were within 50km of the tagging site, although movements of up to 1,000km were recorded. A previous genetic analysis using allozymes found a small, but significant, amount of subdivision and inferred gene flow in *C. sorrah* was higher than in *C. tilstoni*. Six polymorphic microsatellite developed for each species in this study validated these results when applied to sharks collected from northern Western Australia to the east coast of Queensland.

Conservation biology of the estuary stingray *Dasyatis fluviatorum* Ogilby, 1908

Simon J. Pierce, Jonathan L. Combs and Michael B. Bennett

University of Queensland

Habitat degradation and fishing pressures have caused population declines in many elasmobranch species. Those with a restricted distribution are particularly susceptible. The estuary stingray *Dasyatis fluviatorum* Ogilby, 1908 was historically reported as extremely common as far south as Port Jackson and Botany Bay on the east coast of Australia. The species has not been reported from this area since the 1880s, and the southern extent of its range is now uncertain. It is now uncommon everywhere along the central and northern coast of NSW, and the remaining centres of abundance for this species appear to be Hervey Bay and Moreton Bay in Queensland waters. Coastal development and fishing threaten these rays in both areas. Data from tagging studies and parasite surveys indicate that these rays have a limited home-range, and a high proportion of rays in some areas of Moreton Bay bear hook wounds and fishing-related injuries. The critical habitat for these rays appears to be mangrove-dominated inshore sand- and mud-flats, where small-scale habitat modification and predation by these rays is likely to have a significant influence on ecosystem function. Ongoing studies on *D. fluviatorum* include the analysis of short- and long-term movement patterns, life history, conservation status and its role within the inshore ecosystem.

Physiological ecology of the euryhaline bull shark *Carcharhinus leucas* in the Brisbane River

Richard Pillans

CSIRO Marine and Atmospheric Research

Bull sharks are one of the only elasmobranchs capable of living in both seawater (SW) and freshwater (FW) for long periods of time, however the physiological mechanisms that enable them to do this are unknown. Using a combination of sampling animals captured along a salinity gradient and animals chronically and acutely exposed to SW from FW it is apparent that juvenile bull sharks are capable of living in and moving rapidly between FW and SW. Animals living in FW are highly hyperosmotic to the environment (642 mOsm) and are faced with an osmotic influx of water combined with a branchial loss of ions that necessitates active renal reabsorption of ions and high urine flow rates. Despite the need to actively absorb ions against a concentration gradient, there was no difference in activity of the key transport enzyme Na⁺/K⁺-ATPase in the gill of FW and SW acclimated animals. There was no difference in the size of

rectal glands in juvenile bull sharks captured in FW and SW, or animals acclimated to either environment, however Na^+/K^+ -ATPase activity in the rectal gland of SW acclimated animals was significantly higher than FW acclimated animals. Na^+/K^+ -ATPase activity in the kidney was significantly higher in FW acclimated animals illustrating the importance of this organ in actively reabsorbing ions whilst maintaining high urine flow rates.

Juvenile bull sharks (60-120cm TL) were more abundant in the upper reaches of the Brisbane River with catch rates in the upper freshwater reaches being 10-25 times higher than in salinity between 12-28 ‰. Over 400 bull sharks were tagged with plastic dart tags and to date 60 have been recaptured. Long term recaptures show that bull sharks utilise the river as a primary nursery area and remain in the river for at least 3-4 years. Growth rates of tagged animals range from 5-10cm per year. Acoustic tags were attached to 6 animals and movement data on individuals were obtained over 2-6 weeks.

An overview of the ACIAR Indonesian Sharks and Rays, and the FRDC Sustainability of Northern Australian Sharks & Rays projects

John Salini

CSIRO Marine and Atmospheric Research

The CSIRO Marine Laboratories at Cleveland started investigating shark fisheries as part of an Environment Australia (DEH) Sustainability of Northern Australian Sharks and Rays desktop study. This was linked to a Risk Assessment of Elasmobranchs in the Northern Prawn Fishery as part of a major FRDC project on bycatch sustainability in the NPF. The major sharks and rays project currently nearing completion specifically looks at shark gillnet and longline fisheries across all jurisdictions in northern Australia. The laboratories are also the lead agency for an ACIAR-funded project on Sharks and Rays of Eastern Indonesia, phase 1 and phase 2, which investigated the catch of elasmobranchs and the shared resources with Australian shark species.

The biology of *Aetobatus narinari*, with specific emphasis on the olfactory system in comparison to other elasmobranchs

Vera Schluessel

University of Queensland

There is presently very little scientific data available on the white-spotted eagle ray *Aetobatus narinari* and the species is currently listed on the World Conservation Union (IUCN) Red List of Threatened Species as Data Deficient (although a 2005 update proposes to list this species as Near Threatened globally). This PhD study has three main components: 1. examination of the species' basic biological characteristics; 2. genetic evaluation of global *A. narinari* populations; and, 3. examination of the olfactory system of *A. narinari* in comparison to other elasmobranch species. Basic biological data will be collected on reproductive biology (e.g. maturity, reproductive cycle, fecundity and gestation period), age and growth parameters, diet and social behaviour. These results will assist in determining the susceptibility of the species to current and future levels of fishing pressure and help to advise on management options. Presently, *A. narinari* is known as a widespread circumglobal species consisting of several forms, which may in fact represent distinct species. These separate forms are likely to have more limited distributions than the presently known wide-ranging *A. narinari*, resulting in a heightened need for determining population dynamics. Part of this study will therefore genetically assess and compare different populations worldwide. *Aetobatus narinari* is one of the few semi-pelagic batoids and might therefore rely more heavily on olfaction (a far reaching sensory system) than more benthic ray species. Furthermore, the species has been found to possess a specifically large telencephalon (the main processing area of olfactory information in the brain) and large olfactory structures. The size and composition of the olfactory epithelium, bulb, and tract, as well as the size of the telencephalon will be determined and compared to other shark and ray

species, using basic morphological analyses, light microscopy, scanning electron microscopy and transmission electron microscopy and retrograde labelling. This will hopefully aid in speculating on the importance of the olfactory system in various species that occupy different habitats and exhibit different lifestyles.

The biology and ecology of *Chiloscyllium cf punctatum* Müller & Henle, 1938 and orectolobid sharks in southeast Queensland

Joanna Stead

University of Queensland

Chiloscyllium cf punctatum and orectolobid sharks are commonly found in the coastal waters of Queensland. Despite their importance in fisheries and the aquaria trade, little is known about their conservation status. The aim of my study is to determine the biological characteristics of these sharks. The whole project will take a multidisciplinary approach and will be divided into two main sections. 1. Determining general biology. This will involve analysis of age and growth rates, diet, reproductive biology and parasitic fauna of the sharks; and, 2. Investigating habitat use and behaviour using tagging and acoustic telemetry.

Current research in the Queensland Shark Safety Program

Wayne Sumpton, Geoff McPherson, Neil Gribble and Baden Lane

Queensland Department of Primary Industries and Fisheries

Recent research into the Queensland Shark Safety Program (QSSP) has focused on reducing the bycatch and improving the target species selectivity of fishing gear. Various baits and lures have been trialled to reduce interactions with turtles and dolphins with both shark flesh and chicken being effective at deterring dolphins from removing baits from hooks. Despite this, there is no evidence that these baits deter turtles from removing baits and becoming incidentally hooked. Plastic hook guards placed over the eye of the hook have shown the potential to reduce the incidental capture of sea turtles while still being effective at catching sharks. Various acoustic devices have been placed on nets in order to minimise the interactions of marine mammals with shark nets and research is continuing on finding the most effective acoustic deterrent for particular marine mammal species. Data collected by onboard observers have confirmed the accuracy of the logbook records submitted by contractors. Tagging of some shark species was established during 2004 in an attempt to learn more about shark movement patterns and to maximise the information that can be collected from those shark species that are captured alive and can be released unharmed.

Neonate and juvenile Carcharhinidae and Sphyrnidae sharks in Moreton Bay, southeast Queensland

Stephen Taylor

University of Queensland

Moreton Bay, southeast Queensland, Australia is a large, subtropical embayment encompassing an area of 1,523 km². The subtropical waters support a rich variety of aquatic habitats, including mangroves, mud and sandflats, seagrass beds and coral reefs. The bay is host to a large and particularly diverse group of sharks: 34 species have been recorded, with 16 from the family Carcharhinidae. *Carcharhinus falciformis* (Bibron, 1839) is reported for the first time in Moreton Bay.

Although Moreton Bay is a marine park, the shark populations are subject to both recreational and commercial shark fishing and these waters are under increased threat from coastal development and industrialisation. Gill-netters targeting teleosts in the shallow, western fringes

of the bay (less than 3 metres depth) commonly catch neonate and juvenile carcharhinids and sphyrnids between October and May. At least five species of carcharhinid and sphyrnid sharks use this part of the bay as a nursery area: neonates (sharks possessing unhealed or healing umbilical scars) and juveniles have been reported for *C. amboinensis* (Müller & Henle, 1839), *C. cautus* (Whitley, 1945), *C. obscurus* (Lesueur, 1818), *C. limbatus* (Valenciennes, in Müller & Henle, 1839) and *Sphyrna lewini* (Griffith & Smith, in Cuvier, Griffith & Smith, 1834). A fisheries-independent assessment of the shark fauna of the bay is being conducted using gillnets, setlines and droplines. Preliminary results suggest that habitat partitioning occurs between sympatric carcharhinid species. Ongoing studies are examining the life history strategies, conservation status and short- and long-term movements of carcharhinid sharks in Moreton Bay.

Colour vision and visual ecology of the blue-spotted stingray *Dasyatis kuhlii*

Susan Theiss

University of Queensland

This project investigates the potential for colour vision in the blue-spotted stingray *Dasyatis kuhlii* as well as the visual ecology. The potential for colour vision is determined by measuring the absorbance of visual pigments found in the outer segments of retinal photoreceptors using a technique called microspectrophotometry. The rod photoreceptor contains a visual pigment with a wavelength of maximum absorbance (λ_{max}) of 497nm. Three spectrally distinct cone types are also found with λ_{max} values of 479, 501 and 550nm. This provides *D. kuhlii* with the potential for trichromatic colour vision. The blue spots and various areas around the disc produce spectral reflectance measurements that fall within the spectral range of the three visual pigments in *D. kuhlii*, providing the opportunity for intraspecific visual communication. Spectral transmittance of the ocular media combined with the visual pigment absorbance spectra determined relative photon capture by outer segments and the relative colour sensitivity of *D. kuhlii*. Retinal ganglion cell topography shows an increase in the density of cells within the ganglion cell layer to lie in the dorsal retina. Based on the spacing of cells in the ganglion cell layer and measurements of focal length of the eye using lens tracing, spatial resolving power ranged from 3.76 to 5.56 cycles per degree.

Foraging behaviour and prey discrimination in the blue-spotted maskray *Dasyatis kuhlii* (Müller & Henle, 1841)

Bree Tillett

University of Queensland

The blue-spotted maskray *Dasyatis kuhlii* is a benthic elasmobranch that is common in Moreton Bay. Prey selection, foraging efficiency and foraging behaviours were observed in controlled laboratory experiments in which a selection of prey species and sizes were offered at different depths within the substrate. Additional experiments were also conducted to test their ability to discriminate artificial electric fields of similar strength but different size and depth, and to determine the relative dominance of olfactory, electrical or mechanical cues in stingray foraging. Preference for different stimulus was then compared with captive maskrays to determine the effect of environment on sensitivity. Blue-spotted maskrays discriminate species and size of buried prey, though depth did not influence prey selection. Maskrays often excavated prey species that they did not subsequently consume suggesting that they are not accurately able to discriminate among buried prey. All sizes of their preferred prey were consumed once acquired, although maskrays were unable to determine prior to excavation if buried prey are too large to consume. Among sensory modalities tested, there was a clear preference for electrical stimuli, although olfaction was also important in prey detection. Conversely captive stingrays showed a marked preference for olfactory signals. Maskrays did not discriminate between electric fields of similar strength but different size and depth indicating that blue-spotted maskrays are unable to resolve the interaction between prey depth

and prey size. The implications of these findings for the foraging biology of stingrays are considered.

Sharks as cleaners of the ocean? Feeding strategies and habitat association of sharks in Queensland waters

Jonathan Werry^{a,b}, Joe S.Y. Lee^a and Neil Gribble^b

^aGriffith University; ^bQueensland Department of Primary Industries and Fisheries

Sharks are believed to be very prone to overexploitation due to their life history strategies, however fisheries for shark continue to grow on a global basis. The Australian *Environment Protection and Biodiversity Conservation Act 1999* requires fisheries that export to be assessed according to certain guidelines that include the examination of ecological impacts of the fishery on target and bycatch species, threatened, endangered and protected species, marine habitats and marine food chains. Sharks potentially play an important role in the regulation of marine ecosystems at lower trophic levels and may be essential to the maintenance and stability of food webs. The role of sharks, particularly for larger growing species, in the trophic ecology of Queensland waters' has direct implications for both fisheries that target shark and fisheries that target the potential finfish prey of sharks. Based on the assumption of sharks as top level predators it is commonly hypothesised that sharks target sick and injured prey whereby significantly helping to maintain the health of prey populations. However, little direct evidence exists to support this assumption.

The main aim of this study is to examine whether sharks do consume significant quantities of sick and injured fish in their diet. This study will also investigate differences in the feeding strategies and habitat associations of several shark species in Queensland waters, on both spatial and temporal scales and between males and females of different size classes. Fatty acid analysis will be used in this study as it is able to detect the stress level in a fish and these fatty acid profiles can potentially be carried onto and detected in predators. Fatty acid analysis and lipid triacylglycerol (TAG) readings of sharks housed in large tanks and fed stressed versus healthy fish will be done. Samples for fatty acid analysis and lipid TAG readings will also be collected from wild shark populations on a seasonal basis along with stable isotope readings and stomach contents analysis. Age data, relative abundance and habitat information will be collected and stock assessment done where possible. The bull shark *Carcharhinus leucas* will be the primary species studied as it is a commercially important species in the Gulf of Carpentaria Inshore (N3) fishery and has been identified as at potential risk. Large individuals are also caught annually between Cairns and the Gold Coast in the Queensland Shark Control Program (QSCP) and they readily occur in estuarine and canal systems. *Glyphis* sp. A and the hammerhead group of sharks will also be species studied. The objectives of this study will contribute to the core business objectives of the Department of Primary Industries and Fisheries (DPI&F) and its Long Term Monitoring Program (LTMP). It is envisaged that this study will provide important information for both the fisheries and marine park management and conservation of sharks.

Electroreception of shovelnose rays (Batoidea: Rhinobatidae)

Barbara E. Wueringer and Ian R. Tibbetts

University of Queensland

Electroreception is a phylogenetically old sensory modality found amongst fishes, amphibians and mammals. Elasmobranchs use their electroreceptive structures, the ampullae of Lorenzini (each consisting of a canal connecting an ampulla with a somatic pore), during foraging, social interactions and orientation in the earth's magnetic field. In this study, I comprehensively described the electrosensory system of *Rhinobatos typus* and *Aptychotrema rostrata*, two rhinobatids commonly found on sandy bottoms in shallow coastal habitats of southeast Queensland, Australia. The electrosensory system of both species was mapped and ampulla were processed for light and transmission electron microscopy. I found basic pore patterns to be

similar for both species, with 85.7% of pores located on the ventral side of the disk in *R. typus* and 80.4% in *A. rostrata*. The highest densities of pores were found ventrally along the rostrum, around the mouth and in the area surrounded by gills, mouth and abdominal lateral line canal. Ampullae of the ventral side of the rostrum possess short canals ($7.3 \pm 2.8\text{mm}$ in *R. typus* and $8.9 \pm 3.4\text{mm}$ in *A. rostrata*) compared to long canals leading to pores on the pectorals ($22.5 \pm 7.5\text{mm}$ in *R. typus* and $23.4 \pm 9.6\text{mm}$ in *A. rostrata*). Behavioural studies identified the intensity of electric fields used by *R. typus* in detection of prey. 46% of all attacks towards prey simulating electrodes were initiated at field strengths smaller than $0.01\mu\text{V/cm}$. Further study of these complex systems is warranted and would help to increase our knowledge of the food sensing abilities of elasmobranchs in general.

PARTICIPANTS & RESEARCH INTERESTS

Contact Details	Research Interests
<p>Carley Bansemer Queensland Parks and Wildlife Service P.O. Box 402 Cleveland QLD 4154 Ph: 07 38219019 carley.bansemer@epa.qld.gov.au</p>	<p>Grey nurse sharks <i>Carcharias taurus</i>, other elasmobranch and teleost ecological, biological research and marine conservation oriented research, biotelemetry research (particularly on larger marine species), cleaner wrasse <i>Labroides dimidiatus</i>, and fisheries research.</p>
<p>Michael Bennett Reader in Anatomy and Developmental Biology Queensland Shark and Ray Research Group School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33652705 m.bennett@uq.edu.au</p>	<p>Shark and ray biology (in collaboration with my research higher degree students) on aspects of the growth and aging, reproductive biology, population estimates, feeding behaviours and diets, local and seasonal movement patterns, parasitology, fisheries bycatch issues and the taxonomy of elasmobranch fishes, concentrating on (but not restricted to) the fauna of Moreton Bay. My other themes include studies on:</p> <ol style="list-style-type: none"> 1. Shark and ray biomechanics (e.g. material properties and function of stingray spines; The functional outcomes of ontogenetic changes and sexual dimorphism in dentition; Body morphometrics, tooth and denticle form and protein fingerprinting for identification of juvenile <i>Carcharhinus</i> spp.; Vertebral mechanics from a functional and anatomical perspective). 2. Shark and ray physiology (e.g. Interactions between stress and reproduction in sharks; the evolution of the nitric oxide synthase system in the regulation of vascular tone in elasmobranch fishes - in collaboration with Dr John Donald (Deakin University)).
<p>Craig Bohm National Fisheries Campaigner Australian Marine Conservation Society P.O. Box 3139 Yeronga QLD 4104 Ph: 07 38485235; Mob: 0427 133 481 craigbohm@amcs.org.au www.amcs.org.au</p>	<p>The Australian Marine Conservation Society (AMCS) is Australia's national marine conservation organisation. Our Sharks and Rays campaign focuses on raising the profile of elasmobranchs, their vulnerabilities and threats, and on improving their conservation. Our basic premise is that Australia's sharks should be protected like whales and dolphins and not killed for commercial or recreational exploitation.</p>
<p>Ilze Brietze Senior Conservation Officer Environmental Protection Agency Ph: 07 32277090 ilze.brietze@epa.qld.gov.au</p>	<p>Conservation and management of marine and freshwater species.</p>
<p>Damien Broderick Department of Primary Industries and Fisheries Queensland Biosciences Precinct University of Queensland Level 6 North Tower, 306 Carmody Road St Lucia QLD 4072 Ph: 07 33462700 damien.broderick@dpi.qld.gov.au</p>	<p>Damien Broderick is a member of the Molecular Fisheries Lab headed by Dr Jenny Ovenden. He has used molecular techniques to elucidate population structure and address management issues in wild populations of sharks, prawns, birds and turtles. Currently he is using genetic tags to uniquely identify individuals and estimate harvest rates in a Spanish mackerel fishery. Genetic tags are also being developed and used in mark-recapture and paternity study of dugongs.</p>
<p>Chad Buxton School of Integrative Biology University of Queensland St Lucia QLD 4072 Mob: 0400 280 548 sunfish101@hotmail.com</p>	<p>My research interests lie within species conservation, life history assessments, tracking and monitoring species, and risk assessment. My current project is looking at the biology and ecology of Moreton Bay for the purposes of marine reserve design and implementation.</p>
<p>Clint Chapman School of Physiotherapy and Exercise Science Griffith University, Gold Coast Campus Ph: 07 55529208; Mob: 0403 015 535 c.chapman@griffith.edu.au</p>	<ol style="list-style-type: none"> 1. Hypoxia and Anoxia stress response in elasmobranchs. 2. Elasmobranch blood parameters and protein expression levels in response to stress. 3. Stress indicators in elasmobranchs.

Contact Details	Research Interests
<p>Andrew Chin Project Manager (State of the Reef Report) Research and Monitoring Coordination Unit, Great Barrier Reef Marine Park Authority Townsville QLD 4810 Ph: 07 47500810 a.chin@gbmpa.gov.au</p>	<p>Research coordination and planning, elasmobranch conservation and management, marine protected areas, life history. Current activities include: a review of the status of elasmobranchs of the Great Barrier Reef, promotion of elasmobranch related research for management of the Great Barrier Reef.</p> <p>Andrew Chin is the Research and Monitoring Coordination Unit's representative on the GBRMPA's Shark Working Group</p>
<p>Shaun P. Collin Associate Professor and Reader Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33654066 s.collin@uq.edu.au www.uq.edu.au/sbms</p>	<p>Associate Professor Collin's research falls broadly into the field of comparative neurobiology with emphasis on the neural basis of behaviour. Using models from the extant relatives of the first vertebrates (agnathans) to marine mammals, various aquatic sensory systems (including vision, olfaction and electroreception) are investigated to establish broad concepts of plasticity and adaptation to environments as diverse as coral reefs and the deep-sea. Anatomical, electrophysiological, molecular and behavioural techniques are currently being used to trace the prehistoric origins of colour vision, the visual ecology of deep-sea fishes and sharks, the regulation and patterned expression of visual pigments in the vertebrate retina and the development of sensory input to the shark brain.</p>
<p>Scott Cutmore School of Molecular and Microbial Sciences The University of Queensland St Lucia QLD 4072 Ph: 07 33654617</p>	<p>Digenean and cestode parasites of elasmobranchs</p>
<p>Mark Doohan Manager (Crab and Estuarine) Department of Primary Industries and Fisheries G.P.O. Box 46 Brisbane QLD 4000 Ph: 07 32251888 mark.doohan@dpi.qld.gov.au.</p>	<p>Management of shark stocks in Queensland.</p>
<p>Christine Dudgeon School of Integrative Biology University of Queensland St Lucia QLD 4072 Ph: 07 33652500; Mob: 0409 645 227 s4051599@student.uq.edu.au</p>	<p>Population ecology and genetics of elasmobranchs and teleost fishes.</p> <p>I am currently undertaking a PhD on the ecology of a temporal aggregation of the leopard shark <i>Stegostoma fasciatum</i> in southern QLD, using a combination of mark-recapture, acoustic telemetry and genetic methods.</p>
<p>Fahmi Centre for Marine Studies University of Queensland St Lucia QLD 4072 Ph: 07 33652332 fahmi@cms.uq.edu.au</p>	<p>Sharks and Rays study in Indonesia.</p>
<p>Andreas Fischer Curator Aquatic TAG Convenor for ARAZPA Underwater World - Sunshine Coast Ph: 07 54448488; Mob: 0439 034 107 sfischer@underwaterworld.com.au www.underwaterworld.com.au</p>	
<p>Craig Franklin School of Integrative Biology University of Queensland St Lucia QLD 4072 Ph: 07 33652355 c.franklin@uq.edu.au</p>	<p>Cardiovascular and osmoregulatory physiology of elasmobranchs. Recent work has focussed on salt and water balance in bull sharks <i>Carcharhinus leucas</i> in the Brisbane River.</p>

Contact Details	Research Interests
<p>Kerstin Fritsches Research Fellow Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph. 07 33651617 kerstin.fritsches@uq.edu.au</p>	<p>Visual capabilities of blue water fishes, sea turtles and sharks I'm interested in characterizing the visual capabilities of open-ocean predators such as tuna and billfishes, sharks as well as sea turtles. Many of the species inhabiting the open water habitat are actually distributed in distinct vertical niches, some experiencing very dim light conditions while others hunt in the brightly-lit waters close to the surface. How the animals' visual capabilities such as sensitivity to light, ability for motion detection or colour vision have adapted to suit the different vertical niches is the focus of my research.</p>
<p>Katrina Goudkamp Project Officer Research and Monitoring Coordination Unit Great Barrier Reef Marine Park Authority Townsville QLD 4810 Ph: 07 47500895 k.goudcamp@gbmpa.gov.au</p>	<p>Katrina Goudkamp works closely with Andrew Chin in managing GBRMPA's research programs and plays a key role in developing GBRMPA's research priorities.</p>
<p>Blake Harahush Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33469873; Mob: 0404 342 425 b.harahush@uq.edu.au</p>	<p>Visual development in elasmobranchs.</p> <p>Current project: I will be looking at the environmental impacts on the visual system in elasmobranchs and the plasticity of this system, with a focus on <i>Chiloscyllium punctatum</i>.</p>
<p>Nathan Hart (ARC QEII Research Fellow) Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33651867 n.hart@uq.edu.au www.uq.edu.au/~uqnhart/</p>	<p>Vision in elasmobranchs - an anatomical and physiological approach to the study of the eye (especially the retina) in sharks and rays. In particular I am interested in finding out whether sharks have colour vision and discovering how the visual systems of elasmobranchs are adapted to their environment.</p>
<p>Jade Hinner Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33469873 j.hinner@uq.edu.au</p>	<p>Visual ecology of elasmobranchs (i.e. do they possess the ability to see in colour), especially the larger and more pelagic species of sharks. Possibly in a hope to discover new mechanisms or ways to reduce bycatch and shark attacks.</p>
<p>Marnie Horton Curator of Fish and Sharks/ Assistant Manager of Marine Sciences Sea World P.O. Box 190 Surfers Paradise QLD 4217 Ph: 07 55882480; Mob: 0412 612 999 marnie.horton@wvtp.com.au www.seaworld.com.au</p>	
<p>Francis Humphries A/ Senior Fisheries Management Officer Fisheries Resource Management Department of Primary Industries and Fisheries G.P.O. Box 46 Brisbane QLD 4000 Ph: 07 32390436 francis.humphries@dpi.qld.gov.au</p>	

Contact Details	Research Interests
<p>Tanya Huon Honours student Griffith University Gold Coast Campus QLD Ph: 0438 155 063 tanya.huon@student.gu.edu.au</p>	<p>Estimating epaulette shark population based on the reef flats of Heron island. Examining different aspects of the population dynamics, migration and condition factor. Hope to incorporate the use of mitochondrial DNA from fin clips to investigate the relatedness of populations on surrounding reefs. Measuring heat shock proteins (and alternative methods) in tissue samples of the grey carpet shark <i>Chiloscyllium punctatum</i>, as an indicator of handling, capture and transportation stress in captive elasmobranchs.</p>
<p>Charlie Huveneers Graduate School of the Environment Macquarie University Ph: 02 98507980; Mob: 0405 635 257 charlie.huveneers@gse.mq.edu.au</p>	<p>Current research project: The impact of the NSW targeted fishing on wobbegong sharks. Although wobbegongs are commonly seen by divers and have been targeted by commercial fishers for over a decade in NSW, little is known about their habitat, biology and ecology. My main interests encompass all aspects of elasmobranch biology and ecology. In the past I have worked on various species of sharks at several locations (basking sharks in England, white sharks in South Africa, lemon sharks in the Bahamas and pelagic sharks in the Gulf of Mexico). I have been mainly interested in shark biology/ecology and its implications for conservation issues.</p>
<p>Ian Jacobsen Queensland Shark and Ray Research Group School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 37209392; Mob: 0411 293 786 i.jacobsen@uq.edu.au</p>	<p>My current project is looking at the diet, reproduction, and age and growth development of benthic elasmobranch species of the Great Barrier Reef and Torres Strait region. The project will focus on 5 principal species with overlapping distributions; the Australian butterfly ray <i>Gymnura australis</i> (Ramsay & Ogilby, 1885), the black spotted whipray <i>Himantura toshi</i> Whitley, 1939, the blue spotted maskray <i>Dasyatis kuhlii</i> (Müller & Henle, 1841), the painted maskray <i>D. leylandii</i> Last, 1987, and the plane maskray <i>D. annotata</i> Last, 1987. The project will also include a complete taxonomic review of the Gymnuridae. The overall aims of the project include: the development of a 'user-friendly' guide to the Gymnuridae, to assess how ray species of similar distributions and size partition food and habitat resources, examine how benthic elasmobranch species may affect regional ecosystems under reduced fishing mortality i.e. the introduction of GBR marine reserves, and to provide insight into the life-history patterns of species caught as bycatch in GBR prawn fisheries.</p>
<p>Jeff Johnson Manager Ichthyology Queensland Museum PO Box 3300 South Brisbane QLD 4101 Ph: 07 38407720 jeffj@qm.qld.gov.au</p>	<p>Taxonomy of several bony fish families (Aploactinidae, Scorpaenidae, Pinguipedidae, Tetrabrachinae) and biogeography of Australian marine fishes. Current research projects are taxonomic descriptions of new genera and species of Australian Aploactinids & Pinguipedids. My elasmobranch interests focus on their biogeography in north and east Australian waters and on their collection management within the QM.</p>
<p>Tom Kashiwagi School of Integrative Biology University of Queensland St Lucia QLD 4072 Ph: 07 33652500; Mob: 0419 242 082 t.kashiwagi@sib.uq.edu.au kashiwagi@bigpond.com</p>	<p>My research interests are movement, dispersal and biogeography of shark and ray species. My current research project titled "Comparative study to test the effect of vagility on Intra-specific phylogeography of sharks and rays in Indo-Australian Archipelago" investigates these aspects with a molecular approach. With phylogeographic analysis of over 25 species of sharks and rays, this project tests the hypothesis that species with low vagility are more genetically subdivided than ones with high vagility</p>

Contact Details	Research Interests
<p>Peter Kyne Queensland Shark and Ray Research Group School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33652720 p.kyne@uq.edu.au</p>	<p>Conservation and sustainable management of chondrichthyans; elasmobranch bycatch assessment and reduction; biogeography, reproductive biology, diet and age and growth of elasmobranch fishes. Current projects (all under the supervision of A/Prof. Mike Bennett, except number 2): 1. Elasmobranch bycatch of the Queensland East Coast Trawl Fishery and its reduction (with QDPI&F); 2. Assessing the conservation status of chondrichthyans for the IUCN Red List of Threatened Species (with IUCN Shark Specialist Group); 3. Geographic variation in the diet of <i>Aptychotrema rostrata</i> from southern Queensland (with Jo Stead); 4. Comparative reproductive biology of <i>Aymbolus rubiginosus</i> from the east coast of Australia (with PIRVic and CSIRO); 5. Diet, reproductive biology and age of growth of <i>Dipturus polyommata</i>; 6. Comparative dietary analysis of <i>Trygonoptera testacea</i> and <i>Urolophus</i> sp A. (with Andrea Marshall); 7. Distribution and biology of <i>Heteroscyllium colcloughi</i> (with the South African Museum); 8. Age and growth of <i>Trygonoptera testacea</i> and <i>Urolophus</i> sp A; 9. Age and growth of <i>Aptychotrema rostrata</i>.</p>
<p>Janet Lanyon School of Integrative Biology University of Queensland St Lucia QLD 4072 Ph: 07 33654416 j.lanyon@uq.edu.au</p>	<p>Conservation biology and ecology of large marine vertebrates with a focus on feeding ecology, life history, reproductive ecology, population dynamics, distribution and abundance.</p>
<p>Tom Lisney Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33654484 t.lisney@uq.edu.au, tom_lisney@hotmail.com</p>	<ol style="list-style-type: none"> 1. Eye size as an indicator of the importance of vision and relationships between size and ecology. 2. Retinal ganglion cell topography in a range of species 3. Ontogenetic changes in the relative size of sensory brain areas 4. Relationships between brain size and ecology
<p>Lenore Litherland Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33469873 l.litherland@uq.edu.au</p>	<p>My research interests lie in the field of the sensory biology of elasmobranchs. Currently I am studying the visual biology and critical habitat of the sandbar shark <i>Carcharhinus plumbeus</i>, for my PhD.</p>
<p>Geoff Lundie-Jenkins Team Leader Wildlife Conservation Unit QPWS Southern Region P.O. Box 731 Toowoomba QLD 4350 Ph. 07 46994372; Mob: 0408 736 274 Geoff.LundieJenkins@env.qld.gov.au</p>	
<p>David Maguire Senior Ranger Moreton Bay Marine Park Queensland Parks and Wildlife Service P.O. Box 402 Cleveland QLD 4163 Ph: 07 38219000 dave.maguire@epa.qld.gov.au</p>	<p>Officers of Moreton Bay Marine Park will be undertaking a review of the zoning plan for the marine park between now and 2009. In this regard it would be useful to us as managers to be able to identify/protect habitat or sites that are of particular conservation significance. Any research findings or concerns of this nature would be of interest.</p>

Contact Details	Research Interests
<p>Justin Marshall Vision Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33651397; Mob: 0423 024 162 justin.marshall@uq.edu.au www.vthrc.uq.edu.au/ecovis</p>	<p>My principle aim and that of the team I work with is to understand how other animals perceive their environment. As arrogant humans we tend to assume we are the pinnacle of evolution, however, certainly in sensory terms this is far from true. By taking an approach to sensory systems which is based around ecology and includes physiology, anatomy, behaviour, neural integration and machine vision, we hope to decode signals and their intension in the animal kingdom. Animal groups I work with include teleost and elasmobranch fish, birds, lizards frogs, crustaceans and cephalopods. We are currently working hard on understanding more about the sensory systems of sharks and rays.</p>
<p>Ingrid Neilson Grey Nurse Shark Projects Officer Australian Marine Conservation Society P.O. Box 3139 Yeronga QLD 4104 Ph: 07 38485235 ingridneilson@amcs.org.au</p>	<p>Grey nurse shark (as part of the AMCS sharks and rays focus). Also editing "Turning the Tide", the AMCS members' newsletter and doing various project work for AMCS.</p>
<p>Jenny Ovenden Senior Fisheries Geneticist Department of Primary Industries and Fisheries P.O. Box 76 Deception Bay Qld 4508 Ph: 07 38179585; Mob: 0415 949 410 Jennifer.Ovenden@dpi.qld.gov.au</p>	<p>Application of population and molecular genetics and evolutionary biology to the sustainable management of fisheries resources. Current research projects: 1. Genetic stock structure of <i>Carcharinus tilstoni</i> and <i>C. sorrah</i>. 2. Genetic analyses of shared shark and ray stocks between Indonesia and northern Australia. 3. Genetic identification of shark material, including fins.</p>
<p>Stirling Peverell Fisheries Biologist - North Region Animal Science Sustainable Fisheries Department of Primary Industries and Fisheries Ph: 07 40350179, Mob: 0428 570 164 stirling.peverell@dpi.qld.gov.au www.dpi.qld.gov.au</p>	<p>I am employed by DPI & F as a Fisheries Biologist (6 years) working closely with commercial shark fishers in North QLD. I am currently the QLD project officer for the FRDC funded sustainability of northern Australian sharks and rays - phase 2 project. I am also enrolled as a MSc student at JCU undertaking a thesis on Gulf of Carpentaria sawfishes, investigating their distribution and abundance, life history, and biology. My thesis will be submitted by the end of August 2005.</p>
<p>Simon Pierce Queensland Shark and Ray Research Group School Of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33652720 simon.pierce@uq.edu.au</p>	<p>My honours research examined the biomechanics of stingray spines, and I'm currently in the latter stages of a PhD entitled "The inshore elasmobranchs of southeast Queensland: ecology, biology and threatening processes." For this work I'm researching the life history of <i>Dasyatis kuhlii</i>, the conservation biology of <i>D. fluviatorum</i>, the taxonomy of <i>Himantura toshi</i>, and looking at the importance of elasmobranchs in the intertidal ecosystem.</p>
<p>Richard Pillans CSIRO Marine Research 233 Middle Street Cleveland QLD 4163 Ph: 07 38267295 Richard.Pillans@csiro.au</p>	<p>I am currently employed by CSIRO Marine and Atmospheric Research and work on northern Australian and Indonesian elasmobranch research projects. My research interests include: 1. Osmoregulation in euryhaline elasmobranchs and the importance of riverine and estuarine habitats as nursery areas for elasmobranchs. 2. Biology and ecology of freshwater and euryhaline elasmobranchs, particularly in northern Australia. 3. Age, growth, reproduction and diet of elasmobranchs in relation to fishery management. 4. Elasmobranch fisheries in northern Australia. 5. Using acoustic and electronic tags to determine habitat requirements and short and long term movements of elasmobranchs. 6. Identification of illegal elasmobranch catches using fin morphology and genetics.</p>

Contact Details	Research Interests
<p>Gillian Renshaw School of Physiotherapy and Exercise Science Griffith University Gold Coast Campus PMB50 Gold Coast Mail Centre QLD 9726 Ph: 07 55528392 g.renshaw@griffith.edu.au</p>	
<p>Will Robbins School of Marine Biology and Aquaculture James Cook University Townsville QLD 4811 Ph: 07 47815574; Mob: 0408 322 457 will.robbins@jcu.edu.au</p>	<p>In order to preserve current shark stocks, basic life-history information such as growth rates, demographic parameters and stock structure of shark populations must be known. Without such data, effective management cannot be implemented. My project is producing this information through a combination of ageing, abundance estimates, construction of life-tables and genetic analysis for two species of currently un-managed reef sharks. These are the Grey Reef Whaler (<i>Carcharhinus amblyrhynchos</i>) and the Whitetip Reef Shark (<i>Triaenodon obesus</i>).</p>
<p>John Salini Fisheries Ecologist CSIRO Marine Research 233 Middle Street (PO Box 120) Cleveland QLD 4163 Ph: 07 38267244 John.Salini@csiro.au</p>	<p>Shark Fishery Research to improve sustainable management of shark resources. Population Genetics of Fishes and sharks.</p>
<p>Vera Schluessel Queensland Shark and Ray Research Group School of Biomedical Sciences University of Queensland St Lucia QLD 4072 v.schluessel@uq.edu.au</p>	<p>I am interested in general and sensory biology of sharks and rays, specifically in relation to their management and conservation. My PhD project focuses on general eagle ray biology within southeast Queensland and assesses their population status worldwide. In order to determine movement patterns and behaviour in three elasmobranch species I am using standard telemetry methods. In addition, I am examining olfactory structures in a range of different elasmobranchs using various anatomical methods. My Masters research focused on spatial memory and orientation in the freshwater stingray <i>Potomotrygon motoro</i>.</p>
<p>Tracey Scott-Holland Queensland Shark and Ray Research Group School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33652720 t.turner@uq.edu.au</p>	<p>Research Interests: Parasites of elasmobranchs</p>
<p>Jeremy Smith School of Geography, Planning and Architecture University of Queensland St Lucia QLD 4072 Ph: 07 33656471; Mob: 0404 370 566 s4031723@student.uq.edu.au</p>	<p>Elasmobranch taxonomy; fisheries biology; elasmobranch parasite ecology.</p>
<p>Joanna Stead Queensland Shark and Ray Research Group School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33652720 joannastead@uq.edu.au</p>	<p>I am currently doing a PhD on the biology and ecology of the brown-banded bamboo shark <i>Chiloscyllium cf punctatum</i> and orectolobid sharks. I am particularly interested in resource partitioning. Preliminary surveys have indicated that <i>C. punctatum</i> and wobbegong sharks have an unusual affinity and often occur in close proximity in their natural habitat. I hope to determine what allows these sympatric species to co-exist together.</p>

Contact Details	Research Interests
<p>John D Stevens CSIRO Marine and Atmospheric Research P.O. Box 1538 Hobart TAS 7001 Ph: 03 62325353 john.d.stevens@csiro.au</p>	<p>Shark systematics, biology, ecology, fisheries and conservation. Current research projects: chondrichthyan risk assessments and bycatch studies; electronic tagging of various shark species (including white, grey nurse, blue and whale sharks) to examine spatial structure, movement patterns, site fidelity, home range and behaviour; Chondrichthyan biodiversity in SE Asia; conservation assessments of <i>Pristis</i> and <i>Glyphis</i> spp.</p>
<p>Raewyn Street Department of Primary Industries and Fisheries P.O. Box 76 Deception Bay QLD 4508 Ph: 07 38179514 Raewyn.street@dpi.qld.gov.au</p>	<p>Molecular genetics of the Northern Australian Shark fisheries specifically targeting <i>C. tilstoni</i> and <i>C. sorrah</i> Artisanal Shark and Ray Fisheries in Eastern Indonesia targeting the shared stock between Indonesia and Australia mainly <i>C. sorrah</i>, <i>C. falciformis</i>, <i>C. obscurus</i>, <i>S. lewini</i> and <i>P. glauca</i> Gene tagging Spanish Mackerel & anything fishy.</p>
<p>Wayne Sumpton Senior Fisheries Scientist Sustainable Fisheries Program Department of Primary Industries and Fisheries Ph: 07 38179584, Mob: 0408 760 140 wayne.sumpton@dpi.qld.gov.au www.dpi.qld.gov.au</p>	<ol style="list-style-type: none"> 1. Enhancing the survival of line caught reef fish 2. Bycatch reduction in the Queensland Shark Safety Program 3. Fisheries Biology and population dynamics of the blue swimmer crab 4. Fisheries biology of rocky reef fish species
<p>Stephen Taylor Queensland Shark and Ray Research Group School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33652720 stephen.taylor@uq.edu.au</p>	<p>Identifying the life-history strategies of carcharhinid sharks in Moreton Bay, southeast Queensland. Specific aims are as follows:</p> <ol style="list-style-type: none"> 1. To identify nursery grounds for carcharhinids and sphyrnids. 2. To identify the extent of habitat and resource partitioning within and amongst sympatric shark species. 3. To identify growth rates, age, diet, reproductive status and utilisation of the Bay by carcharhinids and sphyrnids.
<p>Susan Theiss Vision, Touch and Hearing Research Centre School of Biomedical Sciences University of Queensland St Lucia QLD 4072 Ph: 07 33469873 s.theiss@uq.edu.au</p>	<p>My main focus is on vision and other senses of elasmobranchs. This work represents my recently completed honours project. I will probably always have an interest in <i>Dasyatis kuhlii</i> and its visual process, but I am planning on starting a PhD in August on the sensory biology and ecology of wobbegong sharks. There will be an emphasis on vision, but electroreception, mechanosensory lateral line, and olfaction will also be examined. I will need live animals for some aspects of the project, and will look at as many species as possible from different (light) environments.</p>
<p>Ian Tibbetts Centre for Marine Studies University of Queensland St Lucia QLD 4072 Ph: 07 33654830 i.tibbetts@uq.edu.au</p>	<p>Distribution and microstructure electroreceptive organs in elasmobranchs</p> <ol style="list-style-type: none"> 1. Feeding behaviour of sharks and rays 2. Microstructure of shark teeth
<p>Bree Tillett Centre for Marine Studies University of Queensland St Lucia QLD 4072 Ph: 07 33656464 s371272@student.uq.edu.au</p>	<p>Sensory biology and behaviour of elasmobranchs.</p>
<p>Jonathan M. Werry Fisheries Biologist Policy and Sustainability Fisheries Department of Primary Industries and Fisheries Northern Fisheries Centre - Cairns Ph: 07 40350169; Mob: 0415 80 2424 jonathan.werry@dpi.qld.gov.au or jonathan.werry@student.griffith.edu.au</p>	<p>Feeding strategies and habitat associations of sharks. Fatty acid analysis, trophic relations – in particular bull sharks and hammerheads.</p>

Contact Details	Research Interests
<p>Darryl Whitehead Centre for Marine Studies School of Integrative Biology University of Queensland St Lucia QLD 4072 Ph: 07 33657071 or 07 33657593 d.whitehead3@uq.edu.au</p>	<p>Sensory Biology of Aquatic vertebrates. Fish and other aquatic vertebrates utilize numerous sensory arrays to gain information about their surroundings. My special interest focuses on receptor cells and primarily electroreception. This sense allows a species to detect natural and artificial electrical fields within one's immediate surroundings. My work focuses on the passive usage of the sense to find prey and other objects in the environment. The definition of how this occurs will allow for the replication of the sensory array in artificial devices in order for man to isolate and locate a variety of either electrical or metallic objects. Commercial application of electrical sensors that may be utilized in today's society are constructed on outlines based upon descriptions of nature's blueprints. The ampullae of Lorenzini of sharks, skates, and rays provide an excellent opportunity to define the structure of tomorrow's metal and electrical device detection systems. This work currently focuses on improving existing detection systems to allow for their usage in shallow water littoral zones of coastal waterways.</p>
<p>Sara Williams Team Leader - Threatened Species and Ecosystems Unit Wildlife Conservation Branch Conservation Services Division Queensland Parks and Wildlife Service PO Box 15155 City East QLD 4002 Ph: 07 32251295 Sara.Williams@epa.qld.gov.au</p>	
<p>Barbara Wueringer University of Vienna (student), University of Queensland (occupational trainee) bababuzz@gmx.at or b.wueringer@uq.edu.au</p>	<p>For my masters I was working on the electroreception of rhinobatids, this project is almost finished. I am interested in the sensory biology and behaviour of elasmobranchs, life history studies and ecomorphology.</p>
<p>Wayne Young Environment Executive Port of Brisbane Corporation Locked Bay 1818 Wynnum QLD 4178 Ph. 07 32584848; Mob: 0408 458 160 Wayne.Young@portbris.com.au www.portbris.com.au</p>	
<p>Brad Zeller Senior Fisheries Scientist Assessment and Monitoring Unit Fisheries Group, Department of Primary Industries and Fisheries G.P.O. Box 46 Brisbane QLD 4000 Ph: 07 32242236 brad.zeller@dpi.qld.gov.au</p>	<p>Long-standing interest in elasmobranch ecology and risk assessment of elasmobranchs interacting with Queensland fisheries.</p>

Checklist of Chondrichthyes of the southeast Queensland region, Western Central Pacific.

11 July 2005

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Introduction

The following is a checklist of all chondrichthyan species (sharks, rays and chimaeras) recorded from the southeast Queensland (SEQ) region in the Western Central Pacific. The SEQ region is defined here as the area from the northern tip of Fraser Island (Sandy Cape; 24°42'S) south to the Queensland/New South Wales border (28°10'S) and extending from the coast seaward to the edge of the Australian Fishing Zone (i.e. 200 nautical miles). This area includes Hervey Bay and Moreton Bay, estuaries and rivers. This checklist follows the global checklist of Compagno (in press). Numbers in parentheses after the order and family names are the number of species recorded in the region for that particular order or family. The total number of species recorded from the region will likely increase in the future as further species are documented and as taxonomic issues are resolved. For example, a number of wide-ranging oceanic species are likely to occur in the region, although not yet recorded. These include such species as the cookiecutter *Isistius brasiliensis* (Quoy & Gaimard, 1824), the pelagic stingray *Pteroplatytrygon violacea* (Bonaparte, 1832) and the longfin mako *Isurus paucus* Guitart Manday, 1966, amongst others. Furthermore, there exists a paucity of information on the diversity of deepwater species in the region and several deepsea species occurring in adjacent areas will likely be recorded in the future. There is some uncertainty as to the occurrence and exact number of species in the region of some taxonomically problematic groups such as the sharkfin guitarfishes (genus *Rhynchobatus*), whiplays (genus *Himantura*) and gulper sharks of the genus *Centrophorus*. Resolution of these issues will likely require an update of this checklist in the future.

Thanks go to Jeff Johnson (Queensland Museum), Carley Bansemer (Queensland Parks and Wildlife Service), Steve Taylor and Simon Pierce (University of Queensland) for unpublished records and assistance in compiling this checklist.

Class Chondrichthyes

Subclass Holocephali

Order Chimaeriformes (Modern chimaeras) (4)

Family Chimaeridae (Shortnose chimaeras) (4)

Chimaera sp. B. [Last & Stevens, 1994]. Shortspine chimaera

Hydrolagus lemures (Whitley, 1939). Blackfin ghostshark

Hydrolagus ogilbyi (Waite, 1898). Ogilby's chimaera

Hydrolagus sp. B [Last & Stevens, 1994; Didier, in prep]. Marbled ghostshark

Subclass Elasmobranchii

Superorder Squalomorphii (Squalomorph sharks)

Order Hexanchiformes (Cow and frilled sharks) (2)

Family Hexanchidae (Sixgill and sevengill sharks) (2)

Heptranchias perlo (Bonnaterre, 1788). Sharpnose sevengill shark

Hexanchus nakamurai Teng, 1962. Bigeye sixgill shark

Order Squaliformes (Dogfish sharks) (8)

Family Squalidae (Dogfish sharks) (3)

Squalus megalops (Macleay, 1881). Piked or shortnose spurdog

Squalus mitsukurii Jordan & Snyder, in Jordan & Fowler, 1903 greeneye or shortspine spurdog

Squalus sp. B. [Last & Stevens, 1994]. Eastern highfin spurdog

Family Centrophoridae (Gulper sharks) (2)

Centrophorus moluccensis Bleeker, 1860. Endeavour dogfish

Deania quadrispinosum (McCulloch, 1915). Longsnout dogfish

Family Etmopteridae (Lantern sharks) (1)

Etmopterus lucifer Jordan & Snyder, 1902. Blackbelly lanternshark

Family Dalatiidae (Kitefin sharks) (2)

Dalatias licha (Bonnaterre, 1788). Kitefin or black shark

Squaliolus aliae Teng, 1959. Smalleye pygmy shark

Order Squatiniformes (Angel sharks) (1)

Family Squatinidae (Angel sharks) (1)

Squatina sp. A. [Last & Stevens, 1994]. Eastern angel shark

Order Rajiformes (Batoids) (43)

Family Pristidae (Modern sawfishes) (1)

Pristis zijsron Bleeker, 1851. Green sawfish

Family Rhinidae (Sharkrays) (1)

Rhina ancylostoma Bloch & Schneider, 1801. Bowmouth guitarfish or sharkray

Family Rhynchobatidae (Sharkfin guitarfishes or wedgefishes) (2)

Rhynchobatus australiae Whitley, 1939. Whitespotted shovelnose ray

Rhynchobatus cf. *laevis* (Bloch & Schneider, 1801). Smoothnose wedgefish

Family Rhinobatidae (Guitarfishes or shovelnose rays) (3)

Aptychotrema rostrata (Shaw & Nodder, 1794). Eastern shovelnose ray

Rhinobatos typus Bennett, 1830. Giant shovelnose ray

Trygonorrhina sp. A. [Last & Stevens, 1994]. Eastern fiddler ray

Family Hypnidae (Coffin rays) (1)

Hypnos monopterygius (Shaw & Nodder, 1795). Coffin ray

Family Torpedinidae (Torpedo rays) (2)

Torpedo macneilli (Whitley, 1932). Shorttail torpedo ray

Torpedo sp. A. [Last & Stevens, 1994]. Longtail torpedo ray

Family Arhynchobatidae (Softnose skates) (1)

Pavoraja sp. F. [Last & Stevens, 1994]. Dusky skate

Family Rajidae (Hardnose skates) (4)

Dipturus australis (Macleay, 1884). Sydney skate

Dipturus polyommata (Ogilby, 1910). Argus skate

Dipturus sp. H. [Last & Stevens, 1994]. Blacktip skate

Dipturus sp. I. [Last & Stevens, 1994]. Weng skate

Family Plesiobatidae (Giant stingarees) (1)

Plesiobatis daviesi (Wallace, 1967). Giant stingaree

Family Urolophidae (Stingarees) (6)

Trygonoptera testacea Banks, in Müller & Henle, 1841. Common stingaree

Urolophus bucculentus Macleay, 1884. Sandyback stingaree

Urolophus flavomosaicus Last & Gomon, 1987. Patchwork stingaree

Urolophus sufflavus Whitley, 1929. Yellowback stingaree

Urolophus viridis McCulloch, 1916. Greenback stingaree

Urolophus sp. A [Last & Stevens, 1994]. Kapala stingaree

Family Dasyatidae (Whiptail stingrays) (12)

Dasyatis brevicaudata (Hutton, 1875). Smooth or shorttail stingray

Dasyatis fluviorum Ogilby, 1908. Estuary stingray

Dasyatis kuhlii (Müller & Henle, 1841). Blue-spotted maskray

Dasyatis leylandi Last, 1987. Painted maskray

Himantura fai Jordan & Seale, 1906. Pink whipray

Himantura granulata (Macleay, 1883). Mangrove whipray

Himantura toshi Whitley, 1939. Black-spotted whipray

Himantura uarnak (Forsskål, 1775). Reticulate whipray

Himantura sp. A [Last & Stevens, 1994]. Brown whipray

Pastinachus sephen (Forsskål, 1775). Cowtail stingray

Taeniura lymma (Forsskål, 1775). Blue-spotted fantail ray

Taeniura meyeni Müller & Henle, 1841. Blotched fantail ray

Family Gymnuridae (Butterfly rays) (1)

Gymnura australis (Ramsay & Ogilby, 1885). Australian butterfly ray

Family Myliobatidae (Eagle rays) (4)

Aetobatus narinari (Euphrasen, 1790). White-spotted eagle ray

Aetomylaeus nichofii (Bloch & Schneider, 1801). Banded eagle ray

Myliobatis australis Macleay, 1881. Southern eagle ray

Myliobatis hamlyni Ogilby, 1911. Purple eagle ray

Family Rhinopteridae (Cownose rays) (1)

Rhinoptera neglecta Ogilby, 1912. Australian cownose ray

Family Mobulidae (Devil rays) (3)

Manta birostris (Dondorff, 1798). Manta ray

Mobula eregoodootenkee (Bleeker, 1859). Longfin devilray

Mobula japonica (Müller & Henle, 1841). Spinetail devilray

Superorder Galeomorphii (Galeomorph sharks)

Order Heterodontiformes (Bullhead sharks) (2)

Family Heterodontidae (Bullhead sharks) (2)

Heterodontus galeatus (Günther, 1870). Crested hornshark

Heterodontus portusjacksoni (Meyer, 1793). Port Jackson shark

Order Orectolobiformes (Carpet sharks) (12)

Family Parascylliidae (Collared carpetsharks) (1)

Parascyllium collare Ramsey & Ogilby, 1888. Collared carpet shark

Family Brachaeluridae (Blind sharks) (2)

Brachaelurus waddi (Bloch & Schneider, 1801). Blind shark

Heteroscyllium colcloughi (Ogilby, 1908). Colcloughs shark or bluegray carpetshark

Family Orectolobidae (Wobbegongs) (5)

Eucrossorhinus dasypogon (Bleeker, 1867). Tasselled wobbegong
Orectolobus halei Whitley, 1940. Ornate wobbegong
Orectolobus maculatus (Bonnaterre, 1788). Spotted wobbegong
Orectolobus ornatus (de Vis, 1883). Dwarf ornate wobbegong
Orectolobus wardi Whitley, 1939. Northern wobbegong

Family Hemiscylliidae (Longtailed carpetsharks) (2)

Chiloscyllium punctatum Müller & Henle, 1838. Grey carpet shark or brownbanded bambooshark
Hemiscyllium ocellatum (Bonnaterre, 1788). Epaulette shark

Family Stegostomatidae (Zebra sharks) (1)

Stegostoma fasciatum (Hermann, 1783). Zebra shark

Family Rhincodontidae (Whale sharks) (1)

Rhincodon typus Smith, 1828. Whale shark

Order Lamniformes (Mackerel sharks) (5)

Family Odontaspidae (Sand tiger sharks) (1)

Carcharias taurus Rafinesque, 1810. Grey nurse shark

Family Alopiidae (Thresher sharks) (2)

Alopias superciliosus (Lowe, 1839). Bigeye thresher
Alopias vulpinus (Bonnaterre, 1788). Thresher shark

Family Lamnidae (Mackerel sharks) (2)

Carcharodon carcharias (Linnaeus, 1758). White shark
Isurus oxyrinchus Rafinesque, 1810. Shortfin mako

Order Carcharhiniformes (Ground sharks) (38)

Family Scyliorhinidae (Catsharks) (6)

Apristurus sp. B. [Last & Stevens, 1994]. Bigfin catshark
Apristurus sp. G. [Last & Stevens, 1994]. Pinocchio catshark
Asymbolus analis (Ogilby, 1885). Grey spotted catshark
Asymbolus rubiginosus Last, Gomon & Gledhill, *in* Last, 1999. Orange spotted catshark
Cephaloscyllium sp. C. [Last & Stevens, 1994]. Northern draughtboard shark
Galeus boardmani (Whitley, 1928). Australian sawtail shark

Family Triakidae (Houndsharks) (5)

Galeorhinus galeus (Linnaeus, 1758). School shark
Hypogaleus hyugaensis (Miyosi, 1939). Pencil shark
Mustelus antarcticus Günther, 1870. Gummy shark
Mustelus sp. A. [Last & Stevens, 1994]. Grey gummy shark
Mustelus sp. B. [Last & Stevens, 1994]. Whitespotted gummy shark

Family Hemigaleidae (Weasel sharks) (2)

Hemigaleus sp. 1 [Compagno, Dando & Fowler, 2005]. Australian weasel shark
Hemipristis elongatus (Klunzinger, 1871). Fossil shark

Family Carcharhinidae (Requiem sharks) (23)

Carcharhinus albimarginatus (Rüppell, 1837). Silvertip shark
Carcharhinus amblyrhynchos (Bleeker, 1856). Grey reef shark
Carcharhinus amboinensis (Müller & Henle, 1839). Pigeye or Java shark
Carcharhinus brachyurus (Günther, 1870). Bronze whaler
Carcharhinus brevipinna (Müller & Henle, 1839). Spinner shark

Carcharhinus cautus (Whitley, 1945). Nervous shark
Carcharhinus dussumieri (Valenciennes, in Müller & Henle, 1839). Whitecheek shark
Carcharhinus falciformis (Bibron, in Müller & Henle, 1839). Silky shark
Carcharhinus leucas (Valenciennes, in Müller & Henle, 1839). Bull shark
Carcharhinus limbatus (Valenciennes, in Müller & Henle, 1839). Common blacktip shark
Carcharhinus longimanus (Poey, 1861). Oceanic whitetip shark
Carcharhinus macloti (Müller & Henle, 1839). Hardnose shark
Carcharhinus melanopterus (Quoy & Gaimard, 1824). Blacktip reef shark
Carcharhinus obscurus (Lesueur, 1818). Dusky shark
Carcharhinus plumbeus (Nardo, 1827). Sandbar shark
Carcharhinus sorrah (Valenciennes, in Müller & Henle, 1839). Spottail shark
Galeocerdo cuvier (Peron & Lesueur, in Lesueur, 1822). Tiger shark
Loxodon macrorhinus Müller & Henle, 1839. Sliteye shark
Negaprion acutidens (Rüppell, 1837). Sharptooth lemon shark
Prionace glauca (Linnaeus, 1758). Blue shark
Rhizoprionodon acutus (Rüppell, 1837). Milk shark
Rhizoprionodon taylori (Ogilby, 1915). Australian sharpnose shark
Triaenodon obesus (Rüppell, 1837). Whitetip reef shark

Family Sphyrnidae (Hammerhead sharks) (2)

Sphyrna lewini (Griffith & Smith, in Cuvier, Griffith & Smith, 1834). Scalloped hammerhead
Sphyrna mokarran (Rüppell, 1837). Great hammerhead

References

- Carpenter, K.E. and Niem, V.H. (eds). 1998. FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Volume 2. Cephalopods, crustaceans, holothurians and sharks. FAO, Rome.
- Carpenter, K.E. and Niem, V.H. (eds). 1999. FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Volume 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae). FAO. Rome.
- Compagno. L.J.V. 2001. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). FAO Species Catalogue for Fishery Purposes No. 1, Vol. 2. FAO, Rome.
- Compagno, L.J.V. In press. Checklist of living Chondrichthyes. In: Fowler, S.L., Camhi, M., Burgess, G.H., Cailliet, G.M., Fordham, S.V., Cavanagh, R.D., Simpfendorfer, C.A. and Musick, J.A. (eds). Sharks, rays and chimaeras: the status of the chondrichthyan fishes. IUCN SSC Shark Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.
- Compagno, L. Dando, M. and Fowler, S. 2005. A field guide to the sharks of the world. Collins, London.
- Johnson, J.W. 1999. Annotated checklist of the fishes of Moreton Bay, Queensland, Australia. *Memoirs of the Queensland Museum* 43(2):709-762.
- Kyne, P.M., Johnson, J.W., Courtney, A.J. and Bennett, M.B. 2005. New biogeographical information on Queensland chondrichthyans. *Memoirs of the Queensland Museum* 50(2):321-327.
- Last, P.R. and Stevens, J.D. 1994. Sharks and rays of Australia. CSIRO Publishing, Melbourne.