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The biology of sharks of the family Carcharhinidae from the nearshore waters of Cleveland Bay, with particular reference to *Rhizoprionodon taylori*.

Thesis submitted by
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in April 1993

for the degree of Doctor of Philosophy in
the Department of Zoology at
James Cook University of North Queensland.

FRONT PIECE: ***Rhizoprionodon taylori***

"This is the most common of all the smaller galeids on our coast"

J. Douglas Ogilby. 1915
Mem. Qld. Mus., 3, p.132

DECLARATION

I declare that this thesis is my own work and has not been submitted in any other form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished works of others has been acknowledged in the text and a list of references is given.

29/4/93
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ABSTRACT

Sharks of the family Carcharhinidae occurring in the nearshore waters (<5m depth) of Cleveland Bay, northern Queensland, were studied between June 1987 and February 1990. Specimens were collected using gillnets at three sites in Cleveland Bay, as well as demersal otter trawls throughout Cleveland Bay. The aims of the study were to examine the biology of the species of carcharhinid sharks that occur in the nearshore waters of Cleveland Bay and to determine the importance of this area to populations of carcharhinid sharks.

Thirteen species of the family Carcharhinidae were examined. One species - *Rhizoprionodon taylori* - was particularly abundant and most of the research was directed at this species. Of the remaining twelve species all were normally caught as juveniles. At least six species, not including *R. taylori*, utilise Cleveland Bay as a communal nursery area. Two patterns of nursery area utilisation were identified. Juvenile *R. taylori* also occurred, but their distribution overlapped with that of the adults. The importance of nearshore waters to populations of carcharhinid sharks, and the role that the sharks have in these areas, are discussed.

The distribution of *R. taylori* was analysed using catch rates from gillnets. There was no significant difference in the catch rate of *R. taylori* between bottom or surface set nets, or between nets set at each of the three main sampling sites. The catch rate of *R. taylori* was significantly different between seasons and years of this study, and was influenced by temperature, salinity, tidal variation and the amount of teleost by-catch. Mechanisms for the possible action of these factors are discussed.

Age and growth of *R. taylori* were studied using the techniques of vertebral ageing, back calculation and length frequency analysis. Vertebrae contained circuli produced annually in January or February, possibly as a result of stress during mating. The oldest male examined was 5.7 years old, and the oldest female 6.9 years. The age

at maturity was one year. Von Bertalanffy growth parameters estimated from vertebral ageing data for males were t_0=0.41yr, K=1.337, L_∞= 652mm TL, and for females t_0=0.46yr, K=1.013, L_∞= 733mm TL. Growth parameters estimated by length frequency and back calculation techniques concurred with those from vertebral ageing.

Stomach content analysis was used to investigate the food and feeding habits of *R. taylori*. The most common identifiable prey were members of the demersal teleost families Leiognathidae, Clupeidae and Teraponidae, the prawn family Penaeidae, and the squid family Loliginidae. 59.4% of specimens had no food in their stomachs. The mean weight of prey in the stomachs containing food was 14.1g (1.1% body weight), and the mean weight of original prey items (prior to digestion) was estimated to be 29.5g (2.3% body weight). It was estimated that individual *R. taylori* feed, on average, every two days, normally on a single prey item.

Maturity in *R. taylori* occurs at 560mm TL in males and 575mm TL in females. Mating occurs in late January and early February. Mature females mate every year, producing litters of one to ten offspring. The gestation period of 11.5 months is divided into an initial seven month period of embryonic diapause, followed by a 4.5 month period of development. During the diapause period embryos remain at the blastoderm stage. Nutrition of the embryos is initially lecithotrophic, however, embryos over 30mm TL have structures to absorb secretions from the uterus and a yolk sac placenta forms during the third month of development. The young of *R. taylori* are born in mid-January of each year at sizes ranging from 220 to 260mm TL.

The results indicate that *R. taylori* has an atypical life history when compared to other members of the family Carcharhinidae. Factors that may cause intra- and inter-specific variations in life history traits are discussed. Finally, the results are discussed in relation to the management of shark stocks and nearshore waters.

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