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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 Information derived from the published or unpublished works of others has been acknowledged in the text and a list of references is given.

Colin A. Simpfendorfer

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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 $t_0=0.41\text{yr}$, $K=1.337$, $L_\infty=652\text{mm TL}$, and for females $t_0=0.46\text{yr}$, $K=1.013$, $L_\infty=733\text{mm TL}$. 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.

TABLE OF CONTENTS

Declaration	i
Statement of Access	ii
Abstract	iii
Table of Contents	v
Table of Figures	viii
Table of Plates	xv
Acknowledgments	xix
Section I. Introduction, study area and sampling	1
Chapter 1. General Introduction	2
Chapter 2. Study area and sampling methods	11
2.1. Study area	11
2.1.1. Sampling sites	13
2.2. Sampling methodology	15
2.2.1. Gillnetting	15
2.2.2. Demersal otter trawling	16
2.3. Data collected on sampling trips	18
2.3.1. Environmental parameters	18
2.3.2. Identification of catch	19
2.3.3. Measurement of the catch	19
Section II. Biology of <i>Rhizoprionodon taylori</i>	22
Chapter 3. Catch statistics and distribution of <i>Rhizoprionodon taylori</i> ..	23
3.1. Introduction	23
3.2. Materials and methods	24
3.3. Results	27
3.3.1. Catch rates of 10cm gillnets	27
3.4. Discussion	38
Chapter 4. Age and growth of <i>Rhizoprionodon taylori</i>	42
4.1. Introduction	42
4.1.1. A review of shark age and growth, with particular reference to the family Carcharhinidae	42
4.2. Materials and methods	50
4.3. Results	54
4.3.1. Centrum morphology	54
4.3.2. Length at age	54
4.3.3. Length frequency	56
4.3.4. Size and age at maturity	57
4.4. Discussion	62
Chapter 5. Food and feeding of <i>Rhizoprionodon taylori</i>	65
5.1. Introduction	65
5.1.1. Food and feeding of carcharhinid sharks	65
5.2. Materials and methods	75
5.2.1. Data collection	75
5.2.2. Analysis	77

5.3. Results	80
5.3.1. Diet	80
5.3.2. Variation in liver weight and body condition	83
5.4. Discussion	91
Chapter 6. Reproductive biology of <i>Rhizoprionodon taylori</i>	97
6.1. Introduction	97
6.1.1. A review of reproduction in sharks from the family Carcharhinidae	98
6.2. Materials and methods	107
6.3. Results	109
6.3.1. Maturation	109
6.3.2. Reproductive cycle	109
6.3.3. Litter size	111
6.3.4. Size at birth	111
6.3.5. Sex ratios	112
6.4. Discussion	121
Chapter 7. Embryonic development of <i>Rhizoprionodon taylori</i>	126
7.1. Introduction	126
7.1.1. A review of the embryonic development of carcharhinid sharks	127
7.1.1.1. Introduction	127
7.1.1.2. Function of the oviducal gland in relation to embryonic development	130
7.1.1.3. Early embryonic development	131
7.1.1.4. Gestation periods and embryonic growth rates of carcharhinid sharks	133
7.1.1.5. Delays during the early stages of embryonic development	135
7.1.1.6. The accommodation of pregnancy	137
7.1.1.7. Embryonic nutrition	139
7.1.1.8. Conclusions	145
7.2. Materials and methods	148
7.3. Results	151
7.3.1. Ovulation and the functions of the oviducal gland	151
7.3.2. Development of embryos	154
7.3.2.1. Description of embryos	155
7.3.3. Accommodation of pregnancy	158
7.3.3.1. Mucosa	159
7.3.3.2. Submucosa	159
7.3.3.3. Muscularis and serosa	160
7.3.4. Structure of tissues possibly associated with embryonic nutrition	160
7.3.4.1. Yolk sac and stalk	160
7.3.4.2. Appendiculae	161
7.3.4.3. External branchial filaments	162
7.3.4.4. Placentae	162
7.4. Discussion	186
7.4.1. The oviducal gland and its functions	186
7.4.2. Embryonic diapause	188
7.4.3. Developing embryos	190
7.4.4. Embryonic nutrition	191
Section III. Other species of the family Carcharhinidae	197
Chapter 8. Biology of other carcharhinid species from Cleveland Bay	198

8.1. Scope and aims	198
8.1.1. A review of the literature on the occurrence and utilisation of nursery areas in the family Carcharhinidae	199
8.2. Materials and methods	205
8.3. Results	206
8.3.1. Abundance and distribution	206
8.3.2. Size distributions	210
8.3.3. Reproduction	210
8.3.4. Feeding	212
8.4. Discussion	222
8.4.1. Utilisation of Cleveland Bay as a nursery area	223
8.4.2. Other aspects of carcharhinid biology	227
Section IV. General Discussion	231
Chapter 9. General Discussion	232
9.1. Life history of <i>Rhizoprionodon taylori</i>	232
9.2. Nearshore waters and sharks of the family Carcharhinidae	238
9.3. Application of the results to the management of shark stocks	240
References cited	243
Appendices	275

TABLE OF FIGURES

Figure 1.1	Region of shark fisheries related research previously carried out in northern Australia (stippled; from Fig. 1, Stevens and McLoughlin 1991) and location of the study area in Cleveland Bay, North Queensland (arrow).	5
Figure 1.2	Catches of sharks reported by Queensland's commercial fishers between 1964/65 and 1989/90. Information from Australian Bureau of Statistics (1964/65 to 1979/80) and the QFMA/QDPI (1988/89 to 1989/90). No data are available for the period from 1980/81 to 1987/88.	8
Figure 2.1	Details of the Cleveland Bay study area. The letters A-C signify the three main sampling sites: A, Strand; B, southern Bay; and C, Middle Reef. Dots represent other sampling sites. Isobaths are indicated by dashed lines.	12
Figure 2.2	Total seasonal effort, in netting hours, of night set 10cm gillnets at three sites in Cleveland Bay between Winter 1987 and Summer 1990.	17
Figure 2.3	Length measurements taken from specimens caught in Cleveland Bay. TL, total length; FL, fork length.	21
Figure 3.1	Length frequency distribution of <i>Rhizoprionodon taylori</i> specimens caught in 10cm monofilament gillnets set in Cleveland Bay.	31
Figure 3.2	The effect of set time on (a) the number, and (b) catch rate, of <i>Rhizoprionodon taylori</i> caught in 10cm gillnets set in Cleveland Bay. s.n.h, sharks net ⁻¹ hr ⁻¹ .	32

Figure 3.3	Frequency distribution of catch rates of <i>Rhizoprionodon taylori</i> caught in 10cm gillnets set in Cleveland Bay. s.n.h, sharks net ⁻¹ hr ⁻¹ .	33
Figure 3.4	Mean catch rates of <i>Rhizoprionodon taylori</i> caught in night set 10cm gillnets at three sampling sites in Cleveland Bay. Error bars plus one standard error; s.n.h, sharks net ⁻¹ hr ⁻¹ .	34
Figure 3.5	Mean annual (a), and seasonal (b), catch rates of <i>Rhizoprionodon taylori</i> in night set 10cm gillnets at The Strand, Cleveland Bay, between Winter 1987 and Summer 1990. Error bars plus one standard error; s.n.h, sharks net ⁻¹ hr ⁻¹ .	35
Figure 3.6	Mean seasonal catch rates of <i>Rhizoprionodon taylori</i> in Cleveland Bay for all years of this study. Error bars plus one standard error; s.n.h, sharks net ⁻¹ hr ⁻¹ .	36
Figure 3.7	Mean monthly salinity and temperatures for Cleveland Bay from data collected during the sampling program. Error bars plus and minus one standard error.	37
Figure 4.1	Diagrammatic sections of vertebrae showing features referred to in the text. (a) whole vertebrae showing plane of section, (b) vertebra with opaque (indicated by arrows) and translucent bands, and (c) vertebra with circuli (arrows). CC, corpus calcareum; and I, intermedialia.	49
Figure 4.2	Relationship between centrum radius and total length for 151 <i>Rhizoprionodon taylori</i> caught in Cleveland Bay.	58
Figure 4.3	Marginal increments for <i>Rhizoprionodon taylori</i> from Cleveland Bay based on individuals with 4, or less, circuli (including the circulus formed at birth). 1 OMU = 0.027mm.	59

Figure 4.4	Von Bertalanffy growth curve fitted to length at age data for (a) 52 male and (b) 85 female <i>Rhizoprionodon taylori</i> caught in Cleveland Bay.	60
Figure 4.5	Length frequency data for (a) male and (b) female <i>Rhizoprionodon taylori</i> caught in Cleveland Bay. The von Bertalanffy growth curves calculated using ELEFAN I for the first four years are shown. Data for juvenile males and females (< 580mm TL) are combined.	61
Figure 5.1	Cumulative diversity of stomach contents of <i>Rhizoprionodon taylori</i> from Cleveland Bay using the method of Hoffman (1979).	85
Figure 5.2	Wet weight of stomach contents from 149 <i>Rhizoprionodon taylori</i> specimens: (a) raw wet weight data; and (b) estimated original weight of prey based on correction factors for different digestive states (see text for description of method).	86
Figure 5.3	Wet weight of (a) stomach contents, and (b) estimated original prey weight, as a proportion of total body weight, of 149 <i>Rhizoprionodon taylori</i> specimens from Cleveland Bay. Weights of prey determined from digestive state (see text for description of method).	87
Figure 5.4	Frequency distribution of state of digestion index (SDI) for 149 <i>Rhizoprionodon taylori</i> from Cleveland Bay (see text for details of SDI values).	88
Figure 5.5	Monthly variation in the hepatosomatic index (HSI) of (a) male, and (b) female, <i>Rhizoprionodon taylori</i> specimens from Cleveland Bay. Circles represent monthly means, bars plus and minus one standard error.	89

Figure 5.6	Monthly variation in the condition factor (K) of (a) male, and (b) female, <i>Rhizoprionodon taylori</i> specimens from Cleveland Bay. Circles represent monthly means, bars plus and minus one standard error.	90
Figure 5.7	Simple food chain for Cleveland Bay.	94
Figure 6.1	Relationships between, (a) the maximum length and the size at birth (SAB), and (b) the maximum length and the size at birth relative to maximum size, for species of the family Carcharhinidae. Where more than one report exists for a species all points are shown. Data from Appendix C.	104
Figure 6.2	Size at maturity (SAM) as a proportion of maximum length in sharks of the family Carcharhinidae, (a) males, and (b) females. Where more than one report exists for a species all points are shown. Data from Appendix C.	105
Figure 6.3	Relationships between, (a) the maximum litter size and maximum length, and (b) mean litter size and maximum length, for species of the family Carcharhinidae. Where more than one report exists for a species all points are shown. Data from Appendix C.	106
Figure 6.4	Relationship of clasper length (as a percentage of total length) to total length in 165 male specimens of <i>Rhizoprionodon taylori</i> from Cleveland Bay.	113
Figure 6.5	Percentage occurrence of maturity groups (juvenile, sub-adult and adult) in 10mm size classes of the female <i>Rhizoprionodon taylori</i> population from Cleveland Bay. See text for description of maturity groups.	114

Figure 6.6	Percentage occurrence of maturity groups (juvenile, sub-adult female and adult) of <i>Rhizoprionodon taylori</i> at the three principal sampling sites in Cleveland Bay. Numbers above bars are sample sizes.	115
Figure 6.7	Mean monthly values (all years pooled) of gonadosomatic index (GSI) for, (a) male, and (b) female, <i>Rhizoprionodon taylori</i> from Cleveland Bay. Error bars, plus one standard error.	116
Figure 6.8	Mean monthly values of maximum ova diameter (MOD) for 29 adult female <i>Rhizoprionodon taylori</i> from Cleveland Bay. Error bars, plus one standard error.	117
Figure 6.9	Relationship between maternal length and litter size in 221 female <i>Rhizoprionodon taylori</i> from Cleveland Bay.	118
Figure 6.10	Proportions of mature male and female <i>Rhizoprionodon taylori</i> caught each month in Cleveland Bay during this study. Numbers above bars are sample sizes for each month (all years pooled).	119
Figure 7.1	Longitudinal section of the uterus of <i>Carcharhinus plumbeus</i> containing three embryos (only the one in the left compartment is shown) showing the location of a compartment (C), embryo (E), storage chamber (SC), uterine wall (U), and yolk sac (YS). Redrawn from Figure 12b in Baranes and Wendling (1981).	146
Figure 7.2	The three types of placenta that occur in the family Carcharhinidae: (a) entire (mature), (b) discoidal (mature) and (c) stalked (early, redrawn from Setna and Sarangdhar 1948). A, Appendiculae; DP, distal portion of placenta; PP, proximal portion of placenta; TB, trophonematous bulb; TC, trophonematous cord; TS, trophonematous stalk; TU, trophonematous cup; U, umbilical cord; Ut, uterus; YS, yolk sac. Asterisk indicates tissues of maternal origin.	147

- Figure 7.3 General morphology of the oviducal gland of *Rhizoprionodon taylori*, and distribution of tubule types A (stippled), B (hatch rising right) and C (hatch rising left) in the basal portion (section A) and the lateral horns (section B). BP, basal portion; Ca, caudal oviduct; Cr, cranial oviduct; L, lumen; LH, lateral horn. 164
- Figure 7.4 Variation in the size (length and width) of the oviducal glands of *Rhizoprionodon taylori* by month. 1, January; 2, February; 3, March; 8, August; 9, September; D, other. 165
- Figure 7.5 Growth of *Rhizoprionodon taylori* embryos. Open circles, stage I embryos; closed circles, stage II embryos; open triangles, free embryos; solid squares, mean monthly sea surface temperature for Townsville (from Kenny 1974). 166
- Figure 7.6 Oblique view (a), and longitudinal section (b), of a diapausing blastoderm of *Rhizoprionodon taylori* based on a reconstruction from serial sections of an embryo from a female caught in May 1988. E, embryo; SC, segmentation cavity; Y, yolk. Anterior of sections is to the right. 167
- Figure 7.7 Relationship between the mean weight of individuals in litters and the litter size, indicating that females that have smaller litters produce larger young. 168
- Figure 7.8 Accommodation of (a) diapausing, (b) mid-term, and (c) full-term, embryos within the uteri of *Rhizoprionodon taylori*. E, egg; EC, egg case; Em, embryo; P, placenta; S, septa; U, umbilical cord; Ut, uterus. 169
- Figure 8.1 Mean catch rates of *Carcharhinus tilstoni* at three sites in Cleveland Bay. Error bars, plus one standard error; s.n.h., sharks net⁻¹hr⁻¹. 214

Figure 8.2	Mean (a) annual, and (b) seasonal, catch rates of <i>Carcharhinus tilstoni</i> , in night set 10cm gillnets at the Strand site. Error bars, plus one standard error; s.n.h., sharks net ⁻¹ hr ⁻¹ .	215
Figure 8.3	Mean seasonal catch rates of <i>Carcharhinus tilstoni</i> , caught in night set 10cm gillnets at the Strand site, for each year of the study between winter 1987 and summer 1990. Error bars, plus one standard error; s.n.h., sharks net ⁻¹ hr ⁻¹ .	216
Figure 8.4	Mean catch rates of <i>Rhizoprionodon acutus</i> at three sites in Cleveland Bay. Error bars, plus one standard error; s.n.h., sharks net ⁻¹ hr ⁻¹ .	217
Figure 8.5	Mean (a) annual, and (b) seasonal, catch rates of <i>Rhizoprionodon acutus</i> , in night set 10cm gillnets at the Strand site. Error bars, plus one standard error; s.n.h., sharks net ⁻¹ hr ⁻¹ .	218
Figure 8.6	Mean seasonal catch rates of <i>Rhizoprionodon acutus</i> , caught in night set 10cm gillnets at the Strand site, for each year of the study between winter 1987 and summer 1990. Error bars, plus one standard error; s.n.h., sharks net ⁻¹ hr ⁻¹ .	219
Figure 8.7	Length frequency distributions of (a) <i>Carcharhinus tilstoni</i> and (b) <i>Rhizoprionodon acutus</i> caught in Cleveland Bay using 5 and 10cm gillnets. S.A.B., size at birth; S.A.M., size at maturity. Estimates of the sizes at birth and maturity based on data from Stevens and Wiley (1986), Stevens and McLoughlin (1991), and the present study.	220
Figure 8.8	Clasper length as a proportion of total length to demonstrate the size at maturity of male <i>Rhizoprionodon acutus</i> from Cleveland Bay. Open circles, uncalcified claspers; solid circles, calcified claspers.	221

TABLE OF PLATES

Plate 4.1	Section of a centrum from a 738mm TL female caught in January and estimated to be 5+ years. Arrows indicate circuli; B, circulus formed at birth; 1-5, circuli formed after 1-5 years.	53
Plate 6.1	Dissected adult female <i>Rhizoprionodon taylori</i> caught in early February showing the presence of large yolky ova (arrow heads) in the ovary prior to ovulation. Scale bar, 10mm.	120
Plate 6.2	Dissected adult female <i>Rhizoprionodon taylori</i> caught in late February. The yolky ova have been ovulated and eggs are present in the uteri (arrow heads). A large corpora atretica is present in the ovary (asterisk). Scale bar, 10mm.	120
Plate 7.1	Eggs from the uterus of a female <i>Rhizoprionodon taylori</i> showing the egg case (a) uncoiled, and (b) in natural position. E, egg; EC, egg case. Scale bars, 10mm.	170
Plate 7.2	Histological section through type A tubules of an adult female <i>Rhizoprionodon taylori</i> caught in early February, showing the presence of spermatozoa (arrow heads) in the lumen. Scale bar, 0.02mm.	171
Plate 7.3	Histological section of the lumen of the lateral horn from the oviducal gland of <i>Rhizoprionodon taylori</i> , showing the column shaped lamellae at the base of which type B tubules open. CL, columnar lamellae; L, lumen of gland. Scale bar, 0.1mm.	172
Plate 7.4	Histological section of part of the lateral horn of <i>Rhizoprionodon taylori</i> during ovulation showing the tufted	172

- lamellae and production of the sheet-like secretion (arrow heads) in type C tubules. L, lumen of gland; TL, tufted lamellae. Scale bar, 0.2mm.
- Plate 7.5 Sagittal histological sections through a diapausing blastoderm of *Rhizoprionodon taylori* from a female caught in April 1988. Section (a) shows the anterior portion of the embryo, and (b) the posterior section. Em, embryo; SC, segmentation cavity; Y, yolk. Scale bars, 0.1mm (a) and 0.25mm (b). 173
- Plate 7.6 Development of *Rhizoprionodon taylori* embryos. (a) 6mm embryo (arrow shows location of embryo), (b) 16mm embryo, (c) 38mm embryo, (d) 68mm embryo, (e) 133mm embryo, and (f) 235mm embryo. E, egg; F, fin buds; U, umbilical cord (or yolk stalk); X, external branchial filaments. 174
- Plate 7.7 Histological sections showing the development of the yolk stalk and umbilical cord in *Rhizoprionodon taylori* embryos. (a) 16mm embryo, (b) 38mm embryo, (c) 133mm embryo, and (d) 235mm embryo. A, appendiculae; D, ductus vitello-intestinalis; VA, vitelline or umbilical artery; VV, vitelline or umbilical vein. Scale bars, 0.2mm (a), 0.5mm (b), 0.3mm (c) and 0.4mm (d). 175
- Plate 7.8 Histological section through a uterine septum of *Rhizoprionodon taylori*. M, mucosa; SG, sheet-like gland; SM, submucosa. Scale bar, 0.25mm. 176
- Plate 7.9 Histological section through the uterus of a mid-term *Rhizoprionodon taylori* illustrating the four tissue layers. EC, egg case; M, mucosa; Mu, muscularis; Se, serosa; and SM, submucosa. Scale bar, 0.08mm. 176
- Plate 7.10 Histological sections of the uterine mucosa of *Rhizoprionodon taylori* from (a) the diapause, and (b) the 177

developmental, periods. The epithelial cells of the mucosa produce an apocrine secretion into the lumen of the uterus. B or arrows, blood vessels; EC, egg case; M, mucosa (epithelium); SM, submucosa. Scale bars, 0.05mm.

- Plate 7.11 Histological section of the sheet-like gland (see text for description) present in the submucosa of the uterus of *Rhizoprionodon taylori*. Arrows indicate tubules that make up the gland. Scale bar, 0.04mm. 178
- Plate 7.12 Transmission electron micrographs of the epithelial cells of the ductus vitello-intestinalis of *Rhizoprionodon taylori* showing vesicles (asterisk), microvilli (arrows) and cilia (arrow heads). (a) 10000 times, and (b) 5000 times, magnification. 179
- Plate 7.13 Histological sections of appendiculae of *Rhizoprionodon taylori*, showing the form of the epithelial cells. (a) 36mm embryo, (b) 68mm embryo, and (c) 235mm embryo. Arrows, apocrine secretion; Arrow heads, microvilli; B, blood vessel; CC, connective tissue; Ep, epithelium. Scale bars, 0.02mm. 180
- Plate 7.14 Surface view of the epithelial cells of appendiculae of *Rhizoprionodon taylori* showing absorptive cells (AC) with apical microvilli and secretory cells (SC) . (a) 36mm embryo, (b) 90mm embryo, and (c) 235mm embryo. Scales indicated on photographs. 181
- Plate 7.15 External branchial filaments of *Rhizoprionodon taylori*. (a) transverse histological sections, and (b) scanning electron micrograph. B, blood vessel; Ep, epithelial cells. Scale bar for (a) 0.03mm, scale for (b) on photograph. 182

- Plate 7.16 General morphology of a mature placenta of *Rhizoprionodon taylori*. A, appendiculae; DP, distal portion of placenta (enveloped in uterine tissue); PP, proximal portion of placenta. Scale bar, 2mm. 183
- Plate 7.17 Histological section of a proximal portion of the mature placenta of *Rhizoprionodon taylori*. Arrows, apocrine secretion; CC, connective tissue; Ep, epithelium. Scale bar, 0.06mm. 183
- Plate 7.18 Histological sections of the early placenta of *Rhizoprionodon taylori* showing the developing interdigitation (a) and the tissue layers present at the maternal and embryonic interface (b). B, blood vessels; EC, egg case; EE, embryonic endoderm; ES, embryonic squamous epithelium; MS, maternal squamous epithelium; Y, Yolk. Scale bars, 0.3mm (a) and 0.04mm (b). 184
- Plate 7.19 Histological sections of the mature placenta of *Rhizoprionodon taylori* showing the complex interdigitation of the uterus and yolk sac (a) and the cellular detail at the maternal-embryonic interface (b). Arrow heads, maternal-embryo interface; B, blood vessel; EC, egg case; RS, remnant submucosa; Y, yolk. Scale bars, 0.3mm (a) and 0.015mm (b). 185

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