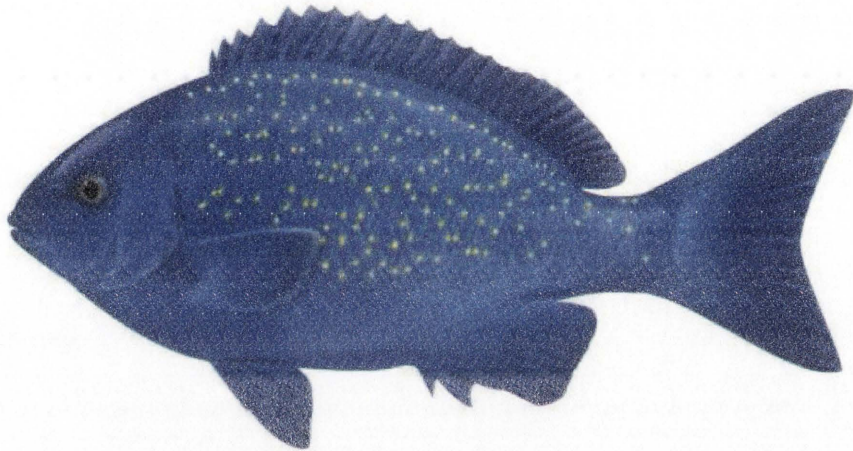


The Life History and Ecology of
Bluefish,
Girella cyanea, at Lord Howe Island



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April 2012

Thesis submitted in fulfilment of the requirements for
the Degree of Master of Science (Research)



Picture source: NSW Department of Primary Industries

Certificate of Authorship & Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that this thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in this thesis.

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Melanie A Lewis

3rd April 2012

Thesis Abstract

Girella cyanea is a conspicuous member of the reef-fish community in the Lord Howe Island Marine Park (LHIMP), but very little is known about its life history. Rareness of this species on mainland Australian coasts in recent years has initiated a fishing ban across the state of New South Wales, however recreational fishing is still permitted on LHI. Effective management and conservation of this population requires increased information on life history and demographics. Management currently in place for this species is limited. A bag limit of 5 fish person⁻¹ day⁻¹ is imposed in habitat protection zones across the Marine Park. It is difficult to measure the effectiveness of this strategy, however, without the knowledge of the resource requirements of the species and how these may change throughout the course of life. This study aimed to describe distribution, diet and growth in *G. cyanea* to provide important information for best-practice management of the LHI population.

An extensive literature search was conducted for published life history, ecology and management data on Girellidae, revealing relatively scarce information for the family. A pilot study assessed the utility of a roaming survey method towing a GPS-receiver behind an observer on snorkel/SCUBA. This new method proved effective and was used for size-based assessments of habitat-use at nearshore and offshore locations around the LHI archipelago. Densities of *G. cyanea* were highest in complex rocky intertidal and rocky-reef areas. Dietary analyses helped explain this distribution, with gut contents showing intertidal green algal species (i.e. *Ulva* and *Enteromorpha*) are important food resources for post-settlement fish.

An ontogenetic dietary shift was found, with fish < 40 mm standard length (L_S) found in intertidal habitat having a mainly carnivorous diet and a digestive system without pyloric caeca. In contrast, pyloric caeca were well-developed in fish > 40 mm L_S and diets exhibited increased ingestion of algae.

Age-at-size using otoliths and von Bertalanffy parameters revealed *G. cyanea* is fast-growing and long-lived (up to 41 yrs). It is likely the transition to sexual maturity occurs between 2 and 5 years of age or 200 mm L_S . Size-based observations place fish of this life stage within complex rock habitats at depths < 5 m. Future management policies should ensure adequate (representative) areas of rocky intertidal habitat are within sanctuary zoning to protect *G. cyanea* at this important life stage.

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So what did I learn from this process? In the words of American writer Poul Anderson:

**“I am yet to see any problem, however complicated,
which when you look at it the right way
did not become still more complicated.”**

Permissions, Permits and Funding

This study involved a species protected in part of its distributional range, and was conducted within a State and Commonwealth Marine Park listed as a UNESCO World Heritage Site. The study forms part of the Marine Parks Authority (MPA) 2006-2012 Research Work Plan, and was approved and supported by the Lord Howe Island Board.

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- RNSH & UTS Animal Care & Ethics Committee (ACEC) approval RNS/UTS 0610-038A
- NSW Department of Primary Industries (DPI) scientific collections permit P05/0130-02

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Table of Contents

TITLE PAGE.....	I
CERTIFICATE OF AUTHORSHIP & ORIGINALITY.....	II
THESIS ABSTRACT	III
ACKNOWLEDGEMENTS.....	IV
PERMISSIONS, PERMITS AND FUNDING	VI
LIST OF TABLES.....	XI
LIST OF FIGURES	XII
ABBREVIATIONS.....	XIV
CHAPTER 1 - GENERAL INTRODUCTION	1
1.1 STUDYING THE ECOLOGY AND LIFE HISTORY OF FISHES.....	1
1.2 LIFE HISTORY AND ECOLOGY OF THE BLUEFISH, <i>GIRELLA CYANEA</i> , MACLEAY 1881.....	2
1.3 PROJECT AIMS	3
1.4 <i>GIRELLA CYANEA</i> AT LORD HOWE ISLAND.....	4
1.5 THESIS STRUCTURE	11
(1) <i>What resources do G. cyanea require/use?</i>	12
(2) <i>What life history traits do G. cyanea exhibit?</i>	12
(3) <i>Do the life history and demographic attributes of G. cyanea display ontogenetic change?</i>	13
CHAPTER 2 - LITERATURE REVIEW	14
2.1 REVIEWING WHAT WE KNOW ABOUT THE FAMILY GIRELLIDAE.....	14
2.2 TAXONOMY	15
2.3 GEOGRAPHIC RANGE.....	15
FIGURE 2.1 WORLDWIDE ANTITROPICAL DISTRIBUTION OF GIRELLIDAE. ADAPTED FROM YAGISHITA & NAKABO (2003)	18
2.4 HABITAT.....	19
2.5 BIOLOGY AND BEHAVIOUR.....	19
<i>Diet</i>	19
<i>Reproduction</i>	22
<i>Age and growth</i>	22
2.6 FISHERIES AND POPULATIONS	23
<i>The Americas</i>	23
<i>Australasia</i>	24
<i>Japanese archipelago</i>	25
2.7 BIBLIOGRAPHY (CH. 2 ONLY).....	26
CHAPTER 3 - METHOD DEVELOPMENT	34
3.1 PREFACE.....	34

<i>Preliminary Study A: Optimisation of underwater visual survey methods for patchily distributed fish</i>	35
.....	35
3.2 INTRODUCTION.....	35
3.3 MATERIALS AND METHODS.....	36
3.5 DISCUSSION.....	39
<i>Preliminary Study B: Determining the accuracy and precision of underwater estimates of fish</i>	
<i>lengths</i>	47
3.6 INTRODUCTION.....	47
3.7 MATERIALS AND METHODS.....	48
3.8 RESULTS.....	49
3.9 DISCUSSION.....	49
CHAPTER 4 - PUTTING BLUEFISH (GIRELLIDAE: GIRELLA CYANEA) ON THE MAP: PATTERNS OF	
ABUNDANCE AND POPULATION SIZE STRUCTURE USING THE ROAMING TRANSECT SURVEY METHOD	
.....	53
4.1 INTRODUCTION.....	54
4.2 MATERIALS AND METHODS.....	54
<i>Study site</i>	54
<i>Nearshore sampling</i>	55
<i>Offshore sampling</i>	57
<i>Data analyses</i>	57
4.3 RESULTS.....	59
<i>Habitat partitioning</i>	59
<i>Depth stratification</i>	63
<i>Environmental factors</i>	63
<i>LHIMP zones</i>	63
4.4 DISCUSSION.....	67
<i>Distribution of juveniles to adults, from complex intertidal to rocky-reef</i>	67
CHAPTER 5 - HERBIVORY, PSEUDO-HERBIVORY OR OMNIVORY? THE HIGHLY VARIABLE DIET OF THE	
BLUEFISH (GIRELLIDAE: GIRELLA CYANEA) AT LORD HOWE ISLAND.....	70
5.1 INTRODUCTION.....	71
5.2 MATERIALS AND METHODS.....	72
<i>Sample collections</i>	72
<i>Fish dissection and measurements</i>	73
<i>Dietary examination</i>	75
<i>Diet composition and data analyses</i>	76
5.3 RESULTS.....	77

<i>Length-weight relationship and morphology</i>	77
<i>Diet composition</i>	78
5.4 DISCUSSION	88
<i>Intertidal algal spp. are an important dietary component for G. cyanea</i>	88
<i>An ontogenetic dietary shift occurs in G. cyanea at < 40 mm L₅</i>	91
<i>Omnivory across adult sizes makes G. cyanea a pseudo-herbivore</i>	93
<i>Conclusion</i>	95
CHAPTER 6 - LONG LIVE THE BLUEFISH: SIZE-AT-AGE, GROWTH AND LONGEVITY OF GIRELLA CYANEA (GIRELLIDAE) AND INFORMATION FOR THE MANAGEMENT OF THE RECREATIONAL FISHERY AT LORD HOWE ISLAND MARINE PARK	96
6.1 INTRODUCTION	97
6.2 MATERIALS AND METHODS.....	100
<i>Samples</i>	100
<i>Otolith preparation</i>	100
<i>Age determination</i>	102
<i>Growth and development</i>	102
<i>Growth and mortality approximations</i>	102
<i>Data analyses</i>	104
6.3 RESULTS.....	105
<i>Otolith and somatic growth morphometry</i>	105
<i>Life history traits and mortality</i>	108
6.4 DISCUSSION	112
<i>Otoliths as a utility for ageing G. cyanea</i>	112
<i>G. cyanea are long-lived with determinate growth</i>	114
<i>Sexual maturity occurs between 2 and 5 years of age</i>	115
<i>Mortality and harvest of G. cyanea</i>	116
<i>Conclusion</i>	118
CHAPTER 7 – FINAL DISCUSSION	120
<i>A life history model for Girella cyanea</i>	120
(1) <i>What resources do G. cyanea require/use?</i>	123
(2) <i>What life history traits do G. cyanea exhibit?</i>	123
(3) <i>Do the life history and demographic attributes of G. cyanea display ontogenetic change?</i>	124
<i>Research needed for conservation and management</i>	124
<i>Major conclusions</i>	126
REFERENCES	128
APPENDICES	151

Appendix 1: Archived collections of G. cyanea 151
Appendix 2: Dissemination of research results 152

List of Tables

TABLE 2.1 LIST OF CURRENT SPECIES RECOGNISED IN <i>GIRELLA</i>	16
TABLE 2.2 DIETS OF ADULT <i>GIRELLA</i> AND <i>KYPHOSUS</i> SPECIES. ADAPTED FROM CLEMENTS & CHOAT (1997)	21
TABLE 3.1 DEFINING CHARACTERISTICS OF HABITAT CATEGORIES USED IN RTS AT NORTH BAY, LHI.	38
TABLE 3.2 DEPENDENT SAMPLES <i>T</i> -TEST OF DENSITY (NUMBER OF FISH CALCULATED 100M ⁻²) AND ABUNDANCE (NUMBER OF FISH COUNTED PER 3MIN RTS) IN EACH HABITAT WHERE FISH WERE OBSERVED	42
TABLE 4.1 DESCRIPTION OF HABITATS ASSESSED FOR <i>G. CYANEA</i> DISTRIBUTIONS AT LOCATIONS NEARSHORE ON THE MAIN ISLAND OF LHI (RK, AZ, CD, DR, SA, SG), AND AT OFFSHORE ISLETS AND DIVE SITES (DI).	58
TABLE 4.2 DETAILS OF TOTAL SAMPLING EFFORT AND <i>G. CYANEA</i> ABUNDANCE ACROSS HABITAT CATEGORIES SURVEYED AT LOCATIONS ACROSS THE LHI ARCHIPELAGO..	60
TABLE 5.1 FOOD ITEMS IN THE DIET OF SAMPLED <i>G. CYANEA</i>	82
TABLE 5.2 DEGREE OF DIETARY SPECIALIZATION WITHIN SIZE CLASSES.	85
TABLE 5.3 DISCRIMINATORY FOOD ITEMS CONTRIBUTING TO DISSIMILARITY IN PAIRWISE COMPARISONS OF SIZE CLASSES ...	86
TABLE 6.1 MEAN AGE OF SIZE CLASSES.	107
TABLE 6.2 GROWTH PARAMETERS DERIVED FROM THE VON BERTALANFFY GROWTH MODEL AND POPULATION CHARACTERISTICS	110

List of Figures

FIGURE 1.1 MAP OF THE GLOBAL DISTRIBUTION OF <i>G. CYANEA</i>	5
FIGURE 1.2 THE LORD HOWE ISLAND ARCHIPELAGO	6
FIGURE 1.3 LOCATION OF LORD HOWE ISLAND WITHIN THE SOUTH-WEST PACIFIC OCEAN, AND EXPANDED TO SHOW THE LHI ARCHIPELAGO.....	7
FIGURE 1.4 OCEANIC CURRENTS OF THE SOUTH-WEST PACIFIC OCEAN. FROM: SCHIEL ET AL. (1986).	9
FIGURE 2.1 WORLDWIDE ANTITROPICAL DISTRIBUTION OF GIRELLIDAE. ADAPTED FROM YAGISHITA & NAKABO (2003)	18
FIGURE 3.1 SCHEMATIC OF THE ROAMING TRANSECT SURVEY (RTS) TECHNIQUE SHOWING SWATHE DIMENSIONS AND FIELD OF VIEW OF THE OBSERVER.....	37
FIGURE 3.2 DISTANCE COVERED DURING A THREE-MINUTE RTS PER HABITAT AT NORTH BAY, LHI.....	40
FIGURE 3.3 DISTANCE (<i>d</i>) VERSUS SPEED (<i>s</i>) OF EACH RTS CONDUCTED OVER A THREE MINUTE INTERVAL.....	41
FIGURE 3.4 DENSITY (NUMBER OF FISH CALCULATED PER 100M ²) AND ABUNDANCE (NUMBER OF FISH COUNTED PER THREE MINUTE RTS) FOR EACH HABITAT THAT <i>G. CYANEA</i> WERE OBSERVED.....	43
FIGURE 3.5 A: ACCURACY OF MODEL FISH SIZE ESTIMATIONS IN THE FIELD. B: SIZE CLASS CATEGORIES USED TO ASSIGN FISH LENGTH ESTIMATES AD HOC.	50
FIGURE 3.6 PRECISION OF MODEL SIZE ESTIMATIONS IN THE FIELD	51
FIGURE 4.1 SAMPLING LOCATIONS WITHIN THE LHI ARCHIPELAGO.....	56
FIGURE 4.2 MEAN DENSITIES (\pm S.E.M) OF <i>G. CYANEA</i> IN NEARSHORE HABITATS, RECORDED FROM RTS SWIMS POOLED ACROSS LOCATIONS	62
FIGURE 4.4 DEPTH DISTRIBUTIONS OF <i>G. CYANEA</i>	64
FIGURE 4.5 OCCURRENCE OF FOUR ENVIRONMENTAL FACTORS ASSOCIATED WITH <i>G. CYANEA</i> SIGHTINGS.	65

FIGURE 4.6 SEGREGATION OF RTS-OBSERVED <i>G. CYANEA</i> ACROSS LHI MARINE PARK ZONES.....	66
FIGURE 5.1 SAMPLING LOCATIONS OF <i>G. CYANEA</i> AT LORD HOWE ISLAND	74
FIGURE 5.2 THE RELATIONSHIP OF LENGTH AND WEIGHT IN <i>G. CYANEA</i>	79
FIGURE 5.3 SCHEMATIC DRAWINGS OF THE DIGESTIVE TRACT OF <i>G. CYANEA</i>	80
FIGURE 5.4 THE RELATIONSHIP BETWEEN THE LENGTH OF DIGESTIVE TRACT AND TWO MEASURES OF BODY SIZE	81
FIGURE 5.5 VOLUME OF MAJOR FOOD GROUPS IN DIGESTIVE TRACT AND RELATIVE GUT LENGTH PER SIZE CLASS.....	87
FIGURE 5.6 GUT LENGTH STANDARDISED FOR BODY MASS, EXPRESSED AS ZIHLER'S INDEX (ZI).....	89
FIGURE 5.7 SEASONAL FREQUENCY OF THE MOST COMMON DIETARY ITEMS IN PLANT (<i>ULVA</i> SPP.) AND ANIMAL (<i>EUPHAUSID</i> SP.) CATEGORIES FOUND IN GUT CONTENTS. TOTAL ANIMAL TISSUE IS ALSO DISPLAYED.....	90
FIGURE 6.1 TRANSVERSELY SECTIONED SAGITTAL OTOLITH OF A FOUR YEAR OLD <i>G. CYANEA</i> , SHOWING A DENSE CENTRAL OPAQUE REGION (F) AND A SUBSEQUENT ALTERNATING SEQUENCE OF OPAQUE AND TRANSLUCENT BANDING.	101
FIGURE 6.2 LINEAR GROWTH OF OTOLITHS IN RELATION TO OPAQUE BANDS (PRESUMED AGE IN YRS) IN <i>GIRELLA CYANEA</i> .	106
FIGURE 6.3 TEMPORAL PATTERNS OF REPRODUCTIVE DEVELOPMENT ACROSS SIZE CLASSES (A), AGES (B) AND MONTHS (C).	110
FIGURE 7.1 DIAGRAMMATIC REPRESENTATION OF HORIZONTAL (HABITAT) AND VERTICAL (DEPTH) PARTITIONING IN <i>G. CYANEA</i> THROUGH ONTOGENY	122

Abbreviations

ANOVA	Analysis of Variance
DPI	Department of Primary Industries
EAC	East Australian Current
EAUC	East Auckland Current
GLM	General Linear Model
HPZ	Habitat Protection Zone (some fishing permitted, see p. 10)
LHI	Lord Howe Island
LHIMP	Lord Howe Island Marine Park
L_T	Fish total body length (rostrum to caudal fin tip)
L_F	Fish body length (rostrum to fork)
L_S	Fish standard body length (rostrum to last vertebrae)
MHWM	Mean high water mark
MLL	Minimum Legal Length
MPA	Marine Park Authority
NSW	New South Wales
QLD	Queensland
RTS	Roaming Transect Survey
SZ	Sanctuary Zone (no-take reserve)
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UTS	University of Technology, Sydney
UVC	Underwater Visual Census
VBGM	von Bertalanffy Growth Model