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THE LIFE HISTORY AND BEHAVIOUR OF THE
SUBSOCIAL AMAUROBIOID SPIDER BADUMNA CANDIDA

Thesis submitted by
Michael Frank DOWNES BA BSc MSc (JCUNQ)
in May 1992

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



Frontispiece. Homespun Badumna candida

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M F Downes
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CONTENTS

Frontispiece	ii
Statement on access to thesis	iii
Statement on sources	iv
List of tables	vi
List of figures	ix
Acknowledgements	xii
Dedication	xv
Abstract	xvi
Chapter 1. General Introduction	1
Chapter 2. The nest: structure and environment	13
Chapter 3. Seasonal change in colony composition	91
Chapter 4. Postembryonic development	111
Chapter 5. The sex ratio	140
Chapter 6. Dispersal	147
Chapter 7. Courtship and mating	162
Chapter 8. Oviposition and fecundity	177
Chapter 9. Nest associates	194
Chapter 10. The activity cycle and nest hygiene	216
Chapter 11. Predation and feeding	226
Chapter 12. Maternal care	241
Chapter 13. Sibling care and interattraction	253
Chapter 14. Subadult and adult interactions	267
Chapter 15. General discussion	277
References	286

Tables

1.1.	The degrees and criteria of insect sociality.	6
1.2.	Characteristics of sociality in spiders.	11
2.1.	Host plants of 280 <u>B. candida</u> nests.	34
2.2.	Frequencies of <u>B. candida</u> nests on host plants in mapping study field plots.	35
2.3.	Decline in condition of <u>B. candida</u> nests on various host plants, between May and November.	35
2.4.	Change in size of <u>B. candida</u> nests on various host plants, between May and November.	37
2.5.	Change in size of <u>B. candida</u> nests at different heights above ground, between May and November.	37
2.6.	Frequencies of <u>B. candida</u> nests with respect to the foliage density of their host plants, in May and November.	40
2.7.	Numbers of <u>B. candida</u> nests showing given combinations of nest condition and host plant foliage density, in May and November.	41
2.8.	Change in size of <u>B. candida</u> nests with respect to host plant foliage density, between May and November.	42
2.9.	Frequencies of <u>B. candida</u> nests with respect to proximity to ecotone.	42
2.10.	Plant species composition in mapping study plots.	44
2.11.	Decline in condition of <u>B. candida</u> nests with respect to ecotone proximity, between May and November.	46
2.12.	Change in size of <u>B. candida</u> nests within and beyond 5m of ecotone, between May and November.	47
2.13.	Size and condition of <u>B. candida</u> nests in 20 transects bordering and not bordering ecotones.	47
2.14.	Life tables for <u>B. candida</u> nests.	63
2.15.	Size changes in 42 vigorously-thriving <u>B. candida</u> nests, between June and November.	70
2.16.	<u>B. candida</u> host plant foliage density within and beyond 5m of ecotone.	90
3.	Mean numbers of the life history stage components of colonies of <u>B. candida</u> in nests at each month of the year.	103

4.1.	Experiment to test interactive control of development in <u>B. candida</u> . Breakdown of spider numbers involved, and estimated instars.	117
4.2.	Distribution of maturation instars and duration of final instars in non-maturing females of <u>B. candida</u> at 25°C.	122
4.3.	Development times and rates, thresholds and thermal constants for <u>B. candida</u> .	124
4.4.	Experiment to test interactive control of development in <u>B. candida</u> . Numbers and sexes of spiders at end of experiment.	126
4.5.	Experiment to test interactive control of development in <u>B. candida</u> . Breakdown of numbers, proportions and instars of 169 spiders that did not mature during the experiment.	127
4.6.	Analysis of variance of group proportions of 169 <u>B. candida</u> immatures from group rearing experiment.	128
4.7.	Estimated mean maturation times of male <u>B. candida</u> in mixed-sex group rearing trials.	128
4.8.	Analysis of variance of estimated mean maturation times of <u>B. candida</u> males reared in mixed-sex groups.	130
4.9.	Mean first instar-maturation times of <u>B. candida</u> in laboratory and field.	130
5.1.	Primary sex ratio data for <u>B. candida</u> .	143
5.2.	Late-cycle secondary sex ratios in naturally-occurring nests of <u>B. candida</u> .	143
6.1.	Proportional distribution of instar of dispersal and nest founding by <u>B. candida</u> females.	153
6.2.	Dispersal distances of <u>B. candida</u> .	153
6.3.	Success rates of 88 founder nests in dispersal trials of <u>B. candida</u> .	155
6.4.	Success rates of founder sites of <u>B. candida</u> , with respect to the number of founder sites established on host plants.	155
6.5.	Artificial sociotomy in captivity in <u>B. candida</u> .	155
8.	The egg sacs of <u>B. candida</u> : clumping and location within nests.	186

9.1.	Arthropod associates of <u>B. candida</u> nests.	197
9.2.	Seasonality and frequency of <u>Ceratobaeus setosus</u> .	198
11.1.	Attack propensities of <u>B. candida</u> , with respect to proximity to prey.	233
11.2.	Attack propensities of <u>B. candida</u> , with respect to proximity of prey; limited criteria.	233
11.3.	Attack propensities of <u>B. candida</u> , with respect to spider size.	233
11.4.	Attack propensities of <u>B. candida</u> , with respect to hunger level; no prior occupancy.	235
11.5.	Attack propensities of <u>B. candida</u> , with respect to hunger level; prior occupancy held by well-fed spiders.	235
11.6.	Attack propensities of <u>B. candida</u> , with respect to subadult sex.	235
12.	Experimental design for <u>B. candida</u> parent-young feeding interactions.	244
13.1.	The effects of presence/absence of a web, and the number of spiderlings present, on the survival of first-instar <u>B. candida</u> spiderlings.	257
13.2.	Survivorship of unfed broods of <u>B. candida</u> , with respect to the number of eggs consumed before emergence.	257
13.3.	Interattraction in <u>B. candida</u> .	259
14.	Levels of tolerance and interattraction in <u>B. candida</u> subadults and adults with and without a history of isolation.	270
15.	Characteristics of sociality in spiders.	280

FIGURES

2.1(a).	The woodland of the study area; a dry spell on campus.	17
2.1(b).	The woodland of the study area; dry sclerophyll country.	17
2.2.	The climate of Townsville - temperature and rainfall.	18
2.3.	Mapping study field plot A.	22
2.4.	Mapping study field plot B.	24
2.5.	Frequency distribution of 280 <u>B. candida</u> nest heights.	31
2.6.	<u>Zizyphus mauritiana</u> , the chinee apple.	32
2.7.	The condition of <u>B. candida</u> nests with respect to their heights above ground.	38
2.8.	Founder funnel of <u>B. candida</u> , showing side pocket.	49
2.9.	<u>B. candida</u> nest with leaves in and around the web.	32
2.10.	The entrance/exit holes at the boundary of the retreat area of a <u>B. candida</u> nest.	51
2.11.	Closeup of Fig. 2.10.	51
2.12.	The structure of the nest of <u>B. candida</u> - subsurface runways.	52
2.13.	Runways and galleries in an opened <u>B. candida</u> nest.	53
2.14.	Retreat area of a <u>B. candida</u> nest.	54
2.15.	Closer view of the runway tunnel entrances.	54
2.16.	The structure of the nest of <u>B. candida</u> - internal structure of runways.	57
2.17.	<u>B. candida</u> nest on <u>Sida cordifolia</u> , with prey-trapping webbing above the retreat.	59
2.18.	<u>B. candida</u> nest with prey-trapping webbing beside the retreat.	59
2.19.	<u>B. candida</u> nest with prey-trapping webbing below the retreat.	59
2.20.	Two <u>B. candida</u> nests growing together.	60

2.21.	At least three separate retreats in a compound <u>B. candida</u> nest.	60
2.22.	The relationship between the sizes of <u>B. candida</u> nests and the numbers of spiders they contain.	62
2.23.	Survivorship curves for 105 <u>B. candida</u> nests.	65
2.24.	Sizes and conditions of <u>B. candida</u> nests between June and April.	67
2.25(a).	Fluctuations in sizes of four <u>B. candida</u> nests over five months.	69
2.25(b).	Mean sizes of 15 <u>B. candida</u> nests over the same period.	69
2.26.	A small, late-season <u>B. candida</u> nest.	72
2.27.	A moribund <u>B. candida</u> nest.	72
3.1.	Adult male <u>B. candida</u> .	94
3.2.	Closer view of Fig. 3.1.	94
3.3.	Penultimate male <u>B. candida</u>	95
3.4.	Closeup of Fig. 3.3.	95
3.5.	Middle-instar juvenile <u>B. candida</u> , showing distinctive chevron pattern on abdomen.	98
3.6.	Middle-instar juvenile <u>B. candida</u> , showing extensive hair pile on cephalothorax.	98
3.7.	Middle-instar juvenile <u>B. candida</u> , side view.	98
3.8.	The eggs of <u>B. candida</u> .	99
3.9.	<u>B. candida</u> postembryos.	99
3.10.	Mean numbers of spiders in <u>B. candida</u> nests at each month of the year.	101
3.11.	Mean numbers of the life history stage components of colonies of <u>B. candida</u> in nests at each month of the year.	102
3.12.	Mean proportions of the life history stage components of colonies of <u>B. candida</u> in nests at each month of the year.	104
3.13.	Mean proportions of subadult males, adult males and subadult females in late-cycle nests of <u>B. candida</u> .	106
3.14.	For each month, the proportion of <u>B. candida</u> nests in which the founder female is present.	107

4.1.	Development of <u>B. candida</u> at 20°C and 30°C.	120
4.2.	Development of <u>B. candida</u> at 25°C.	121
4.3.	The relationship between the rate of poikilotherm development and temperature.	134
7.	The mating position of <u>B. candida</u> .	168
8.1.	Large breaches in two <u>B. candida</u> egg sacs.	181
8.2.	Large breach in a <u>B. candida</u> egg sac.	181
8.3.	Tiny breach normally made by spiderlings leaving a <u>B. candida</u> egg sac.	181
8.4.	Normally camouflaged pair of <u>B. candida</u> egg sacs.	184
8.5.	Camouflage partly removed.	184
8.6.	Camouflage fully removed.	184
8.7.	Group of four <u>B. candida</u> egg sacs.	185
8.8.	Mean number of <u>B. candida</u> egg sacs in relation to nest size.	188
9.1.	Cast pupal case of <u>Cryptolaemus montrouzieri</u> .	202
9.2.	Adult <u>C. montrouzieri</u> .	202
9.3.	Adult <u>Stathmopoda platynipha</u> .	206
9.4.	Larva, either of <u>S. platynipha</u> or <u>Eochrois chrysius</u> .	206
9.5.	Tail end of a larva among spent pupal cases of <u>Ceratobaeus setosus</u> .	206
9.6.	Adult male <u>C. setosus</u> emerging from its pupal case.	208
9.7.	Adult female <u>C. setosus</u> .	208
9.8.	Antenna shape of <u>C. setosus</u> (male).	209
9.9.	Antenna shape of <u>C. setosus</u> (female).	209
10.1.	<u>B. candida</u> nest housed in a wire mesh frame suspended from clothes hoist.	218
10.2.	Clothes-hoist nests sharing territory.	218
10.3.	The daily activity cycle of <u>B. candida</u> .	221
10.4.	Mean proportion of <u>B. candida</u> spiders engaging in web-work activity in different months of the year.	223
10.5.	Mean proportion of <u>B. candida</u> spiders engaging in extra-nest activity in different months of the year.	223
12.	Survivorship of first instar <u>B. candida</u> spiderlings, with and without the parent female.	248

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Auctor et collega; amicus
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ABSTRACT

This study was a broad autecological investigation of the life history and behaviour of the amaurobioid spider Badumna candida (L. Koch), primarily comprising a two-year sampling program of nests and a number of field and laboratory experiments, the latter including rearing from egg to adult at constant temperature.

The main host plants of B. candida nests in the study site at Townsville, North Queensland, were Zizyphus mauritiana (the chinee apple) and Dolichondrone heterophylla. The nests were prevalent at ecotones, though they did not seem to thrive better there.

B. candida was univoltine. Males developed (egg to adult) in about 210 days at 25°C; females in about 265 days. Continuous temperatures below 21°C and above 29°C impaired normal development. The threshold of development for early life history stages was about 17-18°C. Most nests were founded between January and February by solitary subadult females, and mating took place in them in February and March. Both sexes were capable of multiple matings, and the mating position was one as yet unrecorded among the Cribellatae. A mean of six egg sacs, each containing a mean of 27 eggs, were produced between March and October. The primary sex ratio was even. The nest was a non-territorial, uniform structure to which all siblings contributed. At the peak of colony growth in October and November, about 100 spiders, the progeny of the single founder female, inhabited each colony. Subadult females began to disperse before subadult males appeared in the nests. Adult males did not appear until most or all of the subadult females had dispersed. Since males matured earlier than females when

reared singly in the laboratory, it is possible that the development of males is retarded in natural nests, thus synchronizing the maturation of the sexes.

Dispersal may have reached about 50m, but half that distance seemed optimum for successful establishment. Dispersing spiders sometimes reinitiated dispersal if the habitat was unfavourable. Founder females that failed to travel far from the home nest may have suffered more from predation by birds. 23% of nests founded in March survived to the time of the start of dispersal (November); the corresponding survival rate per female dispersing from the home nest was 2%. Groups of spiders sometimes dispersed together (i.e. by sociotomy), but this appeared to be a transitory phenomenon in dispersal.

The scelionid parasitoid Ceratobaeus setosus caused losses of about 20% of B. candida eggs. The egg sacs were camouflaged, and were most often clumped in groups, perhaps to facilitate guarding them from this wasp. Along with C. setosus and the spider hosts, numerous other nest associates comprised a complex community within B. candida nests; among these associates, two oecophorid moths in particular were prominent and often caused serious damage.

The colony was most active in the early evening, improving the web, feeding and (over a restricted season) dispersing. Nests were not cleaned of prey remains and exuvia, but faeces were deposited clear of the nest. Nests fell into disrepair at the peak time of dispersal, usually being abandoned by March.

Although prey was subdued by several spiders and feeding was communal, the behaviour of individuals in predation and feeding was not cooperative; only the usual level of tolerance of conspecifics made it appear so. Other things being equal, attacks on prey were most likely from the largest spiders and from females. Extra-oral digestion and communal feeding created a potential avenue

for the distribution within the colony of substances involved in control of development and/or behaviour.

Spiderlings emerged from the egg sac without assistance and shared the prey of their mother and of their elder siblings; the chances of survival of first instar spiderlings were limited otherwise, for they did not prey and feed effectively. The parent female did not feed her young by regurgitation. In the laboratory, cannibalism between siblings was very rare at 20°C and 25°C, but at 30°C it was frequent (48%). One possible explanation for this difference was that recognition and tolerance were mediated by a volatile body-borne pheromone that dissipated rapidly at sustained high temperatures.

Interattraction was very high among juveniles under normal conditions, but subadult females and adult males (the life stages for which xenophobia was most adaptive) were intolerant of conspecifics of the same age and sex. Adult females, which rarely contacted spiders other than their own offspring, were variable in their reactions to other adult females; but in general they had lost the tolerance levels characteristic of their earlier communal life. In behaviour, as in development, pheromones (silk-borne or body-borne) are invoked as potential explanations of these phenomena.

B. candida was classified as a periodic-social or communal, non-territorial, subsocial (matrifilial) species. Some of the adaptations of its present level of sociality may preadapt it to a more advanced social organization - in particular, if development of conspecifics is really being influenced (retarded, for instance) pheromonally, an independent avenue to eusociality seems a possible feature of its destiny.