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VICTORIA, B.C.
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PRELIMINARY STUDIES OF GREAT BLUE HERON COLONIES

1977

by

Keith Simpson

and

John P. Kelsall



CANADIAN WILDLIFE
SERVICE



Fisheries and Environment Canada
Environmental Management

Pêches et Environnement Canada
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ECOLOGICAL RESERVES COLLECTION
GOVERNMENT OF BRITISH COLUMBIA
VICTORIA, B.C.
V8V 1X4

September 12, 1978

Your file Votre référence

Our file Notre référence 9050 herons

Mr. Bristol Foster
Coordinator of Ecological Reserves
Land Management Branch
Ministry of Environment
Parliament Buildings
Victoria, B. C.

Dear Sirs:

Studies of Great Blue Heron Colonies

Enclosed is a copy of our report on heron colonies in the lower mainland of B. C.

The colony at "U.B.C." is on property administered by you. We hope the information in the report will be of interest to you.

Thank you for allowing us access for the purpose of these studies.

Yours sincerely,

Keith Simpson
Research Technician

Encl.

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Canadian Wildlife Service
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June 30, 1978

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SUMMARY

Ten great blue heron colonies were located and described in the lower mainland area of British Columbia. The population in each colony was enumerated. Reproductive success was good, ranging from 1.9 to 2.9 young fledged/nest. However, one colony was completely abandoned. It may have relocated in a nearby nesting area, and it is hoped that observation in 1978 may shed light on the matter. Observations on predation and other matters are reported.

INTRODUCTION AND OBJECTIVES

A study of nesting colonies of the great blue heron (Ardea herodias) was begun in March 1977. The primary objective was to determine the whereabouts, numerical and reproductive status of colonies in the lower mainland area of British Columbia and to compare our data with historic material available. Colonies located in 1977 are shown on Figure 1.

Previous studies have recorded nesting sites and approximate numbers of nests (Mark 1974 and 1976), while others have done in-depth research on individual colonies (Urhahn 1968, Paine 1972, Krebs 1974). No nesting studies comparable to those done in Oregon (Henny and Bethers 1971), Werschkul et al. 1977) or California (Pratt 1970) have yet been done in the lower mainland. That is probably due to the large time expenditure necessary to gather valid observational data.

Our secondary objective, to be met by P. E. Whitehead of the Canadian Wildlife Service, was to measure the health of each colony through chemical

analysis of eggs for toxic substances and through measurement of eggshell thicknesses for abnormalities. The problems involved have been described by many authors including a summary by Canadian Wildlife Service (1971).

ACKNOWLEDGEMENTS

We are indebted to Mrs. M. Pastrick and the Langley Field Naturalist Club and Mrs. W. A. Pickens and the Alouette Field Naturalist Club, who assisted in the location of several colonies. Thanks are due to Mr. and Mrs. R. Nitsch, Chief Georgina Williams of the Coquitlam Indian Band, Mr. and Mrs. R. Bossley and Mr. and Mrs. J. E. Moore for frequent access to their property during the surveys.

Ecoreserves?

Wayne Campbell, Curator of Birds, provided access to the nest record cards and data files at the Provincial Museum in Victoria. Jim Hunter, of Delta Tree Service, did an excellent job of climbing to some very precarious nests.

METHODS

Colony location

Nesting colonies were located mainly through various naturalist clubs and interested individuals in the Fraser Valley. Many bird watching groups have records of locations of colonies, numbers of nests and numbers of adult birds.

Preliminary surveys

Approximately five visits were made to each nesting colony from March to July 1977 (Appendix 1). Visibility within the colonies was good early

in the season, decreasing as deciduous foliage developed. Since many nests which were in conifers were obscured, counts in those colonies must be considered minimum estimates. Nest counts, made during preliminary ground surveys of each colony, were amended to reflect additional information from succeeding surveys. In colonies with large numbers of nest trees, each tree was marked with spray paint as the nests were tallied to avoid confusion and recounting.

Each nest was judged to be active if there were birds on or near it, or if there were obvious signs of activity under the nest (i.e. droppings, hair pellets, food items, broken branches, egg shells, etc.).

Tree climbing

Nest trees were climbed in the six larger colonies in early May (Appendix 1). Selection of trees was based on ease of climbing and accessibility of nests. Accurate counts of young or eggs per nest and number of occupied nests were made by the climber. Photos were taken of nests, eggs and young birds in each colony. Trees climbed in each colony were numbered consecutively and marked with coloured vinyl flagging for future identification. Individual nests could be identified in some colonies by numbering nests, top to bottom, in labelled trees.

Eggs were collected from some nests for analysis for toxic substances.

Fledgling counts

Fledgling counts were made in each colony in late June (just prior to fledging). At that time young birds were about two-thirds adult size and were readily visible from the ground (Fig. 1). Young birds were counted

in those nests where they were most easily seen. During feeding the young stand and move about facilitating accurate counts. In many cases it was possible to stand directly under a nest and count tails while the young birds ate food regurgitated into the centre of the nest. Counts of young per nest would again have to be considered minimal due to visibility limitations.

Other data

Residents and land owners in the area of each colony were questioned regarding the history of the colony, feeding areas and other information which might be useful.

Egg shells, dropped food, hair pellets and dead young were collected at each colony during the observational visits.

RESULTS AND DISCUSSION

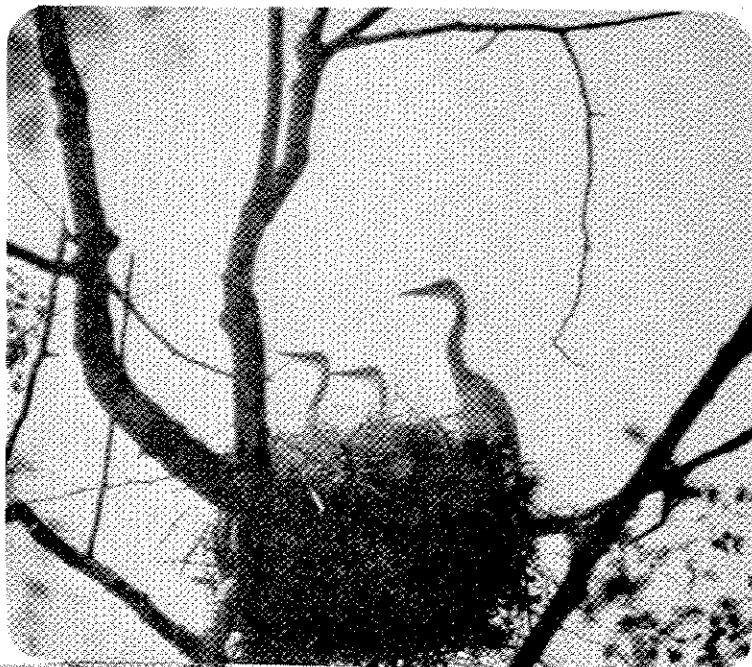
Colony descriptions

In total, 10 colonies were located in the lower mainland area (Fig. 2). Four additional reported colonies were not located. With a more extensive search it is probable that there are several more to be found in the lower Fraser Valley. Colonies varied from 10 to 216 nests and were found in stands of alder (Alnus rubra), Douglas fir (Pseudotsuga menziesii), Sitka spruce (Picea sitchensis) and cottonwood (Populus trichocarpa). Some nests were also found in hemlock (Tsuga heterophylla) and lodgepole pine (Pinus contorta) (Table 1).

Hérons were specific to a single tree species in each colony. Nests were constructed in the selected tree species apparently regardless of available suitable nest sites in other tree species in the same area. Only

FIGURE 1. Adult and young great blue herons on nest at time of fledgling counts in late June.

Young birds alert as
adult approaches



Adult feeding
young

Adult leaving nest
after feeding



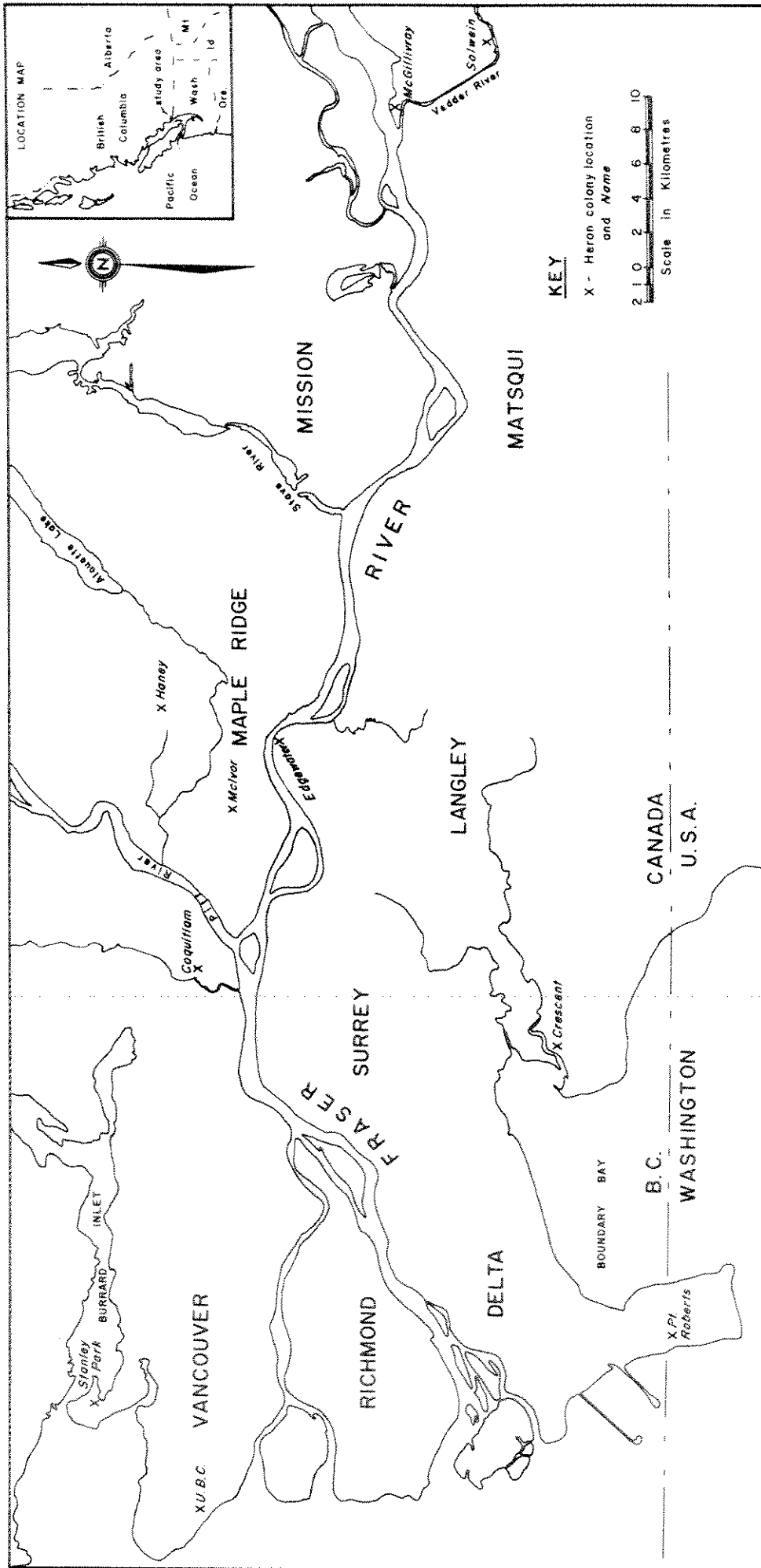


FIGURE 2. Locations of great blue heron nesting colonies in the lower mainland of British Columbia.

in the Coquitlam colony, where nest sites were limited, did the birds nest in more than one tree species (Table 1).

Comparisons with historic data will be made in a later report. Some generalities are superficially evident. Judging largely from Mark (1976) colonies are roughly as numerous as previously recorded in the study area, although some are known to have relocated once to several times. All long standing colonies contain more nests than previously recorded.

Reproductive timing

Times of arrival, egg laying and incubation could not be determined with the limited number of visits made to each colony. However, a comparative index (hatching stage) was calculated for each colony in which hatching data were obtained through climbing (Table 2). Based on a colony egg hatching interval of 50 days (Pratt 1970, Werschkul et al. 1977) the maximum separation between colonies for peak hatching must have been about 12 days.

Either re-nesting or late nesting occurred in at least 2 colonies. Three colonies were recounted after hatching, and in each case more nests were found than had been counted before hatching. Vocalization and movements of young made it easier to locate nests, and new nests had been constructed.

Reproductive success

Since the climbing was done during the hatching period it was possible in most colonies, to estimate clutch sizes and hatching success with the

TABLE 1 - Tabular description of the heron colonies.

Colony name	No. of active nests	Tree species	No. of nest trees	Nest height range (m)	Colony area (x 1000 m ²)	Tree diameters (range in cm)
→ Crescent	37	Douglas fir	5	24-33	5	90-120
→ UBC	82	Red alder	61	18-21	16	30-60
Pt. Roberts	216	Red alder	192	18-21	334	35-50
Coquitlam	169	Sitka spruce	24	12-21	279	45-75
		Western hemlock	4			
		Douglas fir	1			
		Lodgepole pine	1			
Salwein	96	Northern black cottonwood	19	24-30	56	90-180
McGillivray*	46	Northern black cottonwood	10	23-27	112	60-125
Stanley Park	19	Douglas fir	2	27-34	1	150-135
Edgewater	16 (min.)	Northern black cottonwood	3	30-34	28	120-150
Haney	10 (min.)	Douglas fir	2	27-34	19	150-185
McIvor	10	Sitka spruce	1	12-18	0.2	75
Total	701					

*Abandoned

TABLE 2 - Summary of reproductive parameters for each colony.

Colony	Date	Hatching ¹ stage	Mean ² clutch size + SD	Mean ³ young/ nest + SD	% Hatch	Date	Mean fledglings/ nest + SD	% Mortality hatching to fledging	% Mortality egg to fledging
Crescent	May 5	.31	3.62+ <u>.95</u>	3.29+ <u>.95</u>	91	June 23	2.94+ <u>.80</u>	11	19
→ U.B.C.	May 5	.18	3.88+ <u>1.17</u>	2.67+ <u>2.08</u>		June 22	2.91+ <u>.85</u>		25
Pt. Roberts	May 9	.48	3.53+ <u>.94</u>	3.5+ <u>.67</u>	99	June 21	2.79+ <u>.61</u>	20	21
Coquitlam	May 6	.65	3.66+ <u>.88</u>	3.5+ <u>.91</u>	96	June 27	2.31+ <u>.68</u>	34	37
Salwein	May 6	.63	3.89+ <u>.83</u>	3.44+ <u>.73</u>	88	June 23	2.62+ <u>.89</u>	24	33
McGillivray	May 6	0.00	1.8 + <u>.84</u>	0 ⁴	0	June 23	0		
Stanley Park						June 22	2.33+ <u>.65</u>		
Edgewater						June 24	2.55+ <u>.52</u>		
McIvor						June 24	1.88+ <u>.83</u>		

1 - Hatching stage = number of young/nest divided by number of young + number of eggs/nest. (0=eggs only, 1=young only)

2 - Clutch size = number of eggs and number of young/nest.

3 - Young/nest = includes only those nests where all eggs had hatched.

4 - Completely abandoned by June 23, 1977.

single survey. Comparison of clutch size with nestling and fledgling numbers, allowed calculation of mortality at different stages of development (Table 2). Mortality in the egg to nestling stage appeared to be minor, ranging from 1 to 12 percent, while heavier losses occurred in the nestling to fledgling stage (11 to 34 percent - Table 2). Pratt (1970) found that the highest nest mortality occurred during the third and fourth weeks after hatching and attributed that to the intense competition for food.

The numbers of birds fledged per colony varied from 1.88/nest to 2.94/nest giving egg-to-fledgling survivals ranging from 63 to 81 percent (Table 2). Calculating the number fledged from all colonies (mean young/nest x number of nests) gives a total of approximately 1700 young birds compared to the estimated breeding adult population of 1400 (total active nests x 2). That would represent a population increase of 120 percent if all fledglings survived. Owen (1960) found that heavy mortality (71 percent) occurs in the first year and 29 percent mortality in subsequent years for great blue herons. If those rates are applicable, the net increase in the "lower mainland flock" for 1977-78 would be about 120 birds or 9 percent of the breeding adult population. From those estimates it would appear that the heron population in the Fraser Valley is stable or increasing slightly.

Lost broods and loss of complete nests were not considered in the tabular statistics, since identical nests could not be censused during each survey. Many nests visible to the climber, for example, were not visible from the ground. Since fledgling counts were made only for nests in which young were visible, empty and destroyed nests were not included in the survey, causing an upward bias in the fledgling counts. Efforts will be made to eliminate that bias in future work.

Response to harassment

In general, herons were observed to flee when harassed by avian predators but usually only those birds "attacked" by the hawks would actually leave their nests.

During colony surveys, birds would flee from a tree being climbed and also from nearby trees. Birds tended to circle the colony giving continuous loud calls when disturbed. Birds with eggs seemed more "defensive" or reluctant to leave than those with young. On one occasion an adult bird returned from a nearby perch, to which it had fled, and actively defended its nest against the climber. The noise and posture of the bird were so threatening that the climber did not attempt to census the nest.

Several papers claim that herons have no anti-predator behavior (Milstein et al. 1970, Krebs 1974 and Werschkul et al. 1977) but it appears that the coarse squawking may be a type of defense if it is as disconcerting and repulsive to predators as it is to humans. It may be that the birds have no active physical defense, but to say that they have no anti-predator behavior seems less than accurate in view of the above observations.

Avian predators

Predators were commonly observed in the heron colonies. Red-tailed hawks (Buteo borealis) were frequently observed harassing the colonies. Residents at the Crescent colony observed a pair of eagles (Haliaeetus leucocephalus) actually capturing young herons on two different occasions.

A decapitated half-grown young heron was found at the Haney colony. Eckert and Karalus (1974) indicate that great horned owls (Bubo virginianus) will decapitate their prey while feeding young, and great blue herons are

included in their list of known prey species.

Ground predators

Many carnivores are attracted to the area under the heron colonies, probably by the food items and young falling from the nests. Tracks of raccoons (Procyon lotor), and domestic dogs and/or cats were found in virtually all colonies. Opossums (Didelphus marsupialis) would be expected in those colonies south of the Fraser River. A raccoon was observed eating a young heron in the UBC colony and evidence of other devoured young (feathers, bones, etc.) was found in most colonies. No evidence was found of predators actually climbing to the nests. However, it seems probable that some predation on nests occurs since both opossums and raccoons climb well.

Abandoned colony

The reasons for the abandonment of the McGillivray colony (see Appendix I and Tables 1 and 2) could not be determined from the data collected in 1977. Due to its inaccessibility, it is unlikely that human harassment was the cause. However, that colony will be monitored again in 1978 to see if it is re-occupied and if nesting is successful. The proximity of the large, recently formed Salwein colony could indicate that the birds relocated there in 1977. If the McGillivray colony is not occupied in 1978, that will indicate that the birds have chosen to relocate. Preliminary surveys in March, 1978 suggest that the colony has indeed been abandoned.

Studies of eggs and eggshell thickness

Mr. Whitehead will report on chemical analyses of eggs for toxic substances, and on eggshell thickness, in due course. Preliminary information suggests that there will be points of more than usual interest emerge. Eggshell thickness from many dozens of shells picked up under nests, as well as eggs collected from nests, suggest normal eggs. However, at least one colony shows very high contamination of some eggs with polychlorinated biphenyls (PCB's) and variable amounts of DDT and DDE.

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APPENDIX I - Summary of observations and timing of visits to each colony in 1977.

CRESCENT

March 18	Nest count - birds present
April 19	Collected egg shells
May 3	Many shells - birds on feeding flights
May 5	Trees climbed - photos
May 19	Young heard - 2 observed
June 23	Fledgling counts

EDGEWATER

March 18	Nest count - no birds present, but droppings on ground
March 22	Flew over heronry - many birds present
April 28	Collect egg shells
May 19	Collect egg shells - dense canopy
June 24	Fledgling counts

HANEY

March 18	Nest count - no birds present, but droppings & one fish backbone found on ground
March 31	10 birds seen carrying nest building materials
April 28	A few egg shells collected
May 19	Collected egg shells, young heard but none seen
June 24	Young seen, adults actively feeding, fledgling counts not possible

McIVOR

June 24	Newly located. Fledgling & nest count
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TABLE I - (Cont'd)McGILLIVRAY

March 20	Nest count, birds present
April 26	Collected shells - nests occupied
May 6	Climbed tree - colony abandoned - evidence of egg predation - few shells on ground
May 18	3 occupied nests
June 23	No birds seen - some shells under one tree

UBC

March 21	Nest count - no birds present - some droppings
April 20	Nest re-count - shell collection
April 25	Collect shells
May 3	Unsuccessful climb
May 5	Climbed trees - photos
May 19	Young heard, heads seen
June 22	Fledgling count
July 19	Check on re-nesting - 12 additional nests found, most young away

STANLEY PARK

March 21	Nest count - 20 birds present
April 20	No shells (removed from lawn)
June 22	Fledgling count
July 19	Some young still present (14) - few feeding flights

TABLE I - (cont'd)POINT ROBERTS

March 23	Nest count - 50 birds present
April 13 & 15	Re-count of nests - some egg shells
April 19	Collected egg shells and hair balls
May 9	Climbed - photos
May 17	Observed young in 3 nests
June 21	Fledgling count - active feeding
July 25	Climbed one tree - nest vacant - few young present but flew off

COQUITLAM

April 1	Nest counts - 100 birds present
April 28	Egg shell collecting
May 4	Shell collecting
May 6	Climbed - photos
May 19	Few shells, young heard, none seen
June 27	Re-count active nests - fledgling count

Salwein

April 14	Nest count - 60 birds present - egg shells on ground
April 26	Collect shells
May 6	Climbed - photos
May 18	Few shells on ground - young heard, one seen
June 23	Fledgling count - fewer feeding flights than other colonies