SHORT COMMUNICATIONS

RECURRING PAIRS OF WANDERING ALBATROSSES AT A NEW SOUTH WALES WINTER FEEDING GROUND?

Every year since 1958 Wandering Albatrosses *Diomedea exulans* have been captured and banded at Bellambi NSW (60 km south of Sydney). This is one of their few known winter feeding grounds (Gibson 1963, 1967, 1977; Gibson & Sefton 1959, 1960; Tickell & Gibson 1968). This work has revealed several interesting aspects of these birds' patterns of attendance. Birds from most known breeding locations have been caught at Bellambi, including subadults, non breeding adults, and adults, some of which were suspected to be breeding on the Auckland Islands and Macquarie Island. The most spectacular result is the occurrence of regular journeys between Bellambi and Bird Island, South Georgia (Tickell & Gibson 1968; Gibson 1967, 1977).

Using Gibson's unpublished data this paper addresses several questions: over what time span do albatrosses come to Bellambi; how long is there between visits; what proportion of birds present at any time have visited in previous years; and do some birds have a tendency to arrive early or late in the season? Further, among the first 1000 birds banded between 1963 and 1970 there were 142 incidences of the same two birds being caught on the same days but in different years (called here "recurring pairs"). This high frequency has been used to support speculation that specific Wandering Albatrosses (Burger *et al.* 1980; Tickell 1968; Gibson & Sefton 1959; Gibson 1963; Tomkins 1984a) may associate with each other away from their breeding grounds. Richdale (1950) suggested Royal Albatrosses *Diomedea epomophora* do the same. Thus, the primary objective of this paper is to determine whether Wandering Albatrosses at Bellambi recurr as pairs more frequently than could be expected by chance.

Gibson & Sefton (1959) described how the Wanderers were caught by throwing a netted hoop over a bird on the sea from a boat. Not all birds present each day were caught, and in most years each bird was marked with temporary dye to avoid multiple recapture within a few weeks. The number of birds present varied considerably from week to week, and from year to year, as did the intensity of recapture efforts. Numbered metal bands (supplied by Australian Bird-banding Scheme, CSIRO, Canberra) were put on all unbanded birds caught. Many birds banded at Bellambi had been banded at their breeding grounds by other workers. Unfortunately some bands made of unsuitable (aluminium) material used in earlier years, fell off and the individual identities of the birds were lost. The area searched for Wanderers

extended several kilometres along the coast, so that although birds were recorded as being recaptured on the same day, and at the same site, they may have been recaptured up to 7 km apart.

The null hypothesis to be tested here is, given that a bird visited the capture area in a certain number of years, the dates on which it was caught were completely random. It specifically excludes any association between birds or even any similarity of habits such as a tendency to arrive early or late in the season, or to favour certain feeding grounds. There is no standard statistical test available to solve this problem, and any mathematical model would be vitiated by the following considerations. The total number of birds which visited Bellambi each year could not be estimated, as the size of the population from which birds originated was not known, the area known as the Bellambi study site was ill-defined, and recapture methodology changed from year to year. Computer randomisation was therefore applied to the data.

The method used was to choose at random a year and two birds captured in it, and then swap the dates on which they were caught. This was done 500 times. It produced a new set of data in which each bird appeared in the same years as before, but where the dates within those years were sufficiently altered to break nearly all the recurring pairs in the original data. In other words it produced new recurring pairs by chance. This was done 40 times.

RESULTS AND DISCUSSION

Some individuals were retrapped at Bellambi several times each winter, however the probable duration of most visits was only a few days (Tickell & Gibson 1968). Tables I to IV present data on the pattern of attendance of Wanderers at this winter feeding ground. However because not all birds present in any one day were caught these results are only a sample of the actual attendances.

Although the average life span of Wandering Albatrosses is approximately 25 years (Croxall 1981) the greatest recorded span between capture and final recapture at Bellambi was only 17 years. The last year of capture (from these data) was 1981, and as some birds were caught for the first time in 1970, there is a slight bias against a large number of recaptures in Table I. This was borne out by the comparison of the total sample

TABLE I

Proportion of albatrosses caught exactly n times, in different years, at Bellambi*.

Times caught	1	2	3	4	5	6	7	8	>9	Mean	S.D.
all 1000	.692	.182	.077	.031	.012	.003	.002	.001	.000	1.51	0.95
First 500	.656	.210	.074	.036	.014	.006	.002	.002	.000	1.58	1.02

* note: for example 182 birds out of the 1000 were caught twice and no more than twice.

of the entire 1000 with the first 500 of the 1000. The average number of times any of the first five 100s of birds was caught was 1.68, 1.97, 1.34, 1.37, 1.53, i.e. the first two hundreds were caught more often than the later three. Removing later years (i.e. 1979–1981) from the first and second hundreds only reduced these averaged to 1.64 and 1.93. Thus the averages for these earlier years (i.e. 1963 and 1964) were atypically high. This higher recapture rate was more likely to be due to greater recapture efforts in earlier years than to them being available for recapture longer.

Table II shows that the average number of years between first capture and first recapture was 3.6 years.

TABLE II

Number of years between consecutive captures at Bellambi.

Years	Frequency	Relative frequency	Cumulative relative frequency
1	147	0.2882	0.2882
2	90	0.1765	0.4647
3	63	0.1235	0.5882
4	55	0.1078	0.6961
5	46	0.0902	0.7863
6	40	0.0784	0.8647
7	23	0.0451	0.9098
8	17	0.0333	0.9431
9	8	0.0157	0.9588
10	5	0.0098	0.9686
11	5	0.0098	0.9784
12	6	0.0118	0.9902
13	2	0.0039	0.9941
14	2	0.0039	0.9980
15	1	0.0020	1.0000
16	0	0.0000	1.0000
17	0	0.0000	1.0000
	510		

Notes: — average period between consecutive captures = 3.6 years, SD = 2.7 years
— number of birds recaptured = 308
— total number of recaptures = 510

Again there is a bias against large numbers, for the same reason. Clearly the average number of years between visits is likely to be less, owing to the possibility of a bird being present but not caught. Unfortunately the varied plumage of each subspecies, and the great variation within an island population (Tomkins 1984b) prevented estimates of age at first capture and subsequent recaptures. Thus the interval of 3.6 years cannot be linked with the phenology of all birds, although Gibson (1963) and Tickell (1968) have done this with some breeding birds.

The average time span between first capture and last recapture decreased from 8.6 for birds first caught in 1963 to 5.1 for those first caught in 1970 (Table III). The bias towards large values in earlier years is apparent as expected, but when the figures for the years 1963 and 1964 were truncated (i.e. spans of 15 years were excluded, as in this sample recapture more than 15 years after 1965 was impossible), the average figure for birds first caught in 1963 and 1964 was 7.8, still high compared to 1965. Again this might be due to a high initial capture effort. In any case, since not all birds present were caught these are minimum figures.

In spite of the decreased capture effort the proportion of birds recaptured compared with birds caught for the first time was relatively constant from year to year i.e. approximately 0.6 (Table IV).

Early and late birds

We suspected that certain individuals tended to be present earlier in the winter than some others, but there was

TABLE III

Time span between first capture and last recapture at Bellambi.

Year in which bird first caught	1963	1964	1965	1966	1967	1968	1969	1970
Average maximum span (years)	8.6	8.1	6.0	5.7	6.2	4.6	4.5	5.1

TABLE IV

Proportion of recaptures to total captures of
Wanderers at Bellambi.

Year	1976	1977	1978	1979	1980	1981
Old:new	108:76	156:98	96:72	62:71	60:45	26:17
Proportion	.59	.61	.57	.47	.57	.60

no evidence for this. The null hypothesis that the mean capture date is the same for all birds was tested using a one-way ANOVA. The F-ratio was 1.05, which is not significant suggesting that mean capture dates differ very little from bird to bird.

Recurring pairs

The number of recurring pairs observed was 142, and the mean number of recurring pairs in 40 randomisations was 130.6 (SD = 9.2). As six of these randomisations gave figures equal to or greater than 142, 142 belongs to the upper 15% of the total number of randomisations.

Other methods of randomisation tried gave mean numbers of recurring pairs of 129.2, 158.1, 141.5, and 168.7. Although these methods were considered less reliable, none was significantly different from 142. Therefore we cannot reject the null hypothesis that the dates on which the birds were captured and recaptured were random.

If the number of observed recurring pairs had been found to be significantly high, it might have been possible to explain this with assumptions about the birds' habits, but because of the lack of statistical significance, there is no necessity to do this.

Any suggestion that specific Wandering Albatrosses associate with each other away from their breeding ground which is based on the number of recurring pairs at Bellambi is therefore ill-founded. This was also the recent opinion of JDG (unpublished data) who believed that some recurring pairs were of the same sex. He has also noted that some birds are members of more than one recurring pair, and that members of recurring pairs are frequently caught without their "partners". We consider Gibson's data are inadequate to show that birds do, or do not associate with each other away from their breeding grounds.

Further analyses of the data might show if birds banded in the same area on their breeding grounds are included in the 142 recurring pairs. We hope that additional research, e.g. using telemetry and satellites, will clarify whether specific birds, such as breeding pairs, parents and young, neighbours on breeding grounds etc., associate with each other away from their breeding grounds.

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