

SHORT COMMUNICATIONS

CLUSTER ROOSTING IN THE BLACK-FACED WOODSWALLOW

INTRODUCTION

Clusters of Australian woodswallows on nearly vertical faces were first described by Gould (1972) and are now recorded in all Australian species except the White-breasted Woodswallow *Artamus leucorhynchus*. From 5 to 10 May 1975 we studied a cluster of seven Black-faced Woodswallows *A. cinereus* on Woorandara Station ($33^{\circ} 40' S$, $144^{\circ} 50' E$) near Booligal in south-western New South Wales. All birds appeared to be in adult plumage.

METHODS

We sat without a hide behind a bush thirty metres from the cluster trees and used 7 x 35 binoculars. The birds were absent on the evening of 8 May and on the following morning. Like Immelmann (1960) we found that during most of the day no birds were seen near the sites.

Readings of light intensity were taken every minute on an EEL portable photo-electric photometer calibrated in 1973 by the CSIRO Division of Atmospheric Physics. Because there is an exponential relation between time and light intensity in the inter-twilight zones (Leopold and Eynon 1961), the use of one reading, 23 lumens/ 0.093 m^2 , is an accurate reflection of the variation over the five days (Fig. 1). The variation in intensity was caused by shortening of days, as shown by the figures for the beginning of daylight, and cloud-cover. The effect of cloud-cover is illustrated on May 8.

The weather during observations is given in Table I. Direction and speed of wind were not recorded; however, figures during May, from 1961 to 1965, from Hay, eighty kilometres south-west, may be representative; then, sixty-three per cent of the winds at 15:00 came from south-west to north-west (Bur. Meteor. 1972).

RESULTS

The two roosts were on Black Box *Eucalyptus largiflorens*. No woodswallows were seen near either on the evening of 8 May. Site 1 was occupied on the nights of the 5–6, 6–7, 9–10 May. The cluster formed in a concavity measuring 140 (vertical length) by 80 (horizontal width) by 250 (maximum depth) millimetres. It was between three branches at a height of 8.6 metres, inclined 50° from the vertical and faced 340° .

The Woodswallows tried to occupy this site also on the evening of 7 May but did not settle and eventually clustered ninety metres away at Site 2. In the evening, when fine, the cluster formed on the upper surface of a large lateral branch, similar in circumference to the main trunk, 9.3 metres high. During the night it began to rain and by dawn the cluster had moved to the undersurface of the branch, which was inclined at 30° from the horizontal and faced 330° . There were no concavities.

Times of the formation and dispersal of the cluster in relation to intensity of light are shown in Figure 1. About sunset the Woodswallows flew in as a loose group. Because their methods of entering the roosting tree and forming the cluster varied we presume this behaviour is not stereotyped.

They either landed in a nearby dead tree and, after a short period of preening, flew in a group into the canopy of the roosting tree, settled above the concavity and hopped down separately into it or they flew directly to the roosting tree, circled once or twice just above the canopy and settled separately, when they preened or proceeded directly to the site or they flew to the dead tree and then separately to the site. Few calls were heard during formation of the cluster, unlike other observations (Immelmann 1960; I. C. R. Rowley pers. comm.).

The positioning of the birds in the cluster was regular except on 7 May. The first position occupied was just above the maximum depth in the concavity; then, successive birds occupied positions on either side of the first, below it, on either side of this latest bird and then below it. All birds faced up the trunk and their heads could not be seen in a spotlight two to three hours after the formation of the cluster.

On 7 May, however, seven birds flew in together at 17:29 and six went directly to Site 1. Three birds occupied the first position successively. Then one on the outer branches of the clustering tree flew to a dead tree, about twenty-five metres away, and onto a closer tree where it gave a single call. At 17:31 all birds left and returned at 17:36 to reform the cluster. They left again at 17:37. Two returned at 17:38, moved to the site and left almost at once. At 17:47 we found a new cluster complete at Site 2.

Goodwin (in Hall 1974) also noted unsettled behaviour in an attempted roosting cluster of the species. However, his flock abandoned vertical clust-

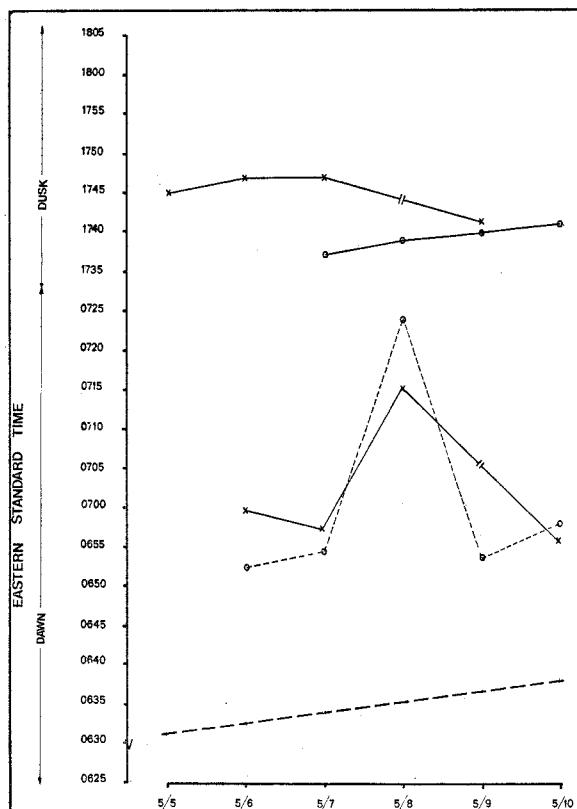


Figure 1. Formation and dispersal of roosting cluster of Black-faced Woodswallows related to intensity of light.

Top: x formation of cluster; o intensity of light (23 lumens/0.093 m²).

Centre: x dispersal of cluster; o light (as above).

Bottom: Start of daylight from Department of Transport's graphs for daylight and darkness in the Visual Flight Guide for pilots.

ering and roosted along a horizontal branch. The behaviour of our birds may have been because they started to cluster early. On other nights they did not go to the roosting tree until after 17:40. We do not think that they were affected by our presence.

At dusk on 9 May the birds clustered first in Site 1, then deserted it and tried to cluster in a fork in a nearby tree. This seemed difficult; some birds were dislodged and flew round the tree. When five had settled, a White-plumed Honeyeater *Lichenostomus penicillatus* pulled the tail of the lower one and dislodged it. The flock then returned to the first site and clustered in the usual manner.

Dispersal at dawn varied; either all birds exploded from the cavity together or were apparently frightened from it by a Galah *Cacatua roseicapilla* or departed quietly and separately, when just before

TABLE I
Weather details during the study.

Date 1975	Dawn	Dusk
5 May		Fine, $\frac{1}{8}$ Cloud cover
6 May	Fine, $\frac{1}{8}$ Cloud cover overhead; heavy cloud on eastern horizon	Fine, $\frac{1}{8}$ Cloud cover
7 May	Fine, $\frac{1}{8}$ Cloud cover	Fine, $\frac{1}{8}$ Thin cloud cover
8 May	Continuous light to medium rain, $\frac{1}{8}$ Cloud	Fine, $\frac{1}{8}$ Cloud
9 May	Fine, No cloud	Fine, No cloud cover
10 May	Fine, No cloud except on eastern horizon	

leaving some birds lifted their heads and looked round; gradually they became active, moved onto nearby branches, where they preened and soon flew, separately or two or three together, to the top of the nearby dead tree where they huddled together, occasionally preening.

We saw no faeces in or below the first site nor did Coleman (1944) with Dusky Woodswallows *A. cyanopterus*. Wood (1970) found a mound of excreta below a cluster of Little Woodswallows *A. minor*.

DISCUSSION

A photosensitive endogenous rhythm of daily activity and rest in birds has been claimed (Palmgren 1949; Leopold and Eynon 1961) and some diurnal species wake long before they leave the roost, e.g. the Common Myna *Acridotheres tristis* (Counsilman 1974). Leopold and Eynon suggest that the birds test their environment during an anticipatory period and sing when the light reaches a certain intensity. Our birds may have shown this rhythm. On 7, 8 and 10 May all seven raised their heads at 06:53, 06:55 and 06:54 hours, yet left at about the same light intensity. On 8 May with heavy overcast the departure was delayed.

At least five reasons for clustering, all perhaps valid in particular circumstances, have been suggested: for thermoregulation (Campbell 1974; Marshall 1957); as a protection against weather, particularly wind (Cooper 1972; Hobbs 1972; Wall 1972); as social rather than individual camouflage (Wood 1970); as a response to a strong social drive (Immelman 1960); and as protection against predators (Gilliard in Immelman 1960). The first and last seem least likely though both thermoregulation and protection may be incidental advantages. Thermoregulation has been questioned because clusters often form in high temperatures (Rowley 1971;

Cooper 1972). Nevertheless, because it does allow closer physical contact than is possible by perching, clustering possibly developed for thermoregulation (Immelman 1960) or as a means of cementing group cohesion.

Immelman, quoting Gilliard, says: 'when danger threatens, (the cluster) explodes like a feathery bomb, probably startling the disturber into a hasty retreat' but disagrees with the probable effect. Cooper (1972) mentions a cluster of twenty *A. cyanopterus* which 'exploded', as ours did once, and Rowley (pers. comm.) found that *A. cinereus* effectively avoided capture at night by this means. Campbell (1974) reports that clusters of *A. cyanopterus* on the Bass Strait islands when frightened create a noise that 'has been compared to a mild clap of thunder'.

Shelter evidently determines the site. It is usually in the lee of prevailing winds and, if the weather changes, the cluster may change position. Both our sites probably faced away from prevailing winds and at the second site the birds changed to a more protected position when the weather worsened overnight. Clusters have been recorded inside trunks but sites on external surfaces usually form in small depressions (Wall 1976; Bourke 1972; Cooper 1972; Hobbs 1972). Rowley (pers. comm.) has twice found woodswallows roosting on the outside of nests on sticks less than 100 millimetres in diameter. It is unlikely that clustering began as sheltering because the added protection would seem little more than that afforded a single bird clinging in a similar spot.

Clusters of several species (Bourke 1972; Hobbs 1972) could function differently from clusters of one species and nocturnal and diurnal clustering may have different roles. Nocturnal clustering has been assumed to occur in 'most species' (Rowley 1971) of Australian woodswallows. Diurnal clustering (between 10:00 and 16:00) has been observed in all except *A. leucorhynchus* (cf. Hobbs 1972; Wood 1970). If social bonding and shelter are possible reasons, the stimulus for the behaviour may vary. If clustering occurs throughout the year, the stimulus

for diurnal clustering might be inclement weather more often in non-breeding than breeding periods.

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