ACTIVITY OF THE SCREECH OWL

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SCREECH OWLS (*Otus asio*) for eight or nine years have regularly accepted some of my numerous boxes erected for them, bringing up each year one or more broods of young. Long interest in the general subject of bird song and other activities in relation to light, temperature and other seasonal and weather conditions led to a study of these interesting little owls. Observations dealing with these birds appeared particularly significant, since there are but a limited number of night-loving birds as compared with the day-loving species. Having amassed a great amount of data bearing on the first-dawn and the last-evening activities of a number of birds typical of the latter class, it was thought of sufficient interest to make comparable studies of the owls, representing the former class.

The owls are not outstanding musicians with striking and regular song habits such as the Robin, the Wood Thrush and many others display. However, their time of arrival at the box at dawn to spend the day, and their departure from the box in the evening to pursue their feeding and domestic activities afford interesting behavior. Furthermore, there is an additional advantage, since in the case of a particular pair of birds, there is, perhaps a better chance to avoid variation in individual behavior, which may obtain in the morning and evening movements of a mixed bird population.

The dawn arrival and the evening departure of both the male and the female were observed from March 19 to May 21, 1930, in relation to the curves of civil twilight, sunrise, sunset and the actual temperatures within the hour as obtained from the hourly records of the U. S. Weather Bureau at Washington, D. C. The amount of data accumulated is too large to present in tabulated form, and for that reason generalizations alone derived from these studies will be presented.

The correlation of departure with sunset was found to be much lower than the correlation of arrival with sunrise. This appears to be the usual relation for all species of birds that have been studied. These without exception have shown less consistent song and activity relations at the close of the day than at the dawn of the new day. In the case of the song-birds, this applies not only to the time of the song or call notes with relation to sunset, but also to their character, regularity and persistence. For some reason, the highest correlation and the finest and most typical twilight expressions are almost invariably confined to the dawn-twilight period.

A study of the data obtained for the Screech Owls shows that these birds, as in the case of the diurnal species, not only regulate their movements

with respect to the time of sunrise and sunset, but are definitely influenced by the degree of cloudiness at such times.

The mean time of arrival for all clear dawns from March 23 to May 21 inclusive was 15 minutes before sunrise; for all hazy and partly cloudy dawns, 10.1 minutes before sunrise, and for very cloudy and stormy dawns for the same period 2.0 minutes before sunrise.

We will now consider the first evening departure of the owls from their boxes. This is a positive and simple matter of determination, since throughout the day oftentimes, and always toward evening, the little owls may be seen clinging to the entrance hole, peering out and patiently awaiting the oncoming of evening to begin their nocturnal day, so to speak. The mean time of departure for all clear evenings from March 19 to May 19 was 7.8 minutes after sunset; for all hazy and partly cloudy evenings 8.5 minutes after sunset; for all very cloudy and stormy evenings 7.4 minutes before sunset. It is obvious that very cloudy weather advanced considerably the time of departure, just as it delayed arrival at dawn.

A similar study was made of the behavior of the male and the female at sunrise and sunset. At the time of incubation and care of the young, the female invariably passed the day in the box containing the nest. The male chose other boxes to his liking, and never encroached upon the domain of his mate. This afforded an opportunity to observe their relative behavior morning and evening with respect to sunrise and sunset. It was found almost without exception that the male arrived at the box at dawn later than the female, on both clear and cloudy mornings. The birds showed the same consistent relations with the evening twilight, the male leaving earlier than the female. For the period from April 10 to May 21, the mean time of arrival of the female at the box was 10.3 minutes before sunrise on clear and cloudy days; for the male 2.4 minutes after sunrise. On clear days the mean time of arrival for the female was 11.6 minutes before sunrise; for the male 6.3 minutes before sunrise. The data and curves which have been constructed, show with no shadow of doubt that the time of arrival at the box at dawn, and the departure around sunset follow with nicety the sun's curve of rising and setting. The temperature curve shows little or no relation to the beginning and ending activities of the birds.

It has been shown that a much closer correlation obtains at sunrise than in the evening, not only with the diurnal birds, but with the nocturnal Screech Owls. It is relevant to seek the underlying reasons for this universal behavior among the birds. If these relations held with the diurnal birds only, it might be considered that general physiological states such as fatigue and other internal conditions attendant upon a long day of activity associated with family care would lower the sensitivities and responses of the birds in the evening. This is not the case, however, with the owls and

other nocturnal birds, for their day begins with evening, after a long diurnal rest. For this reason I am inclined to believe that these conditioned expressions associated with the evening light in both classes of birds may be dependent upon differences in the sensitivity and adjustment of eyes that have become light-adapted and those that have not. It is evident that the diurnal and the nocturnal birds meet the oncoming dawn, passing from conditions of low light to light of higher intensity levels with a completely relaxed and non-adjusted eye. On the other hand, the eyes of both classes of birds at the close of the day are passing from a condition of extreme light adaptation to light intensities of progressively lower values. It is possible that these contrasting conditions may explain to a greater or less degree the consistent discrepancies actually existing between the dawn and the evening relations. It appears that the relaxed eye in darkness may be more highly sensitive to finer gradations of increasing low intensities than the same eye passing from a state of highest light adaptation to gradations of lowering intensity levels. It is possible that the owls, possessing eyes much less adapted to the strong intensity levels of full daylight than the eyes of the diurnal birds, find even more difficulty in appreciating definite gradations of lowering intensities following an adaptation to conditions of bright daylight. Whatever the true explanation, the facts alone have their interest in the behavior of the birds.

We may also ask why the male tends to prolong the activities of the night by coming in later at dawn and leaving earlier in the evening? We may assume that his eye is adaptable to a higher light-intensity level than that of the female, or we may assume that his activities during the breeding season demand a period of maximum duration to feed successfully, himself, and at the same time assist in feeding the young, and adding food to the larder of the sitting female as he does. On the other hand, it is quite as reasonable to assume a greater solicitude on the part of the female when family life has begun. At present, these are merely surmises, yet it is significant that observations of the dawn arrival and evening departures of the Starling throughout the season show comparable relations at the time of nesting.

A study of the data and curves of the Screech Owls, showing the relationship of activity to sunrise and sunset, reveals other trends which deserve some consideration in connection with the first-morning and last-evening activities of some of the strictly diurnal birds. In the case of the crepuscular or nocturnal owls, the curve of the time of dawn arrival after April 15, swings rapidly toward and becomes even later than the curve of sunrise. In the case of the evening departure, the time of leaving likewise swings sensibly into or becomes even earlier than the time of sunset.

The facts seem to be that during the period when young birds have appeared in the family life, both parents are impelled to prolong to the maxi-

mum their working hours, arriving late at their boxes to close their nighttime labors at dawn, and departing early in the evening to begin their activities. These relations are of particular interest, for data at hand indicate that the same trends of behavior are shown by a number of diurnal birds. The Starling parents, for instance, arrive earlier at their boxes coincident with the nesting season in May than during the autumn and winter. They likewise show a pronounced reluctance to leave their nests and broods in the evening, and actually prolong their stay well into the deep dusk after sunset, whereas, in the winter time they leave for their city roosts while the sun is in plain view well above the western horizon. Whatever the true explanation, the birds, those of diurnal and those of nocturnal habit, appear inclined to increase their working hours at the time when the baby brood is calling for the maximum expression of their attention and energies to rear them successfully.

It is interesting to note that S. E. Ashmore ('Time of singing of the Goatsucker,' British Birds, vol. 28, pp. 259–260, Feb. 1, 1935) in the case of the nocturnal Goatsucker in England, found similar relations with sunrise and sunset such as I found with the Screech Owls in 1930. He found the time intervals of the beginning of song to differ with morning and evening, the song starting an average of fifty minutes before sunrise, and only thirty-five minutes after sunset. He also noted that the greatest departures before sunrise and after sunset came at the middle of the song season, and hazards the opinion that this was due to a timing with the activities of certain moths and other creatures in its diet. Whatever the true explanation, it is evident that our observations of two crepuscular birds, mine dealing with the Screech Owl in America, and Ashmore's dealing with the Goatsucker in England, are in close agreement.

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