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EARLY CHICK MOBILITY AND BROOD MOVEMENTS IN THE FORSTER'S TERN (*STERNA FORSTERI*)

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Abstract.—The onset of mobility and brood movements in semi-precocial larid chicks have important implications for their behavioral development and parent-young interactions. In this study of a Forster's Tern (*Sterna forsteri*) colony nesting on a cobblestone substrate, most chicks made their first observed excursion from the nest by 2 d of age and left the nesting territory permanently by 4 d of age. These results are compared to data for other dry-land nesting Sterninae species and show that the ontogeny of mobility in the Forster's Tern is similar, even though Forster's Terns are typically marsh birds whose chicks are confined to nests often surrounded by water.

MOVILIDAD DE POLLUELOS Y MOVIMIENTO DE LA CAMADA DE GAVIOTAS DE FORSTER (*STERNA FORSTERI*)

Resumen.—El comienzo de la movilidad de polluelos y el movimiento de la camada en aves semi-precoces como los de laridos, tiene importantes implicaciones en el desarrollo de los patrones de conducta y la interacción polluelos-padres. En un estudio que se llevó a cabo en una colonia de *Sterna forsteri* que anido en un substrato lleno de guijarros, se encontró que los polluelos comenzaban a dar sus primeros pasos fuera del nido a la edad de 2 días y a la edad de 4 abandonaban permanentemente el territorio de anidamiento. Se compararon los resultados con la data obtenida en estudios similares, y se encontró que la ontogenia de la movilidad en las Gaviotas de Forster es similar al de otros Sterninae, no obstante, de ser las gaviotas estudiadas, típicas de áreas anegadas en donde los nidos están comúnmente rodeados de agua.

In the study reported here, I examined chick mobility and brood movements in Forster's Tern (*Sterna forsteri*), a typically marsh-nesting larid whose development of mobility on a cobblestone substrate has not yet been reported, and compared this mobility to other Sterninae species nesting on dry land. The semi-precocial young of larids require extensive post-hatching parental care, yet begin to exhibit extensive mobility within a few days of hatching. In a paper on Ring-billed Gulls (*Larus delawarensis*), Evans described their mobility as passing through several stages: (1) incipient mobility—chick remains on the edge of or in the nest; (2) restricted mobility—onset of excursions, away from and back to the nest, within the vicinity of the nest site; and (3) extended mobility—permanent emigrations away from the vicinity of the nest site (Evans 1970, page 235). Evans (1980) reviewed this mobility in seabirds from the perspectives of the young's behavioral development and parent-young interactions. Additionally, several authors have proposed that brood mobility is associated with the onset of parent-young recognition (Davies and Carrick 1962, Miller and Emlen 1975; but see also Shugart 1977). Where broods

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have the opportunity to mix, some form of recognition, whether by parent of young, young of parent, or mutual, apparently occurs prior to the broods acquiring sufficient mobility to mix. Developmental data on mobility and recognition have been reported for a number of seabird species (for a summary see Evans 1980).

STUDY AREA AND METHODS

Observations were made during May through July of 1985 in a tern colony of 81 nesting pairs. The study area was located on an island on the Hanford Reach section of the Columbia River in southcentral Washington. The tern colony was situated on the upstream end of the island just above the high water mark caused by the fluctuating water levels from upstream Priest Rapids Dam. The nests were constructed on a predominantly cobblestone substrate that supported a vegetation association dominated by absinthe (*Artemisia absinthium*), northern buckwheat (*Eriogonum compositum*), and Columbia River grindelia (*Grindelia columbiana*). Nests tended to be located near, and sometimes within the foliage of, the scattered vegetation. In the late spring, the cover of nearby willows (*Salix exigua*) was used by chicks and parents once they left the colony nesting area. Although Ring-billed Gulls and California Gulls (*Larus californicus*) flocked at the extreme upstream tip of the island beyond the point of established vegetation, this particular tern colony did not adjoin a gull colony as often occurs on the Hanford Reach.

The colony was surveyed almost daily by walking through it and by subsequently observing it from an elevated blind for an average of roughly 4 h a day during the time chicks were present in the colony. During walking surveys, chicks were banded with U.S. Fish and Wildlife leg bands to facilitate identification. Chicks were considered 1 d old on the day of hatching. During the surveys and observations, data were collected on chick mobility, hiding behavior, and brood movements from which a record could be obtained of each chick's first observed excursion from the nest and its permanent emigration from the nesting territory. An excursion consisted of chick movement away from the confines of the nest. A permanent emigration involved an excursion with no subsequent return to the nesting territory (that area initially defended by the resident adults).

The first observed excursion was recorded only in response to my survey disturbances as this was the only time individual chick identity could be confirmed. Observations from the blind confirmed permanent emigrations by either witnessing their start or finding the nest abandoned the next day. In the latter case, the emigration commenced between observation periods. Because of missing survey dates, reported data are limited to chicks of known age at time of movement.

RESULTS AND DISCUSSION

During the disturbances caused by my surveys within the colony, almost all chicks, a day or older, tended to crouch and remain silent at my approach. Crouching occurred either under the cover of vegetation near the nest, among nearby cobble, where chick coloration provided some camouflage, or within the nest cup. In general, chicks 1 and 2 d old stayed in the nest (incipient mobility stage of Evans 1970) or within a meter of it during a disturbance. The distance of movement away from the nest appeared to increase with chick age, with some chicks moving beyond the nest territory. At times, older chicks also were observed to delay their return to the nest following my return to the blind.

In response to my walk-through surveys, most chicks made their first observed excursion from the nest by 2 d of age (Table 1). The recorded data were strictly in response to my disturbances due to the constraints mentioned previously. However, non-investigator-caused disturbances such as those caused by gulls, boat or air traffic, alarm calls of other bird species, or unknown reasons were observed from the blind to occur frequently throughout the day. These often resulted in colony upflights, adult tern alarm calls, and subsequent chick movement. Thus, the day of first excursion could possibly have been the same or perhaps earlier. All excursions at this stage were temporary in nature in that a return to the nest was made following the disturbance (restricted mobility stage of Evans 1970). Other than initiating chick movement by their alarm calls and fleeing action, adults never directed the orientation of these excursions. Occasionally during feedings chicks were observed immediately outside the nest cup. However, movements similar to those reported in the Ring-billed Gull (Evans 1970) where adults led temporary excursions from the nest, sometimes feeding the chicks during the excursion, were not observed.

Within a few days of hatching, the chicks and parents left the nesting territory permanently to take up residence among the predominate absinthe and willow behind the upstream end of the colony (Table 1). This represented the extended mobility stage of Evans (1970). Chicks were usually led by adults walking ahead or flying overhead. For those nests located farthest from the water, the broods had to be moved 25 m or more through the colony to the dispersal area. Calls were used by the adults to elicit following behavior by the chicks. Although recognition was not tested in this study, the calling behavior of the adults and the selective reactions of the chicks to such calls suggested the chicks were capable of recognizing their parents' vocalizations. Recognition capability prior to the extended mobility stage would probably have followed the pattern observed for other species (cf. Table VI, Evans 1980).

The variability in time of occurrence of permanent emigration from the nesting territory (Table 1) may have been due in part to several factors. First, the hatching interval within the three-egg tern clutch ranged between 2 and 3 d ($n = 16$). Thus, some intra-brood variation in chick age at brood emigration would have been expected. Second, in some nests one of the eggs failed to hatch. Although the parental tendency to incubate the remaining egg decreased with advancing chick age, these nests appeared to have delayed chick movement relative to the mean. Third, my surveys of the colony may have caused earlier brood emigrations, as well

Table 1. Age at which chicks made their first observed excursions from the nest and their permanent emigrations from the nesting territory.[a]

Chick age in days	First excursion (no. of chicks)	Permanent emigration (no. of chicks)
1	19	0
2	31	6
3	8	5
4	1	10
5	0	7
6	0	3
7	0	2
>7	0	0
Mean	1.8 d	4.1 d

[a] The data represent individual chicks of known age without regard to the effects of brood age composition affecting movement.

as first excursions. Additionally, nests closest to my observation blind that had shown previous adult agitation and featured the earliest brood movements may have biased the data toward an earlier chick age at time of movement. The youngest chick of these nests, usually 2 d old at time of movement, lagged behind its older sibling(s) and initially remained behind near the nest. A parent often remained behind as well and tended this chick until it acquired sufficient locomotor ability to continue the move. At one nest, this was observed to continue for at least 3 h after the emigration had started. At another, the movement of a young chick out of the colony nesting area was accomplished over several days. Overall, the data indicated that permanent emigration from the nesting territory most often took place when a chick was 4 d of age and was achieved no later than 7 d of age.

Prior to chick hatching, the river flood level reached to within almost 3 m of some peripheral nests. The water level had lowered at hatching, thus providing the necessary space adjacent to the colony nesting area where the parent birds could have defended areas containing their chicks. These areas were possibly not permanent, but shifted around as chicks moved. Recapture of banded chicks and observation of brood movements indicated that in leaving the colony for the dispersal area, the broods tended to move from their nests via the closest boundary. Until they were near fledging (roughly 4 wk), chicks tended to remain away from the shoreline where cover was lacking. Older chicks were observed, however, to move to water when disturbed during walking surveys.

The chicks were not observed to form creches. Evans (1980) described species that form creches as those in which the adults are flightless or forage relatively far from the breeding colony. Forster's Tern adults generally foraged for fish close to the island. The availability of cover vegetation may have also precluded the need for the formation of a creche in this situation.

The ontogeny of mobility stages in the Forster's Tern as described here is comparable to that reported for other Sterninae. First excursions from the nest were made at about the same time (1–2 d) as the Common Tern (*Sterna hirundo*) (Palmer 1941) and the Arctic Tern (*S. paradisaea*) (Busse and Busse 1977), but slightly later than in the Royal Tern (*S. maxima*) (1 d) (Buckley and Buckley 1972). Permanent emigrations occurred later than for Royal Terns (2–3 d) (Buckley and Buckley 1972), but generally earlier than the minimum time (6 d) reported for Caspian Terns (*S. caspia*) (Shugart 1977). The data from this study showed that the chicks of Forster's Terns nesting on a cobblestone substrate exhibited a pattern similar to other Sterninae species nesting on dry land in the ontogeny of their mobility.

As the Forster's Tern is typically a bird of the marshes (Bent 1921), where they nest near to water, this finding was significant. In the marsh, a common dispersal area does not exist and the chicks are inclined to take to water early (Bent 1921). Comparative data from marsh colonies would be enlightening in order to determine whether brood mobility in the marsh habitat differs from the pattern reported here. If so, the time of early brood movements may reflect some facultative behavioral adjustments to different ecological circumstances.

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LITERATURE CITED

BENT, A. C. 1921. Life histories of North American gulls and terns. Smithsonian Inst., U.S. Nat. Mus. Bull. 113.

BUCKLEY, F. G., AND P. A. BUCKLEY. 1972. The breeding ecology of Royal Terns *Sterna* (*Thalasseus*) *maxima maxima*. Ibis 114:344–359.

BUSSE, VON K., AND K. BUSSE. 1977. Prägungsbedingte Bindung von Küstenseeschwalbenküken (*Sterna paradisaea* Pont.) and die Eltern und ihre Fähigkeit, sie an der Stimme zu erkennen. Z. Tierpsychol. 43:287–294.

DAVIES, S. J. J. F., AND R. CARRICK. 1962. On the ability of Crested Terns, *Sterna bergii*, to recognize their own chicks. Aust. J. Zool. 10:171–177.

EVANS, R. M. 1970. Imprinting and mobility in young Ring-billed Gulls, *Larus delawarensis*. Anim. Behav. Monogr. 3:193–248.

———. 1980. Development of behavior in seabirds: an ecological perspective. Pp. 271–322, *in* J. Burger, B. L. Olla, and H. E. Winn, eds. Behavior of marine animals, vol. 4. Plenum Publishing Corporation, New York.

MILLER, D. E., AND J. T. EMLEN, JR. 1975. Individual chick recognition and family integrity in the Ring-billed Gull. Behaviour 52:124–144.

PALMER, R. S. 1941. A behavior study of the Common Tern (*Sterna hirundo hirundo* L.). Proc. Boston Soc. Nat. Hist. 42:1–119.

SHUGART, G. W. 1977. The development of chick recognition by adult Caspian Terns. Proc. Conf. Colonial Waterbird Gp. 1977:110–117.

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