the adult heron was frequently seen on the nest, and later a juvenile was sighted near the nest.

Although sightings are most frequent on the edges of the oxbow lakes, several individuals have been seen in a single day in the 1 km of rarely flooded upper *varzea* forest separating the two lakes (Paul Coopmans, pers. comm.). We suggest that the Zigzag Heron may prove to be more numerous than previously thought in areas that provide the proper requirements. Among these requirements may be a closely related series of oxbow lakes with substantial lakeside vegetation and undisturbed forest. The frequency of sightings in such habitat at La Selva Lodge suggests that the paucity of past sightings may be a result of the secretive habits, previously unknown voice, and the specific habitat requirements of the Zigzag Heron, rather than uniformly low population numbers throughout its range. Given the knowledge of these specific habitat requirements and its voice, Zigzag Herons may be found to range widely but thinly throughout Amazonia and the Guianas.

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PETER ENGLISH, *Victor Emanuel Nature Tours, P.O. Box 33008, Austin, Texas 78764;* AND CYNTHIA BODENHORST, *La Selva Lodge, Casilla 635, Sucursal 12 de octubre, Quito, Ecuador.*
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Enhanced fledging success by colonially nesting Ospreys in Nova Scotia coastal habitat.—Historically, Ospreys (*Pandion haliaetus*) often nested in colonies along the Atlantic coast of North America. One colony on Gardiner's Island, New York, contained as many as 300 pairs in the early 1900s (Puleston 1977). Recently, more colonial nesting has been reported (e.g., Spitzer and Poole 1980, Hagan and Walters 1990). In Nova Scotia, colonies have been reported by Prévost et al. (1978) and by Greene (1987); the former was part of the population examined in the present study.

An Osprey colony could function as a center where flock mates are obtained for the purpose of social foraging (Flemming 1988, Hagan and Walters 1990). Flemming (1988) found that social foraging reduced the time required to locate prey. This suggests that colonial Ospreys might provide more food to their young, thereby enhancing the adult's reproductive success. The objective of this study was to determine if colonial Ospreys fledged more young than those nesting solitarily and, furthermore, to test whether this was related to colonial nesting alone rather than to nesting habitats or types of nest sites.

Study area and methods.—We studied Ospreys in northeastern Nova Scotia primarily within the Pomquet, Antigonish, and Pictou Harbour watersheds. Each of these watersheds flows into one of several shallow estuaries that border the coastline of the Northumberland Strait. The highlands are covered with deciduous and mixed forests, while valley slopes and poorly drained areas are dominated by coniferous forest. Harvesting of coniferous stands is extensive. Several powerline corridors bisect the study area. Pairs were considered to be nesting along the coast if their nest sites were within 6 km of an estuary, where most coastal foraging by Ospreys occurs (Jamieson et al. 1982). The next closest Ospreys were a distant

13 km from the coast, and were considered inland nesters because their primary foraging sites were inland rivers and lakes (Jamieson et al. 1982). Most nests (70%, N = 188) were in the coastal zone. Seventy-nine percent (N = 131) of coastal Ospreys nested on utility poles, while only half (47%, N = 57) of inland pairs used utility poles as nest sites. Many (31%, N = 188) pairs used more widely dispersed natural nest sites.

Osprey nests were located by land search and from aircraft. Surveys by helicopter enabled us to assess whether an Osprey nest was occupied and active and allowed us to determine the pair's clutch size and fledging success. During the period of 25 May–3 June of 1976, 1978, 1979, 1980, 1981, and 1985, a combined nest occupancy, nest activity, and clutch size survey was conducted for a total of 188 nests. During the 1985 census, nest distribution and inter-nest visibility were also noted. A nest was considered occupied if it was attended by one or more birds (cf. Postupalsky 1974), and it was considered active if it had at least one egg. Fledging success surveys were undertaken during the period of 21–26 July of the same years. Helicopter surveys conducted later than this risk causing premature fledging. All but six nests were revisited, resulting in data for 182 nests. Since this survey period was late in the nestling phase, we assumed that nestlings alive at that time would fledge successfully.

Nearest-neighbor distances between nests and nest-to-estuary distances were normally distributed, so Student's *t*-test was used to test for differences. Clutch size and fledging success data were not distributed normally, so non-parametric statistics were employed. The Kruskal-Wallis test was used to determine if clutch size or fledging success varied with census year. The *G*-test of independence was used to test whether or not nesting status was independent of eggs/fledglings produced each year. Analyses followed methods described in Zar (1984).

Results.—The mean distance (1985) between nearest neighbors using utility poles as nest sites (occupied) in coastal habitat was 0.7 ± 1.1 km (mean ± SD, N = 33). However, it was 6.7 ± 6.2 km (N = 25) between all other nests used by Ospreys. These distances were significantly different (Student's *t*-test, $P = 0.02$), suggesting that coastal Ospreys using utility poles nested in the highest density in our study area. When perched near their nests, most (80.6%, N = 31) coastal Ospreys nesting on utility poles had unobstructed views of 4–9 other nests. The maximum distance between extreme nests in these groups was 2.2 km. Moreover, by flying above their nests, all other pairs could see at least two nests along these straight powerline corridors. Therefore, although there was some variation in inter-nest visibility, all coastal pairs using utility poles as nest sites could readily observe and interact with their neighbors and hence were considered colonial.

In the coastal habitat, occupied colonial nests on utility poles were an average of 2.8 ± 1.7 km (N = 33) from the closest estuary to each nest, while Ospreys nesting solitarily on natural nest sites were an average of 2.4 ± 1.5 km (N = 10) from the closest estuary. The distance from nests to estuaries was not significantly different between these two groups (Students *t*-test, $P = 0.50$), suggesting that neither group had an advantage in terms of proximity to an estuary.

Clutch size did not vary significantly from year to year (Kruskal-Wallis test) for either occupied ($P = 0.14$) or active nests ($P = 0.45$), so the data were pooled for further analysis (Table 1). There was no significant difference in clutch size between birds nesting in coastal (2.09 eggs/occupied nest, 2.56 eggs/active nest) and inland (2.40, 2.74) habitats (*G*-test of independence, $P = 0.29$, $P = 0.27$). There was also no significant difference (*G*-test, $P = 0.47$, $P = 0.31$) in clutch size between pairs nesting colonially on coastal utility poles (2.09, 2.56) versus those nesting solitarily on coastal natural nest sites (2.11, 2.57). Finally, clutch size for inland solitary nesting Ospreys using utility pole (2.30, 2.58) and natural sites (2.50, 2.89) was not significantly different (*G*-test, $P = 0.63$, $P = 0.47$).

TABLE 1

COMPARISON OF CLUTCH SIZES BETWEEN OSPREYS NESTING IN COASTAL VERSUS INLAND HABITAT, AND BETWEEN COASTAL AND INLAND OSPREYS NESTING ON UTILITY POLES VS NATURAL SITES

Comparison	Occupied nests	Active nests	Eggs	Clutch size/ occupied nest[a]	Clutch size/ active nest[a]
Coastal	131	107	274	2.09 ± 1.21[b]	2.56 ± 0.76[b]
Inland	57	50	137	2.40 ± 1.11	2.74 ± 0.69
Coastal utility pole (colonial)	103	84	215	2.09 ± 1.22[b]	2.56 ± 0.78[b]
Coastal natural site (solitary)	28	23	59	2.11 ± 1.17	2.57 ± 0.66
Inland utility pole (solitary)	27	24	62	2.30 ± 1.10[b]	2.58 ± 0.78[b]
Inland natural site (solitary)	30	26	75	2.50 ± 1.14	2.89 ± 0.59

[a] Mean ± SD.
[b] Compared are not significantly different ($P > 0.05$).

As with clutch size, fledging success per occupied and per active nest did not vary from year to year (Kruskal-Wallis test, $P = 0.30$, $P = 0.23$), hence the data were pooled (Table 2). The number of young fledged per occupied nest and per active nest was significantly greater (G-test, $P = 0.02$, $P = 0.01$) for the coastal habitat (1.50 fledglings/occupied nest, 1.80 fledglings/active nest) than for the inland (1.16, 1.32) habitat. Similarly, for the coastal habitat, there was a significant ($P = 0.03$, $P = 0.04$) difference when the same test was used to determine whether or not colonial utility pole nesters (1.53, 1.86) fledged more young/nest than pairs nesting solitarily on natural sites (1.40, 1.59).

If the type of nest (utility pole vs natural) site influenced fledging success, this should have occurred in both coastal and inland habitats (Table 2). However, there was no significant difference (G-test, $P = 0.32$, $P = 0.28$) in young fledged by inland nesting Ospreys that used utility poles (1.24, 1.36) versus those that used natural sites (1.07, 1.26).

Discussion.—Greene (1987) reported that Osprey colonies functioned as a center where colony members could obtain information from one another about the location of distant food sources (cf. Ward and Zahavi 1973). However, Hagan and Walters (1990) found no evidence of information transfer in a North Carolina colony. They suggested that Greene's (1987) findings may have been due to local enhancement. This explains much of the data (Flemming and Greene 1990). An animal foraging by local enhancement joins one or more conspecifics that have indicated in some manner that that have located prey. As a result the animal finds food more readily (Thorpe 1963).

Flemming (1988) and Hagan and Walters (1990) reported flocks forming at colonies. Flemming (1988) also reported that Ospreys used several social foraging strategies, including local enhancement. This resulted in reduced time required to locate prey. It seems reasonable that being part of a colony could facilitate obtaining conspecifics for social foraging (cf. Evans 1982), and this could be one of the benefits obtained by Ospreys nesting in colonies.

If foraging advantages accrue to Ospreys nesting in colonies, this presumably should be reflected in enhanced reproductive success. These benefits would most likely be seen in terms of fledglings produced, rather than eggs produced, since Poole (1985) showed that clutch size was not correlated with pre-laying feedings rates. Clutch size in this study did not vary with habitat or with nesting site regardless of habitat.

Fledging success was greater for Ospreys nesting in the coastal habitat than inland. How-

TABLE 2

COMPARISON OF FLEDGING SUCCESS BETWEEN OSPREYS NESTING IN COASTAL VS INLAND HABITAT, AND BETWEEN COASTAL AND INLAND OSPREYS NESTING ON UTILITY POLES VS NATURAL SITES

Comparison	Occupied nests	Active nests	Fledglings	Fledging succ./ occupied nest[a]	Fledging succ./ active nest[a]
Coastal	121	101	182	1.50 ± 1.19[b]	1.80 ± 1.08[b]
Inland	61	54	71	1.16 ± 1.20	1.32 ± 1.20
Coastal utility pole (colonial)	96	79	147	1.53 ± 1.26[b]	1.86 ± 1.14[b]
Coastal natural site (solitary)	25	22	35	1.40 ± 0.91	1.59 ± 0.80
Inland utility pole (solitary)	34	31	42	1.24 ± 1.26[c]	1.36 ± 1.25[c]
Inland natural site (solitary)	27	23	29	1.07 ± 1.14	1.26 ± 1.14

[a] Mean ± SD.
[b] Compared are significantly different ($P < 0.05$).
[c] Compared are not significantly different ($P > 0.05$).

ever, the fledging success of coastal pairs nesting colonially on utility poles was higher than for those nesting solitarily on natural sites, even though solitary nesters were as close to estuarine foraging areas as colonial birds. Therefore, habitat was not solely responsible for the observed differences in fledging success, as it does not explain the latter finding.

That the type of nest site was responsible for the variation in fledging success is also an unsatisfactory explanation of our results. While utility pole nesters fledged more young than birds using natural sites in the coastal habitat, fledging success did not differ between birds using these two types of nest sites in the inland habitat.

The enhanced reproductive success of coastal Ospreys nesting on utility poles seems related to another factor. In coastal habitat, the only apparent behavioral variable related to the provisioning of food to nestlings that distinguished solitary natural site nesters and colonial utility pole nesters was the recruitment of flock mates at the colony for social foraging. It appears likely that enhanced opportunities for social foraging by colonially nesting Ospreys can result in a greater number of young fledged.

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STEPHEN P. FLEMMING, *Dept. Biology, Acadia Univ., Wolfville, Nova Scotia B0P 1X0, Canada;* ROBERT P. BANCROFT, *Dept. Lands and Forests, P.O. Box 698, Halifax, Nova Scotia B3J 2T9, Canada;* AND NORMAN R. SEYMOUR, *Dept. Biology, St. Francis Xavier Univ., Antigonish, Nova Scotia B2G 1C0, Canada.* (Present address SPF: *General Delivery, Sackville, New Brunswick E0A 3C0, Canada;* RPB: *Dept. Fisheries, P.O. Box 700, Pictou, Nova Scotia B0K 1H0, Canada.)* *Received 26 Oct. 1989, accepted 7 Feb. 1991.*

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The avifauna of the Revillagigedo Islands, Mexico: additional data and observations.— The Revillagigedo Islands are an archipelago of four oceanic volcanic islands in the eastern Pacific Ocean about 650 km (400 nautical miles) west of the Mexican state of Colima. Clarión (3.5 × 8.5 km) is the westernmost and oldest island (early Pliocene). Roca Partida is a rocky islet and is the throat of an old volcano. It is younger than Clarión but older than Socorro, the largest island (16.5 × 11.5 km, early Pleistocene), and San Benedicto (4.5 × 0.9 km), the youngest and northernmost island (late Pleistocene). Seabirds are numerous and diverse, but include only one endemic species. The terrestrial avifauna is relatively depauperate, but its degree of endemism is very high. Socorro, the largest and most diverse island, has the largest number of endemic land birds, followed by Clarión, the second largest but oldest island. The smallest, Roca Partida, has none, and the second smallest and youngest island, San Benedicto, had only one, a Rock Wren (*Salpinctes obsoletus exsul*), that became extinct following the catastrophic volcanic eruption in 1952 (Brattstrom 1990).

Numerous visitors have discussed the status of birds of the Revillagigedos including Grayson (1872), Anthony (1898), Brattstrom and Howell (1956), Jehl and Parkes (1982), Everett (1988), and Howell and Webb (1990). We conducted a cruise in the area from 29 April to 8 May, 1990, visiting all four islands as follows: San Benedicto (19°18′N, 110°49′W) 29–30 April; Socorro (18°47′N, 110°58′W) 30 April–3 May; Roca Partida (19°00′N, 112°04′W) 4 May; and Clarión (18°22′N, 114°45′W) 5–7 May. While at sea, we maintained a continuous watch for seabirds. We here add recent data to the status of the known avifauna of the Revillagigedo Islands and include our observations of other species never observed before on or around the islands.