preferred resources than did unpaired birds during winter (Paulus 1983). Thus, adults should be more successful in obtaining resources and experience greater survivorship in winter. These benefits should insure that more experienced breeders return to the breeding grounds in optimum condition and may, in part, account for the significantly greater contribution of adult, as compared with immature, males to reproductive activities on the breeding grounds (Blohm 1982).

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Interspecific Egg Dumping by a Great Egret and Black-crowned Night Herons

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The terms "egg dumping" and "brood parasitism" describe the laying of eggs in another individual's nest. Brood parasitism, implying some regularity of occurrence, has been reported for a relatively small but diverse number of bird species. The phenomenon has important implications for the reproductive biology of both the parasite and the host, and the topic has received considerable theoretical attention (e.g. Weller 1959, Hamilton and Orians 1965, Payne 1977, Yom-Tov 1980). Egg dumping has been suggested as an evolutionary precursor to brood parasitism (Hamilton and Orians 1965).

Recent studies (Yom-Tov 1980, Brown 1984) suggest that intraspecific brood parasitism, difficult for avian hosts and human observers to detect, may be more widespread than is currently believed. For example, prevalent intraspecific brood parasitism has been discovered in Cliff Swallows (*Hirundo pyrrhonota*; Brown 1984). This is the first report of widespread intraspecific brood parasitism by a colonial animal, although bird colonies have previously been suggested as being favorable for the development of brood parasitism (Hamilton and Orians 1966).

Neither brood parasitism nor egg dumping has, to our knowledge, been reported for the Ardeidae or Ciconiiformes. Here, we describe two cases in which Black-crowned Night Herons (*Nycticorax nycticorax*) abandoned eggs in Snowy Egret (*Egretta thula*) nests and one case in which a Great Egret (*Casmerodius albus*) abandoned an egg in a Black-crowned Night Heron nest. We speculate that a regular low level of brood parasitism may occur among colonially nesting herons.

We conducted this study at Clark's Island, an island of about 30 ha at the mouth of Plymouth Har-

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bor, Plymouth County, Massachusetts. A heronry on its northern half includes about 500 nests of *Egretta caerulea, Casmerodius albus, Egretta thula, Nycticorax nycticorax,* and *Plegadis falcinellus* (Osborne and Custer 1978). Heron nests at Clark's Island are located largely in red cedar trees (*Juniperus virginiana*) but black cherry (*Prunus serotina*), pitch pine (*Pinus rigida*), and white pine (*Pinus strobus*) are also present, with an understory, thick in places, of staghorn sumac (*Rhus typhina*) and poison ivy (*Rhus radicans*). Nests, eggs, and chicks in the heronry were checked and marked at intervals during the 1977 and 1979 breeding seasons as part of other studies.

On 19 April 1977, nests 29A and 30A, both built by Snowy Egrets, were still empty. When next checked, on 30 April, nest 29A contained 3 Snowy Egret eggs and 1 Black-crowned Night Heron egg. A fourth Snowy Egret egg was laid in this nest between 3 and 4 May. Incubation continued by the Snowy Egret host until all of the eggs in nest 29A hatched, including the night heron egg, between 20 and 26 May. Following a large gale on 10–12 June, all the young from nest 29A were found dead in the nest, apparently having died from exposure.

The Black-crowned Night Heron egg from nest 29A measured 50.9 × 40.0 mm and weighed 42.5 g on 30 April. The Snowy Egret eggs from this nest measured 40.4 × 32.6 mm, 42.8 × 32.7 mm, 40.6 × 31.8 mm, and 42.9 × 32.4 mm, and weighed 23.5 g, 22.5 g, 21.5 g, and 24.0 g, respectively.

On 30 April 1977, nest 30A contained three Snowy Egret eggs. By 12 May, it also contained a Black-crowned Night Heron egg. Between 20 May and 26 May, the Snowy Egret eggs in nest 30A hatched. The Black-crowned Night Heron egg had still not hatched by 8 June and was cold. On 15 June, following the gale, the Black-crowned Night Heron egg was cold and cracked. This egg measured 52.0 × 33.8 mm and weighed 29.5 g on 12 May. The egret eggs from nest 30A measured 42.2 × 33.2 mm, 41.8 × 32.3 mm, and 42.0 × 33.7 mm and weighed 24.5 g, 24.5 g, and 25.5 g, respectively.

Nests 29A and 30A were located in different red cedar trees approximately 6 m apart. Each tree contained two other active Snowy Egret nests. There were no Black-crowned Night Heron nests in the immediate vicinity, precluding the possibility that these eggs merely dropped from a higher *Nycticorax* nest, as was observed for marked eggs and nests elsewhere in this colony in 1977 (Harrington and Cannell pers. obs.). Human visitors to Clark's Island are rare in early spring, and we consider separate instances of human interference to be extremely unlikely in this highly inaccessible part of the heronry.

Nest 138A was built and used by Black-crowned Night Herons in 1978 and reused in 1979, also by night herons. It was 3.5 m high in a 5.5 m apple tree (*Pyrus* sp.). In the 1979 breeding season, nest 138A contained one Black-crowned Night Heron egg on 30 April. On 6 May, the nest held two additional Black-crowned Night Heron eggs. On 10 May, nest 138A contained 4 eggs: 3 Black-crowned Night Heron eggs and 1 Great Egret egg. Two of the three night heron eggs hatched between 22 and 20 May; the third never hatched, remaining in the nest until between 12 and 20 June. The egret egg was present in the nest on 29 May, but neither it nor a chick was present on 6 June, by which date a viable egg should have hatched.

The Great Egret egg in nest 138A measured 63.5 mm × 41.1 mm. The night heron eggs from nest 138A measured 52.6 × 37.3 mm, 51.1 × 37.0 mm, and 51.6 × 36.5 mm. These eggs were not weighed. All Clark's Island Great Egret nests have been near or on the tops of evergreen trees, and no Great Egrets have nested within 200 m of the nest 138A. Again, we consider human interference to be extremely unlikely.

Eggs of these species are similar in color, gloss, and shape but are significantly different in size. There is little size overlap, and eggs can usually be identified visually. Each of the foreign eggs was dramatically larger than the host's eggs with which they were found. The eggs of each host individual were tightly clustered in size within the overall variation of egg size of the host species. In surprising contrast, each of the foreign eggs was near or beyond the range of size found in normally laid eggs of that species at Clark's Island. The size difference was not consistent; "dumped" eggs were either larger or smaller than normally laid eggs, in one or both dimensions. We cannot account for this finding.

The mean dimensions of 54 Snowy Egret eggs from 15 Clark's Island clutches in 1977 were 42.8 mm (SD = 1.4, range = 38.8–46.6) × 32.0 mm (SD = 1.4, range = 30.5–34.7). The means of 21 Black-crowned Night Heron eggs from 15 Clark's Island clutches were 53.7 mm (SD = 1.7, range = 48.2–58.1) × 37.7 mm (SD = 1.1, range = 34.8–39.7). The means of 21 Great Egret eggs from 7 Clark's Island clutches in 1977 and 1978 were 57.9 mm (SD = 2.8, range = 53.3–63.3) × 39.9 mm (SD = 1.4, range = 37.4–42.8).

No additional cases of egg dumping have been detected at Clark's Island in over 5 yr of study involving hundreds of nests. Certainly, interspecific egg dumping by Clark's Island herons is rare at best, and the incidents we describe may represent nothing more than egg-laying accidents, such as occur in many species. Nevertheless, these and other aspects of heron breeding biology lead us to speculation. The circumstances of heron nesting include many of the criteria suggested as suitable for the development of brood parasitism (Hamilton and Orians 1965, Payne 1977), such as colonialism, closely spaced nests, nesting synchrony, and similar food given to young, although Yom-Tov (1980) has argued that reproductive synchrony may be a mechanism precisely against nest interference such as brood parasitism.

More to the point, several known aspects of heron reproduction are suggestive, at least, of brood parasitism. Nests with very large clutch sizes are frequently observed in heronries (Byrd pers. comm., Kushlan pers. comm., Smith-Kenneally pers. comm.), including those at Clark's Island. Nests with eggs or young of different species are also frequently found at some colonies (Dusi and Dusi 1968, 1970; Maxwell and Kale 1977; Byrd pers. comm.; Kushlan pers. comm.; Smith-Kenneally pers. comm.). These have traditionally been interpreted as nest adoption, in which individuals of one species take over a nest and its contents from individuals of another species. That adopted eggs and chicks are apparently sometimes successfully reared (Dusi and Dusi 1970) documents the ability of herons to accept and raise young of another species. Nest adoption is itself an interesting phenomenon and has been suggested as a possible evolutionary precursor of brood parasitism (Payne 1977). In fact, in at least some cases, brood parasitism might be an equally satisfactory explanation of mixed-species clutches and broods.

We have reported here three incidents in which heron eggs have been abandoned in nests of other heron species. Only one egg hatched and the chick did not survive, although death appeared to be caused by severe environmental factors rather than by rejection by the host. These incidents do not demonstrate egg dumping as an important or even successful aspect of heron reproductive biology, but, in light of other aspects of heron reproduction, and Brown's (1984) findings, observers should carefully scrutinize colonially nesting ardeids and other colonially nesting birds to determine the true extent of inter- and intraspecific brood parasitism.

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