Nesting and Brood Ecology of Lesser Scaup at Waterhen Marsh, Saskatchewan

JAMES E. HINES

Department of Biology, University of Regina, Regina, Saskatchewan S4S 0A2

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Abstract. The nesting and brood ecology of the Lesser Scaup *(Aythya affinis)* was observed at Waterhen Marsh in central Saskatchewan. Most scaup nests were initiated during the first two weeks of June and the peak of hatching occurred during the middle two weeks of July. The mean clutch size was 9.70 ± SE 0.21 ($n = 56$); if clutches of 13 and 14 are omitted, the mean becomes 9.47 ± 0.18 ($n = 53$). Several incidents of egg parasitism involving scaup were noted. Insular, well-concealed nest sites featuring plants (especially grasses) in the 21- to 60-cm height range were often selected. Twenty-eight (76%) of 37 nests were successful. Striped skunks *(Mephitis mephitis)* and Common Crows *(Corvus brachyrhynchos)* caused most of the nesting failures. The high social tolerances exhibited by brooding scaup and the concentration of broods in areas of suitable habitat resulted in the formation of mixed broods. Redhead *(Aythya americana)* ducklings frequently joined these broods. Possible advantages of this crêching are discussed.

Although the Lesser Scaup *(Aythya affinis)* is one of the most abundant ducks in North America, much remains to be learned about its spring and summer biology. Earlier studies dwelt on the life history of the species (Bent 1923; Kortright 1942; Gehrman 1951). More recently, food habits have been investigated (Rogers and Korschgen 1966; Dirschl 1969; Bartonek and Hickey 1969; Bartonek and Murdy 1970; Sugden 1973; others), as have features of the scaup's breeding biology (Rogers 1959, 1964; Dwernychuk 1968; Long 1970; Trauger 1971).

Previous authors have referred to the Lesser Scaup's habit of forming mixed broods that are often led by several hens (Munro 1941; Hochbaum 1944). A similar type of behavior has been frequently observed in scoters *(Melanitta fusca)*, eiders *(Somateria mollissima)*, and Shelducks *(Tadorna tadorna)* and has been interpreted as a form of crêching or communal "baby-sitting" of the young (Koskimies 1955; Hildén 1964; Hori 1964; Ahlen and Andersson 1970; Gorman and Milne 1972). This differs from the formation of "giant broods" led by a single hen, typical of some species of the tribe Mergini (Hildén 1964).

During a 2-year study of the ecology of the Gadwall *(Anas strepera)*, I had the opportunity to observe some aspects of the nesting and brood ecology of the Lesser Scaup. As mixed broods of scaup and Redheads *(Aythya americana)* were frequent, this phenomenon was also investigated.

Study Area

Waterhen Marsh (50°51′ N, 105°02′ W) is located 8 km south of the town of Kinistino in the aspen parkland of Saskatchewan. The marsh was drained in the 1920s, but after agricultural attempts failed and a fire broke out in the underlying peat soils the basin was reflooded. An earthen dam, constructed in 1938 by Ducks Unlimited (Canada), aids in control of water levels in the 1530-ha impoundment (Figure 1).

The marsh basin is very shallow, exceeding a depth of 1 m only in the drainage ditches. The underlying soils have remained quite unconsolidated since the fire and this has prevented the establishment of rooted submergent vegetation in most portions of the marsh. Only in the northeast corner of the marsh are submergents, primarily spiked water milfoil *(Myriophyllum exalbescens)*, abundant. Emergent vegetation, especially cattail *(Typha latifolia)*, is a dominant feature of the marsh, covering 30–35% of the total area. Large bays of open water are separated by the cattail stands. Dense growths of cattails, sedges *(Carex* spp.), bulrushes *(Scirpus* spp.), and whitetop grass *(Scolochloa festucacea)* are present in the northwestern and southeastern corners of the basin.

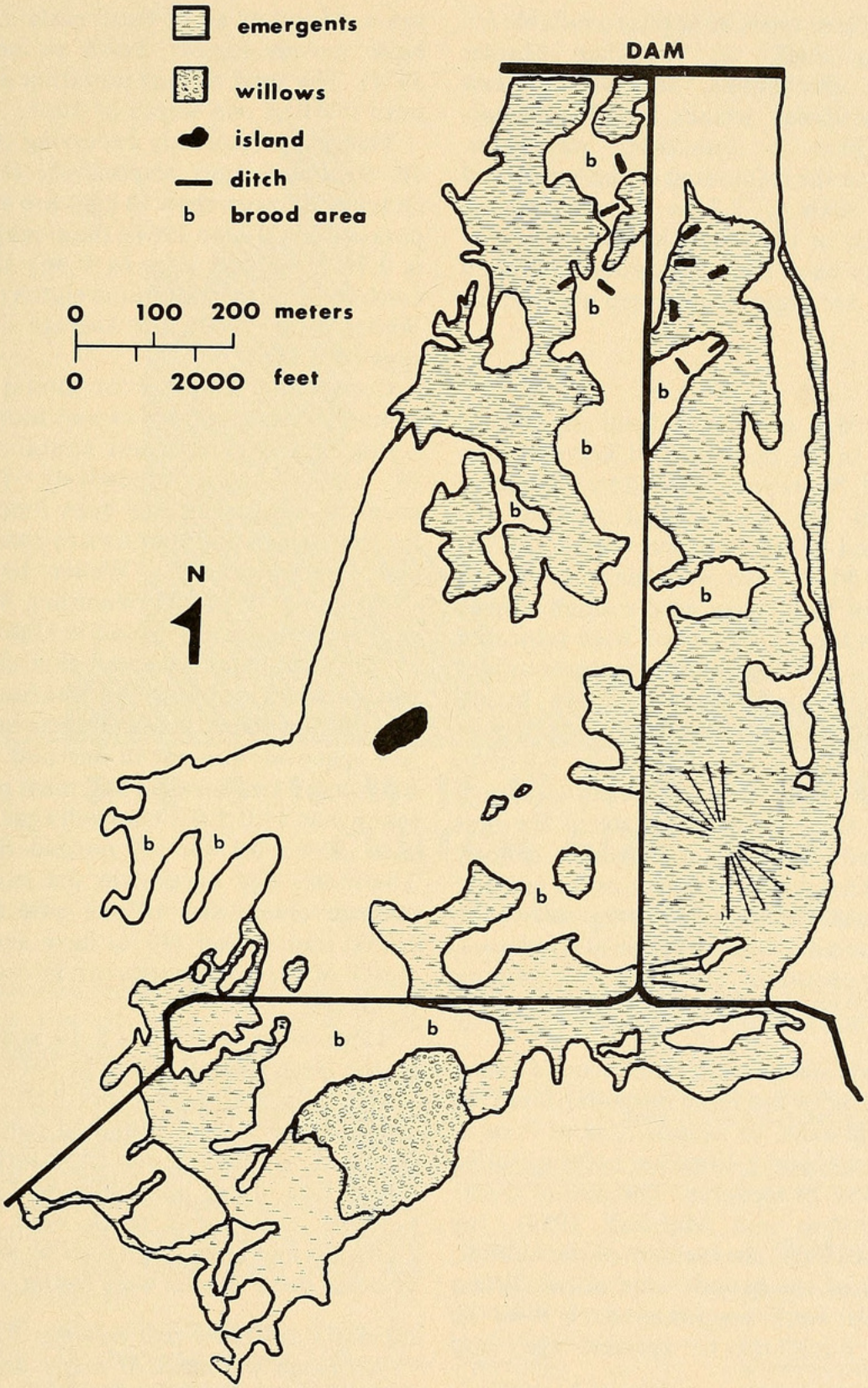

FIGURE 1. Waterhen Marsh, drawn from a 1970 aerial photo.

Throughout the marsh there are a great many aquatic invertebrates, which are an important source of food for waterfowl; two members of the invertebrate fauna are the benthic midge or chironomid larvae and free-swimming cladocerans.

There were three types of habitat available for ground-nesting ducks at Waterhen Marsh: upland areas, ditchbanks, and islands. Ten rectangular artificial islands, each approximately 10 × 30 m in dimension, were constructed prior to the reflooding of the marsh and these, along with a 2.2-ha natural island, constitute most of the island habitat. Many of the ditchbanks have been substantially eroded by waves and are highly segmented and insular in nature.

Methods

Field work was conducted from the second week of May to the first week of September in 1972 and 1973. Nests were located by systematic inspections of the islands and part of the ditchbanks, and by less intensive searches of the upland areas. Most nests were marked, usually at a distance of 10 m away, with a small strip of red surveyor's tape. Other nests were relocated by topographic and vegetational features only. I tried to recheck nests once or twice before hatching to gather information on date of nest initiation and clutch size. Whenever possible, date of nest initiation, date of hatching, clutch size, distance from water, and fate of the nest were recorded. The plant species, canopy coverage, and height of vegetation at the nest site were also recorded. Canopy coverage above the nest was estimated to belong to one of six classes, following Daubenmire (1959): 0–5% canopy coverage, 5–25%, 25–50%, 50–75%, 75–95%, and 95–100%.

Brood observations were made from a canoe or motorboat, or by scanning the marsh from the uplands, ditchbanks, or islands. Use of 7- or 8-power binoculars and a 40-power spotting scope facilitated these procedures. The age of ducklings (see Gollop and Marshall 1954), the number of ducklings, the features of the habitat, and behavior of the broods were noted. When mixed broods were encountered, I tried to identify the ducklings to species, age, and number.

Results and Discussion

Nesting Chronology and Clutch Size

Lesser Scaup were among the most numerous ducks on the study area and were already present at the commencement of field studies in both years. Many or all of these early migrants may have moved further north to nest (Trauger 1971). The peak of nest initiation did not occur until the first two weeks of June.

The most frequently occurring clutches were 10, 9, and 8 eggs respectively (Figure 2). If clutches of more than 14 eggs are considered as parasitized (Hildén 1964), the average clutch size is 9.70 ± SE 0.21 eggs ($n = 56$). If 12 eggs are considered as the maximum clutch (Weller 1959; Weller et al. 1969), the average is 9.47 ± 0.18 eggs ($n = 53$).

Compound clutches or dump nests, presumably resulting from two or more scaup hens laying eggs in a single nest, contained 16, 16, 17, 18, and 19 eggs, respectively. The habit of parasitic egg-laying has been frequently noted for this species and is known to occur both intra- and inter-specifically (Weller 1959; Vermeer 1968; Long 1970). At Waterhen Marsh, scaup eggs were frequently found in Gadwall nests, 26 of 295 completed Gadwall first clutches being parasitized. One scaup egg was found in each of 18 (69%) of the 26 Gadwall nests but as many as five eggs were present in one nest. The average first clutch size for Gadwall nests parasitized by scaup was 11.0 ± 0.3 Gadwall eggs as compared with 10.4 ± 0.1 for all normal first clutches. Therefore, egg parasitism did not reduce the average clutch size of the host duck. Weller (1959) and Joyner (1976) have shown that the clutch of the host species can be reduced in such instances.

Three scaup clutches of 9, 10, and 9 eggs found on the large natural island in 1973, contained 8, 6, and 6 Gadwall eggs respectively. As few other scaup clutches were found to contain Gadwall eggs and, as other studies show little evidence of a high rate of egg parasitism by Gadwalls, it is possible that these nests were initiated by Gadwalls and later taken over by scaup. No eggs of other duck species were found in scaup nests.

Nest-site Selection and Nesting Success

Although the nests of many dabbling ducks were found up to 500 m from the marsh edge, all scaup nests were found close to water. More than 50% of the nests were situated within 5 m of the water's edge and approximately 75% were within 10 m. Nest sites were usually dry and at least 30 cm above water. Many of the ditchbank

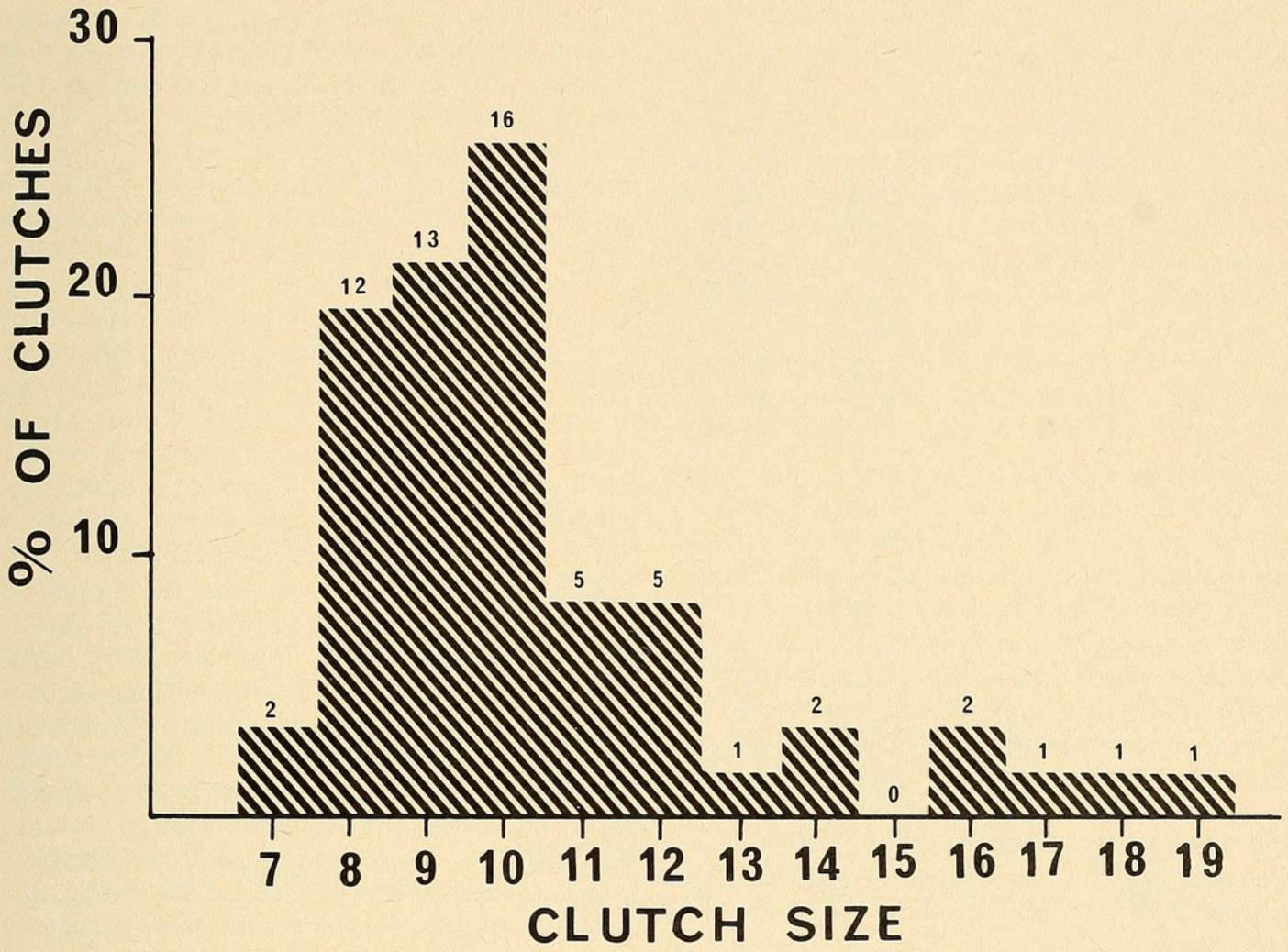

FIGURE 2. A frequency distribution of Lesser Scaup clutch sizes. The numbers of clutches are indicated above the histogram.

nests were situated right along the edge of the bank, within 1 m of water, in thick graminaceous (grassy) vegetation.

In contrast to dabbling ducks' nests, only 3 of 64 scaup nests were situated in upland areas, 18 were on the ditchbanks, and 43 were on the islands. As the ditchbanks were much divided by erosion, most of the nests there were essentially insular in nature. No nests were found among emergent plants, but these areas were not intensively investigated.

Scaup often used graminaceous cover for nesting (Table 1). Awnless brome *(Bromus inermis)* was the most common cover species, providing the greatest percentage of the canopy at 35% of the nest sites. Western snowberry *(Symphoricarpos occidentalis)* was the dominant at 19% of the nests, all on the large natural island. The only forb which was dominant at more than one nest was Canada thistle *(Cirsium arvense)*. Overall graminaceous plants were

TABLE 1—The dominant plant species at 54 Lesser Scaup nests at Waterhen Marsh

Species	Growth form	Nests Number (%)
Bromus inermis	graminaceous	19 (35)
Symphoricarpos occidentalis	shrub	10 (19)
Carex spp.	graminaceous	7 (13)
Scolochloa festucacea	graminaceous	6 (11)
Cirsium arvense	forb	6 (11)
Miscellaneous grasses	graminaceous	4 (7)
Axyris amaranthoides	forb	1 (2)
Rosa woodsii	shrub	1 (2)
Total		54 (100)

dominant at 67% of 55 nests, shrubs at 20%, and forbs at 13%.

The limited use of forbs as nesting cover is somewhat surprising, as plants of this physiognomy were an important cover species elsewhere (Dwernychuk 1968; Long 1970). At Waterhen Marsh, the stands of forbs such as common nettle *(Urtica gracilis)* and Russian pigweed *(Axyris amaranthoides)* appeared to be too tall to be readily used by scaup. Nesting females had great difficulty in getting airborne from these patches and apparently for this reason used mainly the edges of such cover.

Most scaup nests were situated in cover in the 21- to 60-cm height range (Table 2). Vegetation of 20 cm or less in height was avoided, presumably because it provided poor concealment. Nests in the taller height classes (> 60 cm) were normally located near the edge of the stands of vegetation as discussed above. Long (1970) found that Lesser Scaup preferred to nest in vegetation 15 to 34 cm in height. He believed that this resulted from the selection for cover which provided adequate concealment, yet did not too greatly obscure the hen's view of the surrounding area. At Waterhen Marsh, Lesser Scaup used decidedly taller vegetation than indicated in Long's study. The fact that many of the nests on his study area were in gull or tern colonies may have influenced the results. Hildén (1964) has shown that ducks will tolerate sparser cover than usual in order to nest among larids, an association from which they presumably receive protection against aerial predators.

TABLE 2—The distribution of Lesser Scaup nests as related to the height of vegetation

Height of vegetation (cm)	Nests Number (%)
0–20	3 (5)
21–40	22 (39)
41–60	22 (39)
61–80	4 (7)
> 80	5 (9)
Total	56 (99)

Lesser Scaup nests were usually well-concealed as compared with those of earlier nesting species. The average canopy coverage at 57 scaup nests was 35.7 ± 3.6%, a figure which compares favorably with the 39.8 ± 1.2% average recorded for 382 Gadwall nests. The latter species has been noted for its preference for dense nesting cover (Duebbert 1966; Long 1970).

The fates of 37 Lesser Scaup nests were determined. Twenty-eight (76%) were successful (i.e., at least one egg hatched), eight (22%) were destroyed by predators, and one (3%) was deserted. The nesting success for 34 insular nests was 82%. The two common predators on the study area, the Common Crow (*Corvus brachyrhynchos*) and the striped skunk (*Mephitis mephitis*), caused most of the nest failure.

Other studies also indicate that the success of island-nesting scaup is normally high (Keith 1961; Townsend 1966; Vermeer 1968; Long 1970). Under such conditions nesting success should exceed 80% and, assuming a 39% rate of renesting by unsuccessful hens (Keith 1961), more than 85% of the island-nesters should hatch successful clutches. Provision of suitable island habitat for scaup is a good management practice since the upland nests of this species are often destroyed by skunks and other predators (Keith 1961; Rogers 1964).

Hatching and the Brood Period

The peak of hatching was determined by backdating aged broods (Figure 3). Nearly all the successful scaup clutches hatched in July, especially during the middle two weeks of that month. Redhead clutches showed a similar but slightly earlier hatching chronology than did Lesser Scaup. The overall nesting chronology for scaup at Waterhen Marsh corresponds fairly well with that presented for central Alberta by Dwernychuk (1968).

After hatching, scaup broods moved to the shallow bays protected from the wind by emergent vegetation (Figure 1). In these bays submergent plants were very sparse but aquatic invertebrates, especially chironomid larvae, were abundant (unquantified observations). The importance of such invertebrates in the diets of young scaup has been previously described (Bartonek and Hickey 1969; Bartonek and Murdy 1970; Sugden 1973).

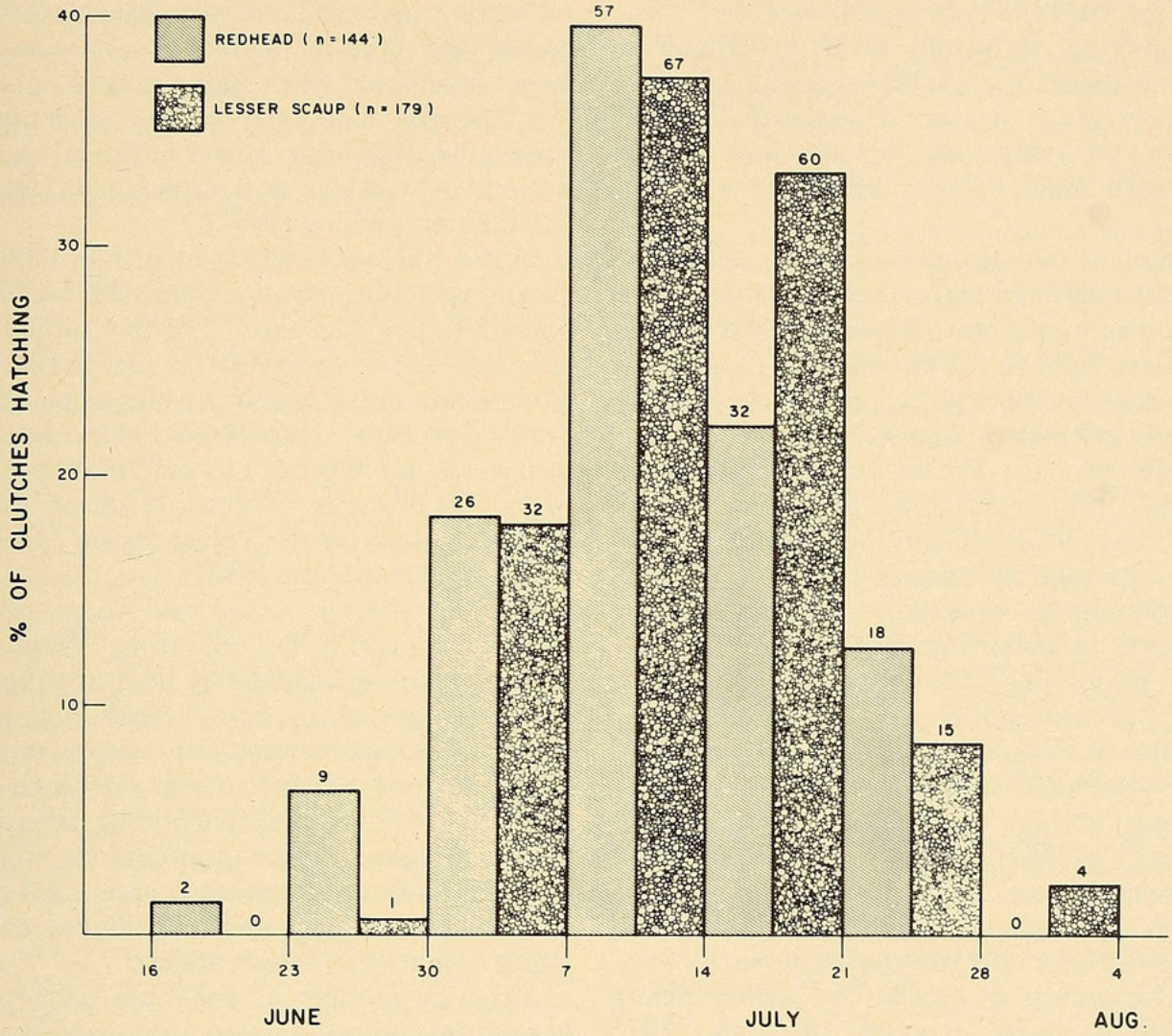

FIGURE 3. The peaks of hatching of Lesser Scaup and Redhead broods at Waterhen Marsh.

Many broods of Redheads were also observed in these areas. The preference for similar habitats by scaup and young Redhead broods, and the large populations of both species present, resulted in a great number of ducklings being concentrated into rather small areas. As a result, mixing of broods occurred commonly. Scaup broods readily joined together since female scaup made little effort to drive away other hens or ducklings. Redhead broods were frequently deserted by their mothers, which typically showed low maternal drives. These ducklings readily joined the scaup broods with no apparent conflict resulting. In contrast to the scaup ducklings, the young Redheads remained close together and appeared to retain their identity within the mixed broods. Mixed broods of scaup were observed to come together and later separate with frequent interchange of ducklings. Female scaup showed little discrimination in allowing ducklings to follow them. The brood following a scaup in many cases consisted of more Redhead than scaup ducklings.

Mixed broods or crêches often consisted of ducklings of several age classes. The largest brood totaled more than 100 scaup ducklings and was accompanied by six hens. Typical crêches contained from 15 to 40 scaup ducklings and were led by two or three hens. By early August, most of the ducklings, except those isolated from the major brood areas, were part of the crêches. At this time, most of the Redhead offspring had been deserted by their mothers and

had also joined the large scaup broods.

The mixing of broods made it difficult to determine the attrition of brood size as time went on. The average size of 78 isolated Class 1a broods (1 to 6 days old), believed not to have mixed with other broods, was 8.5 ± 0.3 ducklings.

Because of the late-nesting habit, scaup and Redhead ducklings lagged behind other waterfowl in attaining flight. By adding the average age at first flight to the known date of hatching for the broods, the expected date of the onset of flight was calculated. Ages at first flight average about 49 days for Lesser Scaup (Gollop and Marshall 1954; Rogers 1962; Bellrose 1976) and 57 to 63 days for Redheads (Weller 1957; Smart 1965). Although Redheads showed a slightly earlier hatching chronology (Figure 3), they were later in achieving flight than were the rapidly developing scaup. By the opening of hunting season on 9 or 10 September, a maximum of 90% of the Lesser Scaup and 65% of the Redhead broods could fly. Under conditions of high early-season hunting pressure, local populations of these species could suffer severe losses.

The Significance of Crêching Behavior

The formation of crêches by Lesser Scaup appeared to arise because of three main conditions. First, scaup showed a relatively dense breeding population, high nesting success, and a fairly synchronized hatching period, resulting in a large number of similar-aged broods being present on the marsh at the same time. Second, there was a limited amount of suitable sheltered habitat for these broods during periods of windy weather and, consequently most broods assembled in the sheltered areas. The third and probably most important condition leading towards crêching behavior was the high degree of tolerance, or perhaps even attraction, between different hen scaup and their broods. Scaup made no effort to drive away approaching hens with broods.

Crêching provides several possible advantages to the participating waterfowl species. Lack (1947) drew an analogy between this behavior in eiders and a convoy system; he suggested that in the larger broods, each female has a smaller periphery to patrol, thereby giving better protection against predators. Kear (1970) suggested that crêching reduces aerial predation, as larger broods are more liable to spot approaching enemies and can huddle together for protection. Further evidence of this advantage is presented by Ahlen and Andersson (1970) and Gorman and Milne (1972).

In the Shelduck, which in Britain undergoes an annual molt migration, the ducklings are left behind under the care of a few adults. This removes the responsibility for the care of young from most adults, which can then depart for the molting grounds (Hori 1964). Crêche formation also allows more broods to use a limited amount of habitat or other restricted resource. This has been suggested for the Velvet Scoter *(Melanitta fusca)* by Koskimies (1955).

For the Lesser Scaup, all three of these advantages could be operating. When large broods were approached by boat or canoe, two or sometimes three hens would rush at the observer tolling or feigning injury while the other hen(s) attempted to lead the brood away. Munro (1941) has reported similar behavior by scaup. Because duckling predators were not overly numerous on the study area, I did not get a chance to observe any interactions between scaup broods and their enemies.

The high number of ducklings per brooding hen in the crêches suggests that many hens had deserted their broods. Presumably these unattached hens would have more time to undergo the post-nuptial molt before autumn migration.

Finally, scaup broods were observed to prefer calm water areas where food was abundant. On windy days, which are frequent on the prairies, the availability of such habitat is limited. Crêching allows scaup to use this habitat optimally.

The mixing of Redhead ducklings with scaup broods is perhaps a further development of the parasitic habit shown by the former species in its nesting ecology. The young Redheads benefit from the protection afforded by the strong maternal drives of the scaup and the crêching system. The hen Redheads can molt sooner than they otherwise might if they were still responsible for their ducklings. In late-nesting species such as the Redhead or Lesser Scaup, this could be of survival value as it allows earlier migration by most of the adult population.

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Literature Cited

Ahlen, I. and **A. Andersson.** 1970. Breeding ecology of an eider population on Spitsbergen. Ornis Scandinavica 1: 83–106.

Bartonek, J. C. and **J. J. Hickey.** 1969. Food habits of Canvasbacks, Redheads, and Lesser Scaup in Manitoba. Condor 71: 280–290.

Bartonek, J. C. and **H. W. Murdy.** 1970. Summer foods of Lesser Scaup in subarctic taiga. Arctic 23: 35–44.

Bellrose, F. C. 1976. Ducks, geese, and swans of North America. Stackpole Books, Harrisburg, Pennsylvania. 544 pp.

Bent, A. C. 1923. Life histories of North American wildfowl. United States National Museum Bulletin 126. ix + 250 pp. (1962 Dover Publications reprint).

Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Science 33: 43–64.

Dirschl, H. J. 1969. Foods of Lesser Scaup and Blue-winged Teal in the Saskatchewan River Delta. Journal of Wildlife Management 33: 77–87.

Duebbert, H. F. 1966. Island nesting of the Gadwall in North Dakota. Wilson Bulletin 78: 12–25.

Dwernychuk, L. W. 1968. Some aspects of the ecology of island-nesting waterfowl at Miquelon Lake, Alberta. M.Sc. thesis, University of Alberta, Edmonton. 155 pp.

Gehrman, K. H. 1951. An ecological study of the Lesser Scaup duck *(Aythya affinis* Eyton) at West Medical Lake, Spokane County, Washington. M.Sc. thesis, State College of Washington, Pullman. 94 pp.

Gollop, J. B. and **W. H. Marshall.** 1954. A guide for aging duck broods in the field. Mississippi Flyway Council Technical Section. 14 pp. *(Mimeo.)*

Gorman, M. L. and **H. Milne.** 1972. Crêche behavior in the Common Eider *Somateria m. mollissima* L. Ornis Scandinavica 3: 21–25.

Hildén, O. 1964. Ecology of duck populations in the island group of Valassaaret, Gulf of Bothnia. Annales Zoologici Fennici 1: 153–279.

Hochbaum, H. A. 1944. The Canvasback on a prairie marsh. American Wildlife Institute, Washington. 201 pp.

Hori, J. 1964. Parental care in the Shelduck. Wildfowl Trust Annual Report 15: 100–103.

Joyner, D. E. 1976. Effects of interspecific nest parasitism by Redheads and Ruddy Ducks. Journal of Wildlife Management 40: 33–38.

Kear, J. 1970. The adaptive radiation of parental care in waterfowl. *In* Social behaviour in birds and mammals. Essays on social ethology of animals and man. *Edited by* J. H. Crook. Academic Press, New York. pp. 357–392.

Keith, L. B. 1961. A study of waterfowl ecology on small impoundments in southeastern Alberta. Wildlife Monographs, Number 6. 88 pp.

Kortright, F. H. 1942. The ducks, geese and swans of North America. American Wildlife Institute, Washington. viii + 476 pp.

Koskimies, J. 1955. Juvenile mortality and population balance in the Velvet Scoter *(Melanitta fusca)* in maritime conditions. Proceedings of the International Ornithological Conference 11: 476–479.

Lack, D. 1947. The significance of clutch-size. Ibis 89: 302–352.

Long, R. J. 1970. A study of nest-site selection by island-nesting anatids in central Alberta. M.Sc. thesis, University of Alberta, Edmonton. 123 pp.

Munro, J. A. 1941. Studies of waterfowl in British Columbia, Greater Scaup duck, Lesser Scaup duck. Canadian Journal of Research, D, 19: 113–138.

Rogers, J. P. 1959. Low water and Lesser Scaup reproduction near Erickson, Manitoba. Transactions of the North American Wildlife Conference 24: 216–224.

Rogers, J. P. 1962. The ecological effects of drought on reproduction of the Lesser Scaup, *Aythya affinis* (Eyton). Ph.D. thesis, University of Missouri, Columbia. 99 pp.

Rogers, J. P. 1964. Effect of drought on reproduction of the Lesser Scaup. Journal of Wildlife Management 28: 213–222.

Rogers, J. P. and **L. J. Korschgen.** 1966. Foods of Lesser Scaup on breeding, migration, and wintering areas. Journal of Wildlife Management 30: 258–264.

Smart, G. 1965. Development and maturation of primary feathers of Redhead ducklings. Journal of Wildlife Management 29: 533–536.

Sugden, L. 1973. Feeding ecology of Pintail, Gadwall, American Widgeon and Lesser Scaup ducklings. Canadian Wildlife Service Report Series Number 24. 45 pp.

Townsend, G. H. 1966. A study of waterfowl nesting on the Saskatchewan River delta. Canadian Field-Naturalist 80: 74–88.

Trauger, D. L. 1971. Population ecology of Lesser Scaup *(Aythya affinis)* in subarctic taiga. Ph.D. thesis, Iowa State University, Ames. 121 pp.

Vermeer, K. 1968. Ecological aspects of ducks nesting in high densities among larids. Wilson Bulletin 80: 78–83.

Weller, M. W. 1957. Growth, weights, and plumages of the Redhead *Aythya americana.* Wilson Bulletin 69: 5–38.

Weller, M. W. 1959. Parasitic egg-laying in the Redhead *(Aythya americana)* and other North American Anatidae. Ecological Monographs 29: 333–365.

Weller, M. W., D. L. Trauger, and **G. L. Krapu.** 1969. Breeding birds of the West Mirage Islands, Great Slave Lake, NWT. Canadian Field-Naturalist 83: 344–360.

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