rings involved in the syrinx than in any other species thus far studied. The intrinsic muscles attach to the ninth bronchial ring on both sides, whereas they attach to the seventh or eighth rings in other members of *Otus* and on still more anterior rings in several other species of owls.—ALDEN H. MILLER, *Museum of Vertebrate Zoology, Berkeley, California.*

The foot action of swimming ducks.—It was with extreme interest that I read Allan Brooks's account of "The under-water action of diving ducks" (Auk, 62: 517–523, 1945), and of the manner in which the alula is fully extended while beneath the surface. Brooks's figures in this paper also show, I think, an interesting action of the feet, but to this he did not call attention. Some recent observations of my own prompt me to offer a brief discussion of this subject, which has received but little attention in the literature.

There are two chief methods of propulsion through the water. One employs a direct thrust, as when rowing, swimming by the breast stroke, and when a duck is paddling along the surface of the water. It is economical of effort at low speed, but the possible rate of progression is definitely limited by the celerity with which the stroke can be made, minus (in the case of submerged feet) the retarding effect of the recovery stroke. The second method of propulsion through the water employs an oblique thrust, as effected by the screw of a steamer, a sculling oar, the feet in the Australian crawl style of swimming, and in swimming by whales, seals and sea lions. This method is efficient for two chief reasons: One is that the propulsive stroke is oblique, and thus it is theoretically possible to progress at greater speed than the rate at which the stroke is made. The other reason is that there is no stroke made purely for recovery, with consequent deceleration, but forward propulsion is effected by all movements of the appendages, which are in the transverse plane, either from side to side (as in pinnipeds, fish, a sculling oar), or up and down (as in whales), but never forward and back.

Until recently I had never had an opportunity actually to see the way in which ducks swim under water. I have seen penguins, a grebe or two, and a loon, and knew that the first of these with their wings, and at least most pygopodes with the bizarre placement of their legs and feet, employ the oblique or sculling method of swimming. With legs held to the side, the feet are waved up and down, "feathered" at each thrust. In some genera the wings are also used under water, but I have seen this only in the case of a cormorant.

I had assumed that ducks could not employ the sculling method of swimming, at least with any degree of efficiency, because their legs have not the same angle or position of articulation as in grebes and loons.

While living on a schooner during the past winter (1946), I spent two weeks in January moored at Eau Gallie, Florida. Among the many Lesser Scaups (*Aythya affinis*) in the neighborhood, some 30 individuals had become sufficiently tame to take food offered them from a distance of four or five feet. Bits of bread thrown would bring them scuttering along the surface or paddling at a great rate. When a piece of bread too large to be eaten at once was thrown, Laughing Gulls (*Larus atricilla*) usually swooped upon the duck that had caught it, which sent the duck beneath the surface, and away it went, legs to the side, sculling along grebe-wise at a speed that would be hardly possible for it to attain while paddling at the surface. Every action could be seen in the clear water. The transition from one method of swimming to the other was abrupt and invariable.

Brooks's figures (*loc. cit.*) suggest that his ducks were employing this same method of swimming by a sculling action of the feet while submerged. Accordingly it seems

logical to presume that although ducks always use the direct thrust or paddling method of swimming while on the surface, the diving ducks, at least, abruptly change to the oblique thrust or sculling method of swimming while beneath the surface.—A. BRAZIER HOWELL, *Bucksport, Maine.*

Nesting of Chestnut-sided Warbler.—This study of the nesting of a Chestnut-sided Warbler (*Dendroica pensylvanica*) was made at Oneonta, N. Y., in the upper Susquehanna valley, on June 13 to July 7, 1944. The nest was located in a wooded park area where the chief species of plants were hickory, elm, and birch, with a heavy interspersion of the herbaceous plants of this region at 1350 feet altitude.

The nest was found when the female was seen with nesting material in her beak on June 13. Apparently the nest was about finished for on this date it contained a cowbird egg which I removed. June 14 at 5:00 A. M. the female entered the nest, picked here and there at the nesting material as she turned around, and then left the nest to return with a piece of grass at 5:02. This time she remained until I left the site at 5:06. When I examined the nest at 3:30 P. M. it contained no egg.

On June 19 there were four warbler eggs in the nest. Since there were none at 3:30, June 14, she probably laid them at daily intervals. On June 20 she allowed me to touch her back before she left the four eggs and the nest in which she was well concealed.

While incubating, the female usually faced the northwest and when the male approached would sometimes leave when the male was within three or four feet of the nest. He usually sang as he approached. While the male seemed to sing from very definite positions during the nest-building period he now sang from a variety of perches. During the last three days of incubation the male sang less often. Once I saw him feed the female. When alarmed, the female raised her body in the nest and erected her head-feathers.

On June 29 at 5:50 A. M. I heard a crackling sound from the nest site which proved to be from the female eating an egg shell. When the nest was examined there were two young hatched. The female left at 6:42 and returned at 6:45 with food. When she offered food she made a coaxing noise. The male was singing two kinds of songs in the territory at this time. On June 30 between 4:50 and 6:06 the male fed the young twice. Each time the female fed she hovered from two to five minutes. At 5:57 on June 30, the last egg had not hatched but I held it to my ear and heard a faint ticking sound. At 6:02 the female returned, pecked at something in the nest, waited on the edge of the nest, and at 6:04 flew away with egg shell. I examined the nest again and found the last young one out of the shell. Thus, the last egg hatched in these five minutes and I believe the female assisted in the process.

A record of the feeding of the young by the two parent birds is given in the following table.

Date	*Length of observation*	*Times male fed*	*Times female fed*
6/30	75 Min.	2	5
7/3	55 Min.	4	7
7/4	30 Min.	1	1
7/5	32 Min.	1	2
7/6	65 Min.	11	10
7/7	30 Min.	3	2
Total	287 Min.	22	27