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THE UNDER-WATER ACTIONS OF DIVING DUCKS

BY ALLAN BROOKS

CONSIDERABLE attention has been paid in the past to the actions of various diving ducks when submerged. The earliest records that I can find are those of that painstaking naturalist, William Macgillivray, during the first half of the last century. On this side of the Atlantic, E. H. Forbush has probably written more on this subject than any other author and in his work on the Birds of Massachusetts he has compiled his own records with those of other observers.

For many years past I have endeavored to collect all the information possible from my own observations and to check them with those already recorded. In spite of the fact that diving ducks are especially plentiful on the Pacific Coast and that they are comparatively unmolested there, it has been difficult to get accurate records of healthy, unwounded birds. Crippled birds or those injured in any way must be ruled out, as also must sick birds, especially when these are emaciated.

The chief difficulty is to get well above the birds unobserved by them when they are feeding over a light-colored bottom of sand or gravel. Near my winter home at Comox, Vancouver Island, there are several fairly good vantage points—one where a long pier extends some 300 feet into the sea; another where a near-by vertical cliff overlooks a feeding ground with a bottom largely composed of light-colored sand. But it was not until the past winter, 1944–1945, that I encountered nearly ideal conditions for such observations. This was at Yellow Point on the sheltered inner waters of Chemainus Bay on the east coast of Vancouver Island. Here the house in which I resided was built into the rocky shoreline in such a way that from the front windows numbers of ducks of 12 different species could be seen diving for food directly below and not more than 25 feet away for most of the species

observed. Best of all, the bottom was mostly composed of broken clam shell, clear white under the crystal clear water. Never before had such an opportunity presented itself and I spent hours with a good binocular watching the unsuspecting ducks. Under such conditions, actions that had never before been clearly apparent were noted with absolute certainty. The most notable of these was the rigid extension of the alula in certain species. I have not noticed this action recorded before in any publication though it may be what F. M. Woodruff describes in Forbush's Birds of Massachusetts, 1: 279: "The wings were held about one-third spread and perfectly rigid."

It was notable how few species used their wings under water or even expanded them slightly as planes. Of course their almost universal use by wounded birds is known to every duck shooter. Although their extension would seem actually to retard speed, it is probably a reaction caused by excitement or fear.

This applies to ducks and geese and also to loons and grebes. Cormorants use their wings under water when feeding and all Alcidae use them at all times, actually flying under water. An especially tame Murre, *Uria troille californica*, a seemingly healthy bird, dived again and again within 15 feet of my canoe without any apparent action of its feet which were held directed backward, close under the tail, and quite inert as the bird pulled itself under the water with its wings. In the Marbled Murrelet, *Brachyrhamphus marmoratus*, the tips of the wings are the last thing seen as the bird dives, obviously the completion of the wing stroke that pulls the bird under.

The results of my observations on diving ducks are presented as concisely as possible under the heading of each species.

Greater Scaup Duck, *Aythya marila nearctica*.—The commonest duck under observation during the past winter. The wings are never used in any way when under water; they are almost entirely concealed under the ample flank feathers. This applies to all the species of the genus which I have observed and includes most of the European species.

American Golden-eye, *Glaucionetta clangula americana*.—Wings are never used under water but are held tight to the sides beneath the flank feathers. The tail is expanded to its full extent and appears under water to be about as broad as the body. Upon emerging, the tail is held flat on the water or slightly under the surface; at rest, the tail is elevated or even cocked up at an angle when the bird is asleep.

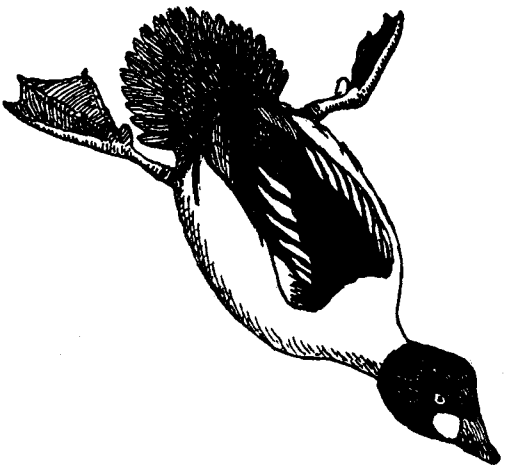
Barrow's Golden-eye, *Glaucionetta islandica*.—Under-water actions are exactly as in the American Golden-eye.

Buffle-head, *Glaucionetta albeola*.—Under-water actions the same as in the Golden-eyes but with an increased agility. No cranny in the

rocks is too deep for it to explore and it searches for its crustacean prey even into dense growths of seaweed.

An attempt is now being made to make the Buffle-head congeneric with the Golden-eyes—see the latest Hand Book of British Birds and the Twentieth Supplement to the A. O. U. Check-List (Auk, 62: 439, 1945). This is a mistake. Its courting actions, color of eggs and several points in its structure are all divergent from the Golden-eyes.

Old-squaw, *Clangula hyemalis*.—Owing to its off-shore habits I have never been able to get above this species when it is diving for food.



TEXT-FIGURE 1.—Golden-eye descending. Note outspread tail.

It seems to open the wings slightly just as it plunges under. Before the dive the tail is held flat on the surface; even the long central streamers of the old male are almost submerged.

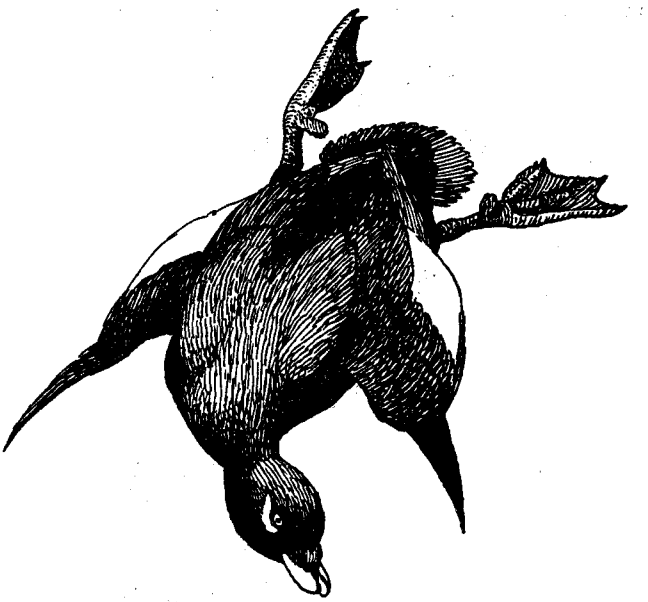
Harlequin Duck, *Histrionicus histrionicus*.—Although I have watched this unique duck for hours, I cannot be sure of its actions under water. It seems to give a flip of its wings just as it plunges forward, as does the Old-squaw, but not always. Like the Old-squaw, it carries the tail flat on the water between dives though it is elevated when courting or at rest.

I cannot find the slightest difference between eastern and western Harlequins and think that the subspecies *pacificus* is founded on second-year and worn-plumaged males; wear would also account for

the supposedly larger bill. These young males can be found throughout the summer in flocks by themselves on the seacoast when the old males are inland at their breeding quarters. As soon as the latter return to the salt water they commence to eclipse.

I will be glad to submit adult males of the Pacific bird to the Committee of the A. O. U. to decide this question.

White-winged Scoter, *Melanitta fusca deglandi*.—The ordinary diving action of the White-winged Scoter is peculiar. The wings are



TEXT-FIGURE 2.—White-winged Scoter. Going down.

flipped forward as the bird plunges, but under water the tips of the primaries can be seen crossed over the tail, the secondaries are somewhat expanded, showing the white patch conspicuously, but the alula is extended to its utmost, giving the appearance of small, sharp-pointed wings held out rigidly on each side during the whole period of the dive. On coming to the surface these winglets are still extended, but I was unable to observe if they were retracted between dives. When resting between dives the wings are still outside of the flank feathers, the carpus submerged, the tail is also slightly submerged, and the primaries show on each side of it. No definite movement of the

wings can be seen when the bird is submerged. As in all the diving ducks the feet appear as huge paddles with a decided lateral action. The ascent to the surface is buoyant and rapid, at an angle of about 45°. To show how dangerous it is to be positive as to the invariability of any action, an adult female of this species always dived with her wings tightly closed and covered by the flank feathers; her mate just

TEXT-FIGURE 3.—Surf Scoters exploring the bottom.

as invariably employed the above detailed action. The pair was watched carefully over a period of six weeks and there was no variation in their diversity. All the other White-wings that I have observed were normal in diving, with a partially open wing and the alula extended.

Surf Scoter, *Melanitta perspicillata*.—Of all the diving ducks the Surf Scoter has given me the best opportunities for observation; also it was the first to clearly display the extended alula. When first I saw the small, sharp-pointed wings held stiffly extended and pointing de-

cidedly downward I thought I was looking at the entire wing and that the diminution was caused by refraction of the water. Eventually the actual condition became evident and the primaries could be plainly seen held tight to the body with the alula extended to its fullest, pointing outward and downward. It has a slight rowing movement at the commencement of the dive, but not afterwards when the appearance is of small, sharp-pointed wings held rigidly extended and pointed slightly forward and downward while the bird explores the bottom. The winglets are still extended when the duck shoots to the surface at an angle of 45°.

American Scoter, *Oidemia americana*.—As in all its actions, the American Scoter's diving is quite different from that of the other two species. There is no suggestion of any wing movement either before or during the dive. The wings are held tight to the body and covered by the flank feathers, with no extension of the alula. Its contour on the water is always distinctive; the head is held high with the bill horizontal or even slightly elevated, giving a 'chins up' appearance. The courting actions also differ radically from those of the other scoters, especially the courting flights where four to ten males may be seen wheeling about after one female, usually fairly high above the surface of the water, exactly as do the Harlequins which are usually found with them.

Ruddy Duck, *Erismatura jamaicensis*.—All the diving Ruddy Ducks that I have observed held the wings tightly closed and covered by the flank feathers.

Mergansers.—All three species of merganser were observed at Yellow Point, but the Red-breasted was by far the commonest. No wing action of any sort when diving has been observed by the writer, although William Macgillivray and other writers have testified to the contrary. It may be that wounded birds use their wings when under water, but all three species, when diving for food, shoot along beneath the water with a streamlined contour and at a great speed. When hunting for schools of small fish, both of the larger mergansers work in a formation abreast, the heads of all the flock partially submerged with the eyes beneath the surface. On sighting fish, the whole flock plunges forward, beating the water with their wings with the obvious intention of confusing the fish or driving them into shallower water. In the midst of the commotion every bird will suddenly go under, and they can then be seen darting about, twisting and turning after their prey, without any visible wing action.

In conclusion I would like to deprecate any impression of finality in my observations. Different variations in buoyancy, as between fresh

and salt water, may give different reactions, and much more observation is called for. For example, I find it definitely stated in one of my notebooks that Harlequins never use their wings under water, but in subsequent observations a decided flip of their wings has been noted as they plunged under. Probably observation of healthy birds in a glass-sided tank will give the final solutions.

Okanagan Landing
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BREEDING BIRDS OF THE PIGMY CONIFERS IN THE BOOK CLIFF REGION OF EASTERN UTAH

BY ROSS HARDY

Plates 23, 24

THE pigmy conifers of the west which are so characteristic of, and cover such extensive areas in, the Great Basin and the Colorado River drainage provide shelter for a number of interesting avian inhabitants. Between September 1, 1935, and May 21, 1938, the writer had the opportunity to make studies of the birds inhabiting sample areas of the extensive pigmy forests which skirt the base of the Book Cliffs in Carbon County, east-central Utah. These pigmy conifers, consisting principally of Utah juniper (*Juniperus utahensis*) and double-leaf piñon (*Pinus edulis*), cover large areas of the foothills which are in turn skirted by open flats and valleys of salty soil bearing stands of shadscale (*Atriplex confertifolia*) and greasewood (*Sarcobatus vermiculatus*) or similar saltbushes.

Two separate areas were selected for intensive study—one at Sunnyside, 6700 feet, near the upper altitudinal limits of the pigmy conifers (September 1, 1935 to June 7, 1936); the other near Price, 5567 feet, extending up over the foothills from 5800 feet to 6500 feet, nearer the lower limits of growth (August 25, 1936 to May, 1938).

The writer is indebted to Dr. A. M. Woodbury of the University of Utah and to Mr. Harold Higgins of Price, Utah, for assistance in connection with this study.

METHODS

Data were obtained by observation and collection of specimens upon frequent visits to and through the areas. Observations were facilitated by the use of eight-power binoculars. Of the specimens of skins, nests and eggs taken, the majority are in the writer's collection and a few at the University of Utah. A total of 1557 notes on field observa-