

BULLETIN OF THE PEABODY MUSEUM OF NATURAL HISTORY, YALE UNIVERSITY

The *Bulletin of the Peabody Museum of Natural History* was published as peer-reviewed monographs from inception in 1925 through 2004. Volumes reported on original research in the natural sciences based on the collections of the Peabody Museum of Natural History at Yale University, covering diverse topics that include evolution, phylogeny, taxonomy, systematics, biology, botany, zoology, invertebrate and vertebrate paleontology and paleoecology, paleobotany, and archaeology.

Beginning with Volume 47 (2006), the *Bulletin of the Peabody Museum of Natural History* was converted to a journal format.

Journal issues are available from BioOne Complete at <https://bioone.org/>.

The original monograph series incorporated the *Bulletin of the Bingham Oceanographic Collection*, which ceased independent publication with Volume 19, Article 2 (1967). The *Postilla* series, which ceased publication with Number 232 (2004), was merged into the journal. These archives are available through EliScholar, a digital platform for scholarly publishing provided by Yale University Library at <https://elischolar.library.yale.edu/>.



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.
<https://creativecommons.org/licenses/by-nc-sa/4.0/>

Yale PEABODY MUSEUM OF NATURAL HISTORY

P.O. Box 208118 | New Haven CT 06520-8118 USA | peabody.yale.edu

THE PEABODY MUSEUM OF NATURAL HISTORY
BULLETIN 3

HYBRID DUCKS, INCLUDING
DESCRIPTIONS OF TWO CROSSES OF
BUCEPHALA AND *LOPHODYTES*

BY
STANLEY C. BALL



NEW HAVEN
THE PEABODY MUSEUM OF NATURAL HISTORY
YALE UNIVERSITY
1934

PEABODY MUSEUM OF NATURAL HISTORY

TRUSTEES

JAMES ROWLAND ANGELL, PH.D., LITT.D., LL.D.
HIS EXCELLENCY THE GOVERNOR OF CONNECTICUT, *ex-officio*.
REV. WILLIAM ADAMS BROWN, PH.D., D.D.
HOWELL CHENEY, M.A.
VANCE CRISWELL McCORMICK, M.A.
FRED TOWSLEY MURPHY, M.D., M.A.
SAMUEL HERBERT FISHER, LL.D.

DIRECTOR

RICHARD SWANN LULL, PH.D., Sc.D.

CURATORS

EDWARD SALISBURY DANA, PH.D., *Curator of Mineralogy, Emeritus*.
GEORGE GRANT MACCURDY, PH.D., *Curator of Anthropology, Emeritus*.
CHARLES SCHUCHERT, LL.D., Sc.D., *Curator of Invertebrate Paleontology, Emeritus*.

STANLEY CRITTENDEN BALL, PH.D., *Curator of Zoology*.
CARL OWEN DUNBAR, PH.D., *Curator of Invertebrate Paleontology*.
WILLIAM EBENEZER FORD, PH.D., *Curator of Mineralogy*.
RICHARD SWANN LULL, PH.D., Sc.D., *Honorary Curator of Vertebrate Paleontology*.
CORNELIUS BERRIEN OSGOOD, PH.D., *Curator of Anthropology*.
ALBERT EIDE PARR, M.A., *Curator of the Bingham Oceanographic Collection, and Scientific Director of the Yale Oceanographic Expeditions*.
EDWARD SAPIR, PH.D., Sc.D., *Honorary Curator of Anthropology*.
MALCOLM RUTHERFORD THORPE, PH.D., *Curator of Vertebrate Paleontology*.

RESEARCH ASSOCIATES

GEORGE GRANT MACCURDY, PH.D., *Research Associate in Prehistoric Archeology, Emeritus*.
HELLMUT DE TERRA, PH.D., *Research Associate in Geology*.
MALCOLM RUTHERFORD THORPE, PH.D., *Research Associate in Vertebrate Paleontology*.
CHARLES EDWIN WEAVER, PH.D., *Research Associate in Invertebrate Paleontology*.

RESEARCH ASSISTANTS

JAMES BROOKS KNIGHT, PH.D., *Research Assistant in Invertebrate Paleontology*.
CLARA MAE LEVENE, B.A.
NELDA EMELYN WRIGHT, M.A.

ADVISOR IN GEOLOGY

CHESTER RAY LONGWELL, PH.D.

DOCENTS

MILDRED CYNTHIA BEULAH PORTER, M.A., *in charge*.
DOROTHY EMMA ARNOLD, B.A.
GERTRUDE HOTCHKISS CLARK.

THE PEABODY MUSEUM OF NATURAL HISTORY
BULLETIN 3

HYBRID DUCKS, INCLUDING
DESCRIPTIONS OF TWO CROSSES OF
BUCEPHALA AND *LOPHODYTES*

BY
STANLEY C. BALL



NEW HAVEN
THE PEABODY MUSEUM OF NATURAL HISTORY
YALE UNIVERSITY
1934

HYBRID DUCKS, INCLUDING DESCRIPTIONS OF TWO CROSSES OF *BUCEPHALA* AND *LOPHODYTES*

By STANLEY C. BALL

MANY hybrid ducks have been recorded, but as pointed out by Bigelow (1907, p. 382), few specimens have been fully described. Suchetet in 1896 published a summary of all descriptions of hybrid birds then in print.

Since Bigelow's 1907 paper numerous additional instances have been recorded. Reviewing the literature, we find crosses between many species. A suggestive list of these follows, the nomenclature being that of Peters' Check-list (1931).

<i>Anas platyrhynchos</i> (Mallard)	×	<i>Anas rubripes</i> (Black duck).....	3
“ “ “	×	<i>Anas fulvigula fulvigula</i> (Florida duck)	1
“ “ “	×	<i>Anas acuta</i> (Pintail)	4
“ “ “	×	<i>Mareca americana</i> (Baldpate)..	2
“ “ “	×	<i>Spatula clypeata</i> (Shoveller)...	4
“ “ “	×	<i>Netta rufina</i> (Red-crested duck)	3
“ “ “	×	<i>Anas superciliosa</i> (Gray duck)..	1
“ “ “	×	<i>Anas crecca</i> (Teal)	1
“ “ “	×	<i>Mareca penelope</i> (Widgeon)....	1
“ “ “	×	<i>Chaulelasmus streperus</i> (Gadwall)	1
“ “ “	×	<i>Cairina moschata</i> (Muscovy) ...	6
“ “ “	×	<i>Somateria molissima borealis</i> (Northern eider)	1
“ “ “	×	<i>Nyroca ferina</i> (Pochard).....	1
“ “ “	×	<i>Mergus merganser</i> (Goosander)	1
<i>Anas obscura</i> (Dusky)	×	<i>Anas undulata</i> (of South Africa).....	1
<i>Anas acuta</i> (Pintail)	×	<i>Anas crecca</i> (Teal).....	1
“ “ “	×	<i>Spatula clypeata</i> (Shoveller).....	1
“ “ “	×	<i>Anas querquedula</i> (Garganey)	1
<i>Branta leucopsis</i> (Barnacle goose)	×	<i>Anser fabalis</i> (Bean goose)	1
<i>Cairina moschata</i> (Muscovy)	×	<i>Tadorna tadorna</i> (Shield-drake)..	1
“ “ “	×	<i>Alopochen aegyptiaca</i> (Egyptian “goose”)	1

<i>Cairina moschata</i> (Muscovy)	×	<i>Anser anser</i> (Gray-lag)	.....	1
“ “ “	×	<i>Spatula clypeata</i> (Shoveller)	....	1
<i>Aix sponsa</i> (Wood duck)	×	10 other species		
<i>Dendronessa galericulata</i> (Mandarin)	×	2 other species		
<i>Mareca penelope</i> (Widgeon)	×	6 other species (7 cases)		
<i>Anas crecca</i> (Teal)	×	3 other species		
<i>Nyroca ferina</i> (Pochard)	×	<i>Aix sponsa</i> (Wood duck)	.....	1
“ “ “	×	<i>N. africana</i> (White-eyed duck)	.....	1
“ “ “	×	<i>N. fuligula</i> (Tufted duck)	.....	1
“ “ “	×	<i>Anas rubripes</i> (Black duck)	.....	1
“ “ “	×	others		
<i>Nyroca marila</i> (Greater scaup)	×	<i>N. africana</i> (White-eyed duck)		1
<i>Nyroca fuligula</i> (Tufted duck)	×	3 other species		
<i>Nyroca collaris</i> (Ring-neck)	×	<i>N. americana</i> (Redhead)	.....	1
<i>Melanitta fusca</i> (Velvet scoter)	×	<i>M. perspicillata</i> (Surf scoter)		1
<i>Bucephala clangula clangula</i> (Golden-eye)	×	<i>Mergellus albellus</i> (Smew)	.....	5
		1. <i>Mergus anataricus</i> Eimbeck, ♂, 1825, “Oker River, near Brunsink.”		
		2. <i>Clangula angustirostris</i> Brehm, ♀, 1829, Germany.		
		3. <i>Clangula mergoides</i> Kjärböling, ♂, immature. In col- lection purchased in Copenhagen, 1853.		
		4. February 1865, near Pöl.		
		5. Nov. 20, 1881, at Kalmarsund. Skin at University of Upsala in 1896.		
<i>B. clangula clangula</i> ♀	×	<i>Mergus merganser</i> ♂	.....	1
		Seen mating at Negelin, Oldenbourg. The male was shot.		
<i>B. clangula clangula</i>	×	<i>Nyroca ferina</i> (Pochard)	.....	1
B. “ “	×	<i>N. marila</i> (Greater scaup)	.....	2
B. “ “	×	<i>Melanitta fusca</i> (Velvet scoter)	.....	1
<i>Bucephala clangula americana</i> (American golden-eye)	×	<i>Lophodytes cucullatus</i> (Hooded merganser)	.....	2
		1. <i>Clangula mergiformis</i> Cabot, ♂, Maine, 1854.		
		2. New Haven, ♂, 1920. Described in this paper.		

At least 63 species (more than 94 instances) have mated with species not their own. *Anas platyrhynchos* leads (14 species and 30 matings); others worthy of note are *Nyroca ferina* (8 and 20); *Aix sponsa* (10 and 10); *Cairina moschata* (4 and 10).

HYBRIDS OF THE GOLDEN-EYE (*Bucephala clangula clangula*) AND THE SMEW (*Mergellus albellus*)

OF special interest in connection with this paper are the hybrids of the European golden-eye (*B. clangula clangula*) and the smew (*Mergellus albellus*) listed above, two of which may now be considered in some detail.

Number 1. This hybrid is described by Eimbeck (in Suchetet) as like the male *Bucephala c. clangula* in size, and in form of body and tail; more like *Mergellus* in its long nape plumes, beak and pointed wings.

From its extremity to the corner of the gape the beak is 46.5 mm.; base higher than wide; distal part flat, wider than high. Seen from the side it resembles beak of merganser, but the serrations are less visible. The statement that the form is especially striking when seen from above may imply that the beak is narrow and parallel-sided as in the merganser.

In color and pattern this bird stands intermediate between the two parent species. Foundation white; head and neck deep iridescent green; *white spot between beak and eye*; back brilliant black, with some scapulars white; breast feathers mostly bordered with black, having as marks *traces of the two black collar-bands* so conspicuous in *Mergellus*, large wing feathers pure white (from which statement we may infer that at least a part of the coverts are black); feet not quite so large as in *Bucephala* but of same form; deep rusty, web nearly black. Brilliant, well-colored plumage stamps this bird as a male in prime plumage.

Number 3. Kjärböling (in Suchetet) first regarded this as a young ♂ *M. albellus*, but later saw its relationship to *Bucephala*. In general color he found it similar to Eimbeck's male described above, but juvenile feathers were particularly evident on the head.

The hybrid *Anas platyrhynchos* × *Mergus merganser* is interesting for comparison with those previously described. According to Schlüter's description (1891) it shows strongly the characters of a domestic mallard drake, thus implying that it is a

male. In size, however, it approaches the larger *Mergus merganser*, on which account Schlüter assumed this species rather than *M. serrator* to have been the mother.

In form the beak resembles that of *A. platyrhynchos*, but is somewhat *larger* and *wider*. The nail, a somewhat interrupted zone on the upper surface, and the base as well, are horn-colored; the rest yellowish brown. Head and adjacent neck feathers gray. A few cheek feathers end in a faint greenish gloss as in the domestic drake, while some neck feathers show a rusty red color on their edges, inherited from the red-headed merganser. Throat yellowish-white although not so extensively as in the female *Mergus*. Lower neck shows wide band of white, broken on hind neck by dark gray feathers like those of head. The breast has, although weakly indicated, the brown feathers of the mallard, shot through with gray, and grades into color of belly whose feathers have grayish-white bases and borders, speckled as in *A. platyrhynchos*. Lower tail coverts similar, partly bordered distally with black.

Back and upper tail coverts show mixture of spotted belly feathers from the *A. platyrhynchos* ♂, and blue-gray back feathers of *M. merganser* ♀. Upper tail coverts also have black terminal borders. Middle tail coverts blue-gray; the outer ones shorter with white outer edges. Wholly wanting is the tendency of the central coverts to curl upward as in the male mallard.

Primaries as well as under wing coverts are white; the speculum blue-gray. Blue-green upper wing coverts edged with reddish brown.

Feet stronger than mallard's, but similar.

HYBRIDS OF THE MERGANSER (*Lophodytes cucullatus*)
AND THE GOLDEN-EYE (*Bucephala clangula americana*)

(Pl. I, Fig. 2; Pl. III, Fig. 17)

ON December 20, 1920, while duck hunting near the break-water at the mouth of New Haven harbor, Mr. L. Genung shot a handsome hybrid duck which is now in the collections of the Peabody Museum of Natural History at Yale (Cat. No. 4745). The shallowness of bill and number of tail feathers (18) at once suggest merganser affinities, while the width and lamellation of bill and color pattern point to one of the ducks as the other parent.

On account of the small number of North American Merginae it is expedient to determine first to which of these this bird is related. The key to this part of the riddle is the two pairs of black bands which extend from the back half way down the sides of the breast. Only the hooded merganser (*Lophodytes cucullatus*) has these. Further comparison brings out the following positive characters resembling this species: size small; sides of breast and flanks tinged with cinnamon; small amount of white on the scapulars; tertials black, four of them each with a narrow white central stripe; shape of crest; black of upper neck joined to that of the back by a broad dorsal stripe along the back of the neck.

The American merganser (*Mergus americanus*) could have contributed neither the breast bands nor the vermiculations on the sides and flanks. Furthermore, it has a complete ring of white about the lower neck (true also of *Bucephala*), a light gray rump and tail, and a longer bill whose sides are orange-red. This merganser lacks a crest and is relatively a larger bird (635-685 mm.).

That the red-breasted merganser (*M. serrator*) is not concerned in this hybrid is concluded from the following considerations. The hybrid lacks the black-flecked reddish breast, and the row of peculiar black-bordered white feathers on the side of

the upper breast in front of the wing; its posterior scapulars have much less white, and the bill lacks the orange, and the back and tail the gray color which characterize *M. serrator*; no evidence of the elongated two-pointed crest exists; the black on the neck all round extends farther posteriorly on the hybrid, and the black band along the back of neck is broader. Again, the red-breasted merganser is a larger bird (508-635 mm.).

Both positive and negative evidence, then, point to *Lophodytes cucullatus* as one of the parents. As to the other parent, there can be no doubt that it was either the American golden-eye (*Bucephala clangula americana*) or Barrow's golden-eye (*B. islandica*); all other ducks are excluded by their size or color pattern, or both.

Two characters of the hybrid favor *B. clangula americana*. First, the iridescence of the head and neck is distinctly green rather than purple and violet. Secondly, the single black wing bar across the bases of the greater coverts is so narrow as to suggest that, with *L. cucullatus* having two distinct bars across the white wing patch, the other parent must have had less of a bar than does *B. islandica*; *B. c. americana* has none. The differences between the bills of the two species of *Bucephala* are not sufficiently great to be helpful in determining which had crossed with such a long, shallow-billed bird as a merganser.

Having settled upon *Lophodytes cucullatus* and *Bucephala clangula americana* as the parents of this hybrid, one sees that it stands as an extraordinary intermediate between the two species.

TABLE I

COMPARISON OF NEW HAVEN HYBRID WITH ADULT MALES OF
LOPHODYTES AND *BUCEPHALA*

		FORM OF MALE	
<i>Lophodytes cucullatus</i>		Hybrid No. 4745	<i>Bucephala clangula americana</i>
Length,	439-502 mm.	445 mm. (as mounted)	535-586 mm.
Wing (folded),	191-201	213	230-238
Tail, length,	80-105	103	90-119
" number of feathers,	18	18	16
Bill*			
Culmen, loral line to tip,	40-42 mm.	43 mm.	41-45 mm.
Height from frontal angle to lower edge of upper mandible,	9.5	14.5	22.5-24.5
Least height (10 mm. from tip),	4.5	Height 10 mm. from tip, 6	Least height (10 mm. from tip), 7.5-9.5
Width at base,	12.5	17	19-22
Width (10 mm. from tip),	7.9	12.7	18-19
Width of scale,	6.1	6.9	6-6.5

From each edge of upper mandible project about 24 lamellae or serrations, of which the most posterior point somewhat backward, their outer faces slanting obliquely inward and forward. On the more anterior teeth successively, these outer faces slant inward less and less until in the terminal teeth they parallel edge of mandible. (Figs. 7, 10.)

About 32 small serrations along each edge of upper mandible are almost concealed from lateral view. As in *L. cucullatus*, the more posterior teeth extend obliquely inward and forward, while the anterior lie nearly parallel with the edge. These teeth are the ends of lamellae which curve obliquely upward and forward on inner surface of bill. (Figs. 8, 11.)

About 33 lamellae extend from each edge of upper mandible directly upward on inner surface of bill. Tips of a few posterior lamellae are barely visible below edge of mandible in the dried skin. (Figs. 9, 12.)

* It may be noted from the measurements above that the beak of *Lophodytes* tapers considerably in width, while that of *Bucephala* has nearly parallel sides. The New Haven hybrid favors the merganser in this character, while the Boston Society bird approaches the golden-eye.

<i>Lophodytes cucullatus</i>	Hybrid No. 4745	<i>Bucephala clangula americana</i>
Lower mandible has along its upper edges corresponding serrations which slant inward and backward. The anterior-most of these unite to form a continuous knife-like edge. (Fig. 7.) No series of ridges extending on outer aspect of lower mandible.	Lower mandible has on each upper edge 40 small serrations, or lamellae, of which the anterior extend backward and inward, and the posterior directly inward. Anterior teeth not united as in <i>L. cucullatus</i> . A series of 46 short external lamellae along the superior-lateral face of the lower mandible, each tooth extending obliquely downward and backward, as in <i>Bucephala</i> . (Figs. 8, 11.)	On each upper edge of lower mandible is a series of 51 serrations or lamellae, of which the posterior extend directly inward and the anterior obliquely backward and inward. A series of 46 well developed lamellae along each side of bill as in most ducks; each ridge extends obliquely downward and backward. (Figs. 9, 12.)
Both upper and lower teeth remain visible when dried bill is closed.	Closure of bill hides all these teeth and lamellae.	Closure of bill hides all these ridges.
Tarsus, 29-31 mm.	31	38-41
Middle toe and nail, 52	61	68
Number of scales on top of outer toe, 44-46	44-47	54-56
Scales in the row along front of tarsus (overlying 3rd metatarsal) all similar; central ones not distinctly wider than those below. (Fig. 13.)	Scalation of left leg as in <i>L. cucullatus</i> ; of right leg as in <i>Bucephala</i> . (Figs. 14, 15.)	Middle scales in the row on front of tarsus distinctly wider than the ones below, thus reducing abruptly the width of the outer row of scales (overlying 3rd metatarsal). (Fig. 16.)
Has distinct crest, laterally compressed; longest nape feathers, 48 mm.	Crest fairly developed; longest nape feathers, 33 mm.	No distinct crest; longest nape feathers, 23 mm.

COLOR OF MALE

Head, entire neck, black. Broad white patch extends from back of eye

Entire head (including crest) and neck black, not extending so far pos-

Head and upper neck black, with strong green iridescence; large round-

<i>Lophodytes cucullatus</i>	Hybrid No. 4745	<i>Bucephala clangula americana</i>
upward and backward covering most of the crest; edge of latter black. Sides of head and neck with faint greenish iridescence.	teriorly on ventral surface as in <i>L. cucullatus</i> . Sides of head and neck with moderate greenish iridescence.	ed white spot between gape of bill and eye.
Back seal brown.	Back dark seal brown, washed with black.	Back black.
The black of neck joins brown of back broadly.	The black of neck joins black of back broadly.	Lower neck white all around, continuous with white of underparts.
Breast and belly white.	Breast and belly white.	Breast, belly, crissum and under tail coverts white.
Two black crescentic bars extend from upper back before wing down sides of white breast.	Two black bars extend from upper back down sides of breast; bars narrower and shorter than in <i>L. cucullatus</i> .	No black bars on sides of breast.
Fore wing, i.e., middle and lesser coverts, gray.	Fore wing dark mouse-gray, some feathers on left wing fading to white at tips.	Front edge and bend of wings black (30 mm. wide).
In folded wing, white patch on outer edges of secondaries and greater wing coverts is crossed by a distinct bar of black 5 mm. wide (the black bases of secondaries not being covered by greater coverts).	White wing patch more extensive than in <i>L. cucullatus</i> , covering the outer secondaries, greater and middle coverts and much of the lesser coverts (to within 22 mm. of front edge of wing).	In folded wing the white patch is very large and lacks the black cross bar because bases of greater secondaries are less extensively black and hence covered by white ends of greater coverts.
A second black bar (exposed bases of greater coverts) divides the white wing patch from gray of fore wing (middle and lesser coverts).	Black on bases of secondaries so much covered by white ends of greater coverts, that no distinct bar in this position is evident. Anterior black wing bar present as in <i>L. cucullatus</i> .	No black bar on greater coverts; their black bases are covered by white middle coverts.

<i>Lophodytes cucullatus</i>	Hybrid No. 4745	<i>Bucephala clangula americana</i>
Inner vanes of secondaries and all of tertials black, the outer 5 tertials with a narrow median stripe of white (about 3 mm. wide).	Six outer secondaries white over entire outer vane; in some the inner vanes are partly white. Inner secondaries and all the tertials black; 4 outer tertials each with narrow white median stripe as in <i>L. cucullatus</i> .	Eight outer secondaries entirely white. Inner secondaries entirely black. Tertials dark brown.
Scapulars black.	Scapulars black, the outer ones with broad white central stripe as in <i>B. clangula americana</i> .	Outer scapulars white with black edges. Inner scapulars black.
Primaries seal brown.	Primaries seal brown to black.	Primaries seal brown.
Tail seal brown.	Tail seal brown washed with ash.	Tail seal brown with much ash.
Sides and flanks reddish brown, cross-waved and barred with black, finely in front, coarsely behind.	Sides and flanks pale cinereous vermiculated with black, finely in front, coarsely behind. Some flank feathers washed with cinnamon.	Sides of breast and flanks white, the upper flank feathers sharply edged with black.
Sides of belly drab-brown slightly barred with whitish. Belly posteriorly with brownish tips.	Sides of belly dark brown, the ends of some feathers edged with whitish. A dusky bar separates white of belly from white crissum.	Sides of belly drab-brown; tips washed with white. Crissum white.
Under tail coverts drab-brown, speckled and barred with white.	Under tail coverts whitish, distally washed and barred with drab-brown.	Under tail coverts white.
Bill black.	Bill black.	Bill black.
Iris yellow.	Iris golden yellow (glass eye).	Iris golden yellow.
Legs and feet light yellowish brown.	Legs and toes apparently yellow; webs dark brown.	Legs and feet orange or yellowish with dusky webs.

Reference to the tabular descriptions and to the illustrations shows that the hybrid strikes nearly an average (blending) between the parents in the following nine characters:

- Length of wing
- Length of tail
- Size and shape of bill
- Serrations or lamellae of bill
- Length of crest feathers
- Size of feet
- Extent of white on outer secondaries
- Degree of green iridescence on head and neck
- Color of fore-wing.

In eleven other characters the hybrid presents a mosaic, resembling *L. cucullatus* in:

- Total length
- Number of tail feathers
- Length of tarsus
- Number of scales on top of outer toe
- Shape of crest
- Extent of black on neck
- Black stripe on back of neck
- Presence of black breast bars
- Black wing bar on bases of greater coverts
- Narrow white stripes on inner secondaries and tertials
- Sides and flanks vermiculated with black and washed with cinnamon.

Characters of the hybrid which approximate those in *B. clangula americana* are:

- Solid black color of head and neck
- Extent of white on wing coverts and outer secondaries
- Broad white stripes on outer scapulars
- Wash of ash on tail.

Perhaps as remarkable as any character in its distribution is the scalation of the legs. On the left tarsus the shape and arrangement of scales in the anterior rows closely follows that of the merganser, while the right reproduces that of the golden-eye (Figs. 13-16).

In these tabulations of the characters of the hybrid drawn from its mismated parents it is to be noted that no cephalic white spots enter. Both the loreal patch of *Bucephala* and the white crest area of *Lophodytes* have been suppressed. This fact might be used as an argument in favor of assuming as the merganser parent *Mergus americanus*, which lacks white on the head and has a higher degree of greenish iridescence than does *Lophodytes*. But these considerations are outweighed by others already emphasized.

Many interspecific and intergeneric crosses are known among ducks, but this specimen seems to be the second recorded hybrid between members of the North American subfamilies of the Anatidae. Certainly the mergansers and golden-eyes are more unlike physically than are the mallard (*Anas platyrhynchos*) and the baldpate (*Mareca americana*) of which a hybrid is described by Elliot (1892, p. 165).

Proximity during the breeding season would be more probable in the western parts of the continent, although not impossible in the east. Bent (1923, p. 13) gives the breeding range of *Bucephala clangula americana* as follows:

Mainly north of the United States, entirely across the continent. South to Newfoundland (Humber and Sandy Rivers), northern New Brunswick (Northumberland County), central Maine (Washington to Oxford Counties), New Hampshire (Umbagog Lake and Jefferson region), northern Vermont (St. Johnsbury), northern New York (Adirondacks), northern Michigan (Neebish Island, Sault Ste. Marie), northern Minnesota (Lake County), northern North Dakota (Devils Lake), northwestern Montana (Flathead Lake and Glacier National Park), and the interior of British Columbia.

North to the limits of heavy timber in central Alaska, southern Mackenzie, the southwest coast of Hudson Bay, and the northeast coast of Labrador. Replaced in northern Europe and Asia by a closely allied race.

The breeding range of *Lophodytes cucullatus*, according to Forbush (1925, p. 188), is:

Locally in wooded regions from southeastern Alaska, central British Columbia, Great Slave Lake, northern Manitoba, Ontario and New

PLATE I

Fig. 1. Hooded merganser (*Lophodytes cucullatus*).

Fig. 2. Hybrid (*L. cucullatus* x *Bucephala clangula americana*), Cat. No. 4745, Peabody Museum.

Fig. 3. American golden-eye (*Bucephala clangula americana*).

Figs. 4, 5 and 6 are dorsal views of the beaks of these respective birds.

Figs. 1-3, $\times \frac{1}{6}$. Figs. 4-6, $\times 1$.

PLATE II

Figs. 7, 8 and 9, beaks of *L. cucullatus*, the hybrid, and *B. c. americana*.

Fig. 10. Enlargement of the part of beak between lines x-y in Fig. 7. *a*, lamellae on left-hand edge of upper mandible; *d*, inner surfaces of lamellae on right-hand edge; *b*, lamellae of lower mandible.

Fig. 11. Similar enlargement of part of Fig. 8. Note *c*, the short lateral lamellae.

Fig. 12. Same for Fig. 9. Note the great lateral lamellae, *c*.

Figs. 13 and 14. External views of left tarsi of *L. cucullatus* and hybrid, showing similar arrangement of scales in the two large anterior rows.

Fig. 15. External view of right leg of hybrid, showing second row of scales interrupted by wide central scale, *a*, of first row.

Fig. 16. Normal scalation of *B. c. americana*, left leg, with the same arrangement as in Fig. 15.

Figs. 7-9, $\times 1\frac{1}{2}$. Figs. 12-16, $\times 1$.

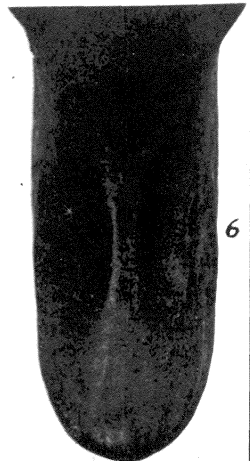
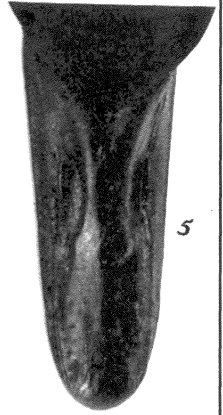
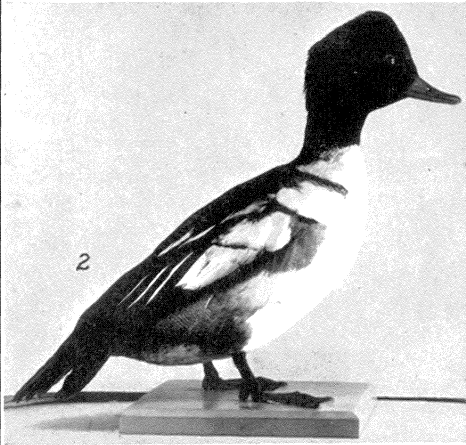
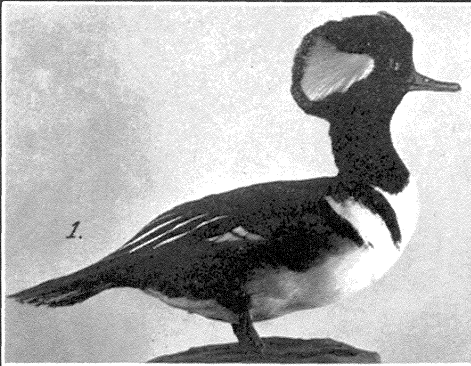
PLATE III

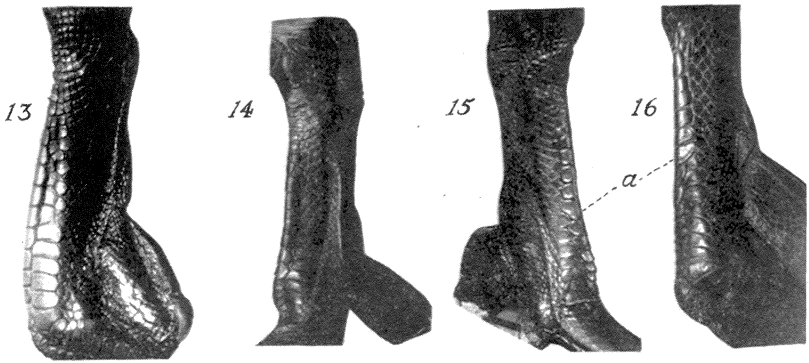
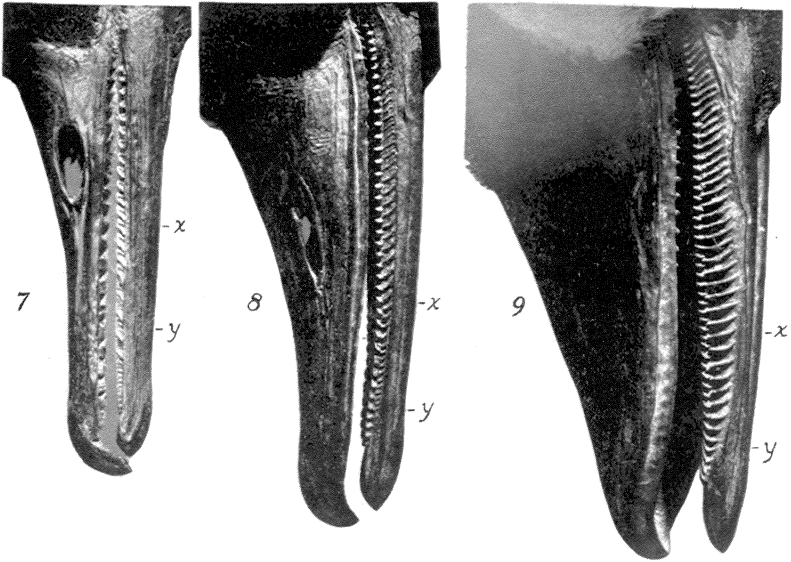
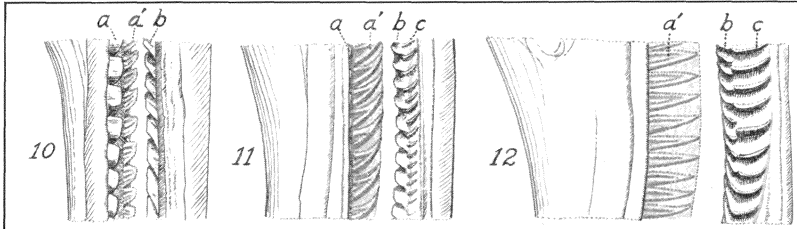
Fig. 17. Hybrid (*L. cucullatus* x *Bucephala clangula americana*). In Boston Society of Natural History; Cat. No. 17972. $\times \frac{1}{3}$.

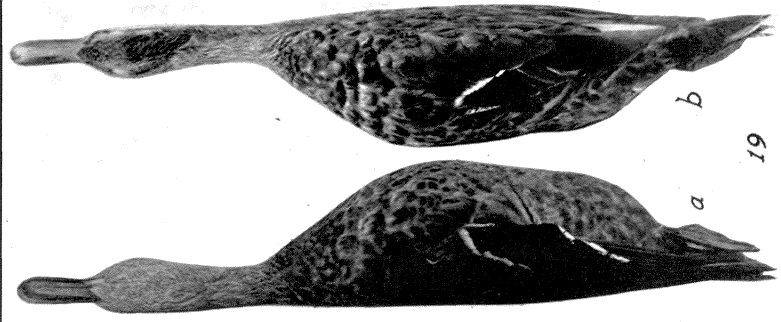
Fig. 18. Beak of same, enlarged to show the serrations and lamellae. $\times \frac{2}{3}$.

Fig. 19. Hybrid (*Anas platyrhynchos* x *Anas rubripes*). In Peabody Museum, Yale University; Cat. No. 11035. $\times \frac{1}{6}$.

- a. Right side, showing white wing bars.
- b. Left side, showing general pattern.







Brunswick (probably in central Ungava (northern Quebec), southern Labrador and Newfoundland) south to Oregon, northwestern Nevada, northern New Mexico, southern Louisiana, southern Tennessee, Alabama and central Florida.

The overlapping winter ranges of the two species concerned would have permitted the mating of this hybrid's parents before their northward migration, for Bent (1925, p. 13) sets the winter range of the golden-eye thus:

Cold coasts and large lakes south of frozen areas. On the Atlantic coast commonly from Maine to South Carolina; more rarely north to the Gulf of St. Lawrence and Newfoundland and south to northern Florida. Rarely to the Gulf coasts of Mississippi, Louisiana, and Texas. On the Pacific coast from the Commander and Aleutian Islands to southern California and casually to central western Mexico (Mazatlan). On the Great Lakes (Michigan, Erie, and Ontario). Irregularly north in the interior to southern British Columbia, northwestern Montana, and the valleys of the Missouri and Mississippi Rivers, as far as Nebraska and Iowa; and south to Colorado and Arkansas and occasionally to Arizona and Texas.

This region is overlapped by the winter range of *Lophodytes*, given by Forbush (1925, p. 188) as:

Southern British Columbia, Utah, Colorado, Nebraska, Illinois, Indiana, Pennsylvania and Massachusetts south to Lower California, southern Mexico, the Gulf states and Cuba; uncommon to rare in northeastern part of range. Recorded from St. Michael, Alaska, also Ireland, Wales and Bermuda.

Since the hooded merganser is seldom seen on salt water, the liaison, if it were contracted south of the breeding grounds, probably took place on some of our inland streams or ponds.

As to nesting habits, it is interesting to note that both *Lophodytes* and *Bucephala* are tree dwellers. Therefore the site selected by his mate was doubtless approved by the male, whether he were merganser or golden-eye.

While it would be idle to speculate concerning the sex of the two species involved, since this male hybrid could as well have inherited his characters from either male or female parent of

either species, one may be allowed to imagine that the male parent was *Bucephala*, for it is well known that the male golden-eye, even among amorous ducks, is an especially ardent wooer (Brewster, 1911). One may also infer that this hybrid inherited from its golden-eye parent at least a tolerance of salt water.

A search of the literature has revealed but one other recorded hybrid between *Lophodytes* and *Bucephala*. This interesting example was presented to the Boston Society of Natural History in May, 1854, by H. D. Morse, having been taken May 2 at Scarborough, Maine, by Caleb Loring, Jr. Dr. Samuel Cabot exhibited this bird (Cat. No. 17972) at the following June meeting of the Society. His description, published in the Proceedings of 1854-56, includes notes on both external and internal anatomy.

Cabot's specimen is a male, apparently two years old, coming into adult nuptial plumage.

A description of the successive *Lophodytes* plumages may be found in A. C. Bent's "Life Histories of North American Wild Fowl" (1923, pp. 26, 27):

The downy young is thickly and warmly clothed with soft down in deep, rich shades of "bister" or "sepia" above, including the upper half of the head, the hind neck, and the flanks; the sides of the head, neck, and cheeks, up to the eyes, are "buff pink" or "light vinaceous cinnamon," the chin, throat, and under parts are pure white; and there is an obscure dusky band across the chest and an indistinct white spot on each side of the scapular region and rump.

In the first plumage the sexes are alike and much resemble the adult female, but they are browner on the back and have undeveloped crests. Young males wear this immature plumage all through the first year, with only a slight change toward maturity during the first spring and the following summer. The summer molt leaves them still in immature plumage and with but little change in the new wings, which still lack the pearl-gray lesser coverts and in which the greater coverts are only slightly white-tipped. In November and December of this, their second winter, they begin to assume a plumage resembling that of the adult; the molt begins with the appearance of black feathers and white feathers in the head, spreading downward to the breast, flanks, and scapulars, until by March or April a nearly adult plumage

is assumed. In this plumage the colors are all duller than in old males; the crown, back, and rump are browner; the gray lesser wing-coverts are acquired, but the wings are otherwise immature. A partial eclipse plumage is assumed during the next summer, when the bird is two years old and late in the fall, November or December, the fully adult plumage is acquired. Young females can be distinguished from adults during the first year by their undeveloped crests and their duller and browner coloring everywhere; they become indistinguishable from the adults during the second winter.

Adult males have a semi-eclipse plumage in summer, in which the head and neck become largely mottled with brownish and the breast and flanks lose their brilliant colors and resemble those of the female. The double molt is probably not complete, though the whole plumage is changed at least once. The full plumage is assumed early in the fall, much earlier than in young birds, and is usually complete in October.

We may now return to Cabot's hybrid. Taken in the second spring, the feathers of its neck, head, and well-developed crest are still largely in the immature brown stage, although many black feathers have already appeared. These are especially conspicuous on the neck, which is dark gray to the base as in *Lophodytes*. Other immature characters are the sprinkling of black tips on the white feathers of the basal ventral surface of the neck and anterior breast, and the ashy edges of the dorsal body feathers, intensified by wear.

This hybrid lacks the white stripes on inner secondaries and tertials which are peculiar to the adult male *Lophodytes*, and also lacks the white outer margins of the scapulars present in *Bucephala*. Perhaps in time they would have developed. The same possibility exists with regard to the very rudimentary black bands extending ventrally in front of the wing on the sides of the breast, the white wing patch, the tertial and scapular stripes. Doubtless maturity would have sharpened the contrast between dark neck and white breast feathers. As in the adult male hooded merganser, but less intensively and over a smaller area, the sides of the breast and flanks are washed with cinnamon and vermiculated with black.

The outer secondary alone is bordered with white, but this is sufficiently prominent to form as in *Lophodytes* the posterior white bar, separated by the black basal bar across this secondary from the anterior white wing bar across the ends of the greater coverts. The middle and lesser coverts are white, irregularly mottled and washed with gray.

The beak resembles that of the merganser more closely than that of the golden-eye, thereby approaching the New Haven hybrid in character, but unlike the latter, its beak, instead of tapering, is parallel-sided as in *clangula* (Fig. 6). The serrations and lateral lamellae, especially on the lower mandible, are less well developed than in the New Haven bird, although closely similar in form and arrangement. Both hybrids follow *Lophodytes* in the shape and position of the nostrils.

Whereas the New Haven specimen in scalation of its tarsi follows *Lophodytes* on one leg, and *Bucephala* on the other, the Maine hybrid resembles the latter on both tarsi.

Compare with Table I, the following:

TABLE II

ANALYSIS OF IMMATURE MALE HYBRID, *LOPHODYTES CUCUL-LATUS* × *BUCEPHALA CLANGULA AMERICANA* (BOSTON SOCIETY OF NATURAL HISTORY, CAT. NO. 17972)

A. EXTERNAL ANATOMY (FIGS. 17, 18)

Length	450 mm.
Wing	222
Tail, length	110
Number of rectrices	18
Bill	
Culmen, loral line to tip.....	41.5
Height, from lower edge of upper mandible to frontal angle	17
Least height (10 mm. from tip).....	6
Width of base	16
" 10 mm. from tip.....	13
" of scale	8

About 26 serrations along each edge of upper mandible are almost concealed from lateral view. They agree with those in the New Haven hybrid in form and direction.

On each upper edge of the lower mandible are 45 serrations similar in form and arrangement to those in the New Haven hybrid, but the six anteriormost hardly rise above the surface.

A series of 39 short external lamellae occurs along the superior-lateral face of lower mandible as in the New Haven hybrid. Closure of bill hides all teeth and lamellae.

The upper mandible is almost parallel-sided, thus resembling *Bucephala* more closely than does the New Haven hybrid.

Tarsus	34 mm.
Middle toe and nail.....	62
Number of scales on top of outer toe.....	44
Scalation of both legs as in <i>Bucephala</i> (Fig. 16).	
Crest well developed; longest feathers	38 mm.

B. COLOR

Second spring plumage, still immature; considerably worn.

Head and neck chestnut brown, with many newly formed black feathers. Dark color does not descend downward so far on fore-neck as in *Lophodytes*; meets white of breast in zone of immature spotted feathers.

Back dark seal brown; feathers edged with grayish.

Dark color of neck and back broadly joined together.

Breast and belly white; two black bars on sides of breast slightly developed.

Middle and lesser wing coverts white mottled with gray.

White wing-patch broken by two broad black bars across bases of secondaries and greater coverts. Outermost secondary alone has white band on outer vane.

Scapulars black; primaries seal brown; tail seal brown; sides and flanks pale cinereous vermiculated with black as in the New Haven hybrid; sides of belly and crissum dark drab brown; bill black; glass eye golden yellow; legs and toes apparently yellow; webs darker.

Apparently the genes which are responsible for many visible characters of *L. cucullatus* and *B. clangula americana* segregated

in true Mendelian fashion in the maturation of the gametes which united to produce the New Haven hybrid. Many of these genes were able to exert almost their full influence, resulting in a bird which presents a remarkable mosaic of the two sets of parental characters; for example, number of tail feathers, tarsal scalation, marking of tertials and scapulars. On the other hand, certain attributes appear as blends between homologous parental structures, e.g., size of bird, color of head, form of bill. Other features which are present in one parent and absent in the other, such as the two black breast bars, crest, lateral lamellae on beak, and vermiculations on flanks and sides, exist in the hybrid, but have been modified somewhat in size, in form, or in both.

While the same remarks apply to the hybrid from Maine, the characters are less well-defined owing to its immaturity.

A comparative analysis of the two hybrids is given in Table III:

Some characters which at first glance suggest that blending has occurred, upon analysis reveal the probability that they are in reality to be regarded as mosaics. For example, the head is entirely black in the New Haven hybrid, but incorporates the black cheeks of *Lophodytes* and the black nape of *Bucephala*. From another point of view, neither the white cheek patches of the one nor the white crest patch of the other parent species were able to develop. This may have been on account of a conflict of genes.

When considering these matters, one should bear in mind the evident immaturity of the Maine hybrid, and the remote possibility that even the New Haven bird might in a following season have developed more fully the pattern elements of one or both parent species.

Table III may be summarized as follows:

	No. of characters favoring <i>Lophodytes</i>	No. of blended characters	No. of characters favoring <i>Bucephala</i>
New Haven Hybrid...	6½	3	7½
Maine Hybrid	6½	3	5

TABLE III

	1 Size of body	2 General form and size of beak	3 Lateral lamellae on lower mandible	4 Serrations on edge of upper mandible	5 Two black breast bars	6 Crest present	7 Black nape	8 Green iridescence on head and neck	9 Black of neck joining back
Like <i>Lophodytes</i>									
New Haven ..				Close	½ length	×			×
Maine				Similar	Rudimen- tary*	×			×
Blending									
New Haven ..	×	×							
Maine	×	×							
Like <i>Bucephala</i>									
New Haven ..			×				×	×	
Maine			×				×		
	10 White on scapu- lars	11 White stripes on tertials	12 Black bar on greater coverts	13 Lesser and middle cov- erts more or less gray	14 Extension of white wing patch	15 Vermicu- lations on sides and flanks	16 Eighteen rectrices	17 Scales of tarsus	18 Outer toe longer than middle toe
Like <i>Lophodytes</i>									
New Haven ..		×	×			×		×	
Maine			×		×	×			
Blending									
New Haven ..				×					
Maine				×					
Like <i>Bucephala</i>									
New Haven ..	×				×		×	×	×
Maine							×	×	×

* Probably on account of immaturity.

This summary reveals the consistency of inheritance in the two birds. Maturity might have brought out in the Maine hybrid *one* more character from *Lophodytes* (white tertial stripes), and *two* more characters of *Bucephala* (white scapular marks, green iridescence on head).

Of the 18 characters observed, 13 were similarly inherited by both hybrids (1, 2, 3, 4, 5, 6, 7, 9, 12, 13, 15, 16, 18); 3 are uncertain because of immaturity of the Maine bird (8, 10, 11); one (17) follows *Bucephala* in the Maine hybrid, while in the New Haven bird the character appears complete as in *Lophodytes* on one leg, and as in *Bucephala* on the other leg; finally, a single character (14), with due allowance for immaturity, is reversed in the two hybrids.

One may now profitably compare with the Maine and New Haven hybrids a few characters of Eimbeck's European hybrid *Bucephala clangula clangula* × *Mergellus albellus* described on an earlier page. This bird was a fine male in full plumage. One parent (*Bucephala*) was almost identical for all three birds. The other parent (*Lophodytes*) was identical for both American hybrids, but for the European was another species of black and white merganser, the smew. This species (*Mergellus albellus*) differs considerably from *Lophodytes*, especially in lack of crest, but resembles it in possessing two black crescentic bands on each side of the white breast, and two white wing bars.

Eimbeck's hybrid inherited traces of the black breast bars of *Mergellus*, the black head and green iridescence of *Bucephala* (wing bars not mentioned). Absence of crest is consistent with its absence in both parents.

The striking feature, as contrasted with the two American specimens, is the presence of a "white spot between the beak and eye." In this respect the *Bucephala* pattern dominated.

Both Guyer (1909) and Phillips (1914) remark on the preponderance of males among hybrid ducks, especially in cases where the parents are distantly related. It is interesting to note that all hybrids discussed in this paper are males.

HYBRID MALLARD (*Anas platyrhynchos*) × BLACK
DUCK (*Anas rubripes*)

(Pl. III, Fig. 19)

THIS bird (Peabody Museum, Yale University, Cat. No. 11035) was taken with two wild red-legged black ducks at Milford, Connecticut, November 11, 1932. It resembles *A. rubripes rubripes* closely on head and neck. The upper and under parts of the body are somewhat lighter and warmer in color. Feathers of the breast and under tail coverts especially are widely margined with vinaceous-cinnamon (IV/15). Many of them have one or more additional interrupted bars of the same color. This reddish tendency is doubtless inherited from the mallard.

Even more mallard-like are the wings. Although in hue the speculum is greenish-blue, as in the black duck, it is bordered by the two white bars of the mallard, one crossing the greater coverts below their black tips and the other whitening the ends of the secondaries. The white under wing coverts show their *rubripes* inheritance in the broken row of dark spots near the edge of the wing. Like both mallard and black duck, this hybrid has white axillars, but is exceptional in bearing one right axillar with three broad, but incomplete bars and a terminal spot of gray.

When first seen the tarsi were lighter colored than in the black duck, and less orange than in the mallard; according to Ridgway's nomenclature (1896) the hue was two-thirds salmon (Plate VII, No. 17) and one-third saturn red (VII, 16); feet somewhat more dilute. Tarsi of a black duck taken at the same time were two-thirds salmon and one-third orange vermilion (VII, 12).

In form the only notable hybrid character is in the bill. This is intermediate between the higher, wider, parallel-sided beak of *A. rubripes* and that of *A. platyrhynchos* which is narrower at the base and somewhat flatter anteriorly. When fresh the color was chromium green (X, 12) warmed with olive-yellow (VI, 16)

toward the base, and fading through sage green (X, 15) to pea green (X, 9) at the tip; darker along antero-lateral edge; nail nearly black; upper surface of culmen dusky. The bill of *A. rubripes* taken at the same time was nearly ochre yellow (V, 9), with nail and margin darker; much darker on inside of upper mandible and on teeth of lower mandible.

There can be no possibility that this bird is an immature male mallard, for the head and neck are typically ashy as in the black duck, not buffy. The tail feathers lack the white margins of the mallard and are in prime condition instead of being ragged and worn as is usually true of the immature mallard in November. The breast is very much darker than that of a young mallard.

BIBLIOGRAPHY

BENT, A. C.

Life histories of North American wild fowl.

U. S. Nat. Mus. Bull. 126, 1923; Bull. 130, 1925.

BIGELOW, H. B.

On hybrids between the mallard (*Anas boschas*) and certain other ducks.

Auk, vol. 24, pp. 382-388, 1907.

BREWSTER, WILLIAM

Courtship of the American golden-eye or whistler.

The Condor, vol. 13, pp. 22-30, 1911.

CABOT, SAMUEL

Wild hybrid duck, *Clangula americana* and *Mergus cucullatus*.

Abstract, Proc. Boston Soc. Nat. Hist., vol. 5, pp. 118-120, 1854.

ELLIOT, D. G.

Hybridism, and a description of a hybrid between *Anas boschas* and *A. americana*.

Auk, vol. 9, pp. 160-166, 1892.

FORBUSH, E. H.

Birds of Massachusetts and other New England States, vol. 1, p. 188, 1925.

GUYER, M. F.

On the sex of hybrid birds.

Biol. Bull., vol. 16, pp. 193-198, 1909.

PETERS, J. L.

Check-list of the birds of the world.

Vol. 1, Harvard Univ. Press, 1931.

PHILLIPS, J. C.

Size inheritance in ducks.

J. Exp. Zool., vol. 16, pp. 131-148, 1914.

RIDGWAY, ROBERT

Nomenclature of colors for naturalists.
Boston, 1896.

SCHLÜTER, W. VON

Hybrid *Anas boscas* × *Mergus merganser*.
Ornitholog. Jahrbuch. Bd. 1, Heft 1, pp. 109–110, 1891.

SUCHETET, A.

Des hybrides à l'état sauvage. Classe des oiseaux.
Règne animal, vol. I, pp. 1002, Paris, 1897.

ZOOLOGICAL RECORD, 1900–1931.

Additional Copies
of this Bulletin may be procured from
Peabody Museum of Natural History, Yale University,
New Haven, Conn.,
at
25 cents per copy.