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Aid to the Identification of Waterfowl Breastbones, Parts I & II

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AID TO THE IDENTIFICATION OF WATERFOWL BREASTBONES PARTS I AND II

By David Oates
Wildlife Division

Aid to the Identification of Waterfowl Breastbones

Part I

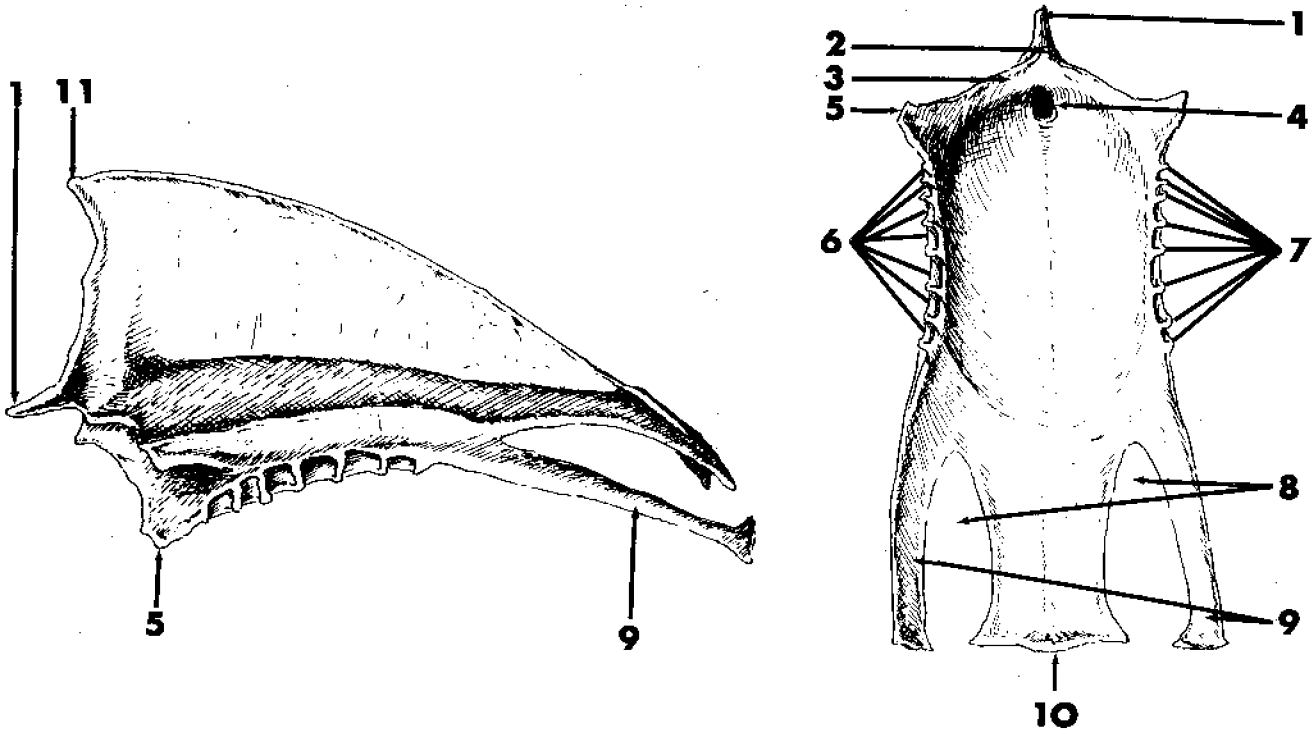
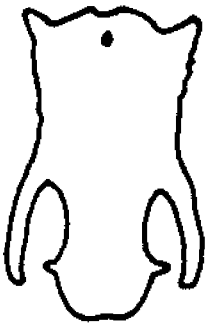


Figure 1. Terminology used to describe parts and points found on the sternum.

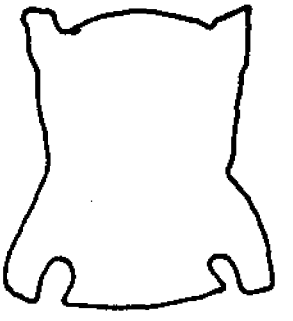
1. Ventral manubrial spine
2. Dorsal manubrial spine
3. Dorsal lip of coracoidal sulcus
4. Pneumatic foramen or fossa (hole or depression)
5. Sterno-coracoidal process
6. Intercostal spaces
7. Costal processes
8. Sternal notch
9. Posterior lateral processes
10. Xiphial area of caudal, distal or tail end of keel
    The caudal ridge is not depicted in this figure (it would actually be on the opposite side). For the species illustrated, it would be a very prominent upraised section of the breastbone on the back side of area 10. For many species, this ridge is not as close, in fact, it may be several mm to even a couple of cm from the caudal end of the keel.
11. Carinal apex or cranial apex of proximal or head end of keel

Oldsquaw
Single broad ventral manubrial spine. Two weak dorsal manubrial spines (on apex of peaks of coracoidal sulcus). Depression (dip) in coracoidal sulcus broader than that typically found in diving ducks. Pneumatic fossa 0.3-2.5 mm. Lateral processes do not extend beyond caudal end of keel. Sternal notches not enclosed. Unique caudal process may extend a couple of cm past weak caudal ridge. Keel length 91-115 mm. Dorsal length (F) 79-99 mm. Body width (C) 33-42 mm. F/C 2.0-2.6 (always was > 2.0).

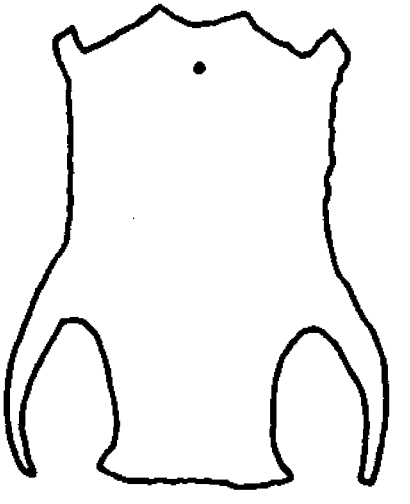
Rough sketch of what the breastbone may look like to you (relative sizes are not correct).



Ruddy duck
Single broad ventral manubrial spine which is uniquely forked at the end. No dorsal manubrial spines. Coracoidal sulcus smooth throughout its surface. No pneumatic fossa. Lateral processes short, thick and frequently even with caudal end of keel. Sternal notches open and small. Caudal process extends a few mm past a weak caudal ridge. Keel length 57-69 mm. Dorsal length 50-59 mm. Body width 32-37 mm. F/C 1.5-1.8 (always was < 2.0).



Black scoter
Zero to 2 ventral manubrial spines. Two dorsal manubrial spines (on apex of peaks on coracoidal sulcus, weaker than on other scoters). Depression (dip) in coracoidal sulcus. Pneumatic fossa 1.8-4.0 mm in width. Lateral processes usually extend beyond caudal end of keel. Lateral processes curve inward and are frequently (not enlarged on caudal end if thick entire length) thick cranially and thin caudally. Caudal process extends uniquely a cm or more past a weak caudal ridge. Keel length 88-106 mm. Dorsal length 79-95 mm. Body width 41-50 mm. F/C 1.7-2.0 (always was < 2.0).

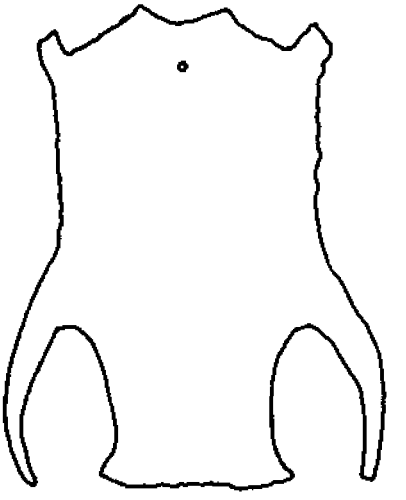


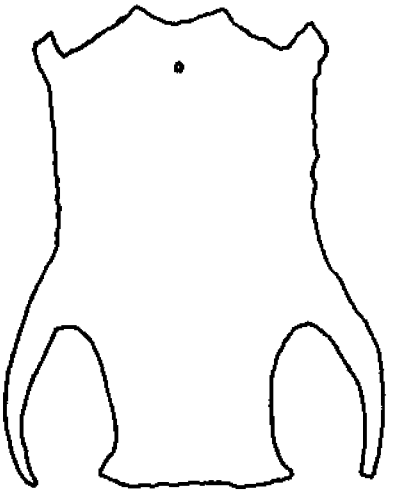
Surf scoter
Zero to 2 ventral manubrial spine. Two dorsal manubrial spines (on apex of peaks on coracoidal sulcus). Depression (dip) in coracoidal sulcus. Pneumatic fossa 1.7-4.2 mm in width. Lateral processes usually extend beyond caudal end of keel. Lateral processes curve inward and are frequently (not enlarged on caudal end if thick entire length) thick cranially and thin caudally. Caudal process extends a few mm past a weak caudal ridge. Keel length 81-92 mm. Dorsal length 69-83 mm. Body width 42-49 mm. F/C 1.5-1.9 (always was < 2.0).

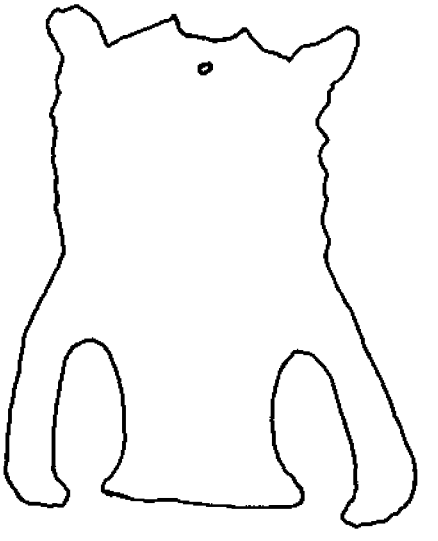
White-winged scoter
Zero to 2 ventral manubrial spines. Two dorsal manubrial spines (on apex of peaks on coracoidal sulcus). Depression (dip) in coracoidal sulcus. Pneumatic fossa 0.6-4.0 mm. Lateral processes usually extend beyond caudal end of keel. Lateral processes curve inward and are frequently (not enlarged on caudal end if thick entire length) thick cranially and thin caudally. Caudal process extends several mm past weak caudal ridge. Keel length 98-117 mm. Dorsal length 84-100 mm. Body width 48-57 mm. F/C 1.6-1.9 (always was < 2.0).

Common eider and king eider
Zero to 2 ventral manubrial spines. Two normally very prominent dorsal manubrial spines (on apex of peaks of coracoidal sulcus). Surface of coracoidal sulcus depressed (dips) at its most anterior point. Small, round pneumatic fossa frequently fused. Lateral processes longer than caudal end of keel. Caudal process may extend 1 cm beyond a non-prominent caudal ridge. Lateral processes are normally broad, enlarged on end, and curve inward on end. Caudal end may be indented in the center (giving it a fish-tail like shape). Most massive breastbone examined. Keel length 102-126 mm. Dorsal length 87-107 mm. Body width 47-64 mm. F/C common eider 1.5-2.0 (always was < 2.0), king eider 1.6-2.0 (usually was < 2.0).

Rough sketch of what the breastbone may look loke to you (relative sizes are not correct).

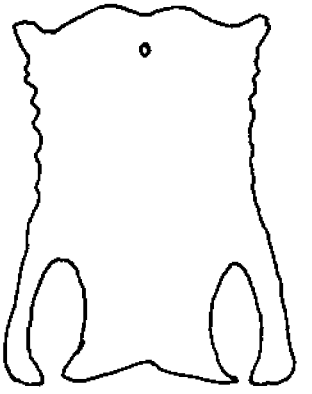




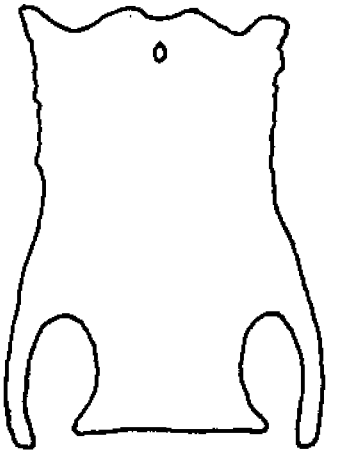


Harlequin duck
Two ventral manubrial spines. Normally no dorsal manubrial spines. Shallow dip in coracoidal sulcus. Pneumatic fossa 0.8-2.8 mm in width. Lateral processes longer than caudal end of keel. Lateral processes broad and heavy, ends tend to hook inward. Sternal notch may be enclosed. Caudal process extend several mm past weak caudal ridge and is normally fish-tailed in shape. Keel length 65-80 mm. Dorsal length 58-70 mm. Body width 31-41 mm.
F/C 1.5-2.0 (always was < 2.0).

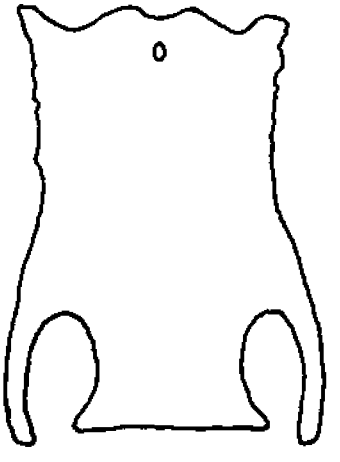
Rough sketch of what the breastbone may look like to you (relative sizes are not correct).



Canvasback
Two ventral manubrial spines. Zero or 2 (normally 0) dorsal manubrial spines. Surface of coracoidal sulcus depressed (dips) at its most anterior point. Lateral processes are normally the same length or longer than the caudal end of the keel. Lateral processes curve outward and then back in towards the center. May have a caudal process which extends 1 to 3 mm past the caudal ridge. The sternal notches are normally open but can be enclosed. Keel length 90-103 mm. Dorsal length 73-84 mm. Body width 40-46 mm. F/C 1.7-2.0 (always was < 2.0).

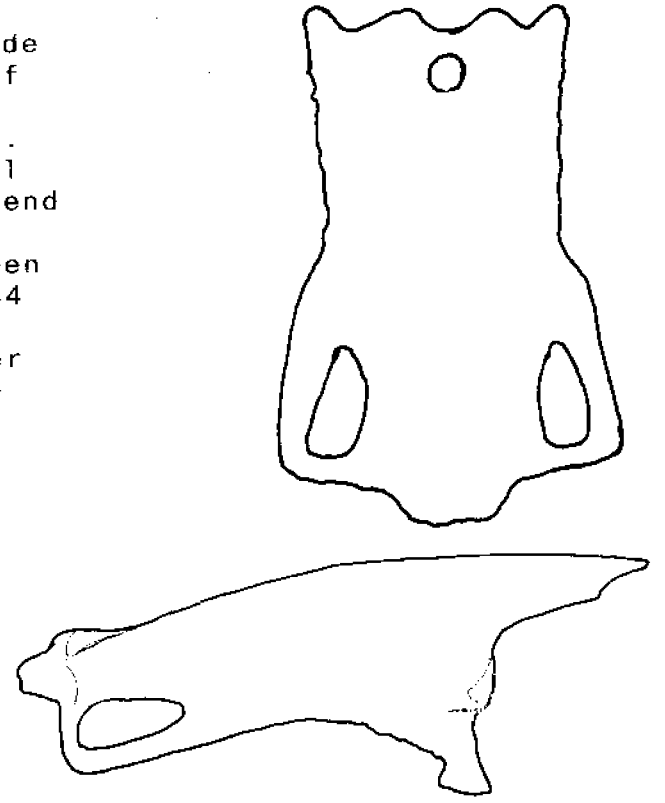


Diving ducks - greater scaup, lesser scaup, redhead and ring-necked duck
Two ventral manubrial spines. Zero or 2 (normally zero) dorsal manubrial spines. Surface of coracoidal sulcus depressed (dips) at its most anterior point. Pneumatic fossa 1 to 4 mm wide. Lateral processes are normally the same length or longer than the caudal end of the keel by 1-2 mm. Lateral processes curve outward and then back in towards the center. May have a caudal process which extends 1-3 mm past caudal ridge. The sternal notches are normally open but can be enclosed. Keel length 80-99 mm. Dorsal length 60-81 mm. Body width 32-47 mm. F/C ring-necked duck 1.7-2.0, redhead 1.7-2.0, lesser scaup 1.5-1.9, greater scaup 1.5-1.8 (always was < 2.0 for all species).

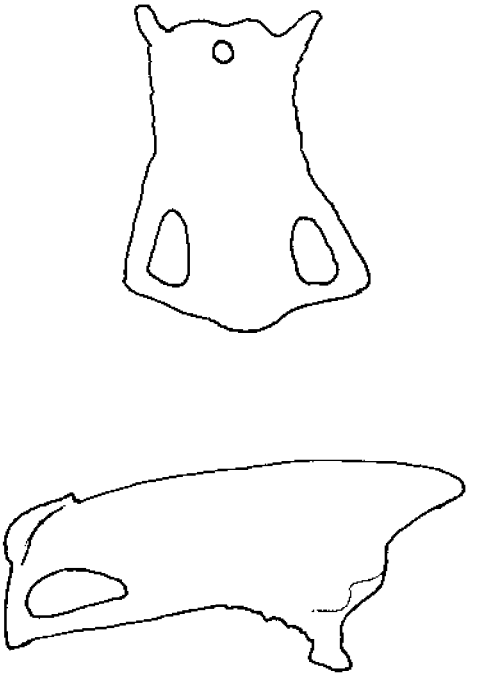


Common merganser and red-breasted merganser
No ventral or dorsal manubrial spines. Very distinct depression (dip) in coracoidal sulcus (wider and deeper than that found in diving ducks). Large pneumatic fossa 3.6-7.0 mm wide (a pencil eraser will normally fit inside it). Keel not very deep and shape of keel differs from all other species. Sternal notches were always enclosed. Lateral processes shorter than caudal end of keel. Caudal process may extend several cm beyond prominent caudal ridge. Caudal process is only between sternal notches. Keel length 100-134 mm. Dorsal length 76-107 mm. Body width 35-49 mm. F/C common merganser 2.0-2.4, red-breasted merganser 1.9-2.3.

Rough sketch of what the breastbone may look like to you (relative sizes are not correct).

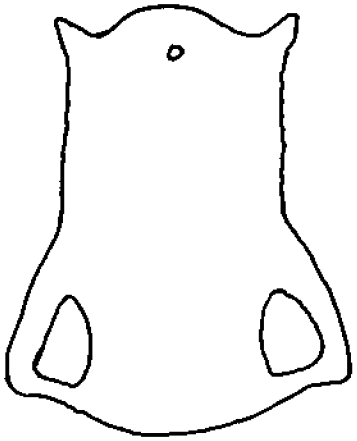


Hooded merganser
Normally no ventral or dorsal manubrial spines. Distinct depression (dip) in coracoidal sulcus not as prominent as with the other mergansers. Pneumatic fossa variable in size from 1.7-5.5 mm wide normally much larger than bufflehead which can have a similar looking breastbone. Sternal notches were always enclosed. Lateral processes shorter than caudal end of breastbone. Caudal process extends several mm beyond prominent caudal ridge. Caudal process is only between sternal notches. Keel length 77-92 mm. Dorsal length 64-76 mm. Body width 30-40 mm. F/C 1.8-2.3.

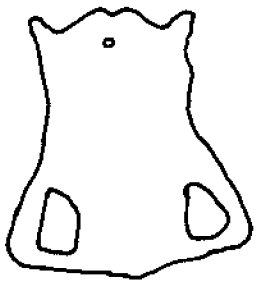


Common goldeneye, and Barrow's goldeneye
No ventral manubrial spine. Zero to 2 dorsal manubrial spines. Coracoidal sulcus may be smooth over its entire surface or may have a depression (dip) at its most anterior point. Lateral processes are shorter than caudal end of keel. Lateral processes are straight but flair out from body. Sternal notches were always enclosed. Caudal process may extend a cm or more beyond the caudal ridge. Very little meat is attached to this extension and it should be obvious even with meat on the breastbone. Keel length 84-110 mm. Dorsal length 69-90 mm. Body width 34-50 mm. F/C 1.7-2.1.

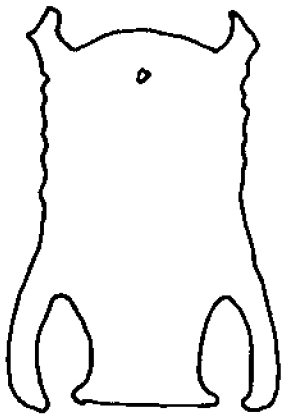
Rough sketch of what the breastbone may look like to you (relative sizes are not correct).



Bufflehead
No ventral manubrial spine. Zero to 2 dorsal manubrial spines. Coracoidal sulcus may be smooth over its entire surface or may have a depression (dip) at its most anterior point. Pneumatic fossa small, frequently only 1-2 mm wide. Lateral processes seem to flair out from the body. Sternal notches were always enclosed. Caudal process extends several mm beyond the caudal ridge. Keel length 59 to 76 mm. Dorsal length 49 to 64 mm. Body width 26 to 35 mm. F/C 1.7-2.1.



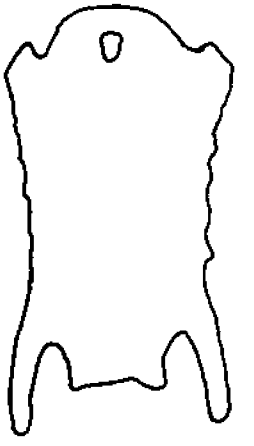
Steller's eider
One short prominent ventral manubrial spines. Zero or two very insignificant dorsal manubrial spines (that are hard to see). Coracoidal sulcus frequently smooth throughout its entire surface. Small, round pneumatic fossa frequently fused. Lateral processes longer than caudal end of keel. Lateral processes are broad, enlarged on end, and curve inward. Caudal process may extend several mm beyond a weak caudal ridge. Sternal notches normally not enclosed. The sterno-coracoidal process is uniquely boot-shaped. Keel length 81-93 mm. Dorsal length 72-81 mm. Body width 37-43 mm. F/C 1.5-2.0 (always was < 2.0).



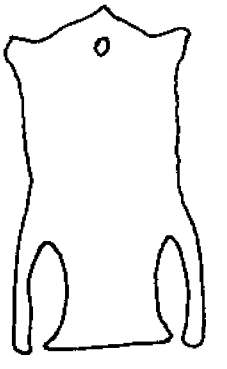
Whistling ducks (tree ducks), black-bellied and fulvous
No ventral manubrial spine. One dorsal manubrial spine that is broad-based and platelike. Smooth curve to the coracoidal sulcus throughout its surface other than the dorsal manubrial spine. Coracoidal sulcus with "sharp drop off" on caudal edge. Large oblong pneumatic fossa 2.5-5.0 mm wide. Lateral processes longer than the caudal end of the keel by several mm. Lateral processes are fairly wide. Caudal ridge almost non-existent. Caudal process extends several mm past this weak caudal ridge. Sternal notches appear odd because of apparent short length of keel. Sternal notches not enclosed.

Keel length 74-91 mm. Dorsal length 65-78 mm. Body width 29-37 mm. F/C for black-bellied whistling duck 2.0-2.4, fulvous whistling duck 1.9-2.6 (normally whistling ducks were > 2.0).

Rough sketch of what the breastbone may look like to you (relative sizes are not correct).

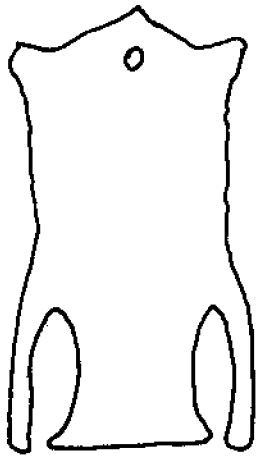


Dabbling ducks (teal) - blue-winged, cinnamon, green-winged Single, long ventral manubrial spine several mm in length. One to 3 dorsal manubrial spines. Smooth curve to coracoidal sulcus throughout its surface other than the dorsal manubrial spines. Fairly large round to oval pneumatic fossa. Lateral processes even with caudal end of keel normally. Lateral processes are slightly curved and convex on the tissued side. No caudal process normally found but can extend 1-2 mm past a very prominent caudal ridge. Sternal notches normally open but can be enclosed. Normally the notches are longer and narrower than that found in any other genera. Keel length 61-78 mm. Dorsal length 53-66 mm. Body width 23-30 mm. F/C blue-winged teal 2.1-2.5, cinnamon teal 2.1-2.7, green-winged teal 2.1-2.6 (always was < 2.0).

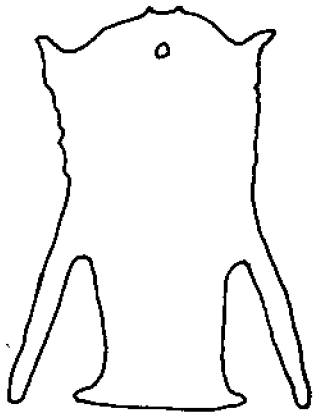


Dabbling ducks - black duck, gadwall, mallard, mottled duck, pintail, shoveler, widgeon (bald pate)
Single, long ventral manubrial spine several mm in length. One to 3 dorsal manubrial spines. Smooth curve to coracoidal sulcus throughout its surface other than the dorsal manubrial spines. Fairly large round to oval pneumatic fossa. Lateral processes are frequently shorter or even with caudal end of keel. Lateral processes are slightly curved and are convex on the tissued side. No obvious caudal process normally found but can extend 1-2 mm past a very prominent caudal ridge. Sternal notches normally open but can be enclosed. Keel length 75-114 mm. Dorsal length 67-98 mm. Body width 28-42 mm. F/C mallard 2.1-2.7, black duck 2.1-2.7, gadwall 1.9-2.5, pintail 2.1-2.8, widgeon 1.9-2.3, shoveler 2.0-2.6 (except for gadwall and widgeon, always was > 2.0).

Rough sketch of what the breastbone may look like to you (relative sizes are not correct).



Wood duck
Either has a single short ventral manubrial spine up to 2 mm or none at all. Zero or 2 dorsal manubrial spines. Normally smooth curve to coracoidal sulcus throughout its surface other than the dorsal manubrial spines. Oval pneumatic fossa 1.4-3.5 mm in width. Lateral processes even with caudal end of keel normally, sometimes 1-2 mm shorter or longer. Lateral processes flair out from body and are straight. Prominent caudal ridge. Sternal notches normally open but can be enclosed. Keel length 73-92 mm. Dorsal length 63-77 mm. Body width 25-34 mm. F/C 2.0-2.8 (always was > 2.0).



AID TO THE IDENTIFICATION OF DUCK BREASTBONES

PART II

The following are general characteristics that can aid in species or at least genus identification. Caution - some of this information is only for calcified breastbones and, since we are dealing with biological specimens, there are most likely exceptions to some of these statements.

The first topic covered will be manubrial spines. It is very important in genera identification, unfortunately it would not be very visible to an officer that may be looking at a duck breast in someone's cooler, but they can frequently be felt anyway (especially in dabbling ducks). Caution: if a breasted bird also has the coracoids removed, the manubrial spine in Anas may very likely be broken.

I. Ventral manubrial spines

A. One manubrial spine 

1. Single long prominent spine

a) Genus Anas (mallard, black duck, mottled duck, pintail, widgeon, gadwall, shoveler, and blue-winged, green-winged, and cinnamon teal)

2. Single short prominent spine 

a) Genus Polysticta (Steller's eider)

b) Genus Aix (wood duck) may have none

3. Single broad spine (not characteristic for many species and normally seen only in the "sea ducks".

a) Genus Clangula, (oldsquaw) common for this species

b) Genus Somateria (common and king eider) can also have none or two

c) Genus Melanitta (surf, white-winged, and black scoter) can also have none or two

B. Two manubrial spines 

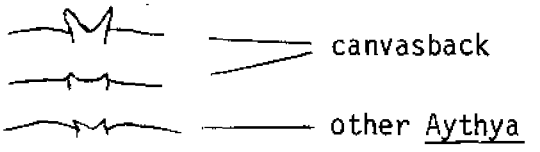
1. A unique single spine (base) that forks on end.

a) Genus Oxyura (ruddy duck) or

2. Two spines (not broad) frequently not very prominent or easily felt with tissue on the breastbone.

   a) Genus Histrionicus (harlequin duck)

   b) Genus Aythya (canvasback, redhead, ring-necked duck, lesser and greater scaup) Note: Canvasback definitely have the most widely spread spines (greater than 6mm outside edge to outside edge, Other ducks in the genus Aythya are less than 6mm) and frequently the most prominent.



3. Two broad spines 

   a) Somateria (common and king eider) can also be none or one

   b) Melanitta (surf, white-winged, and black scoter) can also be none or one

C. No manubrial spine

1. No manubrial spine observed

   a) Genus Mergus (common and red-breasted merganser)

   b) Genus Dendrocygna (fulvous & black-bellied whistling ducks)

   c) Genus Aix (wood duck) may have one short prominent spine

2. No manubrial spine typical but single spine has been observed.

   a) Genus Bucephala (bufflehead and goldeneye)

   b) Genus Lophodytes (hooded merganser)

3. No manubrial or single short spine fairly common.

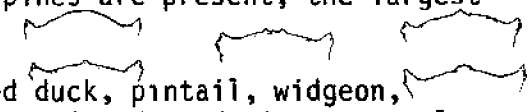
   a) Genus Aix (wood duck)

4. No manubrial spine, single or two broad spines

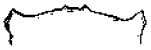
   a) Genus Somateria (common and king eider)

   b) Genus Melanitta (surf, white-winged, and black scoter)

II. Dorsal lip of the coracoidal sulcus. This feature should be visable and useful for officers in the field.

A. Typically no concave surface with 0 to 3 bumps (dorsal manubrial spines) just below ventral manubrial spine. If 3 spines are present, the largest is just below the ventral manubrial spine. 

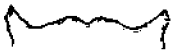
1. Genus Anas (mallard, black duck, mottled duck, pintail, widgeon, gadwall, shoveler, and green-winged, blue-winged, and cinnamon teal. Caution: Some mallards have been seen with a dip in the coracoidal sulcus. 

2. Genus Aix (wood duck) occasionally two short dorsal manubrial spines straddling the ventral manubrial spine. 

3. Genus Polysticta (Steller's eider) 

4. Genus Dendrocygna (whistling ducks) has one short, broad, plate-like (dorsal, no ventral) manubrial spine. 

5. Genus Oxyura 

B. Typically shallow depression just below ventral manubrial spines (in line with keel and center of coracoidal sulcus). 

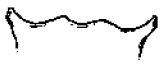
1. Genus Aythya (canvasback,redhead, ring-necked duck, and greater and lesser scaup)

2. Genus Histrionicus (harlequin duck)

C. Typically fairly deep, smooth depression in line with keel. 

1. Genus Mergus (common and red-breasted merganser)

2. Genus Lophodytes (hooded merganser) not as deep as it is in the genus Mergus.

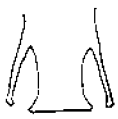
D. Typically dip in center just below ventral manubrial spines but apex of the two peaks are pointed.  to 

1. Genus Somateria (common and king eider)

2. Genus Melanitta (surf, white-winged and black scoter). May be more pronounced in surf and white-winged scoters than black scoters

3. Genus Clangula (oldsquaw) peaks not sharply pointed. 

III. Sternal notches (should also be visable to an officer even if they have a breastbone with tissue on it.

enclosed  not enclosed 

A. Enclosed sternal notch.

1. Almost always enclosed sternal notch

   a) Genus Mergus (common and hooded merganser)

   b) Genus Lophodytes (hooded merganser)

   c) Genus Bucephala (bufflehead and goldeneye).

2. Occasionally enclosed notch

   a) Genus Polysticta (Steller's eider)

   b) Genus Histrionicus (harlequin duck)

   c) Genus Anas (mallard, black duck, mottled duck, pintail, gadwall, widgeon, shoveler and green-winged, blue-winged and cinnamon teal)

3. Rarely enclosed notch

   a) Genus Clangula (oldsquaw)

   b) Genus Aythya (canvasback, redhead, ring-necked duck and lesser and greater scaup)

   c) Genus Somateria (common and king eider)

4. Never observed to be enclosed (expect enclosure possible for wood duck and scoters but unlikely for ruddy and whistling ducks).

   a) Genus Oxyura (ruddy duck)

   b) Genus Aix (wood duck)

   c) Genus Melanitta (surf, white-winged and black scoter)

   d) Genus Dendrocygna (whistling duck)

IV. Length of lateral processes compared to the center only of the caudal end of the sternum. This can also be observed by an officer without removing tissue from a "breasted bird"

A. Longer than caudal end of the keel

1. Genus Melanitta (surf, white-winged and black scoter)

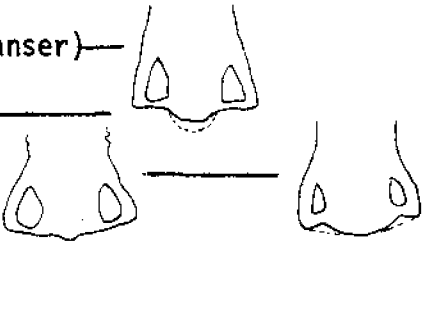
2. Genus Somateria (common and king eider)

3. Genus Histrionicus (harlequin duck)

4. Genus Dendrocygna (whistling duck)

B. Shorter than caudal end of the keel

1. Genus Mergus (common and red-breasted merganser)
2. Genus Lophodytes (hooded merganser)
3. Genus Bucephala (bufflehead and goldeneye)
4. Genus Clangula (oldsquaw)



V. Shape of lateral processes

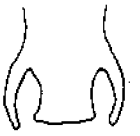
A. Typically relatively broad, the end is enlarged and hooks inward.

1. Genus Somateria (common and king eider)
2. Genus Polysticta (Steller's eider)
3. Genus Histrionicus (harlequin duck)

This feature along with the caudal end of the sternum being "fish-tailed" in shape differentiates this species from Aythya.

B. Typically wide at base and the narrowest point may be at the caudal end of the process (can be wide entire distance but not enlarged on caudal end)

1. Genus Melanitta (surf, white-winged and black scoter)



C. Short and broad

1. Genus Oxyura (ruddy duck)

Tables 1 and 2 serve as a summary of all data collected and much of the information presented in Parts I and II.

Table 1. Morphological characteristics of the sternum of North American Anatinae and Dendrocygna.

Genera	Number of manubrial spines: Ventral	Number of manubrial spines: Dorsal	Depression in dorsal lip of coracoidal sulcus	Lateral processes: length	Lateral processes: shape	Sternal notch enclosed
Dendrocygna	0	1	No	> keel	thick/short	No
Aix	0-1	0 or 2	No	≤ keel	thin/straight	No
Anas	1	0-3	No	≤ keel	straight	No*
Aythya	2	0 or 2	Yes	≥ keel	curved	No*
Bucephela	0	0 or 2	Either	< keel	straight	Yes
Somateria	0-2	2	Yes	> keel	thick/curved	No
Polysticta	1	0	No	> keel	thick/curved	No
Histrionicus	2	0	Yes	> keel	thick/curved	No*
Mergus	0	0	Yes	< keel	thick/straight	Yes
Lophodytes	0	0 or 2	Yes	< keel	thick/straight	Yes
Clangula	1	2	Yes	< keel	curved	No
Melanitta	0-2	0-2	Yes	> keel	tapered/curved	No
Oxyura	1	0	No	< keel	thick/short	No

*The sternal notch in 10% of the birds may be enclosed.

Table 2. Six measurements (mm) of the sternum of North American Anatinae and Dendrocygna.

	A: Keel length			B: Keel depth			F: Sternal length			D: Minimum intersternal notch width			C: 7th intercostal space sternal width*			E: Maximum horizontal sternal width		
Genus (species)	x̄	SE	n	x	SE	n	x	SE	n	x	SE	n	x	SE	n	x	SE	n
Dendrocygna	80	0.7	26	24	0.2	26	71	0.7	26	17	0.3	26	32	0.4	26	37	0.4	26
Aix	83	0.6	51	20	0.2	52	70	0.4	52	21	0.2	52	30	0.2	52	45	0.5	44
Anas																		
Teal	69	0.4	91	18	0.2	91	60	0.3	94	16	0.2	95	26	0.1	96	35	0.3	89
other Anas	95	0.5	358	24	0.1	365	82	0.4	358	23	0.2	347	36	0.2	354	50	0.3	332
Aythya																		
Canvasback	96	0.4	49	24	0.2	49	78	0.3	50	26	0.2	50	43	0.2	50	55	0.3	47
other Aythya	85	0.4	161	21	0.1	159	70	0.4	161	24	0.2	162	40	0.3	157	56	0.3	151
Bucephela																		
Goldeneyes	96	1.2	46	23	0.4	26	79	0.9	46	31	0.5	46	42	0.5	47	59	0.7	46
Bufflehead	67	0.9	36	17	0.3	28	57	0.7	36	23	0.5	36	30	0.4	36	45	0.6	35
Somateria	114	0.5	95	29	0.2	95	98	0.4	95	30	0.4	94	54	0.4	95	69	0.6	93
Polysticta	87	0.4	39	25	0.3	39	77	0.4	39	23	0.3	39	40	0.2	39	52	0.4	39
Histrionicus	74	0.6	36	19	0.2	36	64	0.4	36	22	0.3	36	37	0.3	36	49	0.6	36
Mergus	117	1.3	70	29	0.3	68	90	1.1	70	27	0.4	72	42	0.4	72	58	0.6	70
Lophodytes	86	0.6	42	21	0.2	41	71	0.4	43	24	0.3	43	34	0.3	42	51	0.5	41
Clangula	103	0.9	38	23	0.2	40	88	0.7	38	23	0.3	40	39	0.4	40	55	0.4	40
Melanitta																		
Oxyura	62	0.4	39	17	0.2	39	54	0.3	39	24	0.3	39	34	0.2	39	48	0.4	39

*The 6th intercostal space was used for mergansers.