IDENTIFICATION OF THE YELLOW-BILLED LOON (*GAVIA ADAMSII*)

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The recent increase in sightings of Yellow-billed Loons (*Gavia adamsii*) along the Pacific coast of the contiguous United States (Remsen and Binford MS) has necessitated a revaluation of the characters used for identification, both in the field and in the hand. Field guide treatment is often inaccurate and invariably incomplete, especially in regard to birds in gray-brown plumage. The more technical literature not only is widely scattered and poorly digested for use in modern field identification, but also neglects some of the most important distinguishing characteristics. Confusion on the part of some ornithologists has led to the misidentification of museum specimens, including a supposed Yellow-billed Loon from Colorado (Remsen and Binford MS).

The following discussion is based on published literature; specimens in the California Academy of Sciences, San Francisco (CAS), and the Museum of Vertebrate Zoology, Berkeley (MVZ); published and unpublished photographs of living birds; communications with birders; notes in the files of regional editors of *American Birds*; and our own field experience. Comparisons are confined to the Common Loon (*Gavia immer*), the only species with which confusion is likely. The reader is referred to Figures 1 (*adamsii*) and 2 (*immer*), which depict some of the distinguishing characteristics discussed below. The timing and sequence of molts and plumages are nearly identical in the two species (Godfrey 1962) and thus are of no use in field separation. Both species are sexually monomorphic except in size.

IDENTIFICATION IN THE FIELD

The following discussion, which treats the characters useful in distinguishing Yellow-billed from Common loons in the field, is divided into three parts: characters other than plumage color; plumage color in breeding adults; and plumage color in gray-brown birds.

CHARACTERS OTHER THAN PLUMAGE COLOR

Bill color. The most important field mark in separating Yellow-billed and Common loons, and the only one that is diagnostic in all ages and plumages, is the color of the culmen (ridge of upper mandible). In breeding-plumaged adults the bill of the Common Loon is all black, while that of the Yellow-billed is whitish yellow, often tending to pale brownish or dark grayish at the base of both mandibles (especially from the base of the culmen to the nostrils). In winter adult *immer* the major portion of the bill becomes pale grayish, tinged usually with bluish but sometimes brownish or even ivory; the entire culmen, plus some 5 mm (at the base) on each side, remains black. The bill of adult *adamsii* also

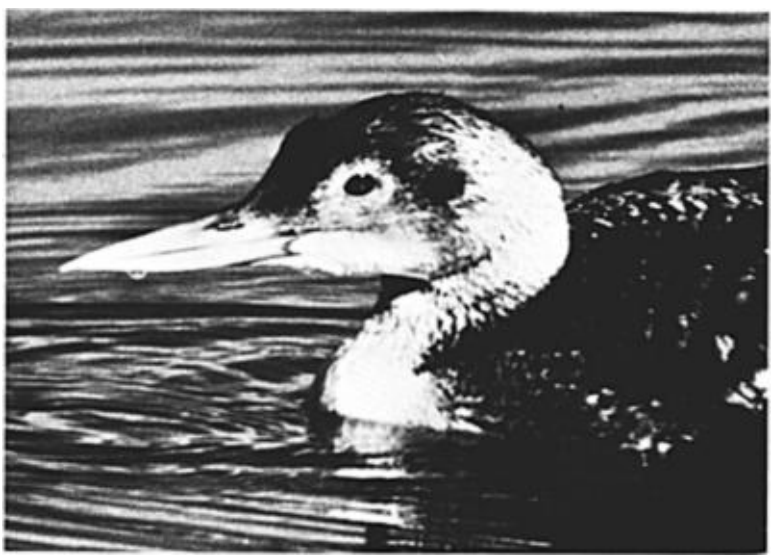

Figure 1. Yellow-billed Loon in gray-brown (immature) plumage. Note the following and compare with Figure 2: mostly *pale culmen*; recurved lower outline of mandibular ramus; bill gap (only partially visible); chin feathering extending to point below posterior edge of nostril; pale posterior auricular region and neck sides, blending with white of underparts and reducing dark of occiput and hindneck to narrow strip; pale face, with whitish extending to above eye; discrete *auricular patch*; small eye; thick neck with proportionately small head. The cross-banded mantle is readily apparent in the specimen but not in the photograph. Note also the similarity to the Common Loon in curvature of culmen, degree of angularity between gonys and mandibular ramus, and absence of gonydeal protuberance. Photographed near Inverness, Marin Co., California on 9 December 1967. From Small, A., *The Birds of California*, Winchester Press, New York, 1974.

Photo by Arnold Small

becomes paler in winter—yellowish white, or white with a yellowish, greenish, or brownish tinge. The base (including the basal half or less of the culmen) remains dark. Gray-brown immatures of both species resemble winter adults, except that in the Yellow-billed Loon the dark of the base may be slightly more extensive, sometimes reaching the halfway point on the culmen; Jehl (1970) described this dark area as "bluish" in his first-winter specimen of *adamsii* from Baja California (San Diego Natural History Museum 36831).

The important fact to note here is that in all ages and plumages of the Common Loon, black covers the *entire* culmen from base to tip (or to within 3-4 mm of the tip) and extends ventrolaterally for several millimeters. In *adamsii* the distal half or more (usually the distal two-thirds) of the culmen is pale, and only the basal portion is dark; gradation between the two colors is even and is always completed basally to

Figure 2. Common Loon in gray-brown plumage. Note the following and compare with Figure 1: Mostly *dark culmen*; decurved lower outline of mandibular ramus; dark posterior auricular region and neck sides, rather sharply defined from white of underparts and not seeming to reduce width of occiput and hindneck; moderately dark face, with dark lores and postocular region; no discrete auricular patch (dark area in this photograph is more posterior and merges with dark occiput); large eye; thin neck with proportionately large head. Photographed at Oxnard, Ventura Co., California on 12 February 1970.

Photo by Arnold Small

the midpoint of the culmen. Because in *immer* the ventrolateral extent of the black narrows toward the tip, field observers should attempt to obtain a front or top view of the culmen, although careful scrutiny from the side usually is sufficient.

Inexperienced observers often are led astray by the color of the lower mandible and sides of the upper mandible of gray-brown Common Loons; these areas may be so pale gray or ivory-tinged as to appear, at least in certain lights, similar in color to the bill of *adamsii* (Figure 2). An occasional museum specimen of *immer* exhibits a pale streak at the center of the culmen, with black toward the base and tip (CAS 15756); we have not observed this condition in the field and suspect that it is an artifact of skins; in any event, such a bird should not cause confusion, because most of the distal half of the culmen is black. The all-dark bill seen rarely in the study skin of *adamsii* (SDNHM 36831) is an artifact.

Bill shape: adults. In the field the unique bill shapes of adult *adamsii* and *immer* are readily apparent to an experienced observer. However, the seven specific characteristics that contribute to this distinctiveness are obscure and are detectible, if at all, only through very careful scrutiny at extremely close range. They are useful only in combination, for each is shared by occasional individuals of the other species. These seven characters of adult bills, plus another erroneously attributed by the literature, are discussed below. Numbers refer to Figure 3. The terms *decurved* (the ends of the line under discussion point ventrally) and *recurved* (ends of the line point dorsally) are used instead of convex and concave, the meaning of which is dependent on the relationship of the subject line to the whole.

(1) The swelling near the base of the culmen frequently is slightly more pronounced in *adamsii*. (2) The distal 15-37 mm of the culmen in *adamsii* is only slightly decurved, rather than strongly decurved as in *immer*. (3) Usually the remainder of the culmen is straight or even slightly recurved in the Yellow-billed Loon, rather than strongly decurved. However, an occasional adult *adamsii* exhibits a culmen that is slightly decurved throughout its length, and a few *immer* have nearly straight culmens. (4) In *adamsii* the upper mandibular tomium (cutting edge) usually is straight or faintly recurved from the center of the nostrils to within 5-13 mm of the tip (this distal area slightly decurved); rarely it is slightly decurved from nostril to tip. In *immer* the entire upper mandibular tomium from nostril to tip is moderately decurved. (5) The remainder of the upper mandibular tomium of *adamsii*, from the center of the nostrils to the base, usually is strongly recurved owing to a downward growth of this structure. The effect is to produce a "smile," which sometimes is very noticeable in the field. This portion of the tomium in *immer* is only slightly recurved—not enough to pro-

duce a "smile." (6) In the Yellow-billed Loon the lower outline of each mandibular ramus from the gonydeal angle (herein defined as the ventralmost point on the gonys as viewed from the side) to within about 10 mm of the base is always rather strongly recurved; in the Common Loon, this line (to the extreme base) usually is slightly decurved. We have seen only one specimen of *immer* in which this line was very slightly recurved. (7) The gonydeal angle is more often pointed, less often rounded, in the Yellow-billed Loon. The great amount of overlap, how-

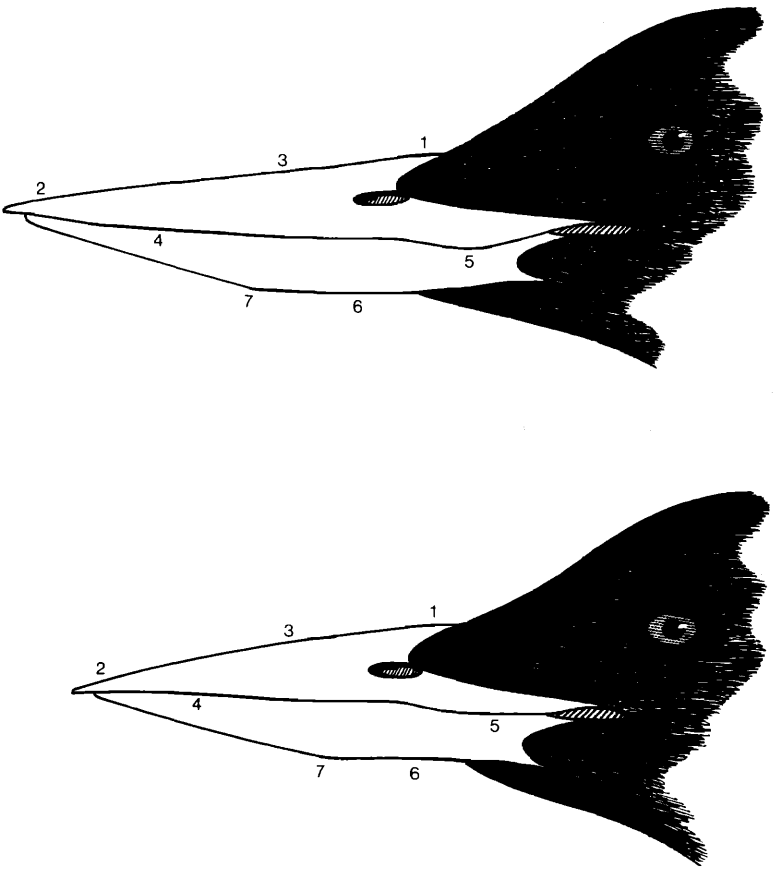

Figure 3. Typical bill shape of adult Yellow-billed (above) and Common loons. Numbers refer to distinguishing characteristics discussed in text. Note also smaller eye and greater anterior extension of chin feathering in Yellow-billed Loon (see text). Bill color not shown.

Drawing by Ken Carlson

ever, makes this difference nearly useless in the field or hand (see discussion of the gonydeal protuberance in juvenal birds).

The literature stresses the "uptilted" bill of adult *adamsii*. Our measurements (Table 1) of the degree of angularity between the gonys (ridge of lower mandible from tip to point of fusion of mandibular rami) and mandibular rami at the gonydeal angle show that *adamsii* averages only 0.5 degrees greater than *immer* . More importantly, 90 percent of the *immer* specimens fall within the range of *adamsii*, and 100 percent of *adamsii* are within the range of *immer*. Thus as an absolute character, the amount of upturn is of no use in either the field or hand.

Nevertheless, the bill of *adamsii* usually seems to be more upturned, an effect that we believe is largely an optical illusion resulting from the eye of the observer inadvertently comparing the degree of angularity with head posture, chin feathering, and the shapes of the culmen and upper mandibular tomium. The angularity will seem greater if, as in *adamsii*, 1) the culmen is straight or recurved (rather than decurved); 2) the upper mandibular tomium is more recurved; 3) the bill is pointed above the horizontal, and the eye of the observer stresses the slant of the gonys only in relation to the horizon; and 4) the chin feathering extends farther anteriorly, producing an "underslung" effect that makes the gonys seem relatively longer and the gonydeal angle closer to the head. The shape of the culmen probably is the most important factor in producing this illusion.

Bill shape: young birds. The bills of young *adamsii* and *immer* develop slowly. At what age full size and shape are attained is uncertain; Godfrey (1962) indicates the first summer. In any event bill shape in juvenal (first fall and early winter) *adamsii* differs significantly from that of adults. In some important characteristics, the bill resembles that of *immer*; the culmen is evenly and rather strongly decurved throughout its length (Figure 1; see also photograph in Jehl 1970); and the upper mandibular tomium is moderately decurved from tip to nostril and only slightly recurved from nostril to base. The curvature of the lower outline of the mandibular ramus is as in adults. We have not measured the degree of angularity of immature bills but presume that age for age it would parallel adults and thus be of no use in identification.

Table 1. Angularity (in degrees) between gonys and mandibular rami in adult *Gavia immer* and *G. adamsii*.

SPECIES	MEAN ANGLE	RANGE	% N WITHIN RANGE OF OTHER SPECIES	N
immer	190.7	187.6-192.5	90	10
adamsii	191.2	189.2-192.5	100	10

Juvenal *adamsii* are said to be distinctive in possessing a slight protuberance at the gonydeal angle (Godfrey 1966). Our inspection, however, indicates that this bump is lacking in some Yellow-billed Loons and well developed in some Common Loons. On the average more individuals of *adamsii* than *immer* have this structure so that when it can be seen in the field, its presence suggests *adamsii*.

In some young *adamsii* (e.g. CAS 65864), perhaps in all at some stage of development, a narrow but rather lengthy gap appears between the middle portions of the mandibles so that in both the hand and field it is possible to look entirely "through" the closed bill. This peculiarity may be a result of the lengthening and straightening of the culmen outstripping the downward growth of the upper mandibular tomia. Because we have never observed this condition in specimens or live examples of *immer*, we suspect that when present it is diagnostic for the identification of *adamsii*.

Size: general. Within each species males average larger than females in most dimensions (see Godfrey 1962 and Tables). Sex for sex and age for age, Yellow-billed Loons average larger than Commons in all linear measurements with which we have dealt except eye size. Extensive variation in most dimensions, especially among Commons, however, produces considerable overlap between the species; this factor and the impossibility of sexing and difficulties of aging birds of either species in the field greatly diminish the value of size as a field mark.

Nevertheless field experience has demonstrated that in certain dimensions *adamsii* does usually appear larger than *immer*; the body seems slightly bulkier, the bill more massive, the neck thicker and the chin feathering more extensive. The first three differences probably are enhanced by an optical illusion resulting from the paler color of the bill and plumage of *adamsii* when viewed against dark water.

Body bulk. Adamsii often appears larger than *immer* in body bulk. Unfortunately our only means for estimating bulk is through correlation with wing (chord) and tarsus lengths, both of which may well vary independently of body size. Those of *adamsii* do average longer (Godfrey 1962), but the differences between means are not statistically significant ($P>0.05$; t-test). Until data on body weight, volume or length become available, we must rely on our field observations. Almost certainly, interspecific overlap, coupled with the difficulties of aging, would allow for the separation of only the largest (adult) *adamsii* and smallest (juvenal) *immer*.

Bill size. Bill size, although exhibiting considerable interspecific overlap and requiring subjective appraisals in the field, is a fairly useful field character for distinguishing extremely large (adult) *adamsii* and very small (juvenal) *immer*. The adult bill is more massive in *adamsii* than in *immer*, averaging 9.7 mm (12.0 percent) longer in exposed culmen

length (Godfrey 1962) and 3.0 (13.8) higher at the anterior edge of the nostril (Table 2). In bill height, 50.0 percent of *adamsii* specimens (all ages) exceed all *immer*, and 37.8 percent of all *immer* are under all *adamsii*. The former percentage, however, probably would be much lower if our sample size were larger. We presume that analysis of culmen length would show similar percentage differences. Further analysis of bill size probably would demonstrate that, age for age, young *adamsii* average larger than young *immer* (indicated but not proven in Table 2), but any differences would be useless in the field in the absence of convenient methods for aging. In the hand, where aging is possible, bill size is more useful.

Neck thickness. The Yellow-billed Loon has a disproportionately thick neck, which is noticeable in the field without direct comparison to *immer* because it causes the body and especially the head to appear relatively smaller (which in turn accentuates the size of the bill). The slenderer neck of the Common Loon makes its head appear proportionately large ("round-headed"). When *adamsii* feeds actively, its neck is extended and feathers depressed, so that the greater diameter may not be apparent.

The thicker neck is the result of longer feathers, as demonstrated by measurements (Table 3) of individual feather lengths taken on the side and rear of the midneck (just anterior to the necklace in adults). *Adamsii* exceeds *immer* by an average of 3.8 mm (15.3 percent) on the side and 6.1 (22.0) on the rear in adults, and 3.5 (19.0) and 4.7 (23.9) in young birds. Age for age there is no overlap between the species in

Table 2. Bill height (mm) in *Gavia immer* and *G. adamsii*.

SPECIES	AGE, SEX	MEAN	RANGE	% N OUTSIDE RANGE OF OTHER SPECIES	N
immer	ad. M	22.5*	20.9-24.7		9
	ad. F	21.1*	19.4-23.7		10
	imm. F	19.7	17.6-24.0		8
	All	20.9*	16.3-24.7	37.8	37**
adamsii	ad. F	26.0*	25.5-26.6		3
	ad. F	24.4*	21.9-28.2		9
	imm. F	21.6	20.6-22.8		3
	All	24.4*	20.6-28.2	50.0	18***

*Difference between means in corresponding age, sex class for other species statistically significant ($P<0.05$; t-test).

**Sample includes 10 immature males. There were no immature male *adamsii* available for comparison.

***Sample includes 3 unsexed adults.

Table 3. Neck feather length (mm) in *Gavia immer* and *G. adamsii.*

SPECIES	AGE	MEAN		RANGE		N
		Side	Rear	Side	Rear	
immer	ad.	24.9*	27.7*	23.1-27.6	25.5-30.2	10
	imm.	18.4*	19.7*	16.8-20.8	17.7-21.2	10
adamsii	ad.	28.7*	33.8*	25.3-31.3	31.2-35.9	10
	imm.	21.9*	24.4*	20.9-23.0	22.5-27.2	4

* Difference between means in corresponding age class for other species statistically significant ($P<0.05$; t-test).

measurements of the hindneck feathers. Aging in the field is not necessary because neck thickness is proportional to head and body size and thus may be used without direct comparison to the other species. No sexual differences could be found. The longer feathers, as well as the smaller eye (see below) and proportionately shorter wing and tarsus, perhaps have some adaptive significance related to the environmental conditions in the more northern range of this species.

Chin feathering. In *adamsii* the chin feathers of birds of all ages and plumages extend farther anteriorly, reaching a point below the posterior edge of the nostrils and averaging 19.7 mm from the anterior edge of the malar feathering (on the sides of the mandibular rami). In *immer* the chin feathers end about halfway to the nostrils and only 12.0 mm on the average from the malar feathering. These measurements (Table 4) show almost no overlap; *adamsii* averages 7.7 mm (64.2 percent)

Table 4. Chin feathering extent (mm) in *Gavia immer* and *G. adamsii.*

SPECIES	AGE, SEX	MEAN	RANGE	% N OUTSIDE RANGE OF OTHER SPECIES	N
immer	ad. M	12.4*	9.7-16.9		9
	ad. F	11.6*	8.9-15.5		10
	imm. F	11.5*	9.7-12.6		9
	All	12.0*	8.2-16.9	97.0	38**
adamsii	ad. M	22.6*	19.3-25.0		5
	ad. F	18.6*	16.8-20.3		9
	imm. F	19.7*	18.9-20.2		3
	All	19.7*	16.7-25.0	90.0	20***

*Difference between means in corresponding age, sex class for other species statistically significant ($P<0.05$; t-test).

**Sample includes 10 immature males. There were no immature male *adamsii* available for comparison.

***Sample includes 3 unsexed adults.

greater than *immer*. This "jutting" of the chin adds appreciably to the uptilted appearance of the bill.

Eye size. One of the most interesting aspects of this study was the discovery that the eyes of the Yellow-billed Loon apparently average smaller than those of the Common Loon: for adults, 1.6 mm (12.9 percent) less in length and 1.3 (17.3) in height; and for immatures, 0.9 (7.8) less in length and 1.6 (23.5) in height (Table 5). Relative to other dimensions, the disparity is even greater. Even in the field Yellow-billed Loons appear smaller-eyed (compare Figures 1 and 2). Eye measurements were taken from the left eye of study skins. To minimize the great error resulting from diversity in preparation, we excluded those eyes that exhibited extreme stretching or shriveling. Careful measurements of living or freshly killed birds are needed to confirm our findings. Inclusion of some poorly prepared eyes in our sample serves to increase the range of variation (at both ends); thus the interspecific overlap shown in Table 5 may well be reduced when better measurements become available.

Posture. Each of us, as well as A. Baldridge, D. DeSante and T. Schulenberg (in field notes), has independently noted that the Yellow-billed Loon usually, but not always, carries its entire head and bill in an uptilted position (bill above the horizontal), much in the manner of a Red-throated Loon (*Gavia stellata*). None of us has ever seen a Common or Arctic (*G. arctica*) loon engage in this behavior. Such posturing greatly accentuates the uptilted appearance of the bill.

Head shape. In the field both species occasionally exhibit a flat or even "double-crested" crown. Because the percentage of occurrence of these features seems higher in *adamsii*, they may be used as additional minor aids in identification (W. C. Weber pers. comm.).

Table 5. Eye size (mm) in *Gavia immer* and *G. adamsii*.

SPECIES	AGE	MEAN		RANGE		% N OUTSIDE RANGE OF OTHER SPECIES		N
		Length	Height	Length	Height	Length	Height	
immer	ad.	12.4*	7.5*	9.2-14.7	5.3-10.0			16
	imm.	11.5*	6.8*	9.7-13.4	5.4-9.8			17
	All	11.9*	7.2*	9.2-14.7	5.3-10.0	3	39	33
adamsii	ad.	10.8*	6.2*	9.7-12.4	4.2-7.5			15
	imm.	10.6*	5.2*	10.0-11.5	4.7-6.0			3
	All	10.8*	6.2*	9.7-12.4	4.2-7.5	0	28	18

*Difference between means in corresponding age class for other species statistically significant ($P<0.05$; t-test).

PLUMAGE COLOR IN BREEDING ADULTS

The breeding plumage of the Yellow-billed Loon differs significantly in a number of respects from that of the Common Loon (Godfrey 1962). In *adamsii* the individual white lines that make up the large necklace (midneck patch) are fewer in number (less than 12 vs. more than 12) and broader, their width exceeding that of the alternating black lines rather than being about equal. Similarly the small patch on the upper foreneck is composed of fewer (usually 4-8, rather than 6-10) and broader white stripes; we find that it seems always to be divided midventrally in *adamsii* but only rarely in *immer.*

The differences in the remainder of the head and neck plumage have to do with the color of gloss. In *adamsii* the chin, throat (herein defined as the gular region only), foreneck (jugulum) and sides of the neck posterior to the necklace are all blackish, rather strongly glossed with bluish purple. These areas in *immer* are blackish, rather strongly glossed with green. In addition the hindneck posterior to the necklace is glossed with greenish in *adamsii* and purplish in *immer*—the reverse of what might be expected. Both species have the remainder of the head and neck faintly to moderately glossed with greenish, dullest on the sides of the head. These differences in gloss probably are undetectable in the field except under the most ideal conditions of distance and lighting.

The Yellow-billed Loon has fewer and larger white spots on the back, scapulars, wing coverts, sides, flanks and lower rump; the largest of the scapular spots, for instance, are about 18 mm in length as compared to about 10 mm in *immer.* In *adamsii* the white spots are absent on the longer upper tail coverts and absent or much reduced in number on the upper rump. Finally, the white streaks on the sides of the chest average somewhat broader in *adamsii.* Godfrey (1962) states that the eye of *adamsii* is reddish brown, while that of *immer* is brownish ruby; the legs and feet are dark grayish brown on the outer side and pale grayish flesh on the inner side and webs (latter tinged pink), rather than black on the outer side, medium gray on the inner side, and with flesh-centered dark webs. Variability in these colors has not been studied adequately to assess their value in identification.

PLUMAGE COLOR IN GRAY-BROWN BIRDS

The term "gray-brown birds" is used in preference to "immature and winter adults" because birds in their third summer (Alternate II plumage) are technically immature in that they have not attained *full* breeding plumage.

Head and neck. Aside from characters of the bill, the color and pattern of the head and neck provide the best field marks for identifying gray-brown birds. The malar region, chin, throat and foreneck of both species are whitish, except that on the foreneck most individuals of *im-*

mer have dusky flecking across the anteriormost part and a much darker, more solid, and wider "projection" (which is somewhat indented ventromedially) onto the posterior portions. The flecking and projection are simply extensions of the dark color of the sides of the neck; the former corresponds to the white foreneck patch of breeding adults and the latter to the black neck posterior to the necklace. In *adamsii* both the flecking and projection usually are much paler; the former may be absent; and the latter is darkest along its posterior edge.

The forehead, crown, occiput (hindhead) and hindneck are dark brown in both species. In *immer*, except for a white triangle extending dorsally from the foreneck and corresponding to the white necklace of breeding adults, the sides of the neck and the posterior portions of the auricular region are also dark brown; they merge imperceptibly with the occiput and hindneck and are more or less sharply defined from the white of the malar region and foreneck. In *adamsii* the neck sides and posterior auricular region are much paler—whitish, finely and sparsely flecked with tan—and thus form a broad blending between the white underparts and dark upper parts. Because these lateral areas are pale, the dark strip composing the occiput and hindneck appears in side view to be much narrower than in *immer*.

The temporal, loral and superciliary regions of *immer*, although much paler than the neck sides, are uniformly moderately dark except for a much darker postocular area (connected to the crown) and, in some birds, a dark loral mark connecting the eye to the forehead. *Adamsii* has a paler face and usually lacks the loral mark and sometimes the postocular connection to the crown; thus the whitish of the face usually extends to above the eye, at least anteriorly.

Aside from the color of the culmen, the best field character for separating gray-brown birds is the presence in the Yellow-billed Loon (and absence in the Common) of a discrete, dark auricular (ear) patch—a roundish or irregularly triangular patch of dark brown feathers, approximately 0.5 inch in diameter, centering about one inch behind and slightly ventral to the eye and directly over the ear opening. This patch is encompassed on three sides by the much paler feathering of the temporal, malar, and posterior auricular regions. A "bridge," occasionally as dark and wide as the patch but usually paler and narrower, connects the patch to the occiput. In some individuals the lower edge of the patch may taper downward to a point. In the field the patch is clearly visible, often at extreme distance. In *immer* the auricular region is also dark but merges dorsally *and posteriorly* with the dark of the occiput and thus does not form a well-defined patch.

Mantle. Juvenal loons of the two species are similar; the feathers of the back and scapulars are dark brown with pale gray margins and are small and narrowly rounded, the color and shape together giving

the mantle a marbled appearance. Adults and older immatures (at least in winter) have broader and more squarely tipped (less rounded) feathers, especially in the scapular region. In *adamsii*, however, these feathers are even broader and squarer than in *immer*. This shape difference, together with the much paler and wider gray tips (subterminal or marginal) give the mantle of *adamsii* a cross-banded effect; the margins form discrete parallel rows, each extending from one side of the bird to the other, which are readily apparent in the field. In the Common Loon these feathers are narrower, more rounded, and have darker and narrower gray tips, the whole producing more of a scalloped, less of a cross-banded, effect. Examination of additional museum skins is needed to assess age and plumage variation in this character and to clarify its usefulness in the field.

IDENTIFICATION IN THE HAND

Most field characters may be applied to birds in the hand, and some, such as dimensions and bill shape, take on added usefulness. In most study skins the pale distal half of the culmen of *adamsii* darkens only slightly and remains diagnostic; however, in some specimens (e.g. SDNHM 36831) the entire bill may turn blackish. As noted previously, a pale streak, probably representing a post-mortem change, may be present on a portion of the otherwise black culmen in the Common Loon. Portions of the head pattern of gray-brown birds, especially the auricular patch and whitish areas around the eyes, sometimes are obscured in skins. The patch may be mistaken for a dirty smudge; often it is more easily detected when the skin is viewed from a distance.

A character that is excellent in separating skins of the two species is the color of the shafts of the seven (or more) outer primaries (mentioned briefly by Godfrey 1962). Ventrally, the width of each shaft is divided into three stripes. In *immer* the central portion is tanish white and the sides are fuscous. In *adamsii* the center stripe is always creamy white and the lateral stripes vary from creamy white to pale tan. Dorsally there is much closer approach. Each shaft of *immer* is black at the tip, gradually merging toward the base into yellowish brown medially and medium brown to fuscous laterally; the three stripes may not be apparent, in which case only the extreme basal half inch is pale brown or yellowish. In *adamsii* the tip is dark brown to black; the remainder has a creamy white to yellowish brown center and dark brown to fuscous edges. Although we have seen no overlap, the close approach, especially dorsally but also ventrally, between some examples of the two species necessitates direct comparison of specimens. In at least extreme examples of *adamsii* the paler shafts are visible in the field under ideal conditions of distance and lighting when the floating bird flaps

its wings, and even (rarely) in the resting bird.

We agree with Godfrey (1966) that in first autumn and winter birds the lesser wing coverts of *adamsii* are "more conspicuously margined with grey." The margins average slightly wider and considerably paler—grayish white rather than medium gray. These feathers are concealed by the scapulars in the live resting bird; and in any event the differences probably would not be discernible in the field.

SUMMARY

The following summary lists those characters present in the Yellow-billed Loon that are more or less useful in separating it from the Common Loon. The reader is cautioned to study the more detailed descriptions in the text before attempting to apply these features.

Birds of any age and plumage: at least distal half of culmen always pale; body usually somewhat bulkier; neck thicker (due to longer feathers), making head appear proportionately small; chin feathering extends farther anteriorly, to a point below posterior edge of nostril; eye appears and probably measures (averages) smaller; bill often held above horizontal; crown more often flat or double-crested; lower outline of each mandibular ramus rather strongly recurved from gonydeal angle to within 10 mm of base; primary shafts paler (most useful in hand).

Adults in any plumage: bill averages longer and higher; swelling at base of culmen frequently slightly more pronounced; basal half or more of culmen usually straight or slightly recurved, the remainder usually only faintly decurved; upper mandibular tomium from nostril to near tip usually straight or slightly recurved, the basal remainder usually strongly recurved to produce a "smile"; gonydeal angle more often pointed.

Adults in breeding plumage: necklace and patch on upper foreneck with broader and fewer white lines; necklace apparently always divided midventrally; ventral portions of head and neck glossed with bluish purple; posterior hindneck glossed with greenish; white spots fewer and larger on mantle, reduced in number or absent on upper rump, and absent from longer upper tail coverts; white streaks on side of chest average wider; apparently, legs and feet paler and eye browner.

Gray-brown immatures and adults: throat flecking and foreneck projection much paler, the former sometimes absent, the latter darkest posteriorly; posterior auricular region and sides of neck much paler, blending with white underparts and (side view) reducing dark of occiput and hindneck to narrow strip; whitish of remainder of face paler and usually encircling at least anterior part of eye; discrete auricular patch present;

mantle of adults and winter immatures beyond juvenal stage strongly cross-banded.

Immatures: presumably, age for age, bill larger; gap between mandibles sometimes present; a few more juvenal individuals have protuberance at gonydeal angle; lesser wing coverts of juvenal birds more conspicuously margined with gray (hand only).

For *adamsii* in gray-brown plumage the best field marks are the paleness of the distal half of the culmen and the presence of an auricular patch; the best in-hand characters are the extent of chin feathering and the color of the primaries and culmen. The bill develops slowly and in many respects, including size and culmen shape, is similar to that of the Common Loon into at least the first summer. The degree of angularity between the mandibular rami and gonys in adults (and presumably young) is of no use in the field or hand. Bill gap and eye size require further testing before they can be treated as confirmed identification marks.

NOTE

As this manuscript neared completion an excellent and comprehensive article on identification of *G. adamsii* appeared in *British Birds* (Burn and Mather 1974). So that the reader will realize that we arrived at many of the same conclusions independently, using entirely different data, we have in no way modified the foregoing discussion.

Burn and Mather discuss three useful in-hand characters not treated herein but with which, upon further inspection, we concur (with certain reservations). These features hold for young birds but to a lesser, more variable degree than in adults. (1) In cross section (as viewed from the front), both mandibles of *adamsii* average more flat-sided, less swollen or convex, especially anterior to the nostrils. (2) The feathering at the base of the upper mandible in *adamsii* "always" extends several millimeters beyond the nasal turbercle, but in *immer* stops at or before the anterior edge of the tubercle. However, we have examined two specimens of *immer* (MVZ 60231 and 144199) in which the feathering clearly extends 1 mm beyond the tubercle. (3) In *adamsii* the mandibular rami fuse completely and evenly to form the gonys; this is true in some *immer* specimens, but most have a groove, more or less developed, continuing for a variable distance beyond the posterior edge of the gonys. We find this character difficult to use.

Measurements given by Burn and Mather confirm our supposition that, age for age, bill size distinctions between young of the two species vary in much the same manner as in adults. These authors do not discuss the auricular patch, eye size, neck thickness, bill gap, or certain features of the adult bill. Neither do they fully differentiate between nor elucidate the problems involved with the gonydeal angle and the degree of angularity between the gonys and mandibular rami. Unlike Burn and Mather, we use the terms "immature" and "young" to mean any bird from the time of acquisition of juvenal plumage through the second summer (Alternate II plumage; bird two years old); the term "juvenal" is restricted to birds in their first fall and early winter.

ACKNOWLEDGMENTS

We wish to thank Ned K. Johnson and Betsy Webb for use of specimens in their care, David L. Pearson and Terence R. Wahl for loan of photographs, and W. Earl Godfrey and Robert W. Storer for helpful comments. Arnold Small supplied his excellent photographs for Figures 1 and 2, and Ken Carlson prepared Figure 3. Will Russell and Richard Stallcup kindly provided notes in their possession. The detailed field notes of the following people were extremely helpful: Alan Baldridge, Bruce Broadbooks, David DeSante, Richard Erickson, Ronald LeValley, Clarence B. Maynard, R. Guy McCaskie, Peter Metropulos, Tom Schulenberg and G. Shumway Suffel. Wayne C. Weber kindly reviewed the manuscript.

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