REPRODUCTIVE BEHAVIOR OF THE YELLOW-BILLED LOON, *GAVIA ADAMSII*

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Little is known about the Yellow-billed Loon (*Gavia adamsii*). Its reproductive behavior has not been investigated apart from short observations by Kretzschmar and Leonowitsch (1965) and Sage (1971). We studied this species in Alaska as a part of an ethological study of the family Gaviidae.

STUDY AREA AND METHODS

The study was conducted in the Alaktak area of northern Alaska, about 80 km southeast of Point Barrow, from 1 July through 26 August 1972. This site was the only one found where the species occurred, although the areas around the camps of the Naval Arctic Research Laboratory at Meade River, Peard Bay and Teshekpuk Lake were checked on foot and from the air. Of 33 pairs located, 10 were checked at least once a week throughout the study period, and four were followed closely (table 1). It was not possible to follow any one pair during the whole breeding cycle. Most pairs were already incubating when we first visited the area, and the young were only half-grown when we left in August. Data on courtship and copulation stem from two pairs attempting to renest and from one pair that never nested.

Direct observations as well as still and motion-picture photographs were made from tent blinds and from natural concealment. Unfortunately, blinds are very conspicuous on the flat and open tundra; they obviously disturbed the birds, who avoided them. Although we do not believe that the presence of the blinds influenced the performance of displays, it may have affected their frequency and certainly the sites chosen for them. Observations were recorded for 231 h (table 1) at all times of day and night. Observation often was interrupted or disturbed by lengthy spells of fog and strong wind. The sex of the birds was determined by observing copulations and noting individual peculiarities in bill and plumage.

Vocalizations were recorded on an Uher Report 4400 tape recorder with a Sennheiser MD 21 microphone and a 50 cm parabola. All birds recorded were breeding, and all recordings were made during the pre-hatching period.

VOCALIZATIONS

The vocalizations in this species were generally the same as those of *G. immer* (Sjölander and Ågren 1972). All calls, however, were pitched about half an octave lower and were executed more slowly, at least the *tremolo* and the *yodeling*. Terminology follows that for *G. immer* (Olson and Marshall 1952, Sjölander and Ågren 1972). Audiospectrograms of most vocalizations are presented in figure 1. An analysis of the situations where different calls were heard is presented in table 2.

Low Call. A very weak, low-pitched, one-note call, heard only in calm weather from birds close to the observer (< 50 m). Performed by both sexes.

Moaning. The call closely resembled a human moan, but when performed at higher intensity, a break to a higher note occurred in the middle. Performed by both sexes.

Wailing. This call was very like the howling of a wolf. It started like the *yodeling*, but stayed on the first note and then slowly diminished with a slight rise in the middle. Performer not identified.

Yodeling. As can be deduced from the audiospectrogram, this long call is characterized by sudden breaks between tones. It is easily mimicked by a low-pitched human whistle. In calm weather, the greatest distance at which we could hear this call was over 8 km. In five ascertained cases, the caller was a resident male.

Short Yodeling. In 12 instances, we heard a short version of the *yodeling* in which the call stopped after the first break. Performer not identified.

Choked Yodeling. In four instances, yodeling was given by a bird in the Fencing Posture. Presumably because of the posture, the sound was choked, but otherwise normal. In one known instance, it was performed by the resident male of a pair with young.

Tremolo. This is equivalent to the well-known "laughing" of *G. immer*, although lower in pitch and slower. In 92 of 128 cases it was performed antiphonally by pairs; the male's pitch was one to two notes lower than the female's.

Chirping. A shrill, garbled note 1–2 sec long and similar to the call in other young loons (Sjölander, unpubl. data). Heard only from young.

DISPLAYS

Different behaviors assumed to have a display function are depicted in figure 2. A situation analysis is presented in table 3.

TABLE 1. Distribution of observation time. Numbers of pairs observed more than 50% of the time are given in parentheses.

Reproductive stage	Hrs obs	Pairs obs
Prenesting	123	12 (5)
Nesting	22	8 (4)
Post-nesting	86	4 (2)

Raised Neck. The bird stretches its neck in a smooth S-curve, with the bill pointed obliquely upward (fig. 2b). The neck feathers are sleeked, and the body sits lower than normal in the water. Performed by both sexes.

High Front. The posture is similar to the Raised Neck, but the neck is less elongated and sleeked. The front feathers on the head are raised in a conspicuous bulge (fig. 2c). The posture was in most cases accompanied by the *tremolo* vocalization. Performed by both sexes.

Short Neck. The neck is very short, and the bill held downward so far that it may touch the breast (fig. 2g). Performed by females, though a similar posture is exhibited by males when seeking nest sites (see Nest Choice).

Mock Sleep. The bird adopts its normal sleeping posture with the bill under the wing, but the uncovered eyes are open, and the bird swims actively. Performed by both sexes.

Fencing Posture. The bird rises almost straight up and treads water; its bill is held towards the breast and its wings folded or extended (figs. 2h, i). It may retain this posture for considerable time (42 sec max. observ.), either remaining stationary or occasionally leaping clear out of the water. When leaping, the head and neck are moved forward and backward; the movement may then become elaborated into Bow-jumping (below). During this posturing and leaping, in 11 of 20 cases, the bird turned through up to two and a half complete revolutions around the body axis. Performed in two ascertained cases by a resident male.

Bow-jumping. This behavior (fig. 2k) seems to be a combination of the Fencing Posture and Bill-dipping (below). From the Fencing Posture, with the wings folded (3 cases) or extended (9 cases), the bird bows forward and submerges its head as in Bill-dipping, although the wings, if extended, remain so. The bird then rises again to the Fencing Posture, then bows again, etc., at intervals of about 2 sec. Up to seven consecutive bows

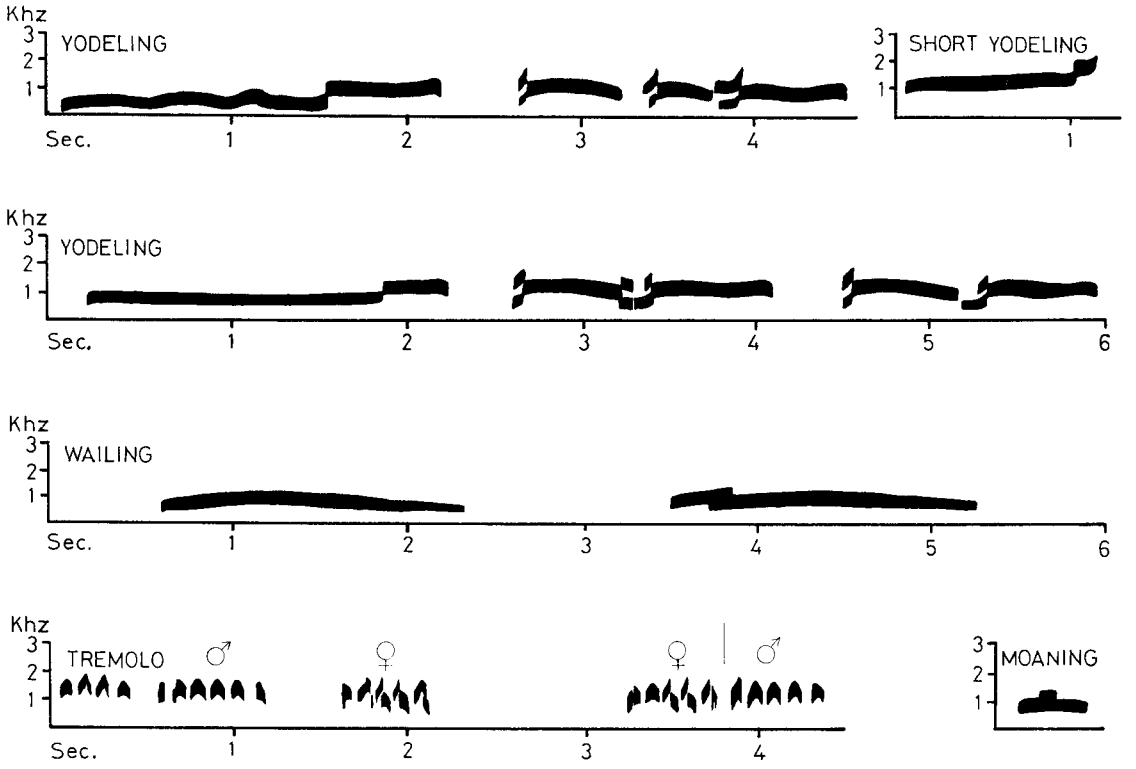

FIGURE 1. Audiospectrograms of vocalizations in *Gavia adamsii*. The *yodelings* are from two different males, the *wailing* from a bird of undetermined sex, and the *moaning* from a male. The *tremolo* is given antiphonally by a pair.

TABLE 2. A summary of the different situations in which various vocalizations were given by resident, breeding pairs of *G. adamsii*.[a]

Situation	Tremolo	Low call	Moaning	Wailing	Yodeling	Choked yodeling	Σ
Pair alone, no stimulus observed	1	8		11	15		15
Within 1 min after vocalization of *G. adamsii* in another lake	14		2	9	28		53
As above, with *G. arctica*					3		3
G. adamsii flying over	1				1		1
Other *Gavia* flying over	2						2
G. adamsii intruder, pre-hatching	2	1		1	1		4
G. adamsii intruder, post-hatching	5					2	7
⩾2 *G. adamsii* intruders	8			3	4	2	8
Partner absent or out of sight	1		3				3
Young out of sight		2	6				6
Human approaching	94						94
Within 10 min before copulation or Going Ashore		5					5

[a] The numbers indicate the number of situations in which vocalizations were heard, regardless of the number of calls given. Σ = the total number of situations where any vocalization was heard.

were observed, alternating with the jump-like rises to the Fencing Posture. Twice, a clear left-right-left alternating orientation of the head in the bows was observed. Not all bows were completed until head submergence, and in three cases series of bows were interspersed with incomplete bows. In four cases, the bird, still in the Fencing Posture, gave the *choked yodeling*. The bird moved forward 0.1–0.2 m when rising after a bow, and thus advanced slowly when performing the behavior. Exceptions were two birds near shore that remained in place but described a half turn and full turn, respectively. Performed in three known cases by a resident male with young.

Bill-dipping. The bird lowers and submerges its bill and the front part of its head in the water (fig. 3e). This behavior usually (table 3c) occurs in connection with the Raised Neck or High Front displays. It differs from the normal peering by being performed much more quickly, the whole sequence lasting less than 0.5 sec. Performed by both sexes.

Splash Dive. The bird suddenly dives with an audible splash and spray, in contrast to its normally silent, gliding manner of submergence (fig. 3). This behavior often (31 cases) was preceded by the Raised Neck posture. In seven of 34 cases it was observed within 10 sec of a Rushing display (below), but it also was observed following Fencing Posture (5 cases). Performed by both sexes.

Jerk Swimming. The bird swims slowly while moving head and neck jerkily forward and backward about every other second (figs. 2f, 3). In 66 cases, this behavior was performed by two birds approaching each other and "jerking" and Bill-dipping simultaneously. Performed by both sexes.

Rushing. The bird runs along the surface with its wings either folded (N = 12, all short rushes) or half-extended and flapping at about the same speed as when taking off (fig. 5). In three cases, a Rushing imperceptibly evolved into an actual take-off. Apart from Raised Neck, Bill-dipping, and Fencing Posture (once), no intention movement preceding Rushing was detected. The birds began suddenly, rushing in wide loops over the lake. The longest Rushing seen covered at least 450 m, and in this case, as well as in at least four others, the bird, when finishing, returned to the other birds (intruders, table 3) at a distance closer than half the maximum achieved during the Rushing. In 25 of 31 cases, when a bird started Rushing, another individual was closer than 1 m, but we have no information as to possible releasing factors from the other birds. Performed by both sexes.

Search Swimming. In the Short Neck posture, the bird swims slowly along the shore, so close as touch it occasionally with the breast, attempting to climb the shore in suitable places. Performed by females.

Going Ashore. The bird climbs the shore and lies down in the Short Neck posture with its head pointing inland. This behavior differs from on-shore defecation where the bird immediately turns around, defecates, and goes back into the water, and where the Short Neck posture is not shown. The behavior was performed by females, though males behaved similarly, but with a less pronounced Short Neck, when searching for future nest sites (see Nest Choice).

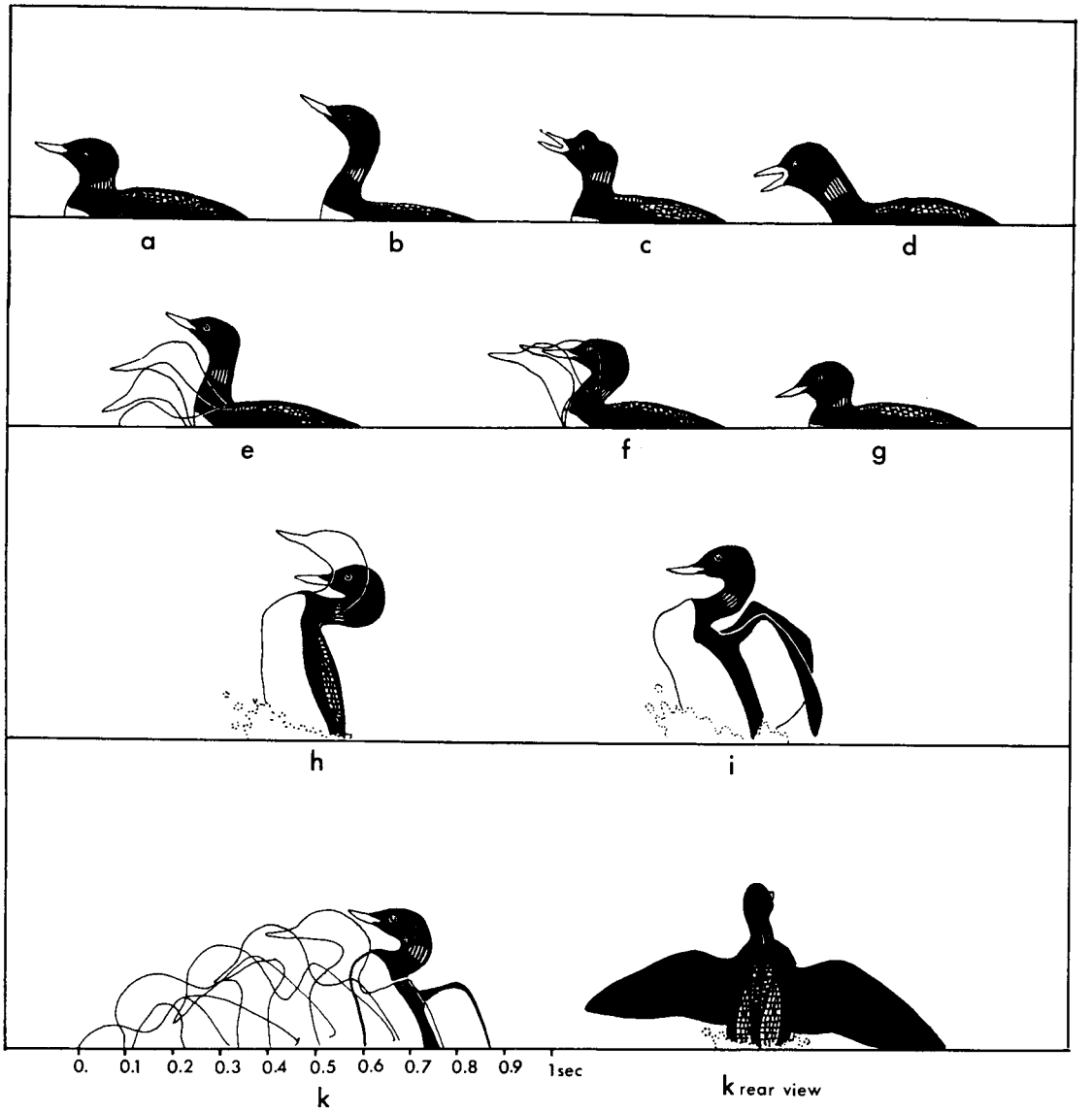

FIGURE 2. Displays of *Gavia adamsii*. a: normal, resting posture; b: Raised Neck; c: High Front; d: calling posture; e: Bill-dipping; f: Jerk Swimming; g: Short Neck; h: Fencing Posture with folded wings; i: Fencing Posture with spread wings; k: Bow-jumping. All drawn directly from film frames or photos.

REPRODUCTION

TERRITORY

We never found two pairs on the same lake (lakes are extremely abundant in the area), and it is thus difficult to estimate the area defended by one pair. The area of the smallest nesting lake was about 20 ha; the largest covered over 150 ha. Of 14 nesting lakes measured, areas of 10 ranged from 30 to 50 ha. In all these lakes, the territorial behavior consisted simply of the resident pair's approaching and threatening any intruding individual. The greatest distance from a nest where Bow-jumping against an intruder was observed (performed by one resident bird, sex undetermined) was over 400 m. The behavior during different situations of intrusion or disturbance is presented in table 3.

COURTSHIP

The only behaviors consistently shown in connection with copulation were mutual Jerk Swimming with dive (table 3, fig. 3), and, directly prior to copulation, Search Swimming and Going Ashore. However, in eight cases the birds started Search Swimming without any preceding Jerk Swimming. In three cases, the female, during her stay ashore, made nest-building movements with her bill.

TABLE 3. Situation analysis of displays of *Gavia adamsii*.[a]

	a	b	c	d	e	f	g	h	i	k	l	m	n	o	Σ
Pair alone, no situation change observed	3	2	6		14	21	1		1			39	33	3	39
Conspecific visiting resident non-breeding pair	4	4	4	3						2	1	2	2	2	4
Conspecific visiting pair in copulation period	3	3	3	3	3	3				2	1	2	2	1	3
Conspecific visiting incubating pair	1	1	1								1				1
Conspecific visiting pair with young	7	5	5	5	4	3	1	1	1	3	3			2	7
Two or more conspecifics visiting resident non-breeding pair	3	3	3	2	2	2	2	1	2	2	2		1	1	3
Two or more conspecifics visiting pair with young	5	5	5	5	5	5	5	5	5	5	5			5	5
Gavia-species flying over pair	3	3	2	1											3
Other species flying over pair	8	2	4												-
Pair partner returning from absence	3	1	1												4
Pair with temporarily lost young	6	2													6
Human approaching resident non-breeding pair	58	36	18												58
Human approaching incubating pair	29	29					1				2				29
Human approaching pair with young under 10 days	38	38	38	13			3			1	1				38
Human approaching pair with young over 10 days	42	28	18	2											42
At nest relief	4		4									6			6
60–10 min. preceding copulation or invitation					2	17			1			19	3	6	33
10–1 min. preceding copulation or inv.					1				1			33	24	4	33
Within 1 min. preceding copulation or inv.						1			1			33	33	1	33
Total	217	162	112	34	31	52	13	7	12	15	16	134	98	25	

[a] a: Raised Neck; b: High Front; c: Bill-dipping; d: Splash Dive; e: Jerk Swimming; f: mutual Jerk Swimming and Splash Dive; g: Fencing Posture with folded wings; h: Fencing Posture with spread wings; i: Bow-jumping; k: Rushing, < 10 m; l: Rushing, > 10 m; m: Short Neck; n: Going Ashore; o: Mock Sleep. The Σ signifies the number of situations in which one or more of the displays was observed. "Conspecific" indicates only *G. adamsii*.

COPULATION

Only three completed copulations, in two pairs, were observed, and of these only two were recorded clearly. The male simply followed the female ashore, crawled up to her, and mounted (fig. 4), making cloacal contact for 9 and 12 sec, respectively. He then dropped down beside the female and immediately returned to the water while the female remained ashore for 130 and 210 sec, respectively. In one case, the female made weak nest-building movements with her bill during this stay.

NEST CHOICE

No selection ultimately resulting in a nest was observed, but in all three courting or copulating pairs the male went ashore (1, 3, and 3 cases seen in the respective pairs) and made nest-building movements. In nine additional pairs both birds went ashore in different places, one of them in a pronounced Short Neck posture (the female in four known cases) and the other making nest-building movements (seven instances). All 10 nests located were within 2 m of the shore and 1 m above the water. Most were at the very edge

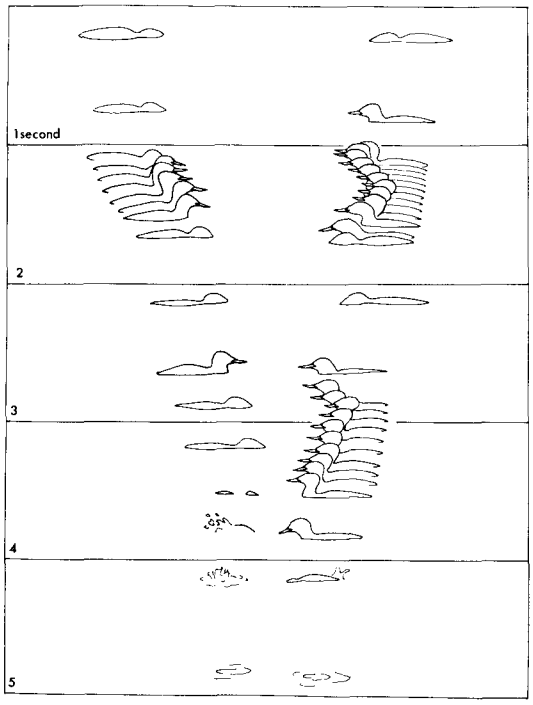

FIGURE 3. Jerk Swimming. Drawn from a film sequence of a pair during pre-copulatory display.

(seven instances). They consisted of a simple depression in the shore grass, 30–40 cm in diameter; only four included any loose nest material. Three nests were on small islets (< 2 m in diam.), and two were on small peninsulas. The remaining nest lakes included no islets or peninsulas, and the nests consequently were on the shore. No preference for any geographical position along the shore was noted. No nest-building was observed, apart from the nest-building movements seen during Going Ashore and occasionally at nest relief (below). The birds performing these movements picked moss or straw from the immediate vicinity of the nest, pulled it in, and arranged it around the body. We never saw material carried to the nest.

INCUBATION

In all four pairs, both parents incubated the eggs. The periods varied greatly, from a minimum of 220 sec to a maximum of at least 14 h. We observed nest relief six times. Twice, the relieving bird went ashore before its mate left; three times the sitting bird left the nest as its mate approached the shore directly in front; once, a sitting male left the nest, apparently spontaneously, while his mate was at least 50 m away and showed no signs of approach, although she started as soon as he appeared on the water. In four instances the sitting bird made nest-building movements as its mate came to relieve it.

The eggs were turned at irregular intervals of from 12 sec to over 6 h. When turning the eggs, the sitting bird rose to about 45°, bent its neck, and stiffly poked at the eggs with its bill (closed or slightly open).

An incubating bird always sat in a normal resting posture with its head towards the water and even slept for short periods (< 1 min) without tucking the head under the wing. Sitting birds also caught insects. When disturbed, the birds adopted the Raised Neck posture. No sitting bird allowed a human to come closer than 40 m before leaving the nest, lowering its neck, and silently sliding into the water to surface out on the lake. Loons never called while on the nest, but disturbed birds usually uttered the *tremolo* once they surfaced (table 2). Twice, birds were surprised on the nest; each jumped from the nest and started short rushes (< 50 m). One of these birds twice interrupted the Rushing and adopted the Fencing Posture with folded wings before resuming Rushing, and ending with a Splash Dive.

HATCHING

The eggs of six pairs hatched between 18 and 21 July, but hatching was not actually seen. These pairs, as well as all others checked, had two eggs. As all eggs observed to hatch were already laid when we arrived, we could not determine incubation time. Judging from the time of ice thaw in the area, however, between 27 and 29 days seems probable. Eggshells were removed from the nest (not observed), leaving only fragments smaller than about 2 cm^2. Egg linings were found on the shallow lake bottom outside two nests, 2 and 7 m away (loon egg linings are thick and usually left as a bag, although the movements of the sitting bird crush the empty shell).

PARENTAL BEHAVIOR

All six pairs observed within the first three days after hatching were brooding their young on the shore, either on the nest or on some lee part of it. It was not possible during this period to observe the birds without disturbing them, due to fog, but as the birds were on land when discovered 14 of 16 times, we suspect that they spent most of the day and night on land. We did not see the young brooded ashore after they were nine days old. Instead, they were warmed on the water under the wing or on the back of the parent, until 16

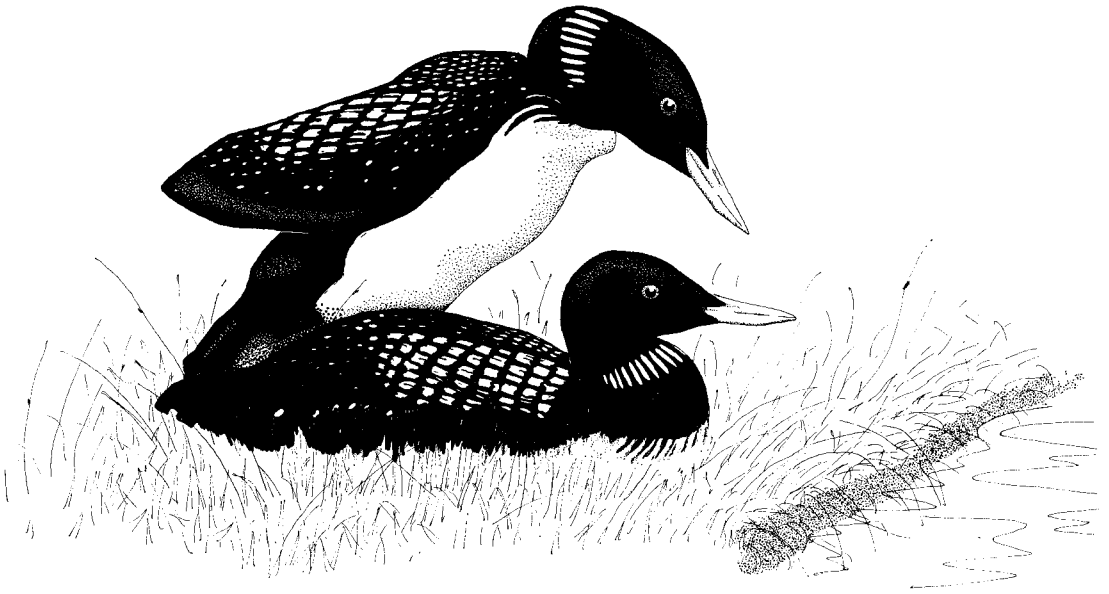

FIGURE 4. Copulating pair of *Gavia adamsii*. Drawing based on photo and sketch made during visual observation.

days old. Upon perceiving a human, the birds immediately withdrew to the water and swam out on the lake where in 13 of 16 cases they started to feed their young. The birds reacted by displaying in only a few instances (table 3).

Both parents fed the young, diving and fetching fish 4–6 cm long (determined by comparison to bill length). Prey were not identified but Grayling (*Thymallus arcticus*) was common in the lakes. In about 15% of all observed feedings, the food consisted of plant material. The parents seemed to have no difficulty getting food even in rough waves and winds in excess of 15 m/sec. The food was held transversely in the bill-tip and offered to the young. If dropped by the young, the parent picked up the food and offered it again. Feeding took place in bouts, with both parents taking part in 42 of 46 instances observed. The longest uninterrupted bout lasted 83 min and the maximum number of bits offered was 73 (22 August when the young were only half-grown). The dives during such a bout averaged 52 sec, (R = 8–104 sec, N = 50). Feeding did not differ between the sexes, and we never saw food passed from one parent to another. Food always was obtained from the nesting lake.

When begging for food, the young swam in semi-circles in front of the parent, nibbling at the latter's breast feathers and *chirping*. Such begging lasted a maximum of 17 min before the parent reacted. During such long beggings, the parent occasionally (9 of 32 begging bouts longer than 4 min) adopted the Mock Sleep posture. All young were still being fed when we left, i.e. when they were about 35 days old. The young did not procure any appreciable amounts of food themselves although they were able to dive well (only six dives observed in one young over 30 days old, during 49 h of observation).

During the first 12 days, the young always were within 2 m of the nearest parent. This distance later increased to at least 30 m in undisturbed birds. When disturbed by intruding loons or by humans, the parents left the young and swam or dived away. The young swam to shore and lay motionless in the vegetation, although still on the water. When the disturbance was over, the parents swam together to the young, giving the *low call*, and the young then emerged and joined them. Six times, however, wind blew young out of sight of their parents who became obviously disturbed and swam rapidly together along the shore, *moaning* strongly with a clear break to a higher note in the middle. The young answered by *chirping*.

BEHAVIOR OF THE YOUNG

The only vocalization of the young was *chirping*. It was heard in connection with begging, and also when a young crawled ashore by itself, waiting to be joined by a parent and brooded. In the latter case, the *chirping* was longer and weaker. This vocalization also was

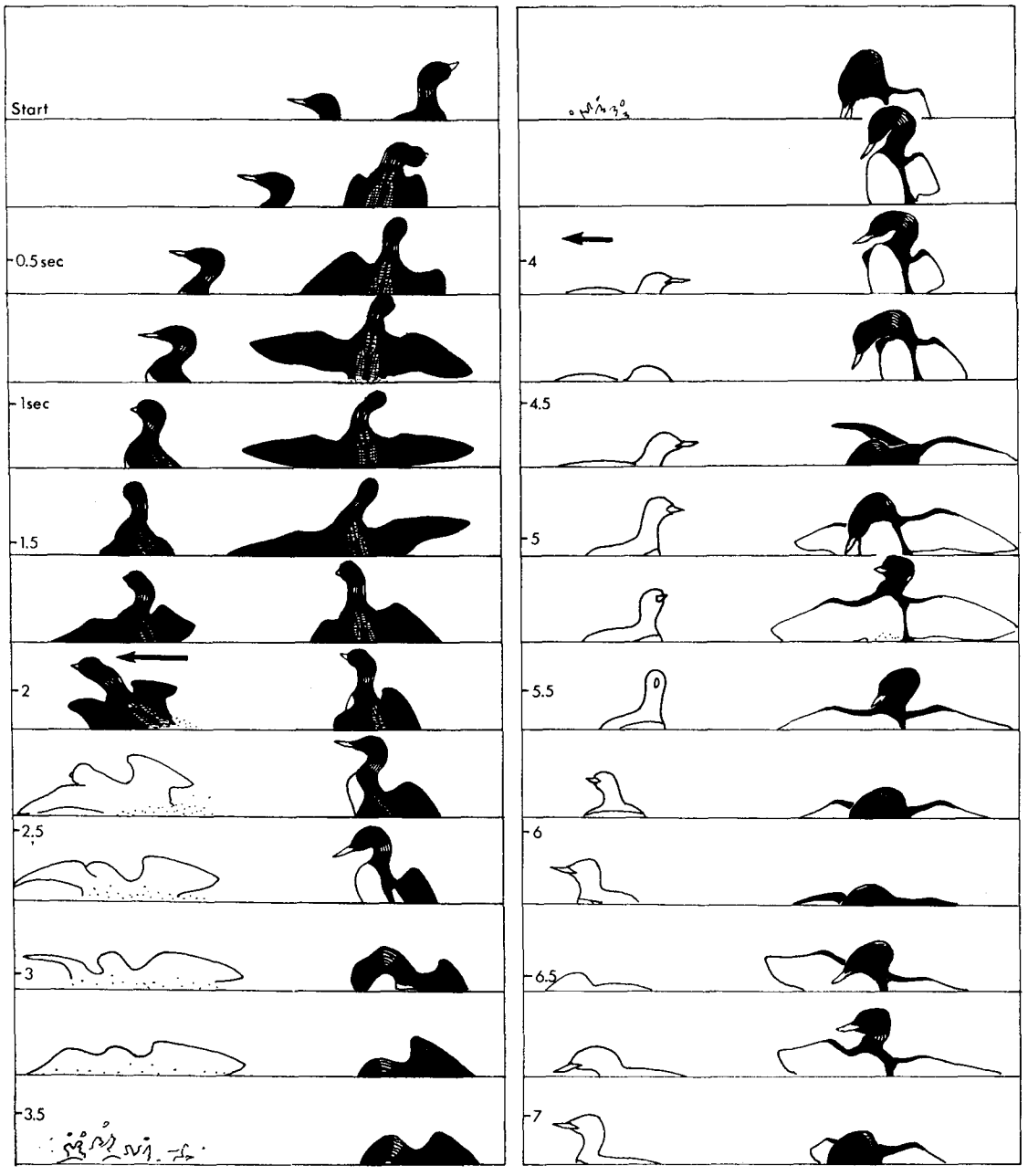

FIGURE 5. Encounter between a territorial male and an intruder. Drawn directly from a film sequence. The intruder is shown in outline when outside the picture frame drawn (distance between birds = 2–3.5 m).

given by young separated from their parents at disturbances; in two such cases the call sounded more like a garbled version of *wailing* (young > 26 and > 32 days old).

Young loons swam and steered easily from their first moment in water on the first day after hatching. However, young under 10 days old were unable to cope with strong winds (in excess of about 15 m/sec) which blew them away from their parents despite vigorous swimming (16 incidents). Two young attempted four dives during the first two days of age but did not succeed in getting below the surface. They improved rapidly, however, the longest dive for young under 10 days of age exceeding 2 m, for one 11–20 days, over 10 m, and for one 21–30 days, at least 40 m. The young did not try to take off or fly.

From the first day, the young defecated on land, as did the adults. They swam to the shore, climbed up, defecated in a strong jet, and immediately returned to the water. The

mean duration of 10 such visits was 12 sec. As the behavior occurred about every 2–4 h, it seems probable that no defecation took place on the water.

All pairs observed had two eggs, but a brood of two young was seen only once. In the four pairs most closely followed, one young disappeared during the first three days. We could not determine whether this was due to aggression between the young and consequent underfeeding, as occurs in *G. stellata* (Von Braun et al. 1968), because the young in the two-young brood were at least 6–8 days old (aggression probably had subsided). Only two fights, consisting of a few rapid peckings, were seen.

DISCUSSION

Even though the number of observations of different behaviors and individuals is small, the close similarity between this species and other loons, especially *G. immer*, aids interpretation of displays and other behavior. Because the vocalizations are essentially the same, we suggest the same interpretations for the different calls as in *G. immer* (Olson and Marshall 1952, Sjölander and Ågren 1972, Rummel and Goetzinger 1975). The *low call* and *moaning* are contact calls within pairs and families, the *low call* probably being a low-intensity form of *moaning*. We regard *yodeling* as a territorial call, *wailing* and *short yodeling* being forms of lower intensity. *Choked yodeling* is yodeling modified by posture, but with the same function. We regard the *tremolo* as a typical "warning" call. It is appropriate then that mates call antiphonally, as this should facilitate coordinated behavior in disturbance situations. It probably also accentuates the pair bond. We interpret *chirping* as a contact call. The sharp begging version and the longer, "freezing" one in *G. arctica* and *G. stellata* (Sjölander, unpubl. data) seem to exist in *G. adamsii* as well. In the former two species, *chirping* imperceptibly develops into *wailing/yodeling*, and a similar development in *G. adamsii* seems probable.

The postures and displays described here also are similar to those of *G. immer* (Sjölander and Ågren 1972). The Raised Neck consequently may be regarded as a posture adopted at general arousal, especially when the bird is frightened. The High Front posture may be interpreted as predominantly aggressive, because a bird assumes it when approaching intruders, instead of, as in the Raised Neck posture, when evading disturbances. Bill-dipping, performed whenever one bird meets a stranger or is disturbed, also may be regarded as a sign of general excitement. The Splash Dive may be interpreted as aggressive and typical of situations where a bird is expected to be alarmed. Although the Raised Neck and High Front postures, and the Splash Dive are all shown in territorial defense, they probably should not be termed primarily territorial, because they occur in other contexts as well.

The Fencing Posture, Bow-jumping and Rushing, however, as in *G. immer* (Sjölander and Ågren 1972), have been observed almost solely in territorial contexts. Kretzschmar and Leonowitsch (1965) regarded these displays, as well as *yodeling*, as courtship, without giving their reasons. This is a point of dispute regarding all loon species because the conspicuous Fencing Posture, Bow-jumping, and Rushing, similar in all four species (*G. arctica*: Sjölander 1968, Lehtonen 1970, Dunker 1975; *G. stellata*: Huxley 1923, Bylin 1971; *G. immer*: Olson and Marshall 1952, Sjölander and Ågren 1972; *G. adamsii*: Kretzschmar and Leonowitsch 1965), have been regarded as sexual behavior, especially by Huxley (1923), Lehtonen (1970) and Dunker (1975). None of these reports, however, has confirmed any connection between these displays and sexual or pair-forming behavior. The interpretation was based merely on the conspicuousness of the displays. Therefore, as these displays are performed in all four species primarily in response to intruders in the territory of already breeding pairs, we feel justified in concluding that the primary function is aggressive and territorial. Obviously, territorial behavior (e.g. in a single male) may attract mate-seekers, but this would be secondary. As all loons probably pair for life (Sjölander, unpubl. data) little need for elaborate courtship exists. We expected and found that *G. adamsii* followed the simple pre-copulatory pattern of the other loons (Sjölander 1968, Bylin 1971, Tate 1969, Tate and Tate 1970, Sjölander and Ågren 1972), i.e., a mutual Jerk Swimming and Splash Dive, followed by Search Swimming and Going Ashore.

Parental behavior we observed agrees with that in *G. immer* in particular (Olson and Marshall 1952, Sjölander and Ågren 1972). In all loons, both parents feed the young, who are dependent on them at least until leaving the nesting lake. It is also common that usually only one of the two young survives (Sjölander 1968, Lehtonen 1970, Bylin 1971, Sjölander and Ågren 1972). In *G. stellata* continuous

aggression between the young may cause one to receive less food and die of starvation within the first days (Von Braun et al. 1968). Similar vicious fights have been observed between the young of *G. arctica* as well (Sjölander 1968); hence, it seems likely that this behavior is common to all loon species.

On the whole, we found no major differences in the reproductive behavior of *G. adamsii* and *G. immer*. This, in turn, provides ethological support for the view that *G. adamsii* is only a subspecies of *G. immer* (Dementiev 1951, Palmer 1962, Burn and Mather 1974).

SUMMARY

Breeding behavior of the Yellow-billed Loon (*Gavia adamsii*) was studied in northern Alaska. Pairs were highly territorial, using both displays and calls in territorial encounters. Copulations, preceded by very little courtship, took place on land. The nest site was chosen by the male. Both sexes engaged in limited nest-building, mostly at nest relief, throughout incubation (estimated to be 27 days). Both parents incubated the eggs. The young left the nest at hatching but were brooded on the nest or on shore during the first days. Both parents fed the young, mostly with fish but also with plants. All pairs had two eggs, but only in one case were two young reared.

The observations revealed no major differences between *G. adamsii* and *G. immer* in reproductive and territorial behavior. They support the view that the Yellow-billed Loon is a subspecies of the Common Loon.

ACKNOWLEDGMENTS

Our investigation was supported by the Swedish National Research Council and the Swedish-American Foundation. We would like to thank the Naval Arctic Research Laboratory for the use of their transportation and supply facilities, Henning Dunker for critical comments on the manuscript, and Davis W. Jones for correcting the English.

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