Time budgets of Surf Scoter broods

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Abstract

We quantified time budgets of Surf Scoter *Melanitta perspicillata* broods at Lake Malbaie, located in the Laurentide Wildlife Reserve, approximately 95 km north of Quebec City. In 1994, the lake harboured 40 breeding pairs of Surf Scoters, the largest and most southerly breeding concentration known. Over 200 hours of observation were distributed among at least 11 different broods. In general, resting and feeding bouts of females and young were synchronized. Feeding bouts for class I young averaged longer (30.2 ± 3.7 minutes) than resting bouts (23.1 ± 1.9 minutes). Overall, young spent more time feeding than females (58% vs. 32%), more time resting (27% vs. 18%), but less time in alert posture (2% vs. 36%). Females spent more time in alert posture with young ducklings than with older ones (41% vs. 22%). Duckling activity was highly synchronized, and transitions between feeding and resting bouts lasted less than five minutes. Preening occurred during these transitions and was more prevalent following feeding bouts than after resting bouts. Overall, time budgets of females and broods at Lake Malbaie were similar to those measured in northern Quebec and similar to time budgets of other waterfowl.

Résumé

Nous avons quantifié l'emploi du temps de la progéniture des Macreuses à front blanc (*Melanitta perspicillata*) au lac Malbaie, situé dans la réserve faunique des Laurentides, à environ 95 km au nord de Québec. En 1994, 40 couples de Macreuses à front blanc habitaient près du lac, la concentration la plus importante et la plus au sud connue. Plus de 200 heures d'observation ont été réparties entre au moins 11 couvées différentes. En général, les périodes de repos et d'alimentation des femelles et des jeunes étaient synchronisées. En moyenne, les période d'alimentation (30,2 ± 3,7 minutes) des petits de classe I étaient plus longues que les périodes de repos (23,1 ± 1,9 minutes). Dans l'ensemble, les jeunes passaient plus de temps à se nourrir que les femelles (58 p. 100 par rapport à 32 p. 100), plus de temps à se reposer (27 p. 100 par rapport à 18 p. 100), mais moins de temps en posture de vigilance (2 p. 100 par rapport à 36 p. 100). Les femelles passaient plus de temps en posture de vigilance avec les jeunes canetons qu'avec les plus vieux (41 p. 100 par rapport à 22 p. 100). L'activité des canetons était fortement synchronisée, et les périodes de transition entre les périodes de repos et d'alimentation duraient moins de cinq minutes. Le lissage avait lieu durant ces périodes de transition, et la fréquence en était plus grande après les périodes d'alimentation que celles de repos. Dans l'ensemble, l'emploi du temps des femelles et de leur progéniture, au lac Malbaie, était semblable à celui observé dans le nord du Québec et à celui d'autres espèces de sauvagine.

1.0 Introduction

Surf Scoters *Melanitta perspicillata* are among the least studied waterfowl species in North America (Bellrose 1976; Palmer 1976). Little is known of their breeding ecology, undoubtedly because they breed in remote areas at low densities (Savard and Lamothe 1991). The recent discovery of a lake with about 50 breeding pairs near Quebec City opened up opportunities to document several aspects of the breeding ecology of Surf Scoters (Reed et al. 1994; Lesage et al. 1997; Morrier et al. 1997). In this paper, we present data on time budgets of Surf Scoter broods.

2.0 Study area and methods

The study was conducted at Lake Malbaie (47°34'N, 71°00'W) in the Laurentide Wildlife Reserve, 95 km NNE of Quebec City. Two wooded islands are found on this 664-ha shallow lake (mean depth ~2 m; maximum depth 7 m). The lake is within a mountainous enclave mostly >800 m above sea level and is characterized by the presence of high boreal plant communities that typically occur farther north (Richard 1975). Lake Malbaie and a few other nearby lakes are probably ecologically similar to those used by Surf Scoters in more northerly areas.

Time budget data were collected during 36 observation periods of 2–4.5 hours, for a total of ~200 hours, between 9 July and 5 September 1994. The behaviour of

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Figure 1
Time budgets of adult female Surf Scoters and broods

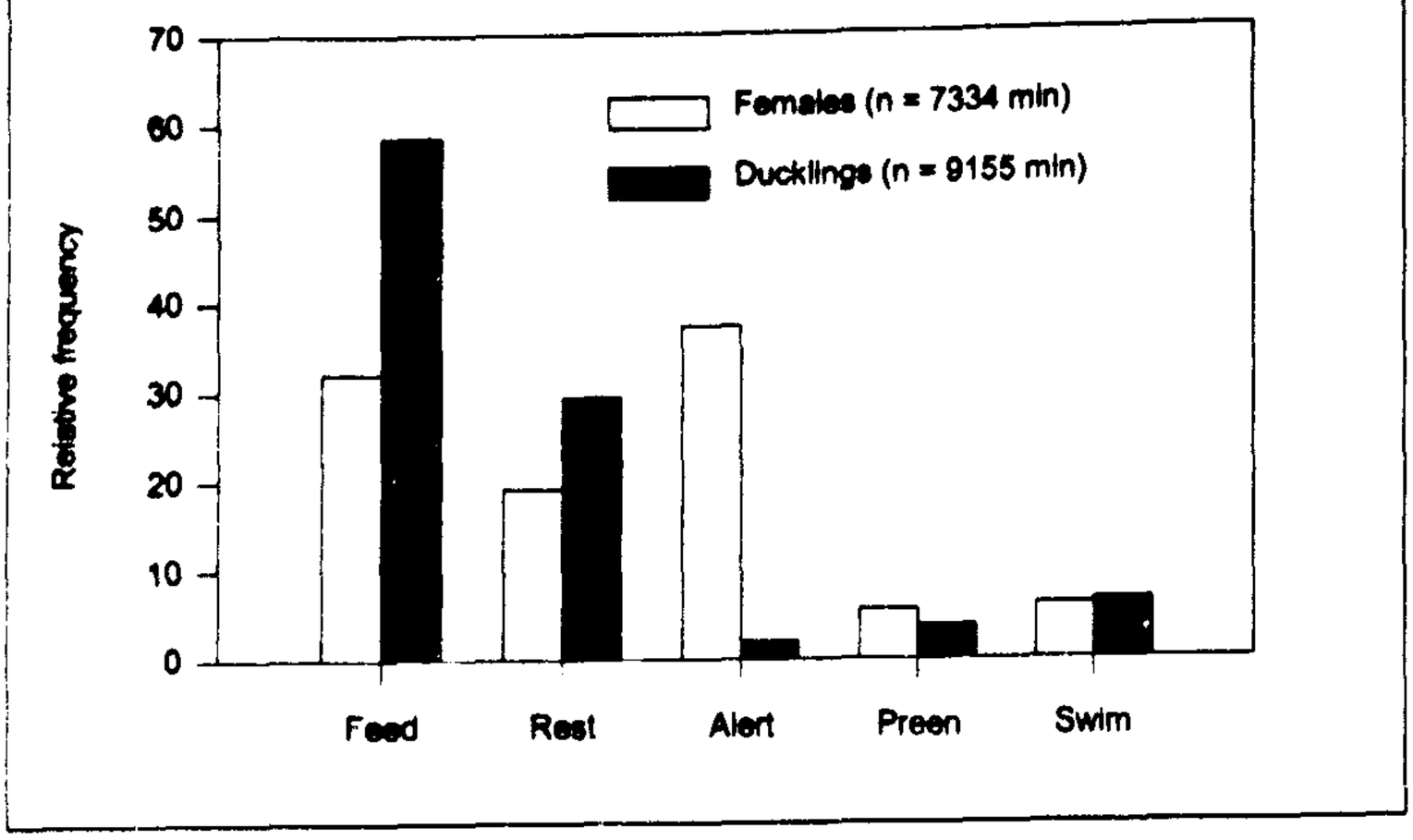

Table 1
Behaviour of adult female Surf Scoters in relation to time of day and brood age

	Relative frequency (%)										Length of observation (minutes)	
	Feed		Rest		Alert		Preen		Swim			
Time of day	Class I	Class II	Class I	Class II	Class I	Class II	Class I	Class II	Class I	Class II	Class I	Class II
05:00–09:00	24.4	81.2	28.4	0.0	39.5	7.4	4.9	11.5	2.7	0.0	958	49
09:00–13:00	25.3	59.0	19.4	6.5	46.3	24.7	4.1	5.0	5.0	4.8	2796	805
13:00–17:00	26.8	38.6	23.9	1.2	35.2	35.4	4.8	23.0	9.4	1.8	1392	151
17:00–21:00	25.6	75.1	21.3	10.0	40.4	2.5	3.7	4.6	8.9	7.8	1078	105
	25.6	58.5	22.6	5.0	41.0	22.2	4.3	10.3	6.5	4.0	6224	1110
Global	32.1		19.1		37.3		5.5		6.0		7334	

hens and broods was observed with a spotting scope from a blind hidden on the shore.

The behaviour of the hen and the dominant activities of the brood were classified as feeding, alert, resting (including sleeping), preening (including other comfort movements), social interaction, and swimming (locomotion). Data were recorded at one-minute intervals. For each female observed, we recorded the number and age of ducklings accompanying her. The age of ducklings followed the classification of Gollop and Marshall (1954). Data were compiled on a per brood and per observation period basis to ensure independence of the data.

We estimated a total population of 10–15 broods, based on a maximum count of 80 young on 18 July. The number of young per brood varied throughout the period because of frequent exchange of young between broods.

Two-way analysis of variance (ANOVA) was used to compare the mean feeding and resting periods of broods for four time periods (05:00–09:00, 09:00–13:00, 13:00–17:00, 17:00–21:00) and two age classes (class I: ≤21 days; class II: ≥22 days; Lesage et al. 1997). The average lengths of feeding and resting bouts for each brood were transformed using the natural logarithm to normalize the data. We also verified the homogeneity of variances. Two-way ANOVA was also used to analyze the time budgets of females and broods in relation to time of day and brood age. Data were transformed using the arcsine value of the square root of the proportions. When this failed to normalize the data, we performed non-parametric ANOVA on ranked values. Two-way interactions were examined in all cases. However, in no analysis were they significant, so they are not presented.

3.0 Results

Time budgets of females and broods were different (Fig. 1). Young spent nearly twice as much time feeding, more time resting, but a similar amount of time preening and swimming. The most common activity of the adult female was watching over her brood (Alert, 38%).

Female behaviour was different over the day and between brood ages (Table 1). Females fed more (ANOVA ranked values, $F = 26.4$, $P = 0.0001$) and rested less

Table 2
Behaviour of Surf Scoter broods in relation to time of day and brood age

	Relative frequency (%)										Length of observation (minutes)	
	Feed		Rest		Alert		Preen		Swim			
Time of day	Class I	Class II	Class I	Class II	Class I	Class II	Class I	Class II	Class I	Class II	Class I	Class II
05:00–09:00	53.3	72.9	36.9	18.6	0.6	0.0	3.5	5.9	5.7	2.6	1318	90
09:00–13:00	53.3	76.2	35.5	13.1	2.2	1.1	2.5	5.8	6.5	3.8	3340	1104
13:00–17:00	50.4	71.0	35.8	19.3	1.9	0.0	3.1	7.9	8.8	1.8	1785	151
17:00–21:00	64.7	68.7	20.3	17.9	4.4	0.0	2.4	7.5	8.2	5.9	1162	205
	54.7	73.4	33.0	15.9	2.2	0.5	2.8	6.6	7.3	3.6	7605	1550
Global	58.5		29.4		1.9		3.6		6.5		9155	

(ANOVA ranked values, $F = 12.1$, $P = 0.0008$) when accompanying class II broods than with class I broods. Neither feeding ($F = 0.82$, $P = 0.48$) nor resting ($F = 0.38$, $P = 0.77$) varied significantly with time of day. Females with older broods were less alert than those with younger broods (ANOVA, $F = 14.2$, $P = 0.0003$). Alert behaviour was marginally influenced by time of day ($F = 2.33$, $P = 0.08$), but a clear pattern was evident only for females with class II broods. They were more frequently alert during the late morning and early afternoon. Preening appeared to occur more frequently in females with class II broods than in those with class I broods; however, this difference was not significant (ANOVA ranked values, $F = 1.23$, $P = 0.26$), nor was there evidence of changes in the frequency of preening behaviour over the course of the day ($F = 1.75$, $P = 0.16$).

Brood behaviour varied with brood age but not with time of day (ANOVA, $P \geq 0.74$), except for alert behaviour ($F = 4.74$, $P = 0.004$) (Table 2). Older broods (class II) spent more time feeding (ANOVA, $F = 4.17$, $P = 0.044$) and rested less (ANOVA, $F = 4.53$, $P = 0.036$) than younger broods (class I). There was a tendency for older broods to be less alert (ANOVA ranked values, $F = 3.61$, $P = 0.06$) and preen more (ANOVA ranked values, $F = 3.82$, $P = 0.054$).

We also examined the behaviour of the female when her young were either feeding or resting (Fig. 2). To some degree, the behaviours of females and their young were similar. Female behaviour also differed with the age of her brood. When her young were feeding, she fed more, was less alert, and rested less with older ducklings than with younger ones (Fig. 2). When her young were resting, she fed and preened more, rested less, and spent less time alert with older ducklings than with younger ones (Fig. 2).

During the day, young alternated feeding and resting bouts. Transitions from resting to feeding bouts (Fig. 3) were more abrupt and rapid than those from feeding to resting (Fig. 3). It was during the transition from feeding to resting that most preening occurred.

Feeding bouts averaged longer than resting bouts (Tables 3 and 4). Length of feeding bouts did not vary significantly with brood age (ANOVA, $F = 0.14$, $P = 0.71$) or time of day ($F = 1.60$, $P = 0.20$) (Table 3). Resting bouts also did not vary with time of day ($F = 2.26$, $P = 0.11$; not including 05:00–09:00) but were, however, significantly shorter for older broods ($F = 12.8$, $P = 0.0005$) (Table 4).

4.0 Discussion

Time budgets of females and broods at Lake Malbaie were similar to those measured in northern Quebec, the centre of the breeding distribution in the province (Savard and Lamothe 1991; Bergeron et al. 1995), suggesting that the values measured reflect well the general behaviour of Surf Scoter broods. In most waterfowl species studied, females usually spend less time feeding and resting and more time alert than young (White-winged Scoter *Melanitta fusca*, Brown and Fredrickson 1987; Bufflehead *Bucephala albeola*, Gauthier 1993; Ring-necked Duck *Aythya collaris*, Maxson and Pace 1992).

In contrast to our findings, Hickey and Titman (1983) reported that female American Black Ducks *Anas rubripes* with class II ducklings spent less time feeding and more time resting than those with class I ducklings. Female Surf Scoters spent nearly half as much time in alert when accompanied by class II broods than with class I broods, whereas female American Black Ducks remained equally alert with ducklings of both those age classes (Hickey and Titman 1983).

The increase in preening in older ducklings seems to be a general trend in waterfowl (Hickey and Titman 1983; Eberhardt et al. 1989) and is thought to result from the acquisition of their new plumage.

Feeding bouts of class I broods averaged slightly shorter than those measured in northern Quebec (30.2 ± 3.7 minutes, $n = 50$ vs. 37.3 ± 3.6 minutes, $n = 28$; t-test, $t = 8.27$, $P = 0.0001$). In both areas, resting periods were shorter than feeding periods (Savard and Lamothe 1991). The differences in the length of feeding bouts between these two studies may reflect ecological differences at the two study sites. Durations of Surf Scoter brood feeding bouts were much shorter than those of Wood Ducks *Aix sponsa*, Ring-necked Ducks, or American Wigeon *Anas americana* measured in Michigan (Beard 1964).

The amount of time spent by females in alert behaviour did not seem to differ between Lake Malbaie, where boat traffic by anglers was frequent, and northern breeding areas, where human disturbance was minimal (Savard and Lamothe 1991; Bergeron et al. 1995). Overall, time budgets of Surf Scoter broods are similar to those of other waterfowl broods.

Figure 2
Behaviour of adult female Surf Scoters while young were feeding (class I, n = 3759 minutes; class II, n = 929 minutes) and resting (class I, n = 2645 minutes; class II, n = 181 minutes)

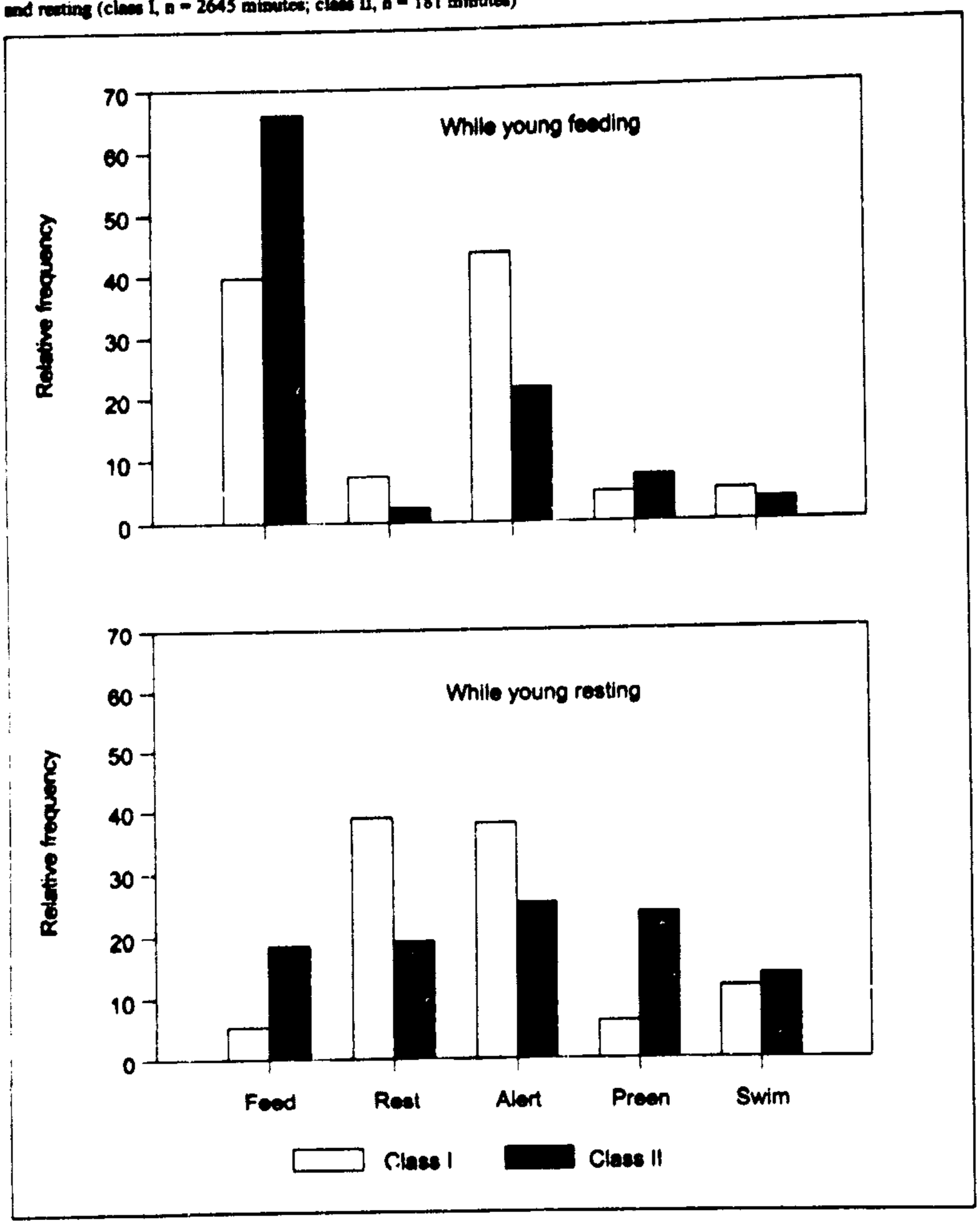

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Figure 3
Behaviour of Surf Scoter broods during transitions from feeding bouts to resting bouts and vice versa. Behaviour presented by five-minute periods: five minutes prior to change, five minutes after change, 5–10 minutes after change. Numbers above bars represent the number of minutes of observation.

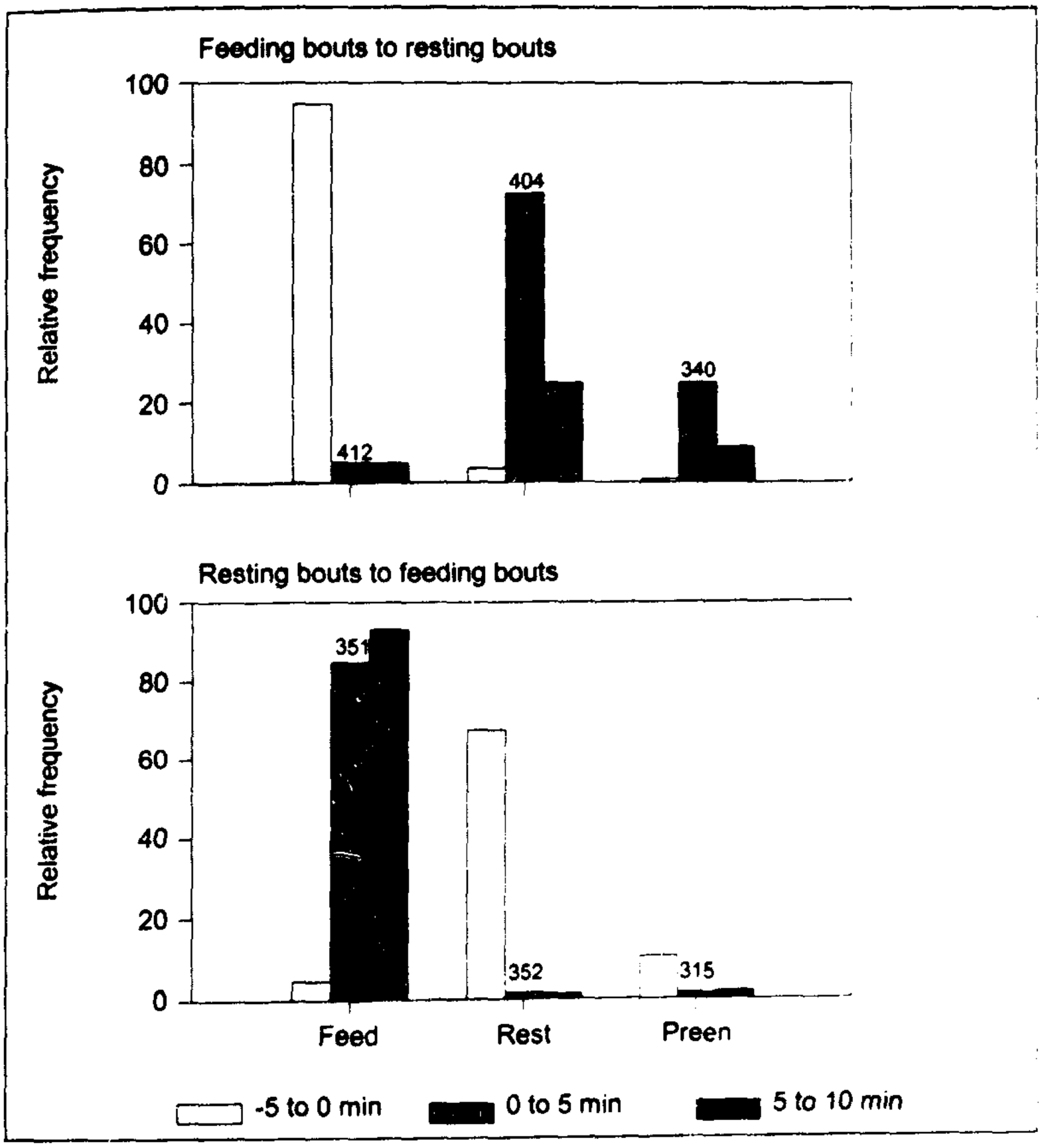

Table 3
Mean length of feeding bouts by Surf Scoter broods (in minutes) versus time of day and brood age[a]

	Time of day				
Class	05:00–09:00	09:00–13:00	13:00–17:00	17:00–21:00	Mean
I	29.2 ± 5.5 (9)	35.9 ± 8.4 (18)	24.3 ± 5.9 (14)	28.8 ± 5.6 (9)	30.2 ± 3.7 (50)
II	27.0 (1)	52.4 ± 18.7 (4)	10.9 ± 5.1 (2)	18.2 ± 5.7 (3)	31.3 ± 9.2 (10)
Mean	29.0 ± 4.9 (10)	38.9 ± 7.6 (22)	22.7 ± 5.3 (16)	26.1 ± 4.6 (12)	30.4 ± 3.4 (60)

[a] Sample size in parentheses.

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Table 4
Mean length of resting bouts by Surf Scoter broods (in minutes) versus time of day and brood age[a]

	Time of day				
Class	05:00–09:00	09:00–13:00	13:00–17:00	17:00–21:00	Mean
I	26.4 ± 5.8 (7)	22.3 ± 2.5 (23)	24.2 ± 4.6 (15)	20.3 ± 4.5 (8)	23.1 ± 1.9 (53)
II	–	13.9 ± 1.6 (8)	12.1 ± 4.4 (3)	6.3 ± 2.3 (2)	12.3 ± 1.5 (13)
Mean	26.4 ± 5.8 (7)	20.2 ± 2.0 (31)	22.2 ± 4.0 (18)	17.5 ± 4.0 (10)	21.0 ± 1.7 (66)

[a] Sample size in parentheses.

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