

CONTRIBUTION TO THE BREEDING BIOLOGY OF THE
WISKERED TERN *CHLIDONIAS HYBRIDA* IN VAL
CAMPOTTO (NORTHERN ITALY)

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ABSTRACT - In the largest Italian colony of the Wiskered Tern, 200-240 pairs nested in 1980 and 150-170 in 1981. Data on clutch size, egg measurements, interspecific and intraspecific aggressive behaviour are reported. Sexual dimorphism in the colour of the cheek was noted in 5 pairs intensively observed. From behavioural observations, a reasonable assumption is made that white-cheeked individuals are female, dark-cheeked ones males. "Females" took the heavier share in brooding activity.

Key words: *Chlidonias hybrida* / breeding / behaviour / sexual dimorphism / egg.

The Wiskered Tern *Chlidonias hybrida* is one of the rarest breeding terns in Italy. Its colonies are all concentrated within a small area in the Eastern Po Valley, although some scattered observations of birds in apparent nest-building activity are also reported from Central Italy (Brichetti 1975). A special contribution on the status and distribution of this species has recently been published (Boldreghini *et al.* 1981).

The aim of this paper is to give some general remarks on the breeding biology of the Wiskered Tern in Val Campotto, where the largest Italian colony is found. The data reported come from the last two censuses and behavioural observations carried on as a part of a research program on the biology of the Wiskered Tern started in 1978 (Frugis *et al.* 1978).

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STUDY AREA

Cassa Campotto is an ample reservoir permanently flooded (but with extensive oscillations in water levels) to control waterflow of the river Reno near Argenta (Ferrara). This wetland is part of a Wildlife Refuge included in and managed by the Consorzio della Bonifica Renana. The Refuge includes also another large water body with extensive marsh vegetation, and several patches of wood and cultivated land. For a detailed description of the habitats in the Refuge see Piccoli (1979), and Santucci (1978).

During the breeding season of the Wiskered Tern, water level at Cassa Campotto averages a depth of 1 m. In the deeper reaches, the Reed *Phragmites communis* gives way to extensive carpets of Water Lily *Nymphaea alba*, which are the nesting sites of the Wiskered Terns. Floating nests are fastened to the *Nymphaea* leaves. The close association of Wiskered Tern with Water Lily seems to be a characteristic of almost all the colonies found in Emilia Romagna (Boldre - ghini *et al.* 1981).

MATERIALS AND METHODS

Observations were made with 8x and 10x field glasses and a zoom telescope 20x-60x. Visits and counts at the colony were made with a small row boat. Census was carried on in each area first by estimating the number of pairs from outside every 'patch' of nests, when adults took off alarming, and then by visiting the area, counting the number of nests and eggs per nest. Eggs were measured by a caliper with an approximation to the tenth of millimeter, while nests were measured with a ruler. Chicks were marked with aluminum rings provided by the Istituto Nazionale di Biologia della Selvaggina. During 1980 breeding season the aluminum rings were died in yellow.

For behavioural observations, at nest a 'patch' in the colony was selected with 15 pairs. In the fringing reed bed a 'hide' was cut to conceal the boat. From the observation point 5 pairs were watched, all of them within a radius of approximately 10 mts. (Fig. 1). Notes were tape recorded and later transcribed on behavioural sheets, which could be used also for statistical analysis. A total of 40h 41' were spent on behavioural observations in 7 days from June 13th to 27th 1981.

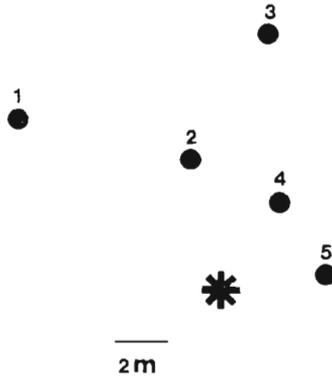


FIGURE 1 - Map of the nests of the five pairs observed; asterisk shows the observation post.

RESULTS AND DISCUSSION

Census

In 1980 the species, found nesting in the area since 1972 (Boldregghini *et al.* 1981), had a very good breeding success. With respect to 1979, a steep increase in number of breeding pairs was noticed, the total population being 200-240 pairs; a total of 178 nests were found. The colony, made of at least three 'subcolonies', occupied a large part of the Water Lily covered surface. In 1981 a decrease of the population brought the total to 150-170 pairs; 84 nests were found.

In Tab. I the percentage of nests with 0, 1, 2, 3 and 4 eggs found in the two seasons, as well as the mean number of eggs/nest is reported. In 1981, the census was made 15 days later than in 1980 (4/6/1980 - 20/6/1981). No relevant difference was noted in the arrival of Wiskered Terns in the area in 1980 and 1981 (15/4/1980 - 9/4/1981). Thus I consider the colony to be in a less advanced stage in 1981, as shown by the lower percentage of nests with three eggs compared to the preceeding year. The most likely reason of the delayed deposi-

tion might then be found in local factors.

TABLE I - Frequency in number and mean value of eggs per nest in two years.

	0	EGGS 1	PER 2	NEST 3	4
percentage nests 1980	5.05	3.93	20.22	69.55	1.12
percentage nests 1981	36.90	9.52	20.23	32.14	1.19

MEAN VALUE OF EGGS/NEST	
1980 = 2.57 ± 0.80	no. nests = 178
1981 = 1.52 ± 1.32	no. nests = 84

Since there is little written information on eggs measurements, a sample of 100 eggs was examined in 1980. The averages were: maximum diameter mm 39.48 ± 1.54; minimum diameter mm 28.41 ± 0.77. These values are very similar to those reported in Witherby (1952) from a sample of 100 eggs: mm 39.23 x mm 28.45. Other data come from Dement'ev (1966): mm 35.2-40.1 x mm 24.8-28.2 (N = 32, Syr Darya, Spangenberg), and mm 35.9-39.6 x mm 26.7-28.8 (N = 7, delta of Volga, Vorob'ev).

Nesting platforms are mainly built with *Phragmites communis* and *Nymphaea alba* stems. For a total of 38 nests, the diameters were: external diameter \bar{x} = cm 51.7 ± 14.0 s.d.; internal diameter \bar{x} = cm 11.9 ± 2.9 s.d.

Boldreghini *et al.* (1981) give some general remarks on the breeding cycle of the Wiskered Tern in several colonies of the Eastern Po Valley based on data collected during ten years. The alleged possibility that this marsh tern rises two broods stems from observations of clutches laid very late in the season in some colonies (Valle Mandriole and Cassa Campotto). I was able to record other late depositions during 1981, when I found three nests still to be completed, 3 with 2 eggs, and one each respectively with 1 and 3 chicks on August 13th, when most of the breeding population had already left the area. These 'late' nests were all located in an area apparently very favourable and which had been previously occupied by several pairs.

Wiskered Terns were last recorded in the study area on September 29th, when one moulting adult and one fully fledged young actively begging for food were observed at Valle Santa.

Unless contrary evidence is provided, these late nests must be considered substitution clutches as all recent researches do not report the species as double brooded (Cramp, *pers. com.*).

Behaviour at nest

The behaviour at nest of 5 pairs was recorded. For each pair I registered arrivals and departures, nest construction activity, food items brought to the nest and all instances of intra- and inter-specific aggression.

According to Dement'ev *et al.* (1962) and Baerends (1956), in two of the three Palearctic species of the Genus *Chlidonias* (*C. nigra*, *C. leucopterus*), a certain degree of sexual dimorphism in the breeding plumage seems to be present. No mention of such a dimorphism has been found in the literature for *Chlidonias hybrida* (*op. cit.* and Kapocsy 1979).

In the five pairs I kept under observation however, I noticed some differences in the coloration of the cheeks. In fact, while one of the partners was white-cheeked (white extending to the lower mandible), the other invariably showed the deep grey proper to the neck and throat extending to part of the cheek almost reaching the eye. This difference was clearly noticeable in all the five pairs and proved to be very useful in recording behavioural data separately for each individual. Figure.

Behavioural observations and statistical analysis of the rôle of each partner during incubation and partly during parental cares, led me to make the reasonable assumption that white-cheeked individuals were females, and dark-cheeked ones males.

The rôle of sexes during incubation

Scanty information exist on the rôle of sexes during incubation in the whole Subfamily Sterninae. For 'sea terns' written reports agree in that both partners of most species have an almost equal share in incubation (*Sterna maxima* in Buckley and Buckley 1972, *Hydroprogne tschegrava*, *Gelochelidon nilotica*, *Sterna sandvicensis*, *S. hirusio*, *S. alexica*, *S. albifrons* in Dement'ev *et al.* 1966). Even scantier are data for the three marsh terns (gen. *Chlidonias*) although most Authors state that the heaviest share is taken over by the female (Baerends *et al.* 1956, Kapocsy 1979, Witherby 1952). Because of complete lack of information concerning the Wiskered Tern, a statistical evaluation of the data collected for the 5 pairs I watched seemed justified even with few hours of observation.

Total time spent brooding eggs or chicks (expecially by pair no. 3, whose eggs hatched first), was calculated and reported on Tab. II as percentage of the

whole observation period.

With the only exception of pair no. 1, in which both parents had a nearly identical share in brooding activity, in the other 4 pairs a definite trend seems to exist, white-cheeked individuals (females) spending a much longer time on nests than dark-cheeked ones (males). These results have been statistically analyzed using a one-tailed Walsh Test ($P = 0.062$) (Siegel 1956).

On the basis of this test, we can exclude the null hypothesis. Even with so small a sample, P value closely approaches significance.

A certain difference in the percentage of brood-lapses with $t \leq 30$ min between males and females has also been noticed (Tab. III).

A one-tailed Walsh Test used to investigate such a difference has given the same results as in the former case ($P = 0.062$).

TABLE II - Time spent brooding on eggs or young by both sexes and total time by the pair, expressed as percentage of the whole observation period.

	PAIR				
	1	2	3	4	5
Female	46.70	60.90	56.74	60.77	58.47
Male	49.36	33.60	16.32	34.02	36.08
	96.70	94.51	73.07	94.80	94.56

TABLE III - Mean brood laps duration for the sexes, and percentage of brood lapses with $t \leq 30$ min in the five pairs considered. Below, mean brood laps for female and male.

Pair no.	BROOD LAPS DURATION						PERCENTAGE OF BROOD-LAPSES ≤ 30 min	
	Female			Male			Female	Male
	mean	s.d.		mean	s.d.			
	min	sec		min	sec			
1	43	53	49.50	43	32	35.97	64.00	40.74
2	42	20	38.98	21	44	16.49	60.00	86.84
3	52	53	59.36	25	15	28.45	67.74	81.25
4	39	12	37.81	23	36	16.98	61.76	80.00
5	51	04	31.90	46	05	49.43	40.00	47.36

Mean value females = 46 min 08 sec
 males = 32 min 26 sec

Student t test: $t = 2.338$ $P < 0.05$.

We can then assume that males brood mostly with shorter-timed lapses than females do. A Student t test applied to the mean values of male and female brood lapses showed a significant difference (Tab. III).

In conclusion female Wiskered Tern seems to have a heavier share in brooding activity than male, as already found by other Authors in *Chlidonias* species (Baerends *et al.* 1956, Kapocsy 1979). Females generally sit on nest for longer periods than males, which have shorter brood lapses (≤ 30 min).

Intraspecific aggression

During the whole observation period, a total of 39 events of intraspecific aggression were observed among the five pairs considered. In Fig. 2 a scheme is reported with vectors proportional to the number of observed aggressions between each of the five pairs and the other four. Territorial defence seems to be the principal reason for aggressive behaviour; a small area around the nest, as well as an aerial space above the nest itself are fiercely defended against any other Tern approaching. Attacks following attempts to take nest material have been also reported.

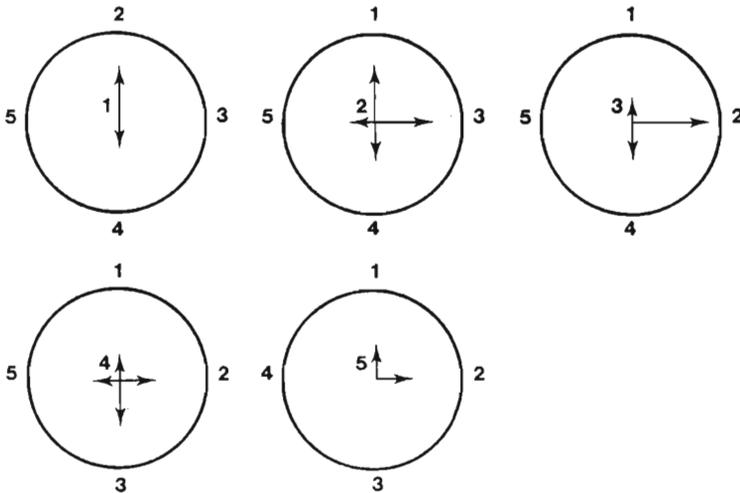


FIGURE 2 - Observed cases of intraspecific aggression by each of the pairs considered. Vectors are proportional to the number of events reported.

Interspecific aggression

Twenty events of interspecific aggression were recorded during the whole observation period, involving 10 different species (Tab. IV). Most of the aggressions were against birds approaching the nests, and in some cases up to nearly 100 Wiskered Terns took part in the attack. A well determined aggressive behaviour was recorded against *Larus ridibundus*, *Larus argentatus* and especially *Pandion haliaetus*.

TABLE IV - Aggressive actions against other species.

SPECIES ATTACKED	NUMBER OF TERNS INVOLVED
<i>Podiceps cristatus</i>	1
<i>Ixobrychus minutus</i>	1
<i>Nycticorax nycticorax</i>	5
<i>Ardeola ralloides</i>	5 - 7
	5
	4
	1
<i>Egretta garzetta</i>	5
<i>Ardea purpurea</i>	3
<i>Pandion haliaetus</i>	80 - 100
	50 - 60
<i>Fulica atra</i>	1
	1
	1
<i>Larus ridibundus</i>	4 - 5
	10 - 12
	5
	7
	3
<i>Larus argentatus</i>	30 - 40

The highpitched alarm call uttered by the Terns in some part of the colony may cause the take off of other individuals which most likely could not directly realize the reason of the alarm itself. No actual strike, but only mobbing has been observed towards the birds attacked.

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RIASSUNTO

Le colonie italiane di Mignattino piombato (*Chlidonias hybrida*) sono concentrate nella Pianura Padana orientale. La più numerosa è nell'Oasi di protezione di Val Campotto. Si riportano i dati raccolti nel corso degli ultimi due censimenti della colonia (nel 1980 e 1981) come pure i risultati di 41 h trascorse nel giugno 1981 osservando il comportamento al nido di cinque coppie.

Nel 1981 la colonia è stata trovata in uno stadio meno avanzato, con una più bassa percentuale di nidi con tre uova rispetto all'anno precedente, sebbene nel 1981 il censimento sia stato effettuato con 15 giorni di ritardo in confronto al 1980. Sono riportati i valori medi del numero di uova per nido nei due anni. Nel 1980 è stato esaminato un campione di 100 uova, e sono riportati i valori medi dei diametri massimo e minimo, come pure le dimensioni medie scaturite da un totale di 38 nidi.

E' stato notato un dimorfismo nella colorazione della guancia in ciascuna delle cinque coppie studiate. Sulla base di osservazioni comportamentali, si avanza l'ipotesi che gli individui a guancia chiara siano femmine, quelli a guancia scura maschi.

E' stato esaminato il ruolo dei sessi nell'incubazione ed almeno in quattro delle cinque coppie considerate la "femmina" covava in misura preponderante rispetto al "maschio". La differenza nella durata media degli episodi di cova di maschi e femmina è risultata essere significativa; i maschi covano meno, e con sedute più brevi.

Sono inoltre riportati 39 casi di aggressività intraspecifica dovuta essenzialmente a motivi territoriali, e 20 casi di aggressività interspecifica nei riguardi di 10 differenti specie di uccelli.

RESUME

NIDIFICATION DE LA GUIFFETTE MOUSTAC *CHLIDONIAS HYBRIDA* EN VAL CAMPOTTO (ITALIE DU NORD).

Le peu de colonies italiennes de Guiffette moustac (*Chlidonias hybrida*) sont concentrées dans la partie orientale de la Plaine du Po. La plus nombreuse se trouve dans l'Oasis de protection de Val Campotto. On rapporte ici les données recueillies au cours des deux derniers recensements de la colonie (1980-81) aussi que les résultats de 47 heures d'observation au nid de cinq couples, en Juin 1981.

En 1981 on a trouvé cette colonie moins développée, avec un plus bas pourcentage de nids de trois oeufs en comparaison de l'année précédente bien que en 1981 le recensement a été fait avec 15 jours de retard par rapport à 1980.

On donne les valeurs moyennes du nombre des oeufs par nid dans les deux années. En 1980 on a examiné un échantillon de 100 oeufs et on a rapporté les valeurs moyennes des diamètres (maximal) et (minimal), ainsi que les dimensions moyennes d'un total de 38 nids. On a noté un dimorphisme dans la coloration de la joue de chacun des cinq couples étudiés. Sur la base des observations comportementales, on suppose que les individus à la joue claire ce sont des femelles, ceux à la joue foncée, des mâles. On a examiné le rôle des sexes dans l'incubation et dans 4 de 5 couples observés, la femelle couvait plus que le mâle. La différence dans la durée moyenne des périodes de couvage de mâle et de femelles est très significative; les mâles couvent moins et avec de séances plus breves. On mentionne aussi 39 cas d'agressivité intraspécifique due à des motifs territoriaux et 20 cas d'agressivité interspécifique à l'égard de 10 différentes espèces d'oiseaux.

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A dark-cheeked individual (male) in an attempt of copulation with a white-cheeked one (female).

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