Avocetta N°18: 107-113 (1994)

Distribution and population-size of colonies of Yellow-legged Gull *Larus cachinnans michahellis* breeding in North-Eastern Adriatic sea

ENRICO BENUSSI* and PIERANDREA BRICHETTI**

** Osservatorio Faunistico Provincia di Trieste, Via A. Grego 35, I-34148 Trieste*
*** Gruppo Ricerche Avifauna, Museo Civ. Sc. Naturali, Via Ozanam 4, I-25128 Brescia*

Abstract - The distribution of colonies of *Larus cachinnans michahellis* in the North Adriatic is related to the vegetation and the presence/absence of human interference. Strong increases in recent years are noted and an estimate for the Northern Adriatic population (40,000 - 50,000 pairs) is given.

Introduction

The present knowledge about status of nesting populations of *Larus cachinnans michahellis* in the Adriatic is scarce and fragmentary.
As far as Italy is concerned the results of a census of Laridae and Sternidae taken in 1983-84 (Fasola 1986) are known, as are annual counts for Valli di Comacchio (P. Brichetti and U. Foschi pers. obs.), Grado and Marano lagoons (P. Utmar pers. com., Parodi *et al.* 1993), and of a study of colonies in the city of Trieste (Benussi *et al.* 1993, Benussi *et al.* in press).
For the Slovenian and Croatian areas (Istria and Dalmatia), the ringing of pulli on the islands of Murkan and Bobara, Southern-Dalmatia, has been carried out (Štromar 1967), as have a census of population and breeding biology in the Kornati archipelago (Štromar 1970), the distribution of colonies on Krk and its satellite islands (Lovrić 1971), the distribution and size of colonies on some islands of Eastern Quarnero (Štromar 1977), Istria and Northern Dalmatia (Benussi 1986) and a study of breeding biology in Sečovlje salt-pans (Škornik 1992).

Methods

Censuses of the colonies were carried out in 1989 on the coast of Istria and Northern Dalmatia islands, down to Ilovik (areas n.1 and 2), in 1991 on Pag's satellite islands (area n.3) and in 1992 in the area between Olib and Skarda (area n. 3). Partial counts were made in 1991 in the Kornati archipelago down to the island of Samograd (Figure 1).
The censuses were carried out in the period between April 15th and June 15th using a motor boat. Collected data was obtained through a direct count of nests (Table 1) or by an assessment of the number of nesting pairs on islands where landing was forbidden, difficult to walk on or with a low nesting density.
Groups of more than 4 nesting pairs (n=78) were considered as "colonies", while the islands with less than 5 pairs or with single pairs were excluded from data processing (n=6).
Annual counts were made from 1988 to 1992 on 4 sample islands (areas n.1 and 2), heterogeneous from a morphological point of view (Lunga, Fenoliga, Galijola, Palacol).

Results

Status and populations trend

Censuses taken from 1988 to 1992 in areas n. 1-3 gave a total count of 12,257-14,167 nesting pairs, spread over 78 out of 227 islands, with a percentage of occupation of 34.3% (area n. 1: 52.3%, n =44; area n. 2: 21.5%, n= 19; area n. 3: 27.2%, n= 15). Eight colonies with a total number of 641-1,041 pairs were counted in the partial census of area n.4 (Kornati archipelago) in 1991.
In the 4 surveyed areas the whole population is at least 12,898-15,208 nesting pairs spread over 86 different islands.
Six colonies with less than 5 pairs were found in areas n.1-3 and 2 in area n.4 (Figure 1). A previous count (1982-1985) of 16 colonies in Istria and Northern

Accepted 15 September 1994

Table1 - General outline of the number of nesting pairs for each colony in the various censuses showing the subtotal for each area. Six islands with less than five pairs are excluded. Denomination of islands is drawn from: Male Karte 1:100000, Drzavni Hidrografski Institut, Split, Rev.1993.

Localities	1988	1989	1990	1991	1992
Regata		22			
Altijež		36			
Fržital		27			
V.Školj		91			
Galopun		35			
Hr.Orlandin		10			
Reverol		7			
Galiner		10			
Sv.Juraj		17			
Lunga	331	339	344	346	376
Banjol	20/30	21			
Sv.Katarina		17			
Sturag		16			
Sv.Ivan		200/250			
Pulari	50/60	30/40			
Revera	20	37			
M.Sestrica		100/130			
V.Sestrica		145			
Gustinja		100/130			
Pisulj	54	33			
Kolona		17			
Porer		27			
Sv.Marko	120/140	150/180			
Gaz	500/600	500/600			
Obljak	400/450	450/550			
Supin	100/150	150/170			
M.Brijuni	100/120	150/200			
Supinić		17			
Galija		200/250			
Grunj	350/400	230/280			
Pusti		200/250			
Vrsar		100/150			
Sv.Jerolim		20/30			
Fraškerić		32		33	
Fenoliga	89	94	97	118	126
Fenera	60/80	180/200			
Šekovac		37			
Bodulaš		80/100			
Ceja		100/120			
Trumbuja		13			
Premanturski		17			
Pomerski		65			
Levan		200/220			
Levanić		60/70			

Area 1 (census 1989): 4,382/5,102

Localities	1988	1989	1990	1991	1992
Galijola	134	147	172	221	243
Samunćel		100/120			
Školjić		32			
Unije		600/800			
Mišnjak		160/190			
Hr.Mišar		12			
Zeča		600/700		600/800	
Zaglav		24			
Galun		630/730			
Zečevo		988			
Kormati		580/630			650/700
Palacol	74	97	108	119	127
Oruda		300/350			400/500
Trstenik		300/350			
Ćutin		400/500			
Dolfin		450/550			
Hr.Ostar		15			
M.Laganj		12			
V.Laganj		20/30			

Area 2 (census 1989): 5,467/6,277

Localities	1988	1989	1990	1991	1992
M.Sikavac				97	
Lukar				105	
V.Brušnjak				300/400	
M.Ražanac				248	
V.Ražanac				100/150	
Morovnik					180/200
Hr.Kurjak					18
Pohlib					100/130
Planik					400/450
Planičić					80/100
Greben-Južni					160/180
Greben-Srednji					20/30
Greben-Zapadni					180/200
Kamenjak					20/30
Lutrošnjak					400/450

Area 3 (census 1991-92): 2,408/2,788

Total (1,2,3 areas; census 1989/92): 12,257/14,167

Localities	1988	1989	1990	1991	1992
Purara				200/250	
Samograd				100/150	
Mrtovnjak				100/200	
Smokvica Mala				10	
V.Zernicovar				4	
Brusak				10	
V.Babugliasi				17	
Mezanj				200/400	

Area 4 (partial census 1991): 641/1,041

Dalmatia, corresponding to the main islands of areas n. 1 and 2, resulted in a population of 3,200-3,600 pairs (Benussi 1986). At least 585 pairs, 400 of which nesting in Vela Balabra were found in 1968 on 9 islands of Kornati archipelago (Štromar 1970).

The results of counts made in consecutive years (1988-1992) in the 4 sample islands (Figure 2) show an increase of 38.8% throughout five years, with an annual average increase of 8.5% (min. 6.5% in 1989-90; max. 11.5% in 1990-91).

If we consider the islands with colonies consisting of more than 200 pairs (n=8) censused in 1982-85 (Benussi 1986) there was an increase of 45% by 1989 (n=8) and of 68.7% by 1992 (n= 3).

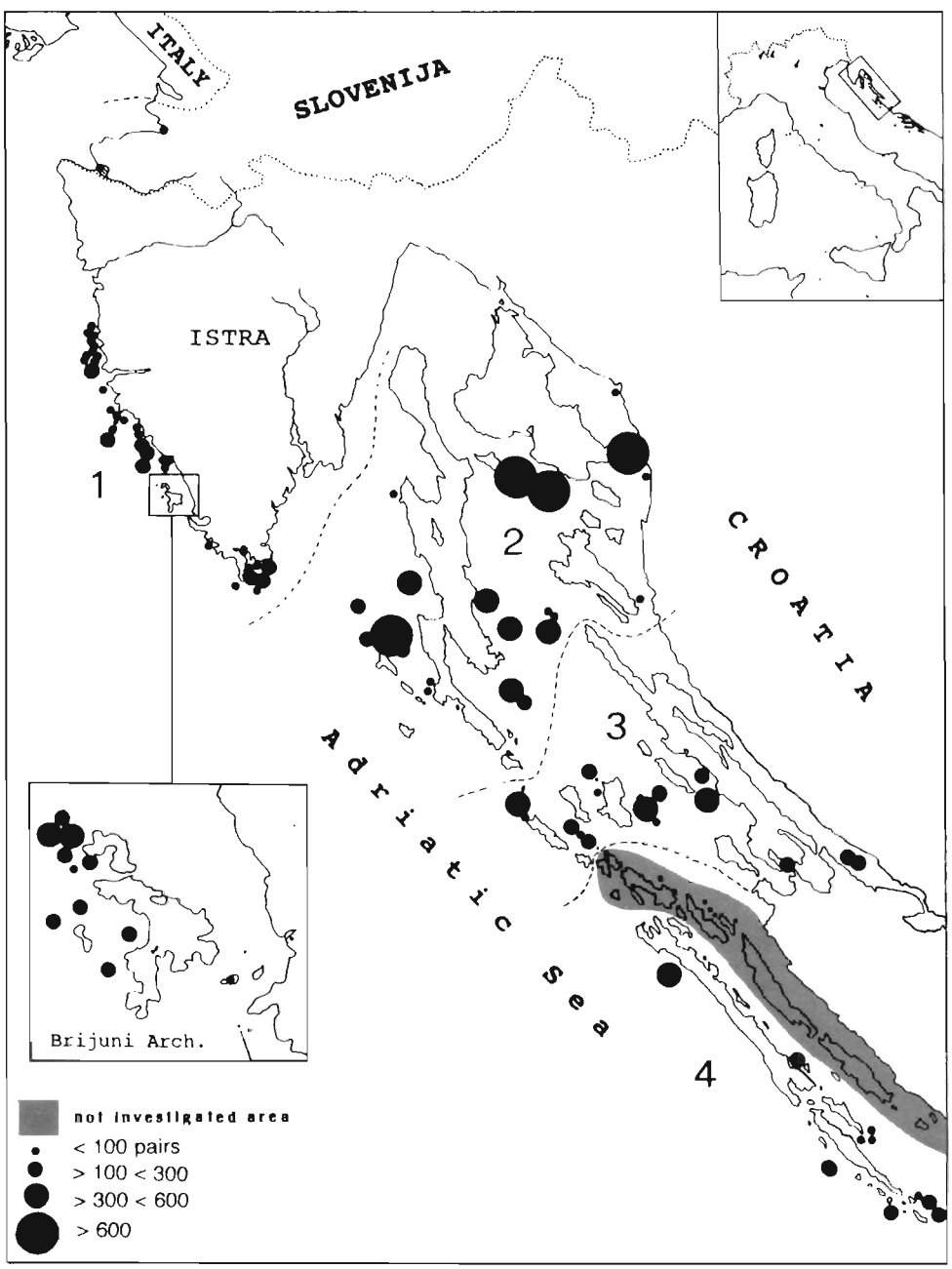

Figure 1 - Distribution and size of colonies of *Larus cachinnans michahellis* in North-East Adriatic for each censused area: n. 1-2, censused 1989; n. 3, 1991-92. Area n. 4 was partially censused in 1991. Also 6 islands with less than 5 nesting pairs have been mapped.

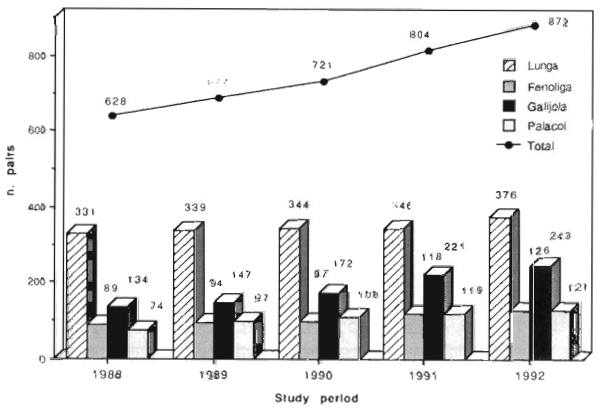

Figure 2 - Evolution of nesting population in 4 sample colonies from 1988 to 1992 (area n.1: Lunga and Fenoliga; area n. 2: Galijola and Palacol.

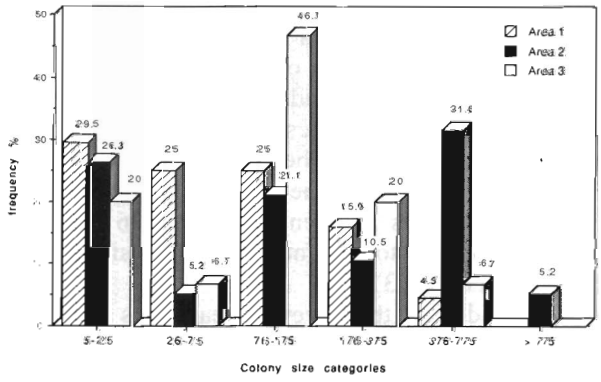

Figure 3 - Distribution of frequency by size-class of the colonies for the areas n. 1,2,3.

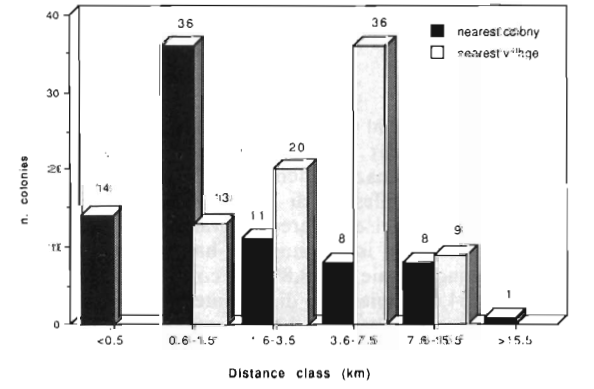

Figure 4 - Distribution of frequency by distance class (km) of the colonies between colonies and human settlements.

In the Italian Adriatic area, 97% of the 3,442 pairs censused in 1983-84 (Fasola 1986) were located between Valli di Comacchio (Emilia-Romagna) and Grado lagoon (Friuli-Venezia Giulia).

Colony-size

The average size of 78 colonies with more than 5 pairs was of 164.4 pairs for each colony (median 97), with the highest value in area n.2 with the presence of 4 colonies of more than 600 pairs (Figure 1 and Table 1). In area n. 1 the colonies occupied 52.3% of the islands, while in areas n. 2 and 3 the values of occupation were of 21.5% and 27.2%. The 26.9% of colonies had a number of colonies from 5 to 25 (n= 21) and 28.2% of colonies of average size (75-175 pairs, n= 22). The largest colony (899 pairs in 1989) was located in area n. 2 on Zečevo island. Small colonies were everywhere evenly distributed throughout the islands (Figure 3); the medium-sized colonies (75-175 pairs) were on the whole more frequent, expecially in area n. 3 where they reach 46.7%. In area n.2 colonies with more than 376 pairs reached 36.8%.

Distance between colonies and human settlements

The distance between two closest colonies is 2.54 km (median 1.25) on average.

The distance between colonies and the closest human settlements is on average 4.13 km (median 3.90). Both these average values rise in relation to the size of the colonies, expecially in the second case where a significant difference (t-test=5.11; $p < 0.001$) has been highlighted between colonies <100 pairs (2.94 km; n=40) and > 200 (5.4 km; n=20). The 46% of colonies stand at a distance of 3.5-7.5 km from settlements and 46% are concentrated between 0.6 and 1.5 km (Figure 4). These results are obviously influenced by the geographical distribution of islands, towns, and villages.

Vegetative cover and typology of islands

The amount (ratio) of vegetative cover is on average 54.42%.

The highest value is in area n. 1 (61.59%), the lowest in n. 3 (35.33%) (Table 2). The ratio of vegetative cover does not seem to influence the colony-size: 52.4% for colonies with more than 100 pairs, 56.8% for colonies with more than 200 pairs.

The 38.5% of colonies are situated on islands with herbaceous vegetation, 33.3% with tall Mediterranean garrigue, 17.9% with maquis and 10.3% on islands without any vegetation. The impact of the traditional presence of sheep in an almost wild state on most Dalmatian islands and the Bora, a cold wind blowing, often very strongly, from N-NE influence the evolution and the difference in distribution of vegetation.

Table 2 - Summary table of parameters of the colonies. The areas are the ones shown in Figure 1; in the counts of colonized islands those with less than 5 nesting pairs have been excluded; distances between colonies and the closest built up areas are in kilometres.

Area	tot. isl.	isl. with colony	mean colony size (S.D.; range)	mean dist. from nearest colony (S.D.; range)	mean dist. from nearest village (S.D.; range)	% vegetation coverage (S.D.; range)
1	81	44 (54.3%)	107.6 (123.78; 7-150)	1.34 (1.19; 0.4-5.6)	3.20 (2.19; 0.7-8.3)	61.59 (25.08; 5-90)
2	73	19 (26.0%)	309.1 (302.03; 12-988)	5.42 (5.10; 0.1-16.4)	5.69 (2.42; 1.3-11.6)	52.89 (27.60; 5-85)
3	67	15 (22.4%)	147.6 (119.41; 17-425)	2.40 (1.95; 0.8-8.2)	4.91 (1.98; 2.1-9.1)	35.33 (25.74; 5-80)
tot.	221	78 (35.3%)	164.4 (198.85; 7-988)	2.54 (3.23; 0.1-16.4)	4.13 (2.45; 0.7-11.6)	54.42 (27.40; 5-90)

In fact most of the tall Mediterranean vegetation is situated on islands sheltered by the Istrian coast, where sheep-farming is totally absent, or on the larger islands close to Cres and Lošinj. On the contrary, most of the islands without vegetation are in the windy Dalmatian coastal parts of Velebitski Kanal and Kvarnerić.

Discussion

The results have shown high concentration of colonies of *Larus cachinnans michahellis* in the North-East Adriatic and an even distribution in all the censused areas.

All the colonies (n=75) are situated on little islands (min. Hr. Orlandin 0.0002 km^2; max. Planik 0.7 km^2), with the exception of the larger Mali Brijuni (1.3 km^2), Zeča (2.5 km^2) and Unije (17 km^2), while colonies are absent from large islands, even in their uninhabited and potentially suitable parts.

Colonies are located on islands either uninhabited or with only the presence of lighthouses, apart from the large colony on the island of Unije, which is however stationed on the side opposite to the little town and with difficult access by land because of the thick Mediterranean vegetation. These preferences highlight the strong insularity of this species and its tendency to colonize islands not subjected to any direct human disturbance and with the absence or scarce presence of land predators. In fact colonies with more than 200 pairs are further from settlements than the ones with less than 100 pairs.

The choice of breeding sites can certainly be related to the geographical distribution of the islands and does not seem influenced by climatic conditions, morphology of islands or their vegetative cover. The presence of sheep in many islands of areas n. 2 and 3 does not seem to affect colonization. The largest colonies are in area n. 2 where suitable islands for breeding are widespread, while in Istria the concentration of little islands causes the presence of smaller colonies.

The total population seems evenly spread in the various surveyed areas and to be steadily increasing. For this reason a progressive colonization of suitable coastal sites on large islands and of some coastal towns seems likely to occur in the future.

The traditional collection of eggs for domestic use, carried out on various islands during the period immediatly following laying, does not seem to influence the population trends seen at these colonies. This conclusion is confirmed by the recent colonization of Sečovlje salt-pans (Slovenia) since 1986 (Škornik 1992) and of the town centre of Trieste since 1987 (Benussi et al. 1993).

If we consider that the surveyed area covers about one third of all the Dalmatian islands and that in Italy 3,442 pairs were counted in the Adriatic during the census made in 1983-84 (Fasola 1986), an assessment of the total Adriatic population (N of the 42nd parallel) of 40,000-50,000 pairs seems reasonable.

Acknowledgements - The Authors are grateful to Loris Dilena, Silvia Gandini, Fulvio Genero, Umberto Mangani, Alfredo Montina and Anastasia Puric for help during field visits.

Riassunto - Dal 1988 al 1992 è stato condotto un censimento delle colonie di *Larus cachinnans michahellis* nelle isole dell'Istria e della Dalmazia settentrionale dal quale è risultata una popolazione complessiva di 12.898-15.208 coppie distribuite in 78 isole suddivise in 4 aree geografiche.

Conteggi annuali in 4 isole campione hanno evidenziato un incremento quinquennale del 38.8%. Le colonie sono composte in media da 164,4 coppie, sono distanziate tra loro in media di 2,54 km e dai centri abitati di 4,13 km, con valori differenti tra aree e colonie. Il grado di copertura vegetale, in media del 54,4%, e la tipologia ambientale delle isole non sembrano influenzare presenza e consistenza delle colonie. Si ipotizza per l'intero settore adriatico (a N del 42° parallelo) una popolazione complessiva di 40.000-50.000 coppie nidificanti.

References

Benussi E. 1986. Status of the populations of *Larus cachinnans* and *Sterna hirundo* nesting in Istria and Northern Dalmatia. Medmaravis, NATO ASI Series, vol.12: 501-503.

Benussi E., Flapp F. and Mangani U. 1993. La nidificazione, in forma coloniale, di *Larus cachinnans michahellis* nell'area urbana della città di Trieste. Fauna, vol.3, Trieste:91-96.

Benussi E., Flapp F. and Mangani U. (in press). La popolazione di *Larus cachinnans michahellis* nidificante nella città di Trieste. Avocetta.

Fasola M. (red.) 1986. Distribuzione e popolazione dei Laridi e Sternidi nidificanti in Italia. Suppl. Ric. Biol. Selvaggina. Bologna: vol.XI.

Lovrić A. 1971. Ornitogene biocenoze u Kvarneru. Larus, XXIII, Zagreb: 39-72.

Parodi R., Perco F. and Utmar P. 1993. L'avifauna della Valle Cavanata. Fauna, vol.3, Trieste: 7-38.

Škornik I. 1992. Kolonija galebov v Sečoveljskih solinah. Anali Koprskega primorja in bližnjih pokrajin. Koper: 2"92.

Štromar L. 1967. Cetiri godine prstenovanja galebova klaukavaca (*Larus argentatus* Pontopp.) na otocicima Mrkanu i Bobari. Larus, XIX, Zagreb: 133-144.

Štromar L. 1970. Prilog poznavanju biologije galebova klaukavaca, *Larus argentatus* (Pontopp.), i čigra običnih. *Sterna hirundo* (L.), te njihovih međusobnih odnosa na nekim Kornatskim otocima. Larus, XXI-XXII, Zagreb: 89-98.

Štromar L. 1977. Rezultati ooloških istraživanja i izvori prehrane galebova klaukavaca (*Larus argentatus michahellis*) za vrijeme gniježđenja na istočnojadranskim otocima. Larus, XXIX-XXX, Zagreb: 89-98.