Avocetta N° 16: 75-76 (1992)

The use of salinas by breeding Charadriiformes: two italian cases

PAOLO BOLDREGHINI*, FEDERICO L. MONTANARI**, ROBERTO TINARELLI***

* Inst. Zooculture, University of Bologna, Via S. Giacomo 9 - 40126 Bologna, Italy
** Centro Ricerche Ecologiche e Naturalistiche, Via Ossi 23 - 47010 S. Varano, FO, Italy
*** Ecostudio, Via Savena inferiore 9 - 40061 Minerbio, BO, Italy

Introduction

This research was carried out during the 1988 breeding season in order to obtain information to be used to improve conservation measures for Recurvirostridae in Italian natural reserves.

Study areas

The Salina di Cervia, 44° 15'N 12° 21' E, surface 827 ha, is a complex of pans, most being little more than 1 ha, with vegetated banks and small emergent mudflats; depth varies from a few to 50 centimetres depending on the productive cycle. The vegetation is nairly alophilous: *Arthrocnemum* sp., *Salsola soda*, *Halimione portulacoides*, *Limonium* sp., *Ruppia spiralis* and Chlorophyceae; the area is surrounded by cultivated land and there are also inside. The Salt-pan is a State natural reserve, a Ramsar site and hunting is forbidden. The average tonnage of salt produced is 50.000/year. *Artemia salina* is present but not exploited.

The Salina di Margherita di Savoia, 41° 25'N 16° 06'E, surface 4000 ha, is a complex of pans where the erosion of internal banks and the scarce bank remoulding has recently caused the junction of several basins. At present the basins used by breeding Charadriiformes are mainly very wide (10-100 ha). The depth varies from a few centimeters to 1.5 metres. Main vegetation is alophilous: *Suaeda fruticosa*, *Arthrocnemum* sp., *Halimione* sp., *Limonium* sp., *Ruppia* sp., Chlorophyceae; *Phragmites australis* and *Juncus* sp. are locally common in marginal areas. The Salt-pan is a State natural reserve, a Ramsar site and hunting is forbidden but poaching is scarcely controlled. The average tonnage of salt produced is 500.000/year. *Artemia salina* is present but not exploited; the water storage basins are exploited throught extensive fish-culture.

In both Salt-pans active conservation and management programmes have been planned but until now not applied.

Results

The two Salt-pans are important breeding areas for Charadriiformes (Boldreghini *et al.* 1989, Tinarelli, in press), in particular for the following species: *Recurvirostra avosetta* (40% of the Italian population), *Himantopus himantopus* (15%), *Sterna albifrons* (11.3%), *Charadrius alexandrinus* (6%), *Larus genei* (3.5%) (Italian populations after Fasola 1986, Tinarelli and Baccetti 1989).

Data on the breeding populations are reported in Table 1.

The average number of species per colony and the average size of colonies are not significantly different (U Mann-Whitney) between the two salt-pars. The association among colonial breeders (Figure 1) is different in the two salinas depending on ecological conditions.

In the Cervia salt-pan the colonies are located mainly on emergent vegetation and mudflats inside basins with low water levels or at the base of the banks. Only 12% of the *Recurvirostra avosetta* population and 20% of the *Sterna albifrons* population breed on the top of banks without vegetation, whereas all *Larus cachinnans* breed on the top of banks and islands with good vegetation cover.

In the Margherita di Savoia salt-pan the colonies are located mainly on the top of banks and bank remains with scarce or absent vegetation inside wide and deep basins. Only *Himantopus himantopus*, *Tringa totanus* and *Gelochelidon nilotica* nearly always breed inside smaller basins on slightly emergent, vegetated or muddy islands.

The number of species per colony is significantly correlated (Spearman's correlation coefficient) with the colony size both at Cervia ($rs = 0.88$, $p < 0.01$) and at Margherita di Savoia ($rs = 0.72$, $p < 0.01$).

Accepted 20 December 1992

Table 1 - Data on breeding populations

	CERVIA SALT-PAN					MARGHERITA DI SAVOIA SALT-PAN				
	no. pairs	no. colonies	pairs/colony mean	sd	single pairs	no. pairs	no. colonies	pairs/colony mean	sd	single pairs
Himantopus himantopus	97-131	8	13.8	9.3	4	46	5	9.8	9.4	0
Recurvirostra avosetta	87-101	7	15.7	12.8	2	304-521	21	23.2	23.9	0
Charadrius alexandrinus	25-30	5	4.2	3.8	15	60-80	5	7.6	6.5	35
Tringa totanus	1				1	2-5	2	2.5	0.7	0
Larus cachinnans	13	2	6	5.7	1					
Larus genei						40-45	2	30	4.2	0
Sterna albifrons	250-280	6	46.5	73.5	1	348-514	18	27.4	23.8	3
Sterna hirundo						1				1
Gelochelidon nilotica						2-3	1	2		1
total no. colonies			15					27		
average no. species/colony			2.53 (sd 1.30)					2.41 (sd 1.01)		
average no. pairs/colony			36.13 (sd 58.71)					42.44 (sd 45.16)		

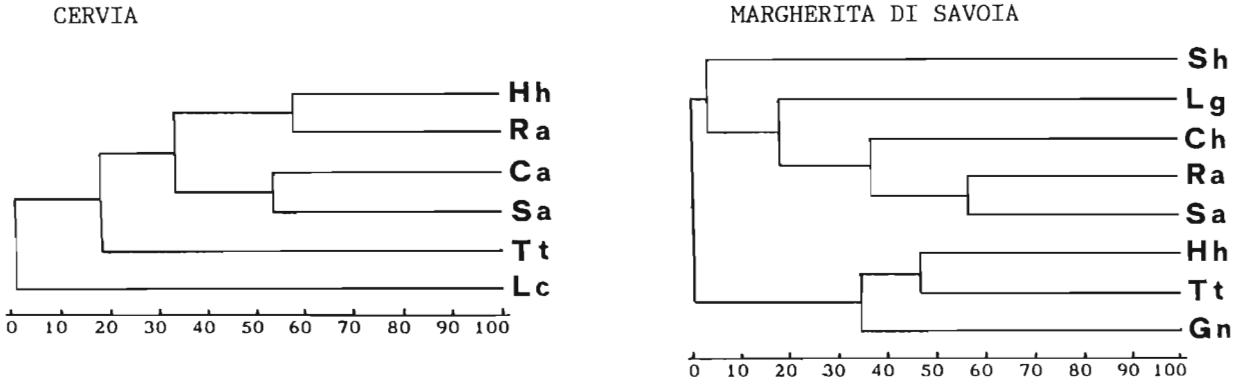

Figure 1 - Dendrogram of the association among colonial breeders. Proportional similarity index (Colwell and Futuyma, 1971) calculated employing maximum numbers per colony.

Aknowledgements — This research was carried out with the aid of a grant from the Italian Ministry of Agriculture and Forests.
We are grateful to S. Mattioli and R. Santolini for their help in field work and to N. E. Baldaccini for his help in organizing the research.

References

Boldreghini P., Montanari F. L. and Tinarelli R. 1989. Nidificazione di Gabbiano roseo, *Larus genei*, e di Sterna comune, *Sterna hirundo*, nella Salina di Margherita di Savoia (Puglia). *Riv. ital. Orn.* 59: 201-204.

Collwell R. H. and Futuyma D.J. 1971. On the measurements of niche breadth and overlap. *Ecology* 52: 567-576.

Fasola M. (ed.) 1986. Distribuzione e popolazione dei Laridi e Sternidi nidificanti in Italia. *Suppl. Ric. Biol. Selvaggina* 11.

Tinarelli R. (in press). Important areas for breeding waders in Italy. *Proceed. Wader Study Group Conference*, Odessa, April 1992.

Tinarelli R. and Baccetti N. 1989. Breeding waders in Italy. *Wader Study Group Bull.* 56 : 7-15.