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The annual presence of the gannet (*Sula bassana*) in the central Thyrrenian Sea

MAURO BERNONI, CLAUDIO CARERE, MARCO GUSTIN (*)

(*) SROPU c/o Oasi Naturale WWF "Bosco di Palo"
Via Palo Laziale 2 - 00055 Ladispoli, Roma.

Abstract — Observations for a total of 249 hours were made on the Thyrrenian coast by the mouths of Tevere river from December 1983 to April 1985. The regular presence of the Gannet was recorded and confirmed both in wintering and migratory periods; the presence of mainly adult individuals in these waters suggests that immatures migrate towards eastern seas. On the whole, a distinct prevalence of single individuals (1.59 ind./obs.) was noticed even during migratory periods.

Introduction

Records of Gannets in Italy have been known since the beginning of our century (Damiani 1912, Orlando 1939, Moltoni 1940). In 1951 Gibb and 1965 Spanò considered the Gannet as a regular visitor in the Central Mediterranean. Since the early 70's the presence of these species has been noticed on the coastline of Rome (Petretti 1973) and further records were provided by other authors (Petretti 1976, Minervini 1981, Fraticelli 1983, Bernoni et alii 1985). This work wants to emphasize the constant presence of the Gannet in the central Thyrrenian sea during both migration and wintering periods and an increasing number of adult individuals.

Study area and methods

Between December 1983 and April 1985, 249 hours of observation along the coast of Lido di Ostia and the mouth of Tevere river (12''41' E, 41''45' N) were made. Our surveys lasted about an hour and they usually started an hour after dawn and always before 11.00 a.m. We chose this schedule for our observations because Gannets seem to prefer the first hours of the morning for movement (Nelson 1978). The observation point "Lido di Ostia" was placed on a landing-stage that leans out on the sea for some 80 metres.
The one by the mouth of the river Tevere leans out on the sea for some 100 metres. The data recorded for each individual the age (adult, subadult, immature) and direction of movement.

Results

Results are given by individuals observed per hour. This way an index of frequency can be evaluated by dividing data per month. Unlike what happens on other coastlines of the Latium region (Fraticelli 1983) it was observed that Gannets rarely used our study area as a feeding area. Therefore this index allowed us to obtain reasonably very results. On a total of 219 hours of observation between the months of October and June, time in which Gannets were present, 509 individuals were recorded, averaging 2.3 individuals/hour.
Table I the gives the mean of observations/hour for the 3 classes of age during the various months of the year.
In table II our data concerning percentages of immatures are compared to those of Fraticelli (1983) on the northern coastline of Roma (χ^2 = 14.75: $P<0.05$) as well as those of Iapichino (1984) in the Jonian sea (χ^2 = 53.56; $P<0.001$); values are basicly similar, but those reported by Iapichino are higher: in the Jonian sea the number of immatures is always greater than 50% of the total, while in the central Thyrrenian sea it never reaches 30% in winter.
Table 3 gives the percentages of Gannets heading South and North during the various months of the year. It can be seen that in winter here is no prevailing direction; by comparing separately the values for October-November (χ^2 = 26.2; $P<0.001$) and March-April (χ^2 = 10.4; $P<0.001$) with the total, a migration flow can be identified in the

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Table 1. Adults, subadults and immature Gannets recorded per hour (January-December) N = number of individuals.

	Jan.	Feb.	Mar.	Apr.	May	Oct.	Nov.	Dec.
ADULTS	.96	.78	.44	1.17	.17	—	58	1.54
SUBADULTS	.07	.28	.23	.83	—	—	.79	.93
IMMATURES	.36	.25	.23	1.09	.83	.46	2.58	1.32
N.	35	42	42	71	45	6	131	175
HOURS OBS.	28	32	34	23	6	13	33	46

Table 2. Percentages of immature Gannets yelded by: 1) Fraticelli (1983) 2) Iapichino (1984) 3) Present work
N = number of individuals

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Oct.	Nov.	Dec.	N
1)	9	14	33	50	66	—	70	29	8	338
2)	52	40	30	—	—	—	75	62	62	364
3)	28	19	19	35	60	—	100	65	35	508

Table 3. Percentages of Gannets heading South and North in the various months of the year. N = number of individuals.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Oct.	Nov.	Dec.
South	47	57	11	34	—	—	100	79	57
North	53	43	89	66	—	—	—	21	43
N	19	42	42	66	—	—	6	121	164

Southern and Northern direction.
In table 3 the numerical dimension of the various groups can be evaluated; single individuals are seen to prevail (42.6%); the mean value reported per observation is 1.59. Only rarely we observed flocks, both in migration and in other periods, as also stated by Henderson (1975) unlike what happens in migratory "bottle necks" such as Gibraltar (Cortes and Finlayson 1984).

Discussion

From a comparison with previous data collected in the Thyrrenian sea (Spanò 1965, Petretti 1973, Petretti 1976) we found a considerable increase in the records mainly due to a larger number of birdwatchers (Fraticelli 1983, Bernoni et alii 1985) as well as an increase in breeding population (Nelson 1978); an increase in the species in the Lybian sea was also observed by Bundy (1976).
We must emphasize (Table 1) the considerable increase in adults compared to previous data (Hopkins 1969, Nelson 1978) unlike other authors who stated that wintering individuals in the Mediterranean sea were mainly immatures (Ticehurst 1940, Thomson 1974, Curry-Lindahl 1977, Nelson 1978).
Differences among percentages of immatures recorded in the Jonian sea by Iapichino (1984) and

Table 4. Number and percentages of single individuals or groups recorded on the total number of individuals observed N = number of individuals.

Group	N	%
1	217	42.6
2	71	27.9
3	18	10.6
4	3	2.3
5	3	2.9
6	4	4.7
7	2	2.7
8	—	—
9	1	1.8
10	1	2.0
11	—	—
12	1	2.4

those of central Thyrrenian sea are to be noted (table 2); probably immature birds have a tendency to migrate over longer distances than adults (Joiris 1983) therefore moving eastward in the Mediterranean basin.

Both our records and those of Fraticelli (1983) show that in autumn most Gannets come from the North (Table 3), presumably following the Spanish and French coastlines. Some of them stay in the Thyrrenian sea (mostly adults) and the rest of them (especially immatures) move on eastwad. This would explain the high frequency of immatures in the Adriatic sea (Pandolfi and santolini 1985) and in the eastern Mediterranean (Nelson 1978).

Our records of an increasing number of adult individuals in autumn agree with those made at Gibraltar (Nelson 1978), some 15-30 days later. A rapid decrease in Gannets in the Jonian sea was observed during spring, while in the Thyrrenian sea individuals were observed up to April and occasionally until June; this probably concerns those individuals flying back to the Atlantic ocean along the opposite migratory route (Table 2 and 3).

Riassunto — Il presente lavoro è il risultato di 249 ore di osservazione effettuate dalla costa Tirrenica presso le foci del fiume Tevere dal dicembre 1983 all'aprile 1985; per ogni individuo sono stati registrati età (adulto, subadulto, immaturo) e direzione di spostamento.

I risultati, espressi in individui/ora di osservazione, confermano ed evidenziano la regolare presenza della Sula sia nel periodo migratorio che durante lo svernamento (2.3 ind/ora di osservazione).

Dal confronto con altri lavori simili nel Mediterraneo si ipotizza che durante l'autunno le Sule arrivino nel Tirreno centrale da nord costeggiando Spagna e Francia; la maggior presenza di individui adulti in questo mare fa ritenere che gli immaturi migrino verso mari più orientali. Durante il periodo primaverile i dati indicano il verificarsi della situazione opposta.

Nel complesso è stata notata una netta prevalenza di individui solitari (1.59 ind./osservazione) anche durante i periodi migratori.

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