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Marine Biogeography of the Mediterranean Sea: patterns and dynamics of biodiversity

Distribution pattern of Audouin's gull (*Larus audouinii*, Payraudeau, 1826) in the Mediterranean basin

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SUMMARY

In this work we analyse the distribution pattern of Audouin's gull in the Mediterranean basin. This gull is endemic to this area. We reported its movements, along the Mediterranean coasts and its islands. Its presence, however, was only registered along Atlantic coast, and, rarely, in the Middle Europe. Currently, the estimated population is around 19,000 pairs. In Spain is found 76% of the population, whereas, in Italy, the population is the second largest group representing 5% of it.

The dynamics of the colonisation of the species is not so simple: there might have been, in previous years, a fragmentation in the primal area followed by diverse and different processes of recolonisation still taking place. The risk of extinction expressed in the years '70-'80 was also connected to the scant knowledge of the species. The invasion and competition by the Yellow-legged Herring gull (*Larus cachinnans*)seems to be among the various probable causes of most evident risk. The impact that the species currently has on the development of the populations of Yellow-legged Herring gull could be one of the original incidental factors for the fragmentation of the area at the time of the Yellow-legged Herring gull's colonisation of the Mediterranean.

INTRODUCTION

The Audouin's Gull (*Larus audouinii*, Payraudeau 1826) is characterised by a red beak with a yellow and black tip, a pearl-grey back, and wings which are black at the extremity. The average wing span for the species is cm 128. It feeds mainly on blue fish (Cramp and Simmons, 1983; Oro et al., 1995), however its diet also includes small mammals, cephalopods, arthropods, and vegetables. At times, it undertakes long searching forays near the coastline, during the night as well, flying up to 100 km far from the colony (Oro, 1998; Baccetti et al., 2000). The breeding season is from April to July, with nest-building in colonies, mostly

monospecific, either on coastal cliffs or small rocky islets, not more than 50 m above sea level. Eggs are laid on the ground, often in association with vegetable matter, such as *Chritmum, Limonium, Eryngium, Pistacia lentiscus, Erica arborea* (Schenk and Meschini, 1986; Goutner et al., 2000). Exceptions are the colonies nesting on the Ebro delta, in Spain (Oro et al., 1996), which have a sandy and brackish ground, and the small colony of S. Andrea on Gallipoli, Italy, nesting on a flat island rich in *Salicornia* (Cataldini and Scarpina, 1993). Therefore, this gull shows a certain flexibility in the habitat selection . Incubation of the 2-3 eggs is undertaken by both parents during a period of about 29 days. Pairs breeding success oscillates from 30% to 60 % and it is not known at which year this gull reaches sexual maturity The Audouin's Gull has been considered a rare and localised species for a long time. It is classified as "Conservation dependent" to a global level (Collar et al., 1994) and as "Localised" to an European level (Tucker and Heat, 1994). The Audouin's Gull has been removed from the list of the threatened species (Collar et al., 1994) due to the exceptional increase of the Spanish colonies, particularly that of the Ebro delta. In this area, however, it is strongly conditioned by the availability of fish scraps from the trawler fishing. For this reason, the species has been classified globally as "near threatened" (BirdLife International, 2000) and included in the Appendix II of the Convention of Berna, in the Appendix of the Convention of Bonn, and in the Appendix of the protocol on the Areas Especially Protected and the Biological Difference in the Mediterranean. In Italy it is considered a protected species on the basis of the law 157/ 92, D.P.R. 357/97 by the Directive 79/ 409/ CEE, and included in the Red List (LIPU and WWF, 1999).

MOVEMENTS (Fig. 1)

This aspect holds a notable importance for the distribution of the species and, accordingly, the conservation status of the species. In the non-breeding season, this gull is wandering and partially migratory. It is noted in many points of the Mediterranean, particularly beside the islands, it is abundant along the African coasts also out of the Mediterranean, it is rare in the sea of Marmora, and in the North and Middle Europe sightings are rarer so far (Cramp and Simmons, 1983; www.eurobirding.co.uk).

The gulls either winter in the nest-building sites or perform their migrations, at times partial, according to the original colonies; summer movements are observed for either immatures or adults that have not reproduced. More precisely, our data show the following:

– based on the ringings (a catching method) carried out in Spain and Portugal, where there is the migratory passage, and the observations in parks and reserves of Andalusia (Salinas del Cabo de Gaeta, Tarifa), we know that nest builders

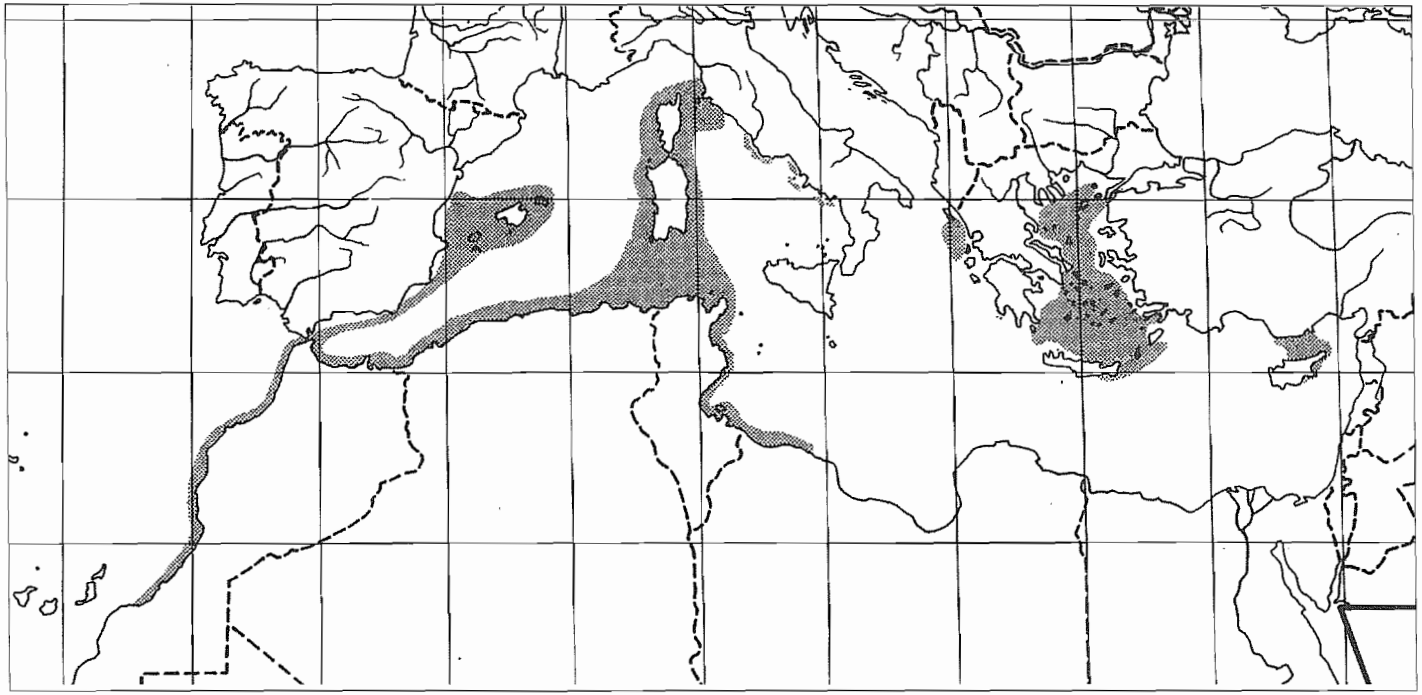

Fig. 1 - Wintering distribution of Audouin's gulls

of such regions migrate from June to September, through the straits of Gibraltar, toward the Atlantic coasts, coming from either North-Western Africa (Canaries, Morocco, Mauritania, Senegal) (Oro and Martinez-Villalta, 1994) or North Africa (Morocco, Algeria, Tunisia, Libya) (Cramp and Simmons, 1983), to which they return in March-April; outside the Mediterranean, young birds are usually to be found; in North Africa, the adults abound; also in the interior of Morocco (Mansour Eddahbi dam in the April 1997 and El Mansour lake in 1999 april; Beaman, 1999) some individuals have been observed;

- some gulls winter out of the Mediterranean along the Algarve coasts (Portugal), and the Basque and Brittany coasts;
- the gulls nesting in Corsica regularly winter on the island; the pond of Biguglia is much frequented (Thibault and Guyot,1989);
- the summer visitors of the Mediterranean coasts of France seem rare (Spanish origin, a few ringed adults from the Ebro delta) (www.ornithologie.fe.st);
- the gulls nesting in the Sardinian-Tuscan area seem to winter locally in Sardinia and on the North African coasts; all lost individuals discovered in Savoia and Switzerland, mostly the youngest, originate from the Tuscan archipelago; a migratory passage has been observed in the Cagliari and Oristano areas, and the Burano-Orbetello Reserve as well (www.ornithologie.fe.st);
- along the coasts of the National Park of the Circeo sightings were made during the migratory passage as well as in the winter (the sightings have been more numerous in the last 15 years, Milone, personal communication);
- in Campania (Southern Italy) the species was considered, at first, occasional (Milone and Grotta, 1983). Since late 80s, it obtained the *status* of wintering, even if it has been observed as a limited event both in terms of small and varied proportions over the years. It has been observed along a wide coastal area from the Domitian coast (province of Caserta) to Sapri (in the Cilento area), with presences also on the coasts of the islands of the Naples gulf as, for example, Vivara and Capri (Finamore and Milone, 2001). These individuals are probably of Tuscan origin;
- a few adult individuals in spring migration or summer are lost in lakes of Germany, Rep. Czech, Switzerland and Bulgaria - those gulls nesting in the Eastern Mediterranean, either stay *in situ*, as do part of the populations of Cyprus, or winter along the Mediterranean and Aegean-Turkish coasts, from the area of Adana up to the Marmora Sea, (M. Ozen, pers comm., 1986-2003), or winter along Middle East (Lebanon ecc.) (Cramp and Simmons, 1983; Ornithological Society of Middle East, www.osme.org/ osmerec/); frequent sightings of individuals are made during the migratory passage, not only on the coast, but also in inner lakes near Adana, (M.Ozen, pers. comm.,

1986-2003); since 1980s there is an increase in the number of gulls wintering in the Peloponnese (Handrinos and Akriotis, 1997) and between the Cicladi (Vassilakis et al., 1994);
- rarely, adults in spring migration or summer are observed either along the coasts of Malta, Lebanon, Jordan or on the Nile delta and in the Red Sea (Eilat in Israel) (my.ort.org.il/ holon/ birds/ index.html)
- rarely, autumn visitors are observed in Zaranik (on the Mediterranean coast of the Sinai) and in the Red Sea to Eilat (my.ort.org.il/ holon/ birds/ index.html); the limited information depends on either the scarce research activity or the marine characteristics of the species which rarely approaches the coasts. Much of the information originates from birdwatchers on holiday (cfr. Internet "*Larus audouinii*").

POPULATIONS AND NEST-SITE BUILDING (Tab. I, Fig. 2)

Currently, the population is estimated around 19,000 pairs (Oro et al., 2000): in the last 50 years only, comparable figures are those of Makatsch (1968) with 800- 1000 pairs and that of Cramp and Simmons (1983) with 3,500 pairs. In Spain is found 76% of the entire population (considering that about 20% belongs to the Chafarinas islands on the Moroccan coast). In Italy, populations are the second largest group (around 1000 pairs) which account for 5% of the entire population (Serra et al., 2001). In Italy, in 1984, pairs were around 550, representing 11% of the total (Fasola, 1986).

The Audouin's gull has been discovered in the XIX century by Payraudeau in the Cerbicales islands (1) (number in parenthesis now on as referred to in Tab. 1 and Fig. 2) in front of Porto Vecchio in Corsica. However, we only have several censuses starting in 1962 (de Bournonville, 1964) and yearly since 1981 (Thibault and Guyot, 1989). In the Cerbicales, however, due to competition with the Yellow-legged Herring gull, the Audouin's gull has not nested consistently since 1988; in 2001, 18 adults have been recorded as not having nested (Milone, personal communication); BirdLife (2001) signals 2 pairs in 1995. In Corsica there were nest-buildings in other sites (Deceuninck et al., 2000). In the Finocchiarola islands (2) (north of Cape Corsica), there were 18 pairs in 1979, 86 in 1986, 85 in 1995 and 47 in 2001 (Thibault and Guyot, 1989; Lambertini, 1994; Hagemeijer and Blair, 1997; Milone pers comm., 1986, 2001; Birdlife International, 2001), - Also, in these areas, the problem of competition with the Yellow-legged Herring gull, which provoked the decline at the end of the century, exists. In the natural reserve of Scandola (3) (north of Porto) have been observed 8 pairs in 2001 (Milone, pers. comm.) and 2 recorded in 1995 from BirdLife (2001). In the islands of Lavezzi (4) (south of Bonifacio), there is a probable nest-building in 2001 (Milone, personal communication) with 2 pairs.

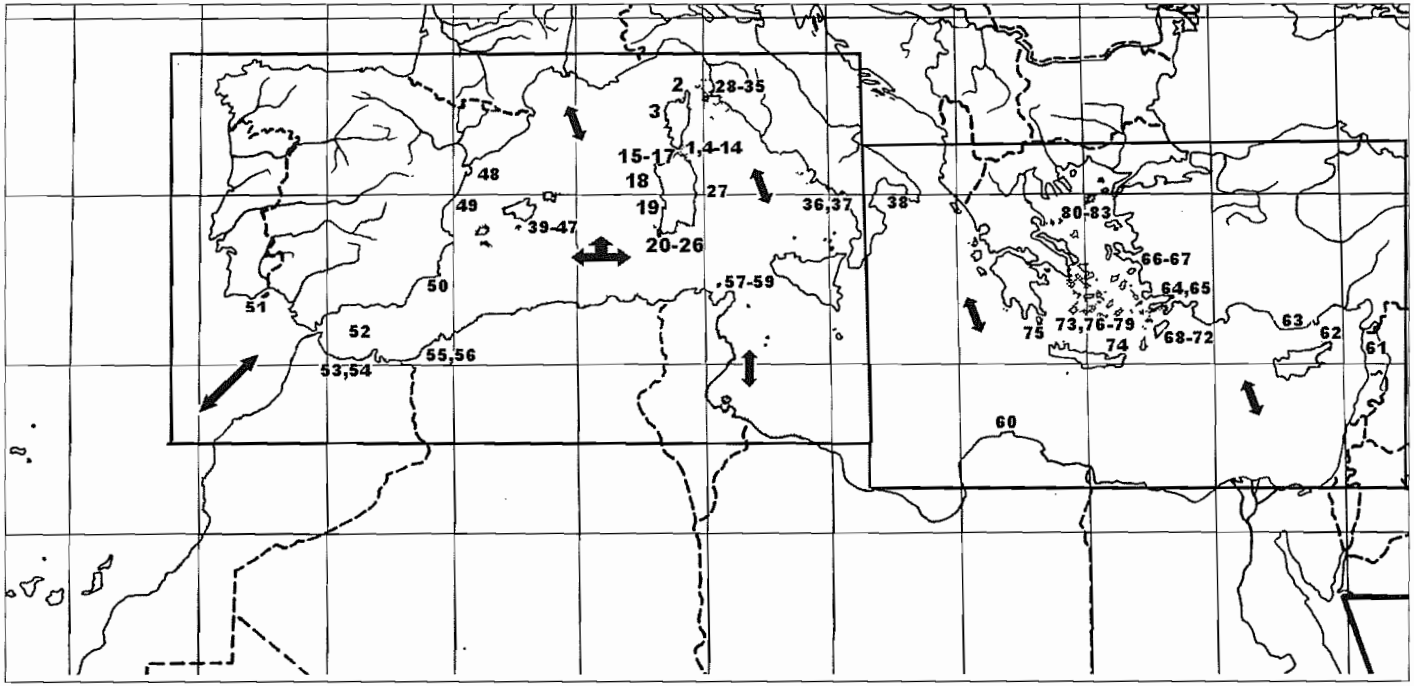

Fig. 2 - Colonies, movements and probably biogeographic nuclei of Audouin's gulls

Tab. I - Audouin's gull colonies and their population data

N°	Site	Colony type	Max pairs (year)	Last nesting (Y.)
1	Is. Cerbicales (Corsica)	deceased		
2	Is. Finocchiarola e Centuri (Corsica)	half past XX century born	86 (1986)	47 (2001)
3	Scandola (Corsica)	historic		8 (2001)
4	Is. Lavezzi (Corsica)	first years XXI century born		2 (2001)
5	Is. Caprera (Sardegna)	historic		77 (1987)
6	Is. Corcelli (Sardegna)	half past XX century born	16 (1997)	8 (1998)
7	Is. La Presa (Sardegna)	half past XX century born		22 (2000)
8	Is. Porco (Sardegna)	half past XX century born		10 (1992)
9	Is. Razzoli (Sardegna)	half past XX century born		23 (1995)
10	Is . Molara (Sardegna)	historic	63 (1997)	50 (1998)
11	Is. Figarolo (Sardegna)	half past XX century born		30 (1999)
12	Is. Soffi (Sardegna)	half past XX century born		35 (1991)
13	Is. Mortorio (Sardegna)	historic		129 (1990)
14	Is. Nibani ovest (Sardegna)	historic	215 (1999)	168 (2000)
15	Is. Rossa di Castelsardo (Sardegna)	half past XX century born	5 (1997)	2 (2000)
16	Is. dell'Asinara (Sardegna)	historic		47(1989)
17	Is. Piana di Asinara (Sardegna)	historic	252 (1998)	47 (1987)
18	Is. Piana di Alghero (Sardegna)	half past XX century born		23 (1996)
19	Is. Mal di Ventre (Sardegna)	historic	126 (1999)	61 (2000)
20	Is. San Pietro (Sardegna)	half past XX century born	22 (1998)	2 (1999)
21	Is. Piana di S. Pietro (Sardegna)	half past XX century born		34 (1999)
22	Is. Ratti (Sardegna)	half past XX century born		32 (2000)
23	Is. Rossa di Teulada (Sardegna)	historic		100 (1992)
24	Is. Tuarredda (Sardegna)	half past XX century born		141(1999)
25	Is. Coltellazzo (Sardegna)	historic	112 (1998)	56 (1999)
26	Is. Cavoli (Sardegna)	half past XX century born	31 (1998)	15 (2000)
27	Cala Magroni (Sardegna)	half past XX century born		15 (1999)
28	Is. Gorgona (Toscana)	half past XX century born		60 (1988)
29	Is. Capraia (Toscana)	half past XX century born	53 (1998)	37 (2000)
30	La Caletta, Is. Elba (Toscana)	half past XX century born		50 (1999)
31	Is. Topi (Toscana)	half past XX century born		100 (1990)
32	Is. Palmaiola (Toscana)	half past XX century born		18 (1993)
33	Is. Pianosa (Toscana)	half past XX century born		54 (2000)
34	Is. di Montecristo (Toscana)	half past XX century born		4 (1995)
35	Is. del Giglio (Toscana)	half past XX century born		81 (2000)
36	C. Palinuro (Campania)	first years XXI century born	8 (2000)	1 (2002)
37	Costa degli Infreschi (Campania)	first years XXI century born	1 (2001)	1 (2001)
38	Is. S. Andrea (Puglia)	first years XXI century born	53 (1998)	30 (2000)
39	Is. Menorca (Baleares)	historic		over 100 (1995)
40	Is. Dragonera (Baleares)	historic		over 100 (1995)
41	Cabo Freu,C.Farrutx, Is.Mallorca (Baleares)	first years XXI century born		20-25 (1995)
42	Is. Cabrera (Baleares)	historic	381 (1995)	257 (1999)
43	Is. Conejera (Baleares)	half past XX century born		200-250 (1996)

Tab. I - Audouin's gull colonies and their population data

N°	Site	Colony type	Max pairs (year)	Last nesting (Y.)
44	Is.S.Eulalia,Redona,Es Canar (Baleares)	half past XX century born		57-65 (1996)
45	Is. Vedra e Vedranell (Baleares)	first years XXI century born		25 (1995)
46	Is. Freu (Baleares)	historic		300 (1996)
47	la Mola, Is.Formentera (Baleares)	half past XX century born		10 (2001)
48	Delta of Ebro (Cataluna)	half past XX century born	11.600 (1997)	10.500 (2000)
49	Is.Columbretes (Costa Valenciana)	half past XX century born		250 (2001)
50	C. Huertos, Is.Tabarca y Grossa (Costa Blanca)	half past XX century born		450 (1996)
51	Castro Marim (Algarve)	first years XXI century born		11 (2001)
52	Is. Alboran (Spain)	half past XX century born		100 (1996)
53	Is. Chafarinas (Melilla)	historic	3.540 (1993)	2.700 (1997)
54	Is. Bokoyas (Al Hoceima)	half past XX century born		50 (1999)
55	Cape Falcon-C.Blanc (Oran)	half past XX century born		400 (1993)
56	Is. Habibas (Oran)	half past XX century born		100 (1992)
57	C. Bon (Tunisia)	half past XX century born		2 (1984)
58	Is.La Galite (Tunisia)	half past XX century born		50 (1991)
59	Is. Zembra (Tunisia)	half past XX century born		20 (1991)
60	Al Akhdar coast (Cyrenaica)	first years XXI century born		3 (2001)
61	Is.of Tree Palm (Lebanon)	historic	10 (XIX sec.)	2 (2000)
62	Is. Klidhes (Cyprus)	half past XX century born		18 (1996)
63	islets near Aydyncyk (Anamur coast-Turkey)	half past XX century born	30 (1987)	6 (1996)
64	Datca coast (Resadiye peninsula-Turkey)	half past XX century born		20-30 (1998)
65	Torba-GÅvercinlik coast (Bodrum pen.-Turkey)	half past XX century born		10 (1997)
66	Is. of Ildyr gulf (Karaburun pen.-Turkey)	first years XXI century born		23 (2001)
67	Alacati coast (Karaburun pen.-Turkey)	half past XX century born		20 (1995)
68	Is.Tilos (Dodekanissa)	half past XX century born		18-25 (1997)
69	Is. Simi (Dodekanissa)	half past XX century born		12 (1997)
70	Is.Chalki (Dodekanissa)	half past XX century born		47 (1997)
71	Is.Kalolimnos (Dodekanissa)	half past XX century born		36 (1996)
72	Is.Kasos (Dodekanissa)	half past XX century born		60 (1997)
73	North Dodecanese (Dodekanissa)	half past XX century born	110 (1995)	65 (1997)
74	Is.Dionisiades (Kriti)	half past XX century born		5-6 (1995-97)
75	Is.Kythira (Greece)	half past XX century born		30 (1996)
76	Is.Astypalea (Dodekanissa)	half past XX century born		18-23 (1996)
77	Is.Amorgos (Kiklades)	half past XX century born		51 (1997)
78	Kinaros and Levitha (Dodekanissa)	half past XX century born		32-38 (1995)
79	Is.Fourni (Samos)	half past XX century born		40-55 (1996)
80	Is. Skiros and Ag.Fokas (Sporades)	half past XX century born		55 (1996)
81	Is. Alonisos (Sporades)	historic		100 (1995)
82	Is.Limnos (Limnos)	half past XX century born		50 (1998)

The nest-buildings in the Bonifacio strait are connected certainly to those in Sardinia of the Maddalena archipelago (5 nest- sites) (**5, 6, 7, 8, 9**). Other sites in Sardinia are found on the coasts and islets near Olbia (5) (**10, 11, 12, 13, 14**), in the Asinara gulf (3) (**15, 16, 17**), Cape Caccia (1) (18), in the area of Cape Marrnu (1) (**19**), between Iglesias and Cape Pula, included islands (6) (**20, 21, 22, 23, 24, 25**), Cape Carbonara (1) (**26**), and Orosei Gulf (1) (**27**). Many of these sites have not always been frequented, and the number of pairs has been varying through the years. In this area 77.1% of the Italian population is found. Another remarkable percentage is in Tuscany (8 sites with the 17,7%) (**29, 30, 31, 32, 33, 34, 35**), and, precisely, in the Tuscan archipelago, with three sites on the island of Elba. For each of the above sites we have sporadic records since the 70s (Moltoni, 1975; Meschini et al., 1979; Baccetti and Mongini, 1981), but the first complete and yearly census of the area has been carried out since 1999 by INFS (National Institute of the Wild Fauna in Bologna), that shows a decrease of the population in Sardinia in the year 2000.

Recent colonies are in the Thyrrhenian and Ionian sea. In the former there have been two sites of interest in the Cilento area, Cape Palinuro (**36**), and the Infreschi Coast (**37**), with a maximum of 8 pairs at the first site in 2000 and one pair at the second site since 1994 and only in 2001 we recorded nest-buildings at both sites (1 pair each) (Milone and Finamore, in press). In the Ionian sea, nest-building on the S. Andrea island (**38**) initiated in 1992 with 8 nesting pairs (Cataldini and Scarpina, 1993) reaching the maximum in 1998 with 53 pairs (Serra et al., 2001). Therefore, in Italy 984 pairs have been estimated in 2001 (Serra et al.), respect to 549 pairs in the 1984 (Fasola, 1986) Therefore, in the world, the percent report of italian populations has been decreasing from 11% in 1984 to 5% in 2000-2001.

On the Western side of the Thyrrhenian sea, along the Spanish coast, over 50% of the population of the species is found. The most ancient colonies of the Spanish coastlines and Ebro delta are probably the Balearic ones (www.eurobirding.co.uk; Hagemeijer and Blair, 1997; Oro, 2000; Viada, 2000; Serra, 2001; BirdLife 2001). In the last 20 years the Balearic colonies increased from 532 pairs in 1983, to 709 in 1993, and 1650 in 1997. The largest part of the colonies was localized on islets and rocks. Remarkable are those of Menorca and Mallorca: the Menorca colonies (Cape of Banyos; Bledas Isl.; Cape of Caballería; Isl. of Addaya S' Albufera; Isle of Aire) (**39**) with more than 100 pairs in 1995 (BirdLife, 2001); the Mallorca colonies (Isl. of Dragonera, the rocky cape of Andraitx and some small rocky islets, Isl. of Pantaleu, at west; Cape of Freu and Cape Farruch, a rocky section, with high limestone cliffs and Mediterranean scrub, of coast at the north-east; limestone cliffs and several offshore rocky islets, Isl. Malgrats, Isle of Taurus, in the south-east) with 257 pairs in 1983. Recently BirdLife (2001) noted nest abandon-

ment in the Malgrats by human disturbance, while not in other areas, like Dragonera (**40**), where have been recorded more than 200 adults, and C. Freu and C. Farrutx (**41**), where nested 20-25 birds in the 1995. A small archipelago to the South-East of Mallorca, formed by two main islands Cabrera (**42**) and Conejera (**43**) and many small rocky islets, with rocky limestone ground and high cliffs, shows rich populations. Cabrera populations are the most abundant (100 pairs in the 1983, 257 in the 1999, 381 in the 1995); in Conejera has been recorded 200-250 pairs in 1996-57-65 pairs has been recorded in 1996 (BirdLife, 2001) in the islets of Santa Eulalia, Redona and Es Canar (**44**), very small rocky islets off the South-East coast of Ibiza, with). Occasional breedings (25 pairs in 1995) have been observed in islands of Vedrá and Vedranell (**45**) at South-West of Ibiza . At least Freus Islets (**46**), (between Ibiza and Formentera) showed -about 300 pairs in 1996 and in La Mola (47) (a peninsula in eastern Formentera with high coastal cliffs) has been censused 10 pairs (BirdLife, 2001).But the most important colony of the area, and of all the zones of the Audouin's Gull, is that of the Ebro delta: it ranges from 36 pairs in 1981 (the formation of the colony), to 10,500 pairs in 2000, to a maximum of 11,600 pairs in 1997 (Oro, 1998). Of all these areas only Cabrera and the Ebro have good protection. Between the Baleari and Valencia lies a small volcanic archipelago, the Columbretes, with 107 pairs in 1993 (Lambertini, 1994). Number of pairs were even more than the double in 2001 (www.eurobirding.co.uk) with large presence of not-nesting residents. Along the coast of Andalusia from Alicante to Almeria, Cape Huertos, the Tabarca island, the Big island, and other small islets (**50**), sporadic pairs were observed until 1995, when there was a rapid increase in the following year (www.eurobirding.co.uk), up to 450 resident pairs in 1996 (BirdLife, 2001).

The only external colony outside the Mediterranean is Castro Marim (Algarve, Portugal) (**51**) where 5 pairs have been registered in 2000 (the year of birth of the colony) and 11 in 2001 (Elias, 2002).

Between Spain and Morocco, far of the coast of Melilla, 160 pairs have been recorded on the Alboran islands in 1996 (BirdLife, 2001). Near to the Moroccan coasts (3.5 km off Ras Quebdana to the East of Melilla), we have the Chafarinas islands (Isabel II, Congreso and Rey, rich in volcanic rocks, some cliffs, xerophytic and halophytic scrub, and bare ground), with the first nest-building observed in 1966 (Brosset and Olier, 1966) This, was followed by a remarkable peak of 3540 pairs in 1993, decreasing to 2700 in 1997, probably due to uncontrolled visiting, egg-collecting, and an expanding Yellow-legged Herring gull colony (Lambertini, 1994; Hagemeijer and Blair, 1997; BirdLife/ EBCC, 2000). Always in Morocco there is a new colony on the Bokoyas islands (**54**), in front of Al-Hoceima, (M. Dakki pers comm. in Lambertini, 1996) with 29 pairs in 1989 and 50 in 1999 (Milone, pers. comm.).

Along the African coast other colonies are found on the West coast of Orán (55), from Cape Falcon to C. Blanc (Jacob and Courbet, 1980). First colonies have been discovered in 1970, however, there is no available data before this date. There are four colonies in this area with about 400 pairs (Boukhalfa, pers comm. in Lambertini, 1996); these colonies have halved over the past 15 years, but new sites are now colonised: recently 100 pairs have settled in the Habibas islands (56) (Boukhalfa 1990, 1992), the largest breeding colony in Algeria. Also, these breeding sites are mainly rocky islands which remain undisturbed because of the difficult access.

On the Tunisian coast the Audouin's Gull has been reported as a breeding species only since the early 1980s (Gaultier and Ayache, 1986). One of us has reported 2 pairs at C. Bon (57), 12 in La Galite islets (58), and 22 pairs in Zembra islands (59), all in 1984 (Milone, unpublished data). Lambertini (1996) reports that the more recent available data confirm two major breeding sites in La Galite archipelago and in the Zembra National Park (Isl. Zembra and Zembretta) with a total of 70 pairs (Essetti no date). There is strong competition with the Yellow-legged Herring gull on the island of Zembra. In Libya (www.eurobirding.co.uk, 2001) 2-3 pairs were recorded on the cliffs along the coast of Al Akhdar between Ra's Ahim and Ra's to the Hilal (60), to the East of Bengasi.

In the Eastern Mediterranean a little colony (a maximum of 10 pairs) has been recorded since the nineteenth century on the Trees Palm Islands (61) (now a Natural Sea Reserve) off the port of Tripoli (Libya) (de Bournonville, 1964); 18 adults were present in April 1973, but none in 1975 (Evans 1994), in 1981 (Milone, pers comm.) and in 1993 (X. Monbailliu in Lambertini, 1996), two pairs were checked in 2000 (N. Ramadan-Jaradi, pers comm.). In Cyprus (Charalambides, 2000) the oldest recorded nest-building is in 1960, with one pair. Afterwards, a positive trend was noted, culminating in 15 pairs in 1987 (de Juana and Varela, 1993) and 18 in 1996 (BirdLife, 2001). Breeding is confined to the Klidhes islands (62), included in the Zafer Burnu National Park, off Zafer Burnu at the tip of the Karpaz peninsula. In front of Cyprus, on the Turkish coast, in two small islands near Aydnck (63) 9 pairs were observed in 1976 (Milone, pers comm.), 30 pairs in 1987 and 6 pairs in 1996, when the nesting of Yellow-legged Herring gull (Viada, 2000b) began. However, in this part of the Mediterranean, the most important area is the Aegean islands and coasts. In Datca (64), the Resadiye peninsula between Marmaris and Gnaw, 20-30 pairs have been recorded in 1998 (BirdLife/ EBCC, 2000) while, in 1976, no one pair has been observed (Milone, pers comm.). Gulls in the breeding season in the Northern coast of the Bodrum peninsula, still in Turkey, have been registered by the members of the Ornithological Society of the Middle East (www.osme.org/osmerec/, 1996-97), who observed 2 pairs, at the same time, in an area between Peat Güvercinlik and the gulf of Güvercinlik (65) (Milone, pers. comm., 1976); BirdLife (2000)

registered 2-10 pairs in islets of the area in 1997. In 2001, there were 23 pairs in the Izmir area (BirdLife, 2001), beyond the peninsula of Karaburun in the gulf of Ildyr (**66**). South of Cesme, in the same area, were a maximum of 20 pairs in 1995 in Alacati (**67**) (Viada, 2000b), while in 1976 there were probably not more than two pairs (Milone, pers. comm.).

Far the Turkish coast between Marmaris and Bodrum is the Dodecanneso. Between the peninsula of Resadiye and Rode are the colonies of Tilos (**68**) with 18-25 pairs in 1997, Simi (**69**) with 12 pairs in 1997, Chalki (**70**) with 47 pairs in 1997 (Bourdakis and Varelitzidou, 2000). Along the coast of the Bodrum peninsula in Kalimnos, Telendos, Kalolimnos islands and islets (**71**) 36 pairs have been observed in 1996 (Bourdakis and Varelitzidou, 2000). In the Southern island Kasos (**72**), nest-buildings have been individuated (max 60 pairs) since 1997, and in the northern islands (**73**) 110 pairs were individuated in 1995 Handrinos and Akriotis (1997), with a maximum of 65 pairs in 1997 (Bourdakis and Varelitzidou, 2000). More South-West, near Klidhes, North-West of the Vai point, in a small group of cliffs and three small islands, the Dionisiades (**74**), 1 pair in 1988 (Milone pers comm.) has been observed and 5-6 pairs in 1995-97 (Vassilakis et al., in 1994; ornithologiki.gr/en/enmain.htm, 2000). Toward the Peloponnese, in Kythira (**75**), there were 30 pairs in 1996 (Bourdakis and Varelitzidou, 2000). An island West of the Dodecanneso, Astypalea, and nearby islets, hosted 18-23 pairs in 1996. A little more West, in the Cyclades (**76**) and in Amorgos (**77**) 51 pairs nested in 1997 (Bourdakis and Varelitzidou, 2000); still west, toward Kalimnos, there are Kinaros and Levitha, some islands and rocky islets (**78**) where 32-38 pairs were present in 1995 (Bourdakis and Varelitzidou, 2000). More north before Samos, in the Fourni islands (**79**), 40-55 nesting pairs have been sighted in 1996 (Bourdakis and Varelitzidou, 2000). In the Northern Egean, in the Sporadi colonies, 55 pairs nested in 1996 in Skyros and Ag. Fokas islets (**80**) (Bourdakis and Varelitzidou, 2000); moreover, in the Northern Sporadi, in islets east of Alonissos (**81**) (Handrinos and Akriotis, 1997), a first nest-building has been observed in 1894, 15-20 pairs in 1961, 30-33 pairs in 1980, and about 100 pairs in 1995. The most Northern colony in the Egean, was in Limnos (**82**) with 50 pairs in 1998 (Bourdakis and Varelitzidou, 2000).

CONCLUSIONS

The limited knowledge on the distribution and evolution of the colonies of the Audouin's gull can be explained by two principal biological factors: the type of fidelity to its breeding site and the pelagic habits of the gull. The colony site fidelity is very strong (Ruiz et al., 1993, Oro and Martínez-Villalta, 1994), while year-to-year fluctuation in nest-site selection and number of breeding

pairs have been recorded in almost all colonies. Site fidelity is likely to be related to previous breeding success. The marine habits of the Audouin's Gull, the low visiting of the inside areas, including lakes, the low interaction with human activities, perhaps lead the species to develop an erratic habit, not inclined to the discovery of new and perhaps fitter sites for nest-building.

The Sardinia-Corsica nucleus is the first centre of known colonies, beginning with the Cerbicales Islands in Corsica. The information on the Tuscan archipelago are the following: the ornithologists of the first part of the 19th century (e.g., Giglioli, 1907, Arrigoni degli Oddi, 1929, Martorelli, 1931) talk about erraticism and a double migratory passage (in spring and autumn) for the Audouin's gull, but not about nest-building for this area. There is, therefore, a probable diffusion from the Corsican to the Tuscan archipelago, from where, in turn, the colonisation of the coast of Campania (Southern Italy) has perhaps departed.

The Balearic colonies are surely more ancient than those along the Spanish coastlines and that of the Ebro, even if the latter is today the most numerous; probably the Ebro colony represents the nucleus of conjunction between Spanish and Sardinian-Corsican-Tuscan colonies.

In absence of precise data it has been thought, at present, to consider these nuclei as sub-unities of a probable bigger colonial entity not completely documented.

The African colonies seem generally younger than the Spanish and the Italian-Corsican nuclei, both observing the recent colonisation in the Algarve and that, from the other side, in Libya. The lack of data in the first half of the 20th century makes it difficult to ascribe the African colonies to either the above-named subunities or to consider it as another sub-unity, remembering that the flow of migrant and wintering is connected to the European colonies. The nuclei of the Eastern Mediterranean seem, absurdly, to have a history on their own. On the basis of the dates of acquaintance of the earliest colonies one might think that the central nucleus of diffusion could be located in the Sporadi, as if those of the area of Cyprus and those in Lebanon would form a formal different sub-unity. On the basis of the movements, it might be supposed that the colony of Gallipoli (S. Andrea), localised near a characterised area of wandering birds as the Ionian Greek Islands and the coasts of the Peloponnese, is derived from the Aegean ones. The same could be hypothesized also for the colony of Libya, not distant from the coast of Cyprus.

The erraticism seems, therefore, to have a role in the chances to know new sites: the colonisation of the Algarve and Cilento areas has been preceded for a long time by winter-only presences and afterwards summer ones.

We consider it very important to follow the movements along the Atlantic Moroccan coasts just as we follow the occasional presences that are recorded in the Basque or Breton areas along the coasts. Certainly the dynamics of colonisation of the species is not so simple: the most obvious matter is how to

explain the existing fracture between the two groups of colonies, the Central-Western and the Eastern. In early years, there might have been a fragmentation in the primal area followed by diverse and different processes of recolonisation, which are still taking place. In fact, the species has a positive growth trend of population which is due not only to the single colony of the Ebro. Certainly the development of this colony shows a peculiar type of adaptation not registered elsewhere, in that the increasing number of individuals while formally decreases the risk of extinction of the whole species, it weighs too much on the colony itself thereby creating its fragility.

The risk of extinction expressed in the years 70'-80' was also connected to the scant knowledge of the species, in a period in which a certain increase of the populations has been verified and perhaps in the number of the colonies The invasion and competition by the Yellow-legged Herring gull seems to be among the various probable causes of most evident risk of extinction. The impact that the species currently has on the development of the populations of Yellow-legged Herring gull could be one of the original incidental factors for the fragmentation of the area at the time of the Yellow-legged Herring gull's colonisation of the Mediterranean.

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