

## MOVEMENTS OF YELLOW-LEGGED GULLS *LARUS [CACHINNANS] MICHAHELLIS*<sup>1</sup> FROM TWO SMALL WESTERN MEDITERRANEAN COLONIES

ALEJANDRO MARTINEZ-ABRAIN<sup>1</sup>, DANIEL ORO<sup>1</sup>, JOSEP CARDA<sup>2</sup> &  
XAVIER DEL SEÑOR<sup>2</sup>

Martinez-Abraín A., D. Oro, J. Carda & X. del Señor 2002. Movements of Yellow-legged Gulls *Larus [cachinnans] michahellis* from two small western Mediterranean colonies. *Atlantic Seabirds* 4(3): 101-108. *In this study we analyse recoveries and resightings of ringed Yellow-legged Gulls *Larus [cachinnans] michahellis* from two small colonies located along the E and SE Mediterranean Iberian coast. Results show that birds follow the same migratory routes as birds of other colonies of the western Mediterranean. Gulls move to the Atlantic coast of France and Iberia after fledging, where they summer and winter, although equally important numbers probably remain close to their natal colonies. Immature gulls (1y + 2y) seem to return and stay in the vicinity of their natal colonies during spring. Long-range movements target Atlantic areas with a high primary production during periods of food scarcity in the western Mediterranean. Adult gulls probably do shorter-term long-range dispersal movements than juveniles and immatures, owing to their larger experience on where to find alternative food sources.*

<sup>1</sup>Instituto Mediterráneo de Estudios Avanzados (CSIC-UIB), Miquel Marqués 21, 07190 Esporles, Mallorca, Spain. E-mail: a.abrain@uib.es; <sup>2</sup>Centro de Información de la Reserva Natural de las Islas Columbretes, Planetario de Castellón, Paseo Marítimo 1, 12100 El Grao, Castellón, Spain

### INTRODUCTION

Yellow-legged Gulls *Larus [cachinnans] michahellis* have become increasingly common during the last 30 years due to protection of breeding sites, development of industrial fisheries and proliferation of open-air garbage dumps. Today, the western Mediterranean population numbers at least 120 000 breeding pairs (Vidal *et al.* 1998). It is important to know the location of wintering quarters to understand patterns of winter survival which influence the growth of colonies.

Yellow-legged Gulls from the Iberian Mediterranean were considered as sedentary in the past owing to the paucity of observations through the Gibraltar Straits during autumn and spring migrations (Tellería 1981). More recently, a N-NW movement was identified, albeit it was at first thought to be mere summer dispersal, corresponding with the period of complete moult (Carrera *et al.* 1993). However, although Iberian Atlantic populations show non-

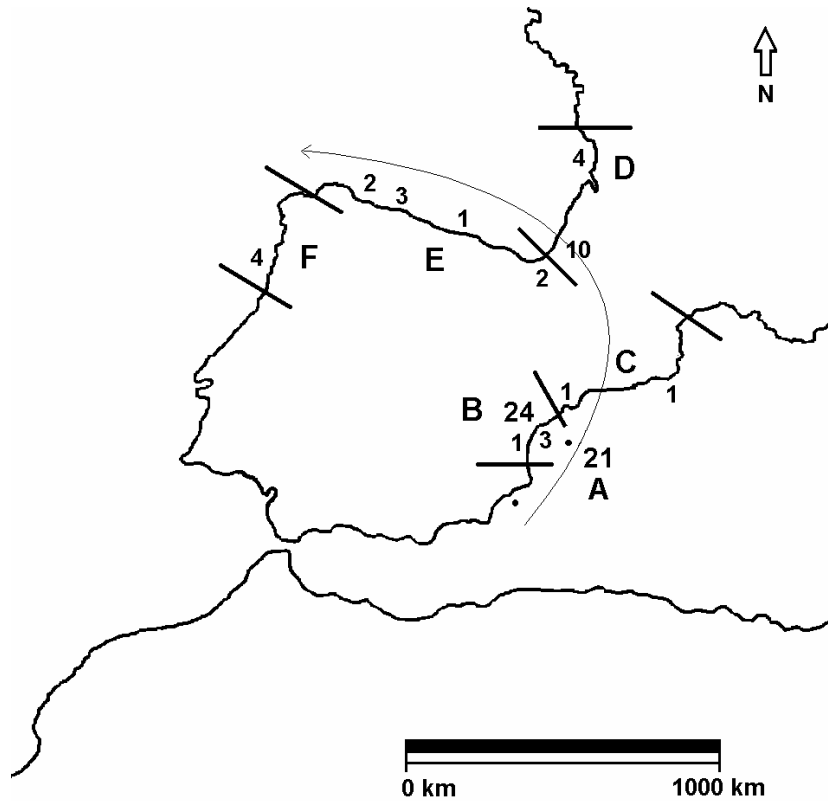


Figure 1. The number and approximate geographic location of recoveries and sightings of Yellow-legged Gulls ringed at colonies of the Columbretes Islands and the Island of Benidorm. Solid dots show the location of both islands and the solid arrow indicates the most likely overall migration route. Letters correspond to the geographical sectors used in the paper to study variations in migratory patterns in relation to age and season: A = Columbretes archipelago; B = East Iberian Mediterranean coast; C = Northeast Iberian Mediterranean coast; D = French Atlantic coast; E = Cantabric Iberian coast; F = North Portugal.

Figuur 1. Het aantal en de locatie van terugmeldingen en waarnemingen van geringde Geelpootmeeuwen afkomstig van de Columbretes Eilanden en het eiland Benidorm. Zwarte stippen geven de locatie van beide eilanden aan, de pijl geeft een indicatie van de meest waarschijnlijke trekweg. De letters corresponderen met de geografische sectoren die in dit artikel worden gebruikt: A = Columbretes archipel; B = Oost-Iberische Middellandse zee kust; C = Noordoost-Iberische Middellandse zee kust; D = Franse Atlantische kust; E = Cantabrische Iberische kust; F = Noord-Portugal.

migratory habits (Munilla 1997), it has been demonstrated that increasing numbers of western Mediterranean Yellow-legged Gulls undertake long summer migrations. Gulls fly overland to the Bay of Biscay, French Brittany, the English Channel, the southern North Sea and even to alpine lakes, following major river valleys (Yésou 1985, Le Mao & Yésou 1993, Carrera *et al.* 1993, Munilla 1997). Western Mediterranean birds known to migrate to the Atlantic and southern North Sea originate from Sardinia, colonies along the coast from the Hyères archipelago (France) to the Ebro Delta (Spain), the Balearic Islands and probably Corsica (Carrera *et al.* 1993). The aim of this paper is to characterise the migration routes, phenology and age structure of gulls ringed at two small colonies of the Western Mediterranean and compare this with information on Yellow-legged Gull migration reported so far.

#### METHODS

The study area includes the Columbretes archipelago and the island of Benidorm. The Columbretes archipelago is a protected area consisting of a 19 ha volcanic outcrop comprising four major islet groups, located ca. 57 km off Castellón (39°54'N, 00°41'E), close to the edge of a wide continental shelf. Gulls breed mainly on the largest of the islands, Grossa Island, with a surface area of about 13 ha. The number of breeding pairs, around 500 pairs, has not changed much over the last 15 years (Table 1). A total of 1411 chicks have been marked during annual campaigns since 1993. Since 1998 most chicks (471 chicks; Table 1) have been ringed with a yellow darvic band engraved with a black alphanumeric code (beginning either with 0 or 1) and with a metal ring. In 2001, gulls were only marked with darvic bands due to a lack of metal rings. The island of Benidorm is a 6.5 ha limestone outcrop at ca. 3 km off the coast of Benidorm (38°30'N, 00°08'E), 165 km to the south of the Columbretes Islands. The breeding population of Yellow-legged Gulls has tripled during 1999-2001 (Table 1) and 231 gulls have been marked in that same period. Of these, 201 were also marked with the same type of darvic bands as used in Columbretes and again, in 2001 gulls were only marked with darvic bands due to a lack of metal rings. No resighting effort was done on the island. Resightings of engraved darvic rings (with an individual and unique alphanumeric code) and recoveries of metal rings were considered together. The frequencies used should be seen as an index, combining information on relative abundance, degree of permanence and degree of fidelity of marked gulls to a given site, since we pooled all sighting data and not only one record for each individual resighted (*cf.* North 1987). Four age classes were considered:

1y            juveniles in their first year of life,

2y	sub-adults in their second year of life,
3y	sub-adults in their third year of life, and
4y	adults in their fourth year or older.

Ages of birds recovered are given to the nearest year (i.e. gulls recovered after 1 May were considered to belong to the next year age class). Juvenile birds found dead at the breeding colony one year after ringing were not considered for dispersal analysis to avoid confusion in dating recoveries of fledglings, which probably died before fledging (see Coulson & Wooller 1976, Møller 1981). Recoveries were grouped in three sets of months:

March-June	breeding period
July-October	post-fledging dispersal, and
November-February	wintering

Contingency tables together with the Chi-square statistic were used when appropriate. Yate's correction was applied to 2x2 contingency tables (Zar 1984).

## RESULTS

A total of 77 recoveries and sightings were reported up to the end of 2001, of which 73 (2 metal rings, 71 darvic rings) corresponded to 41 individuals ringed at the Columbretes archipelago. Of the 71 resightings of darvic bands, 14 corresponded to sightings of gulls ringed at Columbretes as adults. These sightings corresponded to five individual birds, controlled several times from March to October at their colony of origin. Only 4 resightings of gulls from Benidorm were reported, all on sites located further north from Benidorm where gulls from Columbretes were also recorded.

Young gulls performed large-scale movements. Juvenile birds seemed to move north along the Mediterranean coast and once they reached the French border they moved west or northwest across the continent to reach French Brittany, the Bay of Biscay (Cantabria, Asturias) and up to the north coast of Portugal (Figure 1 and Table 2). Juvenile gulls seemed to reach their long-distance dispersal quarters not before September, since most sightings occurred in winter (November-February; Table 2) and provided that a constant effort between months is assumed. In contrast, Carrera *et al.* (1993) reported that the bulk of Yellow-legged Gulls arrive to their summer quarters during the second half of July.

A contingency analysis revealed highly significant differences in the proportions of gulls resighted close (sectors A+B+C, see Figure 1) or far (D+E+F) from natal colonies within (March-June) or outside (July-February) the breeding season ( $\chi^2_1 = 8.39$ ,  $P < 0.01$ ). Studentised residuals of the

Table 1. Yellow-legged Gulls ringed at the Columbretes and Benidorm Islands, which have been recovered or resighted from 1993-2001. BP= number of breeding pairs. Number of adults between brackets.

Tabel 1. Op de Columbretes en op Benidorm geringde Geelpootmeeuwen die tussen 1993 en 2001 werden teruggevonden of teruggezien. BP = aantal broedparen. Adulte vogels zijn tussen haakjes weergegeven.

Year	COLUMBRETES					BENIDORM				
	BP	Gulls ringed		Recoveries		BP	Gulls ringed		Recoveries	
		Metal	Darvic	Metal	Darvic		Metal	Darvic	Metal	Darvic
1993	425	165	0	0	0					
1994	425	135	0	0	0					
1995	475	102	0	0	0					
1996	675	88	0	0	0					
1997	650	96	0	0	0					
1998	500	160	141	0	2					
1999	530	40 (51)	16 (12)	2	28(1)	193	18 (1)	18 (1)	0	1
2000	400	154 (13)	154 (13)	0	30(13)	361	126 (26)	96 (26)	0	0
2001	420	0	160	0	13	652	0	87	0	3
Total		940 (64)	471 (25)	2	71(14)		144 (27)	201 (27)	0	4

contingency table showed that the proportion of gulls resighted close to the Columbretes colony was higher during the breeding season whereas gulls outside the breeding season were equally frequently resighted close and far from the colonies.

## DISCUSSION

**Migratory routes** The analysis of ringing recoveries suggests that the birds of the two colonies under study follow the same migratory routes as those of other western Mediterranean colonies studied so far (i.e. move north and northwest after fledging; see Carrera *et al.* 1993, Le Mao & Yésou 1993). This is probably because Yellow-legged Gulls simply follow the shortest way, and because they can find food on mainland sources (e.g. following river valleys). Oceanic seabirds like Balearic Shearwaters *Puffinus mauretanicus* travel from the western Mediterranean (Balearics) to similar post-nuptial quarters, but have to pass through Gibraltar Strait and follow the Atlantic Iberian coast (Le Mao & Yésou 1993).

**Age and movements of gulls.** According to our data, adult birds seem to be either sedentary or move north late in the season (November-February). The lack of observations of adult gulls during the winter months in northern

Table 2. Number of recoveries and sightings (number and proportion) of Yellow-legged Gulls ringed at Columbretes and Benidorm Islands by age and geographical sector (see Fig. 1). Percentages between brackets.

Tabel 2. Aantal terugmeldingen (en percentage) van Geelpootmeeuwen van verschillende leeftijden en van de diverse geografische sectoren (zie Fig. 1).

	March-June				July-October				November-February			
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
Columbretes	3	1	1	9	0	0	1	5	0	1	0	0
	15.8%	9.1%	100%	100%			100%	100%		16.7%		
E Iberia	14	4	0	0	3	3	0	0	4	0	0	0
	73.7%	36.4%			50%	100%			25%			
NE Iberia	1	0	0	0	0	0	0	0	0	1	0	0
	5.3%									16.7%		
French Atl.	0	4	0	0	0	0	0	0	6	4	0	0
		36.4%							37.5%	66.7%		
Cantabric	1	2	0	0	2	0	0	0	3	0	0	0
	5.3%	18.2%			33.3%				18.8%			
N Portugal	0	0	0	0	1	0	0	0	3	0	0	0
					16.7%				18.8%			
Total	19	11	1	9	6	3	1	5	16	6	0	0

locations could alternatively be interpreted as an artefact, due to the low number of adults ringed. The chicks marked with darvic bands had not yet attained adult ages during our study. Munilla (1997) suggested that adult Yellow-legged Gulls ringed at Medes Islands (NW Mediterranean) performed long-range movements from July to February although Sol *et al.* (1995) found that adults from the Medes colony tended to stay closer to their natal colonies during the winter than juveniles. By direct observation of colonies outside the breeding season we know that a large number of adult and sub-adult gulls concentrate in both islands (Columbretes and Benidorm) in autumn (with decreasing numbers as winter begins) and that adult birds in colonies may start sexual displays and defence of territories as early as December (own data). However, if rough weather conditions prevail around colonies (e.g. during November-December), gulls may be deprived of one of their most important food sources (i.e. fisheries discards), since trawler boats can not work out at sea (Arcos 2001) and, hence, some gulls might be forced to move. This may be especially true for the Columbretes Islands, located much farther from the mainland coast than Benidorm Island, and where access to alternative food sources on the mainland becomes more difficult.

Juveniles and immatures were involved in long-range movements, as it is the case in other gull species (Coulson & Butterfield 1986, Belant & Dolbeer 1993). Young Yellow-legged Gulls did not travel north only to summer, as

reported so far (Carrera *et al.* 1993), but also to overwinter. Results suggest that during spring immature gulls (1y + 2y) move south to the vicinity of their natal colonies, when food availability is more favourable due to oceanographic conditions.

**Food abundance and movements** Oceanographic conditions of the Mediterranean are characterised by the development of a thermocline, which forces a decrease in primary productivity during the summer (Rodríguez 1982; Margalef 1985). On the contrary, the coast of the French Brittany and the Bay of Biscay are dominated by upwellings and large surfaces of tidal flats where food is abundant (Le Mao & Yésou 1993). These features probably explain why gulls move northwards to their summer and winter quarters. However, since the ratio of adults to juveniles observed during the summer feeding behind trawler boats in the western Mediterranean is favourable to adults as a rule (Martínez-Abraín *et al.* 2002), it is likely that long-term long-range movements involve more juveniles and immatures than adults. In fact, first-age classes of other gull species breeding in the Mediterranean, like Audouin's Gull *Larus audouinii* are linked to other upwelling systems (Oro & Martínez-Vilalta 1994), whereas subadults and adults are more independent of these sites. Hence, the interaction among age, time period and location in Mediterranean Yellow-legged Gulls is probably mediated by the experience acquired by gulls on where to find alternative food sources as refuse tips or fishing discards.

#### ACKNOWLEDGEMENTS

We are most grateful to the wardens of the Columbretes archipelago and Benidorm island for their help ringing gulls. We also thank a long list of friends who helped during ringing campaigns in both islands and all those anonymous persons that reported recoveries and sightings of rings and bands. Juan Jimenez (former director of the Columbretes Nature Reserve) always encouraged ringing efforts in Columbretes and first suggested the interest of beginning analysis of recoveries reported so far. Marc Bosch provided valuable ringing information. MA. Monsalve kindly commented on an early draft of the paper.

#### TREKBEWEGINGEN VAN GEELPOOTMEEUWEN *LARUS MICHAHELLIS* AFKOMSTIG VAN TWEE KLEINE KOLONIES IN DE WESTELIJKE MIDDELLANDSE ZEE

Sinds 1993 worden jaarlijks Geelpootmeeuwen geringd op de Columbretes eilanden op 57 km voor de kust van Castellón (39°54'N, 00°41'O). In totaal zijn 1411 kuikens geringd. Sinds 1998 wordt behalve een metalen ring ook een gele kleurring met inscriptie aangebracht. In 2001, toen de metalen ringen op waren, werden de vogels alleen met kleurringen gemerkt. Op het eiland Benidorm, 3 km voor de kust van Benidorm (38°30'N, 00°08'O) werden gedurende 1999-2001 eveneens Geelpootmeeuwen ge(kleur)ringd. Net als op de Columbretes eilanden ging het hier in 2001 alleen om kleurringen. In totaal werden 77 terugmeldingen verzameld, waarvan 73 van vogels van de Columbretes eilanden. Van deze groep ging het om twee terugmeldingen van metalen ringen en om 71 waarnemingen van gekleurde vogels. Onder de waargenomen individuen bevonden

zich 14 meldingen van in totaal vijf verschillende adulte Geelpootmeeuwen in de omgeving van de kolonie. De jonge meeuwen bleken zich net als veel andere Geelpootmeeuwen in het westelijke Middellandse Zeegebied over veel langere afstanden te verplaatsen. De vogels trokken kennelijk noordwaarts tot aan de Franse grens en vervolgens noordwestelijk om over land Bretagne, de Golf van Biskaje en de noordkust van Portugal te bereiken. De uit de Middellandse Zee wegtrekkende vogels profiteren wellicht van de rijkere voedselaanbod door *upwelling* bij Bretagne en in de Golf van Biskaje in een periode waarin er in de Middellandse Zee minder te halen valt. De trek over land is mogelijk doordat de meeuwen ook in terrestrische habitats aan de kust kunnen komen.

## REFERENCES

- Arcos J.M. 2001. Foraging ecology of seabirds at sea: significance of commercial fisheries in the NW Mediterranean. Ph.-D. Thesis. Univ. de Barcelona, Barcelona.
- Belant J.L. & Dolbeer R.A. 1993. Migration and dispersal of Laughing Gulls in the United States. *J. Fld Orn.* 64: 557-565.
- Carrera E., Monbailliu X. & Torre A. 1993. Ringing recoveries of Yellow-legged Gulls. in Northern Europe. In: Aguilar J.S., Monbailliu X. & Paterson A.M. (eds.) Proc. II MedMarAvis Mediterranean Seabird Symposium. SEO, Madrid: 181-194.
- Coulson J.C. & Wooller R.D. 1976. Differential survival rates among breeding Kittiwake gulls *Rissa tridactyla* (L.). *J. Anim. Ecol.* 45: 205-213.
- Coulson J. C. & Butterfield J. 1985. Movements of British Herring Gulls. *Bird Study* 32: 91-103.
- Le Mao P. & Yésou P. 1993. The annual cycle of Balearic Shearwaters and western Mediterranean Yellow-legged Gulls: some ecological considerations. In: Aguilar J.S., Monbailliu X. & Paterson A.M. (eds.) Proc. II MedMarAvis Mediterranean Seabird Symposium. SEO, Madrid: 135-145.
- Margalef R. 1985. Introduction to the Mediterranean. In: Margalef R. (ed.) Western Mediterranean: 1-16. Pergamon Press, Oxford.
- Martínez-Abraín A., Maestre R. & Oro D. 2002. Demersal trawler waste as a food source for western Mediterranean seabirds during the summer. *ICES J. Mar. Sc.* 59: 529-537.
- Møller A.P. 1981. The migration of European Sandwich Terns *Sterna s. sandvicensis*. *Vogelwarte* 31: 74-94.
- Munilla I. 1997. Desplazamientos de la Gaviota Patiamarilla *Larus cachinnans* en poblaciones del norte de la Península Ibérica. *Ardeola* 44: 19-26.
- North P.M. 1987. Ring recovery analytical methods: A brief review. *Acta Orn.* 23: 7-12.
- Oro D. & Martínez-Vilalta A. 1994. Migration and dispersal of Audouin's Gull *Larus audouinii* from the Ebro Delta colony. *Ostrich* 65: 225-230.
- Rodríguez J. 1982. Oceanografía del mar Mediterráneo. Pirámide, Madrid.
- Sol D., Arcos J.M. & Senar J.C. 1995. The influence of refuse tips on the winter distribution of Yellow-legged Gulls *Larus cachinnans*. *Bird Study* 42: 216-221.
- Tellería J.L. 1981. La migración de las aves en el Estrecho de Gibraltar. Vol II. Aves no planeadoras. Universidad Complutense, Madrid.
- Vidal E., Medail F. & Taton T. 1998. Is the yellow-legged gull a superabundant bird species in the Mediterranean? Impact on fauna and flora, conservation measures and research priorities. *Biodiversity and Conservation* 7: 1013-1026.
- Yésou P. 1985. Le cycle de présence du Goeland leucophée sur le littoral atlantique français: l'exemple des marais d'Olonne. *L'Oiseau et R.F.O.*, 55: 93-105.
- Zar J.H. 1984. Biostatistical analysis. Prentice Hall, New Jersey.

---

<sup>1</sup> Larus [cachinnans] michahellis is presently known as Larus michahellis on the Dutch list (*Ardea* 87: 139-165).