

THE CONTROL OF THE YELLOW-LEGGED GULL 'LARUS CACHINNANS' IN GIBRALTAR

John Cortes / Eric Shaw / Michael Blair / George Candelin

The Gibraltar Ornithological & Natural History Society, Gibraltar Natural History Field Station

RESUMEN

El control de la población de las gaviotas *Larus cachinnans* en Gibraltar.

La población de la gaviota patiamarilla a aumentado en los últimos años hasta ser considerada una plaga. La población empezó a aumentar hacen varias décadas en el peñón de Gibraltar, llegando a anidar en edificios y ya también extendiéndose esta costumbre a otras poblaciones del Campo de Gibraltar. La especie tiene impacto sobre las personas y sobre el medio ambiente, ya muy cerca del Parque Natural Los Alcornocales.

Desde la década de los setenta se lleva a cabo un programa de control de estas gaviotas, con mas o menos éxito.

Este trabajo resume el problema de las gaviotas en Gibraltar y describe los métodos empleados para su control, llegando a conclusiones que serán útiles a considerar en el control de la especie en otras localidades en la zona.

Palabras claves: conservación, control, gaviota, *Larus cachinnans*, población.

ABSTRACT

The Gibraltar population of the Yellow-legged Gull has increased in recent decades to the stage where it is now considered a pest. It now nests on rooftops as well as in the scrub and in its more traditional cliff habitat. The species impacts on Man and on the natural environment.

Since the 1970s culling has been carried out on these gulls with varying degrees of success.

This work summarises the methodologies used, comparing the different methods employed through the years and drawing comparison also with other studies on this and similar species.

Recommendations for future control in the region are made.

Key words: Conservation, control, gull, *Larus cahinnans*, population.

INTRODUCTION

The Yellow-legged Gull *Larus cachinnans* was recorded in Gibraltar by writers in the 19th Century, such as Saunders (1871), Irby (1895), Jones (1900) and Verner (1909), but none of these make any mention of a nesting population. It was not until 1934 that Rait-Kerr made the first definite mention of breeding. It seems likely that it bred on the Rock earlier than this (Cortes *et al.* 1980) but not in the numbers of recent decades.

Since at least the late 1950s the species has been a very common breeder on Gibraltar, initially frequenting mainly the sea cliffs on the east and south of the Rock. In the early 1970s it underwent a large increase in numbers and expansion of nesting sites. It had by then populated most of the cliffs, including those on the west side of Gibraltar, and began nesting among the matorral vegetation of the Upper Rock. Cortés *et al.* (1980) estimate the nesting population at the time at 600 pairs. While it used rooftops in the Town regularly for resting and roosting for some years since at least the late 1960s, the first documented record of successful nesting on buildings was in the Rosia Bay area of Gibraltar in 1981. Since then rooftop nesting has become regular, with the habit now spreading to neighbouring towns like La Linea and Algeciras. Nesting on trees has been recorded in Gibraltar (on Stone Pine *Pinus pinea*) and Algeciras (on palm *Washingtonia robusta*). It is also a regular nester in clearings of any size within the matorral of the Upper Rock Nature Reserve in Gibraltar. To achieve this the gull uses a technique of dropping through the open gaps in the tree and scrub canopy to the ground below.

In order to take off from these sites, the gull walks along the ground until it finds an opening from which it can take off.

The increase in numbers during the second half of the 20th Century led the Royal Air Force (RAF) in Gibraltar to initiate seasonal culling in 1979. Nevertheless, the population continued to increase throughout the 1980s and 1990s, albeit probably at a lower rate than if culling had not taken place. In 1997 the Government of Gibraltar contracted the Gibraltar Ornithological & Natural History Society (GONHS) to undertake year-long culling and develop techniques for effective control of the gull population.

Estimates of the population made in the early 1990s indicated 30,000 birds at the end of the nesting season, which suggests around 7,000-8,000 pairs, although Finlayson (1992) states the population, which was in need of censusing, "may be in the order of 4,000-5,000 pairs with 60% nesting on the Rock". However, there was a need, particularly following several years of culling by GONHS, to establish a new baseline for the population. A count was therefore conducted on behalf of GONHS by the RAF Ornithological Society (RAFOS) in the spring of 2002. In this paper we summarise the cull effort since 1997. In addition we provide details of the 2002 census and discuss the possible future of the Yellow-legged Gull population of the area.

THE YELLOW-LEGGED GULL IN GIBRALTAR

In its western range the Yellow-legged Gull typically nests colonially on ledges on cliffs where the topography permits, or in undisturbed areas of dune or gravel, as in Cadiz Bay in Spain (Ruiz Martínez *et al.*, 1990). The nest itself may be quite well constructed and neat, unlike many other gull species. In Gibraltar, there are many precipices and rock faces, rocky slopes, screes and low scrub, providing suitable ledges for nesting. While numbers are increasing in built-up areas in Spain, there are no other nearby colonies of comparable size. Potential predators at the colony are few: feral cats exist, and recently a pair of Ravens has become established after an absence of nearly three decades.

Yellow-legged Gulls are present in Gibraltar throughout the year. Following nesting, and once the young are fledged, usually by the end of July, the population in Gibraltar drops considerably, with counts at this time averaging between 400

and 600 birds at any one time. There are concentrations of Yellow-legged Gulls on beaches and estuaries throughout the area, including the estuaries of the rio Palmones (7 km WNW of Gibraltar) and rio Guadiaro (17km to the north). This in all likelihood includes Gibraltar gulls. However, ringing suggests that some gulls range much further afield, with observations of Gibraltar ringed gulls having been made in summer near Cape St Vincent, in Almeria and (to be confirmed) in Mauritania (Cortés in prep.)

By the end of October and into November, there is a notable increase in numbers once again with established pairs returning to nesting sites and new adult birds prospecting sites. There is some evidence to suggest that this return of adults is occurring earlier than a decade ago. The gulls are present in the area for several months but there is no real evidence of nest building until the beginning of February. The first eggs are noted at the end of March, with the first chicks seen towards the end of April. Fledging takes place from the end of May, with most young having left the nest by mid July. Observations of late chicks still at the nest in early August probably relate to replacement broods possibly following a culling operation.

Young gulls apparently return to nest no earlier than when they attain three years of age when attaining their adult plumage. On several occasions in recent years there have been observations of gulls nesting while still showing immature plumage.

The gulls are opportunistic feeders and consume a wide range of items. They are often to be seen foraging at sea, while they are regular scavengers throughout the area, feeding on scraps on beaches, opening rubbish bin liners in built-up areas, and frequenting the open rubbish tip at Los Barrios approximately 15km to the west. This is well in keeping with other studies on the species where refuse dumps have consistently been the main foraging habitat but pellets have consistently included food from more than one habitat (refuse dumps, terrestrial and marine habitats) (Duhem *et al.* 2003). Observations in Gibraltar suggest that items fed to young tend to be from marine habitats rather than from refuse dumps, although more intensive work remains to be done on this.

Other food items noted in Gibraltar have included fruit of *Osyris quadripartita* and *Dracaena draco* (Cortés 1993), black rat *Rattus rattus*, and Pallid Swift *Apus pallidus* which they have been seen to catch alive at nesting sites.

THE RAF CULLS

Culling of gulls in Gibraltar began at the instigation of the RAF which had (and continues to have) responsibility for Gibraltar airport and for air safety over Gibraltar. Gull culling initially was exclusively on the airfield (mainly shooting) and on accessible areas of the Rock overlooking the airfield. These areas, which essentially were the Middle Hill/Rock Gun area and the talus at the base of the North Face, were worked during the nesting season, using bread baits laced with the stupeficient alpha chloralose and seconal. Gulls feeding on the baits would become unconscious and they were collected and destroyed. Eggs were destroyed and the nests either raked or the eggs replaced with large stones to dissuade the gulls from re-laying. Any chicks present were also destroyed.

After the third year of culling, the RAF cull extended this methodology to the rest of the Upper Rock and other peripheral sites in Gibraltar, notably Hole in the Wall and Windmill Hill. However, instances of gulls literally dropping from the sky onto residential areas, and the presence of dead birds of other species (House Sparrows and a Blue Rock Thrush) led to concerns on the safety aspects of this method and to a decrease in the use of poison. By 1990, only shooting at the airfield and removal of nests, eggs and chicks, formed part of the military culling effort.

After several years of culling by RAF personnel, the RAF presence in Gibraltar was greatly reduced as part of the cuts in Ministry of Defence spending. The Royal Gibraltar Regiment provided personnel to carry out the cull, but by 1999 this was only during two days in April and eventually the RAF culling effort was reduced to shooting on the airfield.

The full results of the RAF culls will be published elsewhere.

CULLING SINCE 1997

In situations where there is such close contact between the gulls and the human population, pressure for control of the species often comes from public opinion. Public opinion was greatly concerned about the gulls. As the military effort decreased and there were more instances of nesting in built-up areas, there were increasing reports of attacks by nesting gulls on householders, when putting out washing, walking by, or in some cases, of children being harassed by gulls for food in school playgrounds or being attacked when there was a nest nearby.

The interest of the military was mainly in the airfield, and there was no system in place to deal with instances such as these.

GONHS, in its role as an environmental non-governmental organisation, stressed that the root cause of the problem was the overall increase in the population, which had to be tackled. It focused on reducing feeding opportunities for the gulls (such as covering rubbish bins), and on the need for an overall decrease in the population through year-round culling throughout Gibraltar as a way of achieving this.

This, however, presented an important problem, as it was important that year-round culling did not affect other species of gull which migrate through or winter in the area (such as Audouin's Gull *Larus audouinii*, Lesser Black-backed Gull *Larus fuscus*, or Black-headed Gull *Larus ridibundus*). GONHS therefore insisted that such culling should be carried out by persons who were capable of correct identification of the species and who were familiar with the ecology of the area. The Government of Gibraltar accepted these arguments and engaged GONHS, which created its Gull Control Unit in July 1997.

Methods

Table 1 summarises the methods used for culling during the period 1997 to 2003.

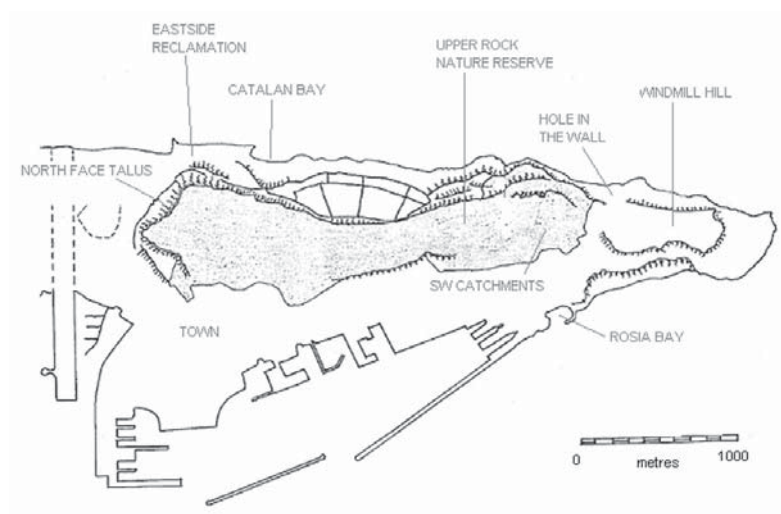
YEAR	METHODS USED	TOTAL CULLED (including chicks and eggs)
1997 (July to December only)	Poison; hand nets; catapults	50
1998	Plap nets; catapults; nest raking	1760
1999	Catapults; nest raking	2498
2000	Shooting	4298
2001	Shooting	3952
2002	Shooting	4056
2003	Shooting; nest raking	5025

Table 1. Methods employed for gull culling 1997-2003

1997-1999

The first year of the Unit's operation (1997-1998) involved a great deal of learning. The gulls were quick to learn to recognise threats, to the point of reacting with alarm calls and evasive behaviour when the Unit's vehicle appeared. Adult birds in particular are wary and will rarely fall for the same trick twice. Inexperienced, immature birds were thus much easier to catch.

Other than chicks, recently fledged juvenile gulls were the easiest to catch and on occasion could be caught with long handled nets. This was the method used in the first two months of activity. After the return of the bulk of the population in November the juveniles were much more wary and the method proved useless. Towards the end of November the use of catapults was introduced. Small pebbles were used as projectiles. This resulted in an increase in success with culling adult gulls



Map 1. Locations mentioned in the text.

In addition, during the cooler months (December to January) in 1997/98, alpha-chloralose was used to drug the birds. Sites were baited over several days with untreated bread and/or fish, and then treated bait was applied. Sites on the east side reclamation were mainly used. All untaken bait was removed at the end of each session which was supervised throughout. Drugging resulted in very few birds being killed. Temperatures tended to rise quickly and the drug rapidly became ineffective. Consideration was being given to stopping the use of alpha-chloralose or combining this with a second drug (seconal). However, an incident on 15th 1998 January involving "copy-cat" poisoning at Catalan Bay when the Unit was accused of not removing poisoned bait led to a decision to cease the use of all drugs.

The final method of catching gulls during the first year of activity was the use of a clap net, constructed by the Unit. This method failed with adult gulls which were too wary and would not venture close to the nets, but was the most successful of all with inexperienced juveniles on the beaches of the east side in June and July 1998.

The method used during the rest of 1998 and 1999 was essentially the use of catapults. During the 1999 season, as military culling had almost entirely ceased, except in the area of the airfield, a greater number of chicks and eggs was removed by the Unit.

Gulls caught were disposed of by a firm blow to the head and were then transported to the Refuse Incinerator.

2000-2003

It was felt that little progress was being made in the culling effort, with no notable increase in the numbers of gulls killed due to the limits imposed by the methodology. Catapults had the disadvantage that only gulls in relative proximity could be tackled. This led to the acquisition of 5.5mm air rifles. Training was undertaken in the use of these rifles, and five persons were licensed in their use by the Royal Gibraltar Police. Following the training period, shooting became the main method of culling as from April 2000.

Shooting gulls has its difficulties as was evident from early on, with the gulls seeming to learn to identify the threat of men with rifles and flying almost as soon as they emerged from their vehicle.

During the 2000 nesting season, the Unit concentrated on shooting and did not specifically target nests and eggs, although a number were removed incidental to the shooting operation. However, the shooting of nesting birds will in all likelihood have reduced the nesting success of affected pairs. The Unit continued to respond to call-outs to deal with nests in built-up areas, which were causing a nuisance to residents.

During the 2000 nesting season the Unit also continued to cause disturbance at accessible nesting colonies in order to try to reduce nesting success. As well as shooting in these areas, this included the use of raptors by the GONHS Bird of Prey Unit. In particular, a captive-bred Harris Hawk, *Parabuteo unicinctus*, trained to catch juvenile gulls, was used successfully in several areas, notably Hole-in-the-Wall and Windmill Hill. Harris Hawks were again used during the 2001 and 2002 seasons. In 2002 and 2003 a female goshawk *Accipiter gentilis*, was also used, while in 2003 the goshawk, two gyr x saker hybrids *Falco rusticolus x cherrug* and a Bonelli's eagle *Hieraaetus fasciatus* were flown, especially on the east side sand slopes above Catalan Bay, and again at Hole-in-the-Wall and at Windmill Hill.

The main method of culling employed since 2000 has been shooting with air rifles. This stabilised the overall number of gulls culled at around the 4000 mark. During the 2003 nesting season, the Unit also specifically targeted nests and eggs. This resulted in a further increase to around 5000 for the year, suggesting that the combination of shooting and removal of nests, eggs and chicks, is the ideal.

The Unit is fully licensed, under the Nature Protection Ordinance, to carry out all its activities, including falconry and shooting. Unlicensed killing of gulls is a criminal offence in Gibraltar under the Nature Protection Ordinance (1991). Catapults and rifles are only used at times and in areas where there is no possibility of danger to the public and the highest standards of safety are exercised.

CULL RESULTS

Figures of gulls culled by the GONHS Unit since 1997 are given in Tables 2-8. Figure 1 illustrates the total number of gulls culled during the period 1997-2003. Figure 2 shows the total numbers of gulls culled per month during the same period.

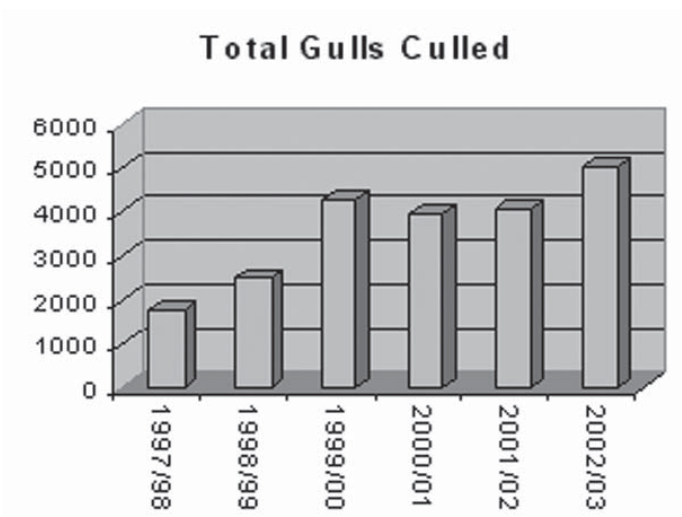


Figure 1. Total number of gulls culled 1997-2003.

Table 2. Totals of gulls and eggs destroyed 2002/2003

	O02	N02	D02	J03	F03	M03	A03	M03	J03	J03	A03	S03	Totals
Ad		176	177	162	471	575	416	445	478	380			3280
3-y								5	10	6			21
2-y								26	21	12			59
Juv								10	411	488			909
Ch							6	251	26				283
Egg							265	206	2				473
Tot		176	177	162	471	575	687	943	948	886			5025

Ad = Adult; 3-y = 3rd year bird; 2-y = 2nd year bird; juv = juvenile; ch = chicks

Table 3. Totals of gulls and eggs destroyed 2001/2002

	O01	N01	D01	J02	F02	M02	A02	M02	J02	J02	A02	S02	Totals
Ad		69	104	162	235	835	633	768	322	597			3725
3-y													
2-y													
Juv													
Ch						35	44	79	98	75			331
Egg													
Tot		69	104	162	235	870	677	847	420	672			4056

Ad = Adult; 3-y = 3rd year bird; 2-y = 2nd year bird; juv = juvenile; ch = chicks

Table 4. Totals of gulls and eggs destroyed 2000/2001

	O00	N00	D00	J01	F01	M01	A01	M01	J01	J01	A01	S01	Totals
Ad	125	486	439	425	530	725	611		458				3799
3-y													
2-y													
Juv													
Ch								18					18
Egg						46	89						135
Tot	125	486	439	425	530	771	718		458				3952

Ad = Adult; 3-y = 3rd year bird; 2-y = 2nd year bird; juv = juvenile; ch = chicks

Table 5. Totals of gulls and eggs destroyed 1999/00

	O99	N99	D99	J00	F00	M00	A00	M00	J00	J00	A00	S00	Totals
Ad	3	11		57	81	280	1178	752	817	604	44	0	3827
3-y													
2-y													
Juv									371	67			438
Ch								9	16				25
Egg								8					8
Tot	3	11		57	81	280	1178	769	1204	671	44	0	4298

Ad = Adult; 3-y = 3rd year bird; 2-y = 2nd year bird; juv = juvenile; ch = chicks

Table 6. Totals of gulls and eggs destroyed 1998/99

	O98	N98	D98	J99	F99	M99	A99	M99	J99	J99	A99	S99	Totals
Ad	19	15	14	10	18	23	23	27	33	6			188
3-y			1	1	1	2			1				6
2-y				2	1	2	2	3	2				12
Juv			1	1	1	1	1	1	317	221			544
Ch							7	351	24				382
Egg						24	646	667	29				1366
	19	15	16	14	21	52	679	1049	406	227			2498

Ad = Adult; 3-y = 3rd year bird; 2-y = 2nd year bird; juv = juvenile; ch = chicks

Table 7. Totals of gulls and eggs destroyed 1997/98

	O97	N97	D97	J98	F98	M98	A98	M98	J98	J98	A98	S98	Totals
Ad		33	17	33	43	77	61	43	39	26			372
3-y		1		2	5	5	4	2	4	3			26
2-y		1	1			5	3	4	2				16
Juv		8	3			1			232	254			498
Ch							3	133	84	4			224
Egg							300	305	19				624
		43	21	35	48	88	371	487	380	287			1760

Ad = Adult; 3-y = 3rd year bird; 2-y = 2nd year bird; juv = juvenile; ch = chick

Table 8. Totals of gulls destroyed July-September 1997

	J97	A97	S97	Totals
Ad		1		1
3-y		1		1
2-y		1		1
Juv	17	30		47
ch				
egg	17	33		50

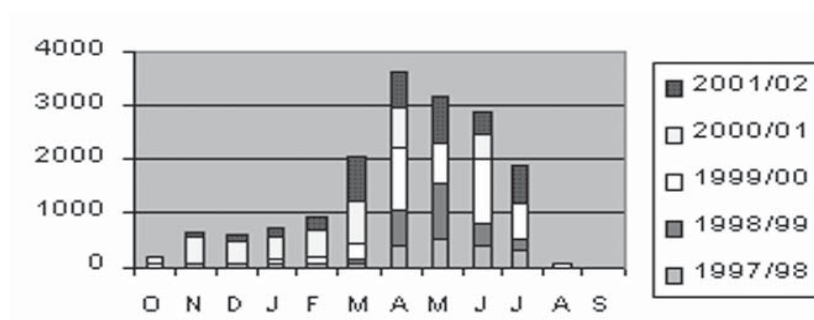


Figure 2. Gulls culled by month (1997-2003).

NESTING GULL SURVEY 2002

During the spring of 2003, RAFOS observers conducted a survey of the nesting gulls of Gibraltar. Details of this survey are given in Appendix I.

An estimated total of 1846 breeding pairs were counted. When compensated for methodology, the result is an estimate of 4018 breeding pairs or 8036 adult birds. Estimates of non-breeding birds suggest that there is about one non-breeding bird for every breeding pair, making a total of about 11,000 birds present in Gibraltar in the spring. If all the 3653 breeding pairs were to successfully rear two young each to fledging, the total number of birds present in Gibraltar at the end of the nesting period, would be:

Adult nesting birds	8,036
Non-breeders	4,018
Fledged young	8,036
TOTAL	20,090

If we assume these figures were similar in 2003, and we deduct the total number of eggs, chicks and juveniles culled (1648: Table 2), we arrive at an estimate of 18,442. An autumn census in October 2003 estimated the population in the area (Gibraltar, Los Barrios and the Straits as censused from Europa Point) to be around 19,000.

Previous, unpublished estimates of gull numbers at Gibraltar (GONHS 1998, 2001, 2002) have been based on less extensive surveys, but have placed the post-nesting population in Gibraltar at around 30,000. Based on these figures, the Yellow-legged Gull population in Gibraltar at the end of the nesting season, is now at 61% of the 1996 figure.

It should be noted that it is unlikely that there are 18,442 gulls in Gibraltar at any one time. The timing of fledging varies, and the gulls, both adults and juveniles, leave Gibraltar very soon after flying. The above figure in any case assumes two fledged young per pair. This is likely to be unrealistically high as there will be nest failure attributable to such factors as disturbance from shooting, disturbance from trained birds of prey and inexperienced pairs.

DISCUSSION

The reasons for the increase in the population of the Yellow-legged Gull in Gibraltar are not clear, although similar increases of large gulls have been noted elsewhere (Cramp *et al.* 1974, Cramp *et al.*, 1985). The increase in availability of human waste, both in Gibraltar and to a larger scale in nearby Spanish towns, especially Los Barrios, will have had a contributory effect. Those species that may have acted as natural predators of the gulls disappeared before the increase in gull population, although it is unlikely that the loss of these predators will have in itself had such a drastic effect on the population. Thus the Bonelli's Eagle was last recorded nesting in 1934 (Rait-Kerr 1934) and the Raven, which preyed on chicks and eggs, disappeared in 1975 (Cortes *et al.*, 1980) and was absent until a pair became established on the Rock in 2000.

It was probably as a result of a combination of factors, namely the absence of predation, the availability of surplus food, and abundant nesting sites, that the gull population increased.

In the same way that it is difficult to accurately assess the reasons for the increase, it is hard to attribute cause first, for the halt in the increase, and then, for the apparent decrease of the population. Factors other than culling will be operating on the gull population. Some of these are known, others are not. Among those that are possibly having an effect are changes

in the disposal of waste, natural variation in the availability of natural food, the possibility of disease (although we have seen no evidence of this), and what is happening elsewhere in the Yellow-legged Gull metapopulation. However, we believe that it is likely that the greatest and most consistent negative factor operating on the gulls of Gibraltar, has been the constant culling effort.

While there are no accurate figures historically for the gull population of Gibraltar, casual observations from residents and ornithologists suggest that until at least 1997, the population was increasing. This suggests that the methods applied by the RAF, while possibly effective in clearing the airfield of gulls, was not having an impact on the overall population.

The RAF culls were aimed primarily at reducing the number of bird strikes at Gibraltar airport. While this is part of a separate study (Cortés, in prep.) it is relevant to point out that recent evidence elsewhere (Brown *et al.* 2001) suggests that colony management is not as effective at reducing bird strikes at airports as is on-airport management (such as the use of falconry).

In the early years of the GONHS cull, relatively few gulls were killed, showing once more the limitations of the methodology. Removal of nests, eggs and chicks, poisoning, and netting do not remove sufficient numbers, nor cause sufficient disturbance, to show any impact. A decrease in numbers first became apparent in 2001, with the results of the 2002 census apparently confirming this, and observations suggesting that this trend has continued into 2003. As the birds do not return to nest, as a rule, until they are three years old, a time lag of three years in showing results is expected.

It appears that the methods most recently employed, which involve constant harassment of the gulls, are the most effective. Year-round shooting has resulted in a real loss to the population of 14,417 full-size birds (after fledging to adult). Shooting at nesting colonies has disrupted breeding and forced the gulls to abandon sites accessible to the shooters (Map 2). The flying of birds of prey in specific areas has had a similar effect. Other studies have shown that culling (Bosch *et al.* 2000), human disturbance and egg pricking (Smith & Carlile 1993) and nest destruction (Olijnyk & Brown, 1999) have all proved successful in reducing numbers of some species of gulls.

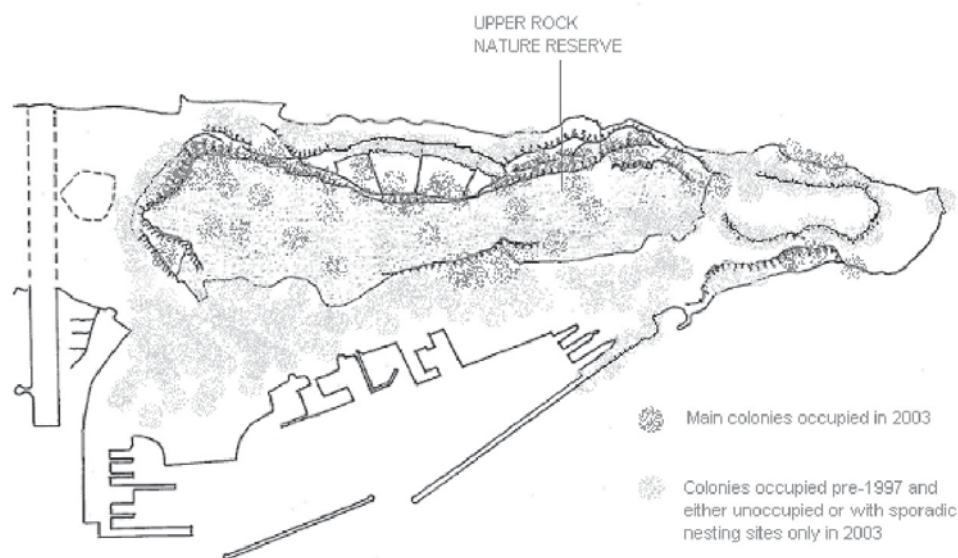
Bosch *et al.* (2000) found that culling resulted in a decrease of clutch size through time in both culled and adjacent uncultured areas as well as a decrease in egg-volume in 3-egg clutches, although fledging success and breeding success increased over the period of the study. Overall there was a large decrease in breeding gull numbers, at a rate estimated at 19% per year with between 21% and 29% of breeding adults killed. In Gibraltar in 2003 3280 adults were killed, with an estimated 8036 breeding adults. This would give a percentage of 40.8%, but will in fact be smaller as not all adults shot were on nesting sites and therefore some will have been non-breeders. However, the estimate for Gibraltar of a 39% reduction in the gull population since 1996 (with effective culling starting in 2000) is comparable.

In fact, there have been continuing casual comments by members of the public about the absence of nesting gulls in several areas and about a general decrease in numbers. For example, there have been reductions in call-out requests to built-up areas from 47 in 2001, to 35 in 2002 and 22 in 2003.

There was only one letter appearing in the Gibraltar Press complaining about gulls in the 2003 nesting season. This was at the end of a letter referring to a problem with Barbary apes at Catalan Bay and therefore can only be considered a passing remark.

Studies on other seabirds have looked at the impact of culling on their long-term populations. Frederiksen *et al.* (2001) concluded that in the Great Cormorant *Phalacrocorax carbo*, annual shooting of 17,000 cormorants (8.5%) had a limited effect, of 30,000 (15%) still had a limited effect, but shooting 50,000 a year (25%) led to population extinction within

20-40 years. They concluded that culls probably "have had a limited effect on cormorant populations, but if carried out in a density-dependent way they could stabilise numbers near a desired level". Although the two situations are not at all comparable, the above discussion shows that the shooting in the 2002/2003 season was about 25% of the estimated population of Yellow-legged Gulls in Gibraltar.



Map 2. Gibraltar Yellow-legged Gull colonies

CONCLUSIONS AND RECOMMENDATIONS

Constant culling and harassment of the Yellow-legged Gulls has had some, but difficult to measure, effect, in reducing the population of Yellow-legged Gulls in Gibraltar. These efforts need to continue as it is highly likely that, if they cease, the population will once again expand, with the suggested trends reversed.

The effect of the closure of the Los Barrios rubbish tip will need to be considered as a factor in the future dynamics of the population. Nesting censuses should be carried out at five yearly intervals in order to be able to trace the development of the population.

The population of the Yellow-legged Gull in nearby Spanish towns is increasing. This may have been initially as a result of increasing numbers in Gibraltar and of the gulls beginning to use rooftops as nesting sites. However, it is possible that the increased culling effort has contributed to an exodus of gulls from Gibraltar to other nesting sites in the area, and beyond. This is suggested by Bosch *et al.* (2000) who found a clear suggestion of emigration of gulls as a result of culling of breeding adults.

Lessons need to be learnt from the Gibraltar experience. This has shown that targeting nesting sites is a method to be recommended. However, as most of the new nesting gulls in these towns are urban, the use of firearms is not recommended in most situations. Therefore, destruction of nests would have to be the chief method employed. This is relatively time-intensive if the nests are to be sought-out, and resorting to only destroying reported nests may not be enough.

However, the authorities in the Campo de Gibraltar have the advantage of being able to take action on the disposal of rubbish in open tips. It must of course be recommended that no such dumping be allowed in the future.

Duhem *et al.* (2002) have shown that in French colonies increased distance from refuse dumps impacts on nesting success. In contrast to a site very close to the large refuse dumps of Marseilles city, a site 30km from the nearest dump revealed fewer 3-egg clutches, smaller mean volume for the C-egg and significantly lower hatching success and chick survival rates. A negative impact on population is therefore predicted from the closing of the Los Barrios dump.

However, this study suggests and other studies appear to confirm that there will also be a considerable, at least partially compensatory impact on the behaviour of the gulls when refuse dumps are no longer operational. When refuse dump accessibility is low, Yellow-legged Gulls broaden their trophic niche, with an increased exploitation of alternative foraging habitats, such as terrestrial habitats (Duhem *et al.* 2003). It is unlikely that a loss of the refuse dumps will result in a population crash (although there may be a drop in numbers), rather the birds will switch to alternative diets. Evidence in Gibraltar suggests that foraging in scrub for fruit and predation of small animals, including birds, could increase. There will also be a greater dependence on smaller sources of refuse (e.g. city bins and bin stores in housing or commercial estates). Increased use of other natural food sources, such as fish and insects is also predicted.

It is therefore likely that Yellow-legged Gulls will become increasingly evident within areas of scrub, including those within the Parque Natural Los Alcornocales and the Parque Natural del Estrecho, especially in areas with fruiting olive *Olea europaea*, Mediterranean buckthorn *Rhamnus alaternus*, Dwarf Fan Palms *Chamaerops humilis*, and possibly Lentisc *Pistacia lentiscus*. They will also probably increase the frequency in which they occur in arable land, such as in La Janda, where they would be dominant to such species as Cattle Egrets *Bubulcus ibis*. Raiding of bins in built-up areas will increase. This activity will include a behaviour already observed in Gibraltar and La Linea de la Concepción, the extraction and tearing of plastic bin liners from bins and feeding on the food items contained therein. Other "easy" sources of food, such as school playgrounds will also in all likelihood become more frequented.

Therefore it is likely, even if there is a small drop in numbers on the closure of rubbish dumps, that contact with humans and their activities will in fact increase.

It must be borne in mind also that these dumps have become important feeding sites for other species, such as White Storks *Ciconia ciconia*, Black Kites *Milvus migrans*, and Griffon Vultures *Gyps fulvus*. The possible impact on these populations should be considered also.

In their work on Great Cormorants, Frederiksen *et al.* (2001) rightly stated that a reduction in the population of a pest species may not lead to a similar reduction in conflicts. Thus 10,000 gulls are two thirds of 30,000 but will still cause a great deal of disturbance. It is therefore important that action also be taken to control damage and the possibility of disturbance. This principle establishes the value of smaller actions to reduce the threat of harassment of the human population, such as by covering rubbish in bins instead of using plastic bin liners, reduction in littering, and fining for feeding of gulls (and pigeons, whose provisioned food is often taken by gulls). Actions to discourage gulls from landing on roofs and other loafing areas will also continue to be necessary. These will include more steeply sloping roofs in newly designed buildings, and protection of flat roofing areas with a mesh of fishing line or similar, of a size that does not discourage other birds such as House Sparrows *Passer domesticus* or Spotless Starlings *Sturnus unicolor*.

It is accepted that seabird populations can be examples of metapopulations (Oro, 2003), and it appears clear that the Yellow-legged Gulls of Gibraltar are part of a Mediterranean or at least a West Mediterranean meta-population, as continued ringing effort will in much likelihood establish. This calls for full and absolute co-operation between jurisdictions in research and

in their control. As Oro (2003) states, seabirds are wide-ranging species, which operate in ranges beyond political boundaries and far greater than those encompassed by traditional management practices.

This also places a responsibility upon the authorities in areas with significant gull colonies. This responsibility extends well beyond the borders of any local jurisdiction as the dynamics of gull populations are such that the effect of neglecting to control yellow-legged gulls in one zone could more-or-less directly impact in other areas a considerable distance away.

Bearing in mind all of the above evidence, the best method of approach on a regional level must consist of the following items, all happening in a co-ordinated way:

- Closure of rubbish dumps
- Better disposal of waste in urban and commercial areas
- Strict enforcement of litter laws
- Prohibition of feeding of gulls
- A gull hotline to report incidents of roof nesting
- Continued culling in Gibraltar using existing methods
- Culling in urban areas in neighbouring Spanish cities to involve removal of nests, eggs and chicks
- Removal of adults in areas of concentration (rubbish dumps while they remain, loafing grounds, etc.) by carefully supervised shooting or cannon netting
- A joint Committee to co-ordinate gull culling operations across the region

As usual, a conclusion of this study is the need for further research especially into diet and movements. However, there is also the pressing need to cull and it will be necessary to agree on a percentage of accessible nests and individual gulls to leave undisturbed or to ring and release in order to be able to obtain information which will in itself prove useful in management in the future.

ACKNOWLEDGEMENTS

The authors are grateful to the GONHS Gull Control Unit, Paul Rocca, Roger Rutherford, and Michael Wahnnon, for their work and for providing the information on gulls culled, and in particular to Paul Rocca who began the cull single handed and was instrumental in developing the methodology. We are also grateful to Keith Bensusan and Charles Perez who contributed through discussion, comment and literature search.

Thanks are also due to the RAFOS expedition team who conducted the nesting census, *viz.*, Al Brimmell, Simon Dennis, Peter Leaver, Ian Mackenzie, John Orme, Terry Powney, Alex Smith, John Stewart-Smith and Peter Tithecott.

REFERENCES

- BOSCH, M., Oro, D., Cantos, F.J. & Zabala, M. 2000. Short-term effects of culling on the ecology and population dynamics of the yellow-legged gull. *Journal of Applied Ecology* 37(2):369-385.
- BROWN, K.M., Erwin, R.M., Richmond, M.E., Buckley, P.A., Tanacredi, J.T. & Avrin, D. 2001. Managing birds and controlling aircraft in the Kennedy Airport-Jamaica Bay Wildlife Refuge complex: The need for hard data and soft opinions. *Environmental Management* 28(2):207-224.
- CORTES, J. E. 1994. The Dragon Tree *Dracaena draco* (L.)L. naturalised in Gibraltar. *Almoraima* 11:183-189.
- CORTES, J. E. 2000. Gibraltar. pp257-260. In: Heath, M.F. and M.I. Evans. (Eds). *Important Bird Areas in Europe: Priority sites for conservation. Vol 2: Southern Europe*. BirdLife International. Cambridge. UK. (BirdLife Conservation Series No 8).
- CORTES, J.E. (in prep). Aspects of the biology of the Yellow-legged Gull *Larus cachinnans* in Gibraltar.
- CORTES, J E, Finlayson, J C, Garcia, E F J & Mosquera, M A J. 1980. *The birds of Gibraltar*. Gibraltar Books. Gibraltar.
- CRAMP, S., Bourne, W.R.P. & Saunders, D. 1974. *The Seabirds of Britain & Ireland*. London.
- CRAMP, S., Bourne, W.R.P. & Saunders, D. 1974. *The Seabirds of Britain and Ireland*. London. Collins.
- CRAMP, S. (ed). 1985. *Handbook of the Birds of Europe the Middle East & North Africa: The Birds of the Western Palearctic. Volume III*. Oxford University Press. Oxford.
- DUHEM, C., Bourgeois, K., Vidal, E. & Legrand, J. 2002. Food resources accessibility and reproductive parameters of Yellow-legged Gull *Larus michahellis* colonies. *Revue d'ecologie - La terre et la vie* 57(3-4):343-353.
- DUHEM, C., Vidal E., Legrand, J. & Tatoni, T. 2003. Opportunistic feeding responses of the Yellow-legged Gull *Larus michahellis* to accessibility of refuse dumps. *Bird Study* 50:61-67
- FINLAYSON, J.C. 1992. *Birds of the Strait of Gibraltar*. London. Poyser.
- FREDERIKSEN, M. Lebreton, J.D. & Bregnballe, T. 2001. *Journal of Applied Ecology* 38(3): 617-627.
- GONHS. 1998 (unpubl). *Gull Cull Report 1997-1998*. The Gibraltar Ornithological & Natural History Society. Gibraltar.
- GONHS. 2001(unpubl). *Gull Cull Report 2000-2001*. The Gibraltar Ornithological & Natural History Society. Gibraltar.
- GONHS. 2002 (unpubl). *Gull Cull Report 2001-2002*. The Gibraltar Ornithological & Natural History Society. Gibraltar.
- GONHS. 2003 (unpubl). *Gull Cull Report 2002-2003*. The Gibraltar Ornithological & Natural History Society. Gibraltar. (www.gonhs.org)
- IRBY, L. H. 1895. *The ornithology of the Straits of Gibraltar*. Second edition, revised and enlarged. Taylor & Francis. London.
- JONES, K. H. 1900. Ornithological notes from south-western Europe. *Zoologist* (4)4:448-457.
- OLIINYK, C.G. & Brown, K.M. 1999. Results of a seven year effort to reduce nesting by Herring and great Black-backed Gulls. *Waterbirds* 22:285-289.
- ORO, D. 2003. Managing seabird metapopulations in the Mediterranean: constraints and challenges. *Scientia Marina* 67:13-22 Suppl. 2.
- RAIT-KERR, H. 1934. The birds of Gibraltar. What to look for on the Rock. *Articles in the Gibraltar Chronicle*.
- RUIZ MARTÍNEZ, D., Almorza Gomar, D. & Fernández Zapata, J. M. 1990. The SALT-pans of the Bahía de Cádiz as a new and unique nesting habitat for Herring Gulls *Larus argentatus*. *Alectoris* 7:70-76.
- SAUNDERS, H. 1871. A list of the birds of southern Spain. *Ibis* (3)1:54-68, 205-225, 384-402.
- SMITH, G.C. & Carlile, N. 1993. Methods for population control within a silver gull colony. *Wildlife Research* 20: 219-226.
- VERNER, W. 1909. *My life among the wild birds in Spain*. John Bale, Sons & Danielsson Ltd. London.

Appendix I

Gibraltar Gull Counts

Census of the Yellow Legged Gull *Larus cachinnans* in Gibraltar

Gull Breeding Distribution in Gibraltar

The high cliff ledges and just below the ridge line, whether naturally open or occupied by buildings or abandoned defence works, comprise prime breeding habitat, and just below, many semi-open areas of Gibraltar's western slopes now abound with breeding gulls. On Gibraltar's east side, exotic succulent vegetation (notably *Opuntia ficus-indica*, *Agave americana* and *Aloe saponaria*) predominates on very steep slopes towards the southern end where the topography has permitted soil to build up, although patches of maquis occur elsewhere. In 2002, the semi-succulent habitat was up to 2m high and clearly provided secure nesting opportunities for the gulls, although it is likely that pairs are quite widely and evenly dispersed because the near-homogenous growth allows relatively little access, and then only to tiny areas. However, this habitat illustrates particularly well the difficulty in counting gulls in areas where sightlines of any kind are almost impossible to find. The Mediterranean Steps walk passes through much of this habitat, and here 77 individuals were counted along its 1.8km path length, but when a passing raptor raised the gulls in alarm, over 100 birds were counted rising from just a two ha area alone (above and below the path).



Map A1. Areas censused in 2002 nesting gull survey

Count Compensation Factors (CF)

Counting gulls in other habitats also faced similar, if generally lesser, difficulties. The effect of different habitats prevented the use of a single simple compensation factor applicable to count totals. Consequently, individual compensation factors had to be devised subjectively for each dominant habitat type within a nesting and roosting area (N&R Area), and depending upon the extent of secondary habitats, some variation of value had to be assessed (Table A1). Where birds that were present (usually 'standing') in areas where breeding either did not occur or did so in insignificant numbers, a CF of 1 or slightly greater than 1 (depending upon the habitat composition and topography) was assigned; the birds seen mostly comprised immatures, 'loafers' or 'sentries'. In areas used predominantly for breeding, those adult birds 'sitting' were assumed to be making a breeding attempt, and could be treated as being one half of a breeding pair (bp), and so numbers of bp reflect the numbers of sitting single birds. Relatively few sitting birds in these areas had their mate close by.

Table A1

N&R Area Type	N&R Area Description	Compensation Factors (CF)
1	Cliffs, bare rocks (or beach)	1-2 (1)
2	Sandy slopes above open garrigue	2
3	Maquis with open areas	2-3
4	Dense maquis or semi-succulent vegetation and relict woodland	4-5
5	Urban areas	1.2

The variability of three of the five compensation factors reflects the nature of the overall habitat composition and the underlying topography; for example, some areas are uniform without declivities and others are non-uniform with many hollows and boulders. Being subjectively obtained from on the spot examination of the areas, the compensation factors need to be tested and where necessary adjusted.

Count Results

The count results are given in Table A2. Three values were sought from N&R area counts: sitting birds, airborne or standing birds (loafers and sentries), and birds entering and leaving. Only the first category formed the estimates of nesting birds. The ‘best’ count for any area was defined as that count during which there were no alarms. Attempts were made to count apparently occupied nests (AON) in a number of areas, but only in area E, where access was possible to the part that was clearly occupied densely by nesting gulls, did the factored estimates and counts of AONs tally well. In all other areas, slope steepness, dense vegetation cover, declivities, physical safety considerations or entry prohibitions (for safety reasons) prevented full and systematic coverage from being achieved during the study period. Systematic coverage of many areas may be possible if considerable time can be spent in reconnaissance beforehand, so that physical safety aspects can be evaluated in ways that would allow nest-counting effort to be swift and effective. Consequently, estimates of breeding pairs (bp) are derived solely from the factorised counts.

Table A2

N&R	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Type	1	1	1	1/3	2	1/3	1/3	4	3	1	1	1	3/5	3	3	3	1/3	1/3/5	4/5	4/5	4	4/5	W	X
Sit	100	18	254	140	180	107	40	77	120	60	33	40	50	105	75	20	40	48	55	20	132	110	112	10
xCF	1	1.2	1.5	2	2	2.2	1.2	5	2	1.5	1.5	1.2	1.5	2	2.3	2	1.2	1.5	1.3	*	4	1.2	1.2	1.2
Calc	100	22	381	280	360	235	48	385	240	90	50	48	75	210	172	40	48	72	71	20	528	132	134	12
AON	**	**	198	40	362	62	58	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

Sit = Count of Sitting Gulls, **Calc** = Estimated number of Sitting Gulls after CF applied, * = Fixed estimate of 20 bp, ** = Nest counts not undertaken.

Area A, being the beach near the end of the runway, has no nesting gulls, and so its total is omitted from bp estimates. The counts in Area T concentrated on gulls seen in the large urban section from the viewpoint; subsequently it was realised that each counter thought the nesting gulls had been counted on other occasions, and so an arbitrary 20bp was assigned from subjective post-count estimates.

Discounting Area A, the total of the actual counts was 1846bp and the total of the compensated counts 3653bp, which agrees quite well with a previous estimate (3000-4000bp) not based on actual counts (Cortes 2000). This represents 7306 adult birds. No specific counts were made of immature birds. The areas surveyed comprise about 50% of the area of Gibraltar. Of the remaining 50%, where gulls undoubtedly breed (probably mostly at low densities), most is dense maquis or relict woodland, but it does include some open areas, the extent of which was not easily calculable. The proportion of the total breeding population nesting in this area has been set at an arbitrary 10%, or 365bp, making 4018bp overall (8036 adults).

Apart from nine fledglings found in the sub-colony in Area E at the top of the Great Sand Slopes, all other nests found that could be examined contained 1-3 eggs. Valid repeat coverage was not obtained over enough areas (mainly because of gull alarms, other disturbance and the culling programme) to establish useful count confidence limits: in any case, better coverage of AONs (through detailed reconnaissance of selected areas prior to counts) is required. Subjectively, the true totals probably lie at 4000bp +100/-500bp.

Non-breeding Gulls in Gibraltar

It was noticeable that even on days where the colony was not in a state of alarm, the number of gulls airborne over any area was highly variable. Furthermore, a proportion of these would be the 'unemployed' half of a pair. The 'alarm' flocks are a mobile entity, with even the sitting birds joining in, entailing a high risk of double-counting due not only to the non-breeding birds but also to breeding birds participating in the alarm. Additionally, there is also a good chance of the patrolling or loafing airborne birds being elsewhere when counts of sitting birds were being carried out. Consequently, our estimates of non-breeding bird numbers necessarily are broad. In view of this experience, the number of gulls that participate in an airborne alarm probably is best counted from photographs taken near-simultaneously over the arc of the flock (Photos taken from the ridge restaurant terrace would probably have to cover a full 360°, for example).

Our on the spot estimates of airborne gulls ranged from 2,400 responding to a relatively minor alarm to 4,000 for an extended alarm, but these figures probably are on the low side, because one photograph taken over a fairly narrow arc of about 60° contains over 900 gulls. Given the estimates of breeding birds and the tendency of immature gulls to wander widely (gulls whose natal site is Gibraltar may well be 'replaced' to some extent by wanderers from elsewhere), it is not unlikely that the total number of Yellow-legged Gulls (breeding and non-breeding) using Gibraltar in spring lies between 11 000 and 13 000 birds (ie for every pair there is one non-breeding bird). The number of birds departing from and arriving at a count area was so variable that it is difficult to see how the data collected can be interpreted.

Although no study of gull movement was undertaken, individual birds were watched through telescopes and binoculars as they left the Rock, usually to join those wheeling above buildings north of the runway and in La Linea de la Concepción, then heading roughly northwest before being lost to sight; this is the general course to the Los Barrios landfill site. At Los Barrios, most gulls seemed to be feeding or watching from the roof of the large rubbish processing facility that created the 'cubes' for burial, but of those thermalling amongst the storks, kites and vultures, some seemed to head towards the general direction of the Rock. For the calculations, we assumed that the 'unemployed' bird of a pairs had a 50% chance of being feeding, mostly at Los Barrios. The corollary is that the other 50% were assumed to be present on the Rock, amongst the loafers or acting as sentries, but distant from the nesting bird. The remainder of the birds loafing or on sentry-go were non-breeders.

Formal counts and informal daily observations revealed that the Yellow-legged Gull seldom used either the urban area (despite many suitable roofs for roosting) or the harbour area, counts being in the low hundreds. This may reflect the Gibraltar policy of refuse collection, which allows little opportunity for scavenging. However, given the ample food source at Los Barrios, there seems no barrier to prevent the species taking to roof-nesting in a major way, as its congeners Herring Gull *L. argentatus* and Lesser Black-backed Gull *L. fuscus* do in the UK and elsewhere. Yellow-legged Gull is regarded as a pest in urban Gibraltar (noise, faeces at favoured roosts) and as a threat to some habitats on the Rock itself (destabilising the restoration of the Great Sand Slopes) and so a culling programme is already in operation, targeted at adult females in an attempt to halt the population expansion. As a likely consequence of the culling, several pairs attempting to breed comprised adult males and third and fourth summer females. One second-summer female had formed a pair-bond with an adult male. An unexpected difficulty facing the counters was that gulls temporarily (sometimes only for 24 hours, when eggs probably would survive) deserted areas where a cull had taken place.

Almoraima, 31, 2004