

First breeding colony of Audouin's Gull *Larus audouinii* in Sicily, characteristics and its origin

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Abstract – The Audouin's Gull *Larus audouinii* Payraudeau, 1826 has never been recorded breeding in Sicily: the authors are here reporting the discovery of a breeding colony on the island of Vendicari, province of Siracusa, off the south-east coast of Sicily. An estimated 50-60 pairs have bred there in 2010 and 2011 and 100 to 130 pairs in the period 2012-2016. All the basic information on breeding attempts and success, egg-laying dates, number of eggs laid, number of chicks fledged, and characteristics of each nest was collected. During the breeding season of 2012-2016 a total of 19 ringed adults were observed at the colony: 11 of these originated from the same colony (Vendicari) while 8 came from other colonies, of which 6 from Italy and 2 from the Ebro delta in Spain. Those gulls ringed as chicks from the Vendicari colony have so far shown that they spend the winter months in Sicily and North Africa, while in the spring and summer months, these birds have been observed in Sicily, Calabria, Apulia and Campania. The data presented here demonstrate the ability of this species in occupying new territories, sometimes on the periphery, and a tendency of population increase in a very short period of time, presumably through recruitment of individuals originating from other colonies. The data collected confirm a strong nest-site tenacity and also show that a significant part of the individuals present in the colony consisted of birds in their third year of life.

Key-words: breeding colony, population and movements, philopatry.

INTRODUCTION

The Audouin's Gull *Larus audouinii* is a Mediterranean endemic, in 1966 the entire population was estimated at 800-1,000 pairs. In the early years of the 1980s a substantial increase in the population was noted following the colonization of a site in the Ebro delta; in the last thirty years the Iberian population grew considerably and it has been estimated at over 20,000 pairs. This constituted about 90% of the world population (De Juana & Garcia 2015). This extraordinary population increase had a very positive effect throughout the Mediterranean.

In the late eighteenth century up to the second half of the last century the Audouin's gull was considered as a scarce visitor to Sicily (Salvadori 1872, Doderlein 1869-74, Arrigoni degli Oddi 1929, Orlando 1935), with a gradual increase in sightings (Priolo 1975, Iapichino & Massa 1989), it eventually became more frequent (Corso 2005), with most of the sightings originating along the south-eastern coast of Sicily. In view of the ever increasing number of adult birds seen in the spring and summer months of

2008 and 2009, a survey of potential nesting sites (small offshore islets and cliffs) was carried out in 2010. During one of these visits, carried out on 4th May 2010 at Vendicari (SR), a number of adult birds were observed from the coast, resting on a small offshore islet. A few days later, on 11th May, a site visit was carried out, resulting in the discovery of a number of breeding adults, thus confirming the first breeding record for this bird in Sicily.

In this note we present our findings from the census work carried out in the first six years since the discovery of the colony. Visits were controlled so as to minimize disturbance considering the small size of the islet as well as the colony still in its early stages and susceptible to disturbance.

STUDY AREA AND METHODOLOGY

The small island of Vendicari (36°47'N, 15°07'E) forms part of the *Riserva Naturale Orientata* di Vendicari located in the municipality of Noto (Siracusa). The islet is of el-

litical shape with its two major axes being about 300 and 250 metres long; it lies at a distance of about 600m from shore with a shallow depth of about 2 metres. The surface of the islet is flat with the highest part being only 2 metres; it is, in most parts rocky with the exception of the southern side which holds a small lagoon of about 1000 m² and a sandy beach along the west side. The islet is covered with low sparse vegetation; for more detailed information on the flora see Minissale & Sciandrello (in press).

The islet is protected and access is restricted, the governing body (Dipartimento Regionale Sviluppo Rurale e Territoriale) only issues permits for scientific studies, nevertheless, it is occasionally visited by tourists and at least on two occasions (2014, 2016) saw the embarkation of immigrants. In view of the islet's geomorphology it is not possible to view the gull's colony from the mainland, therefore site visits to census and assess the colony were inevitable. Each year from 2010 up to 2016 one to four annual visits were carried out: 11/6-, 23/6- and 21/7/2010; 1/7/2011; 10/5-, 12/7/2012; 23/6-, 6/7/2013; 8/5-, 13/6/2014; 16/5-, 7/6-, 26/7-, 15/7/2015; 15/6-, 8/7/2016. On certain dates the islet could not be reached due to adverse weather conditions and so visits had to be postponed. The activities carried out during the site visits, depending on time of year, included the census of all the nests and the ringing of chicks. The elaboration of the accumulated data for every single year made it possible to calculate the number of breeding pairs. The data collected for each nest included: number of eggs laid, different typology in its construction and their distribution over the island. At the same time, data were also collected on other seabird species breeding on the islet.

During the bird ringing sessions we estimated (in days) the ages of the chicks handled, based on growth and taking into consideration egg laying date and an incubation period of 30 days. A series of standardized photographs of each chick was taken and later analyzed on a home computer. On each visit we carried out a census on all the birds present, classed according to age. Also, note was taken of all the colour ringed birds present at the time. The equipment used during these visits included; a 10x binocular, a 20-60x telescope and a digital camera with a 400mm lens. In some instances, the photographs provided us with the possibility of reading some of the colour rings. Added to these, we also carried out observations within a 15km radius of the islet mainly in resting areas, wetlands and harbours to check and read colour ringed birds. All the colour rings recorded were checked with the ISPRA database, updated October 2016, containing all the birds ringed on the islet of Vendicari and other colour ringed Audouin's Gulls sighted along the south-eastern coast of Sicily. We have looked at the history of each bird found on the islet: adults birds, old-

er than their 3rd year, presumably breeding on the islet, that is, observed during the peak breeding season, incubating or partaking in the caring of the young (May and June); these have been separated from others observed earlier or later in the breeding season as they may include birds in transit from or to other colonies. In addition, movements of young birds ringed at Vendicari are provided.

RESULTS

It has been estimated that in 2010-2011 the breeding colony on Vendicari Islet held about 50-60 pairs, increasing to 100-130 pairs in the period between 2012 and 2016. A total of 98 chicks were ringed between 2010 and 2015 of which 82 also carried a colour ring (white with 4 letters) the other 16 were only ringed with a metal ring (INFS, Italian Bird Ringing Scheme). In the period 2000-2016 a total of 16 colour-ringed individuals originating from other colonies (13 from Italy and 3 from Spain) have been recorded along the south-eastern coast of Sicily.

Reproductive Phenology

A total of 69 ringed chicks were aged, ringed as following: 13 in 2011; 11 in 2013; 25 in 2014 and 20 in 2015. For each year under investigation, the different ages between the youngest and the oldest chick varied between 16 and 20 days. Egg laying dates were as follows: 14-22 May in 2011; 29 April-15 May in 2013; 18 April-6 May in 2014; 28 April-16 May in 2015 (Fig. 1). Overall, egg laying took place in the first 10 days of May, it was only in 2011 that eggs were laid later.

During a brief visit on 10th May 2012, a partial census of the breeding colony was carried out and 37 nests were counted with an average of 2.45 eggs per nest (3 in 20, 2 in 15 and 1 in 2 nests); a more detailed census was carried out on 8th May 2014 where six persons counted 122 occupied nests with an average of 2.58 eggs in each nest (4 in 4, 3 in 83, 2 in 20, 1 in 10 and 5 empty nests). The young usually fledged towards the end of June or the beginning of July. During this period, the number of young birds and those ready to fledge were counted: 44 on 21 July 2010, 194 on 15 July 2015 and 149 on 8 July 2016. The total number of adults noted in the colony varied from 120 (10 May 2012) to 270 individuals (26 June 2015). Second year birds were almost absent from the colony with only up to 4 individuals recorded.

Characteristics and location of nests in the colony

Two types of nests were found during our visits: nests were located on the ground on a rocky surface, with a solid base

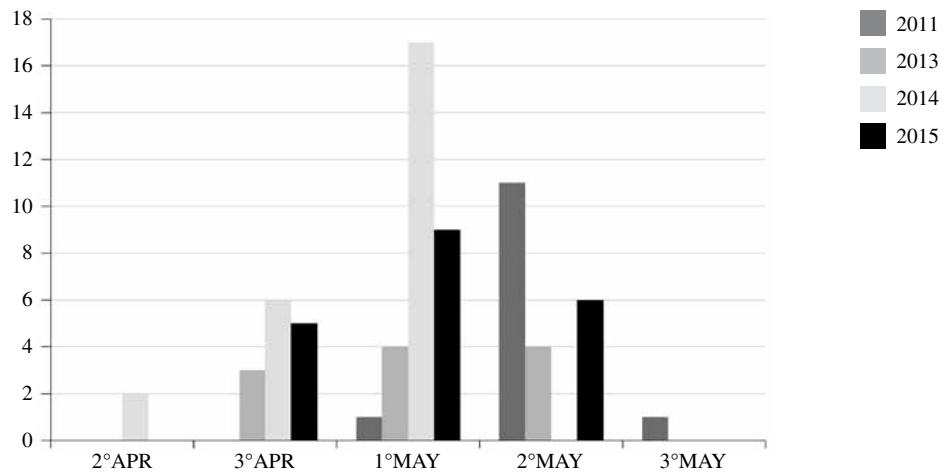


Figure 1. Frequency of egg laying, estimated ages of chicks ringed (see text), per decade, for each year analyzed.

or on loose material, frequently in close proximity to low *Salicornia* bushes, usually with little if any material; alternately nests were slightly higher, located on *Salicornia* bushes, in which cases these nests were adorned with a lot of material. In all cases, material derived from beached *Posidonia oceanica* (rhizomes etc) was used. Nest distribution varied from year to year. In the first three years, the colony was concentrated along the south-centre part of the islet; from 2015 the colony shifted further south, around the lagoon, in this case, all nests were built on *Salicornia* bushes, as demonstrated in the second type of choice described above. In 2015 and 2016 nest failure was recorded as a result of nests located around the lagoon's edge being flooded by the rising tide: on 16 May 2015 nests containing eggs were seen submerged and in 2016 a number of abandoned nests containing intact eggs were also seen.

Other breeding species on Vendicari islet

Throughout our visits, apart from the Audouin's Gulls, we also recorded the following species breeding on the island: Mallard *Anas platyrhynchos* 0-2 pairs, Shelduck *Tadorna tadorna* 0-1 pair, Little Tern *Sternula albifrons* from 5 to 15 pairs, Kentish Plover *Charadrius alexandrinus* 1-2 pairs. Every year a pair of Yellow-legged Gulls *Larus michahellis* was present continuously calling and in 2016 a family party made up of 2 adults and 2 chicks was seen. In 2015 and 2016 a small number of Yellow-legged Gulls bred on the mainland inside Vendicari wetland, located right in front of the islet and it has been breeding on the island of Capo Passero (Siracusa) some 12km south of Vendicari since 2000; previously it has been known to breed in small numbers (Ientile & Massa 2008) increasing to over 150 during the most recent census in 2015.

Origin and age of presumed breeders

A total of 43 individual Audouin's gulls have been recorded on and around the islet through visual readings of colour rings and one metal ring found on a dead individual. A total of 19 adult birds have been recorded on the islet during the breeding seasons from 2012 to 2016. Eleven of these hatched from the Vendicari colony and eight originating from other colonies. Of these eight individuals, two hatched at Nora (Cagliari), one at Asinara (Sassari) and three at Isca (Naples), the other two were Spanish birds originating from the Ebro delta (Fig. 2). The Spanish individuals, born in 2003 and 2007 respectively were first recorded at the colony during the breeding season, in their 13th and 8th year of their respective lives; they have been recorded before these dates, in areas distant from the colony, at Avola (Siracusa) and at Portopalo (Siracusa); the first in its 3rd year and the second in its 4th and 5th year. Italian (non-Sicilian) birds recorded for the first time at the colony were: 3 in their 3rd year, 2 in their 5th and 1 in its 6th year. Individuals born at Vendicari in 2010 and 2011 were later observed: 4 in their 3rd year, 1 in its 4th year (the individual with a metal ring and found dead), 3 in their 5th and 1 in its 6th year. Other ringed birds noted in or near the colony in April-July (non-breeding period) include 5 birds from the Vendicari colony, one from Gallipoli (Lecce) and another from Carloforte (Cagliari); their age ranged from: 2 in their 7th year (birds originating away from Vendicari), 3 in their 5th year, 1 in its 4th and 1 in its 3rd year.

Movements by birds hatched at Vendicari

A total of 11 birds ringed as chicks have been reported away from their natal colony at Vendicari. These birds have been sighted from various localities around the colo-

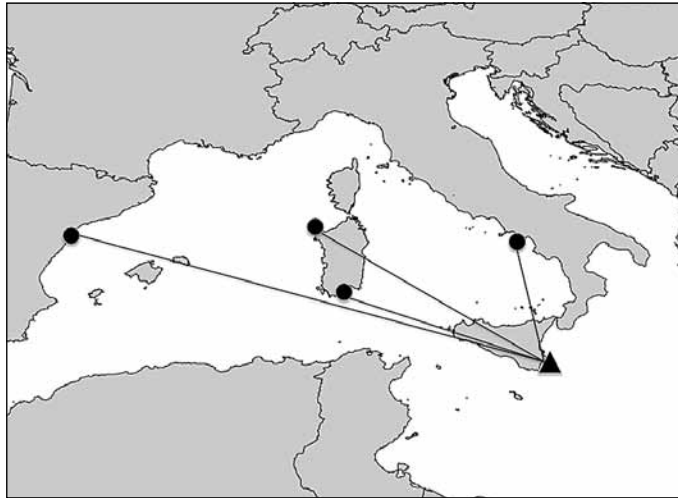


Figure 2. Hatching sites of adults seen at the colony on the island of Vendicari.

ny (Fig. 3). The autumn-winter sightings showed that birds remained at the same latitude as the colony or to the south of it while the spring-summer sightings revealed birds moving further south. Two individuals have been seen along the Libyan coast: a young bird in November in Tripolitania (462km south of Vendicari), while a 2nd year bird was seen at the Gulf of Sirte in January (570 km south of Vendicari). Two 2nd year birds were observed in the province of Bari (508 km); one of which was observed on three consecutive years at a breeding colony on the island of Procida, Naples (312 km). One adult, in its 4th year was seen at Crotona (312 km) in April. The remaining observations are of birds re-sighted along the south-east coast of

Sicily and include an individual sighted three times: first time in its 2nd year at the Biviere di Gela (72 km) (Caltanissetta) in November, the following year at Penisola Magnisi (72 km) (Siracusa) and in July of its 6th year at the Siracusa salt pans (32 km).

Non-native individuals with no ties to the Vendicari colony

A small number of birds, apart from the above mentioned ringed birds, have been recorded along the south-east coast of Sicily of which: one was ringed as a chick in 1998 at Asinara (Sassari) and seen at Portopalo in July 2002 and March 2003; a bird hatched in 1998 at Villasimius (Cagli-

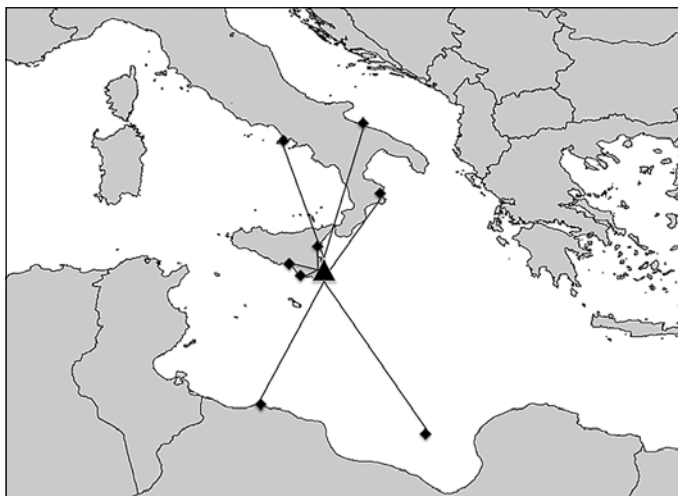


Figure 3. Documented movements of birds ringed as chicks from Vendicari.

ari) and recorded close to Siracusa in August 2001 and July 2007; and another individual fledged in 2011 from Isca (Naples) and seen in February 2016 at Priolo (Siracusa). A number of juvenile birds were also recorded in their 1st year but were never seen again: a Spanish ringed bird seen in April 2007 at Portopalo, two birds from Gallipoli, one in 2001 at Gela and the other at Portopalo in 2009; one from Pianosa (Livorno) was also seen at Portopalo, in 2005.

DISCUSSION

This newly discovered colony appears to be of high importance, due to its size, being one of the three largest in Italy and for its biogeographic position in the central Mediterranean, in between the Aegean, Maghrebian and Sardinian-Corsican breeding colonies. The colonization of the southern Ionian coincides with the expansion in the species reported in Italy since the 1990s (Serra *et al.* 2001) with the consolidation of historic sites and the establishment of new ones in Apulia (Cataldi & Scarpina 1992) and Campania (Milone *et al.* 1999).

Given the large size of the colony at the time of discovery, it is considered unlikely that the first nesting occurred in 2010; it is very possible that the settlement on the island took place before, passing unnoticed, probably between 2005 and 2010. Investigations made by Oro & Ruxton (2001) in the colony of the Ebro Delta, show that a high increase of the colony, from one year to another, cannot be explained except with a high rate of recruitment of birds hatched in other colonies; but with the proper proportions, the data collected in the colony of Vendicari suggest a similar dynamic. We think that immigration of birds originating from other colonies played an important role in the consolidation of the Vendicari colony. The observations presented in this work indicate a flow of movements consistent with the model of meta-population proposed by Oro & Pradel (1999) for the Iberian colonies. Serra *et al.* (2001) identify as one biogeographic unity the Corsica-Sardinia-Tuscany population, while more recently Recorbed *et al.* (2012) highlight the exchange between a Corsican colony (Ajaccio) not only with Sardinian ones but as far away as in Tuscany, Apulia and Spain (Ebro Delta).

The data presented show a strong ability of the species to colonize a peripheral site and relative ease in recruiting individuals from outside the natal colony. Oro & Pradel (2000) for the colony in the Ebro highlight as a determining factor in the recruitment of individuals the habitat quality derived from colony size; a site occupied by many pairs is more attractive. Apparently less influential were those factors that vary annually such as food availability and re-

productive success. In any case the conditions present in the Spanish colony are optimal, secure site and food availability. The gulls in the Spanish colony hunt in open sea but largely depend on fishing by-catch and discards (Oro *et al.* 1996) and may also feed in inland, in the rice fields (Christel *et al.* 2012). Ongoing research on subjects of Vendicari marked with satellite transmitters show a total dependence on marine resources, apparently not linked to human activity.

The data collected also shows the importance of Vendicari for birds in their third year of life, as seen with other long-term studies in the population of the Ebro (Oro & Pradel 2000). The information collected on individuals ringed show a high fidelity to the nesting colony as reported for this species by Oro & Martinez (1994). Periods of deposition covering a two week period or so, coincide with those reported for other colonies (Witt 1977, De Juana *et al.* 1979, Guyot 1985, Lambertini 1993). The characteristics of the chosen site for nesting, rocky open areas with poor or no halophilic vegetation, are very similar to those reported in Audouin's Gull colonies in the Aegean (Goutner *et al.* 2000) and Cyprus (Charalambidou & Gücel 2008).

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