Observations of nesting Little Ringed Plovers at Għadira Nature Reserve in 2011–2012

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The Little Ringed Plover *Charadrius dubius* (Scopoli, 1786) is a common passage migrant from early March to late May and from late July to early November, generally in singles or in small flocks, but sometimes flocks of up to 25 or even occasionally up to 50 birds have been recorded (Sultana *et al.* 2011). The Little Ringed Plover is mainly seen in Malta in the few wetlands such as Għadira nature reserve (largest wetland area in the Maltese Islands), saltpans and also in open grassy areas including the Malta International Airport (Sultana *et al.* 2011). The species nests on bare ground often on terrain covered with sand, shingle or gravel (Sultana *et al.* 2011); at Għadira nesting habitat was created in 1980 with patches of shingle on some of the islands.

A study of the Little Ringed Plover was carried out by the author through observation at Għadira nature reserve in a two year period (2011–2012). Six pairs nested in 2011 and four pairs nested in 2012. In this paper pairs are given numbers but pair 1 of 2011 does not necessarily mean that it is the same pair 1 as in 2012.

The Little Ringed Plover started nesting at the reserve in 1995 (Gauci & Sultana 1999; Raine *et al.* 2009). Generally pairs have two broods, sometimes three. Four to five breeding pairs normally nest at Għadira, but eight pairs nested in 2008 (Raine *et al.* 2008).

Nesting in 2011

In 2011 a total of six pairs were observed nesting. Five pairs had chicks from the first brood. A sixth pair was seen incubating but the nest failed. Four pairs made a second brood, but only one chick fledged from these. A third brood of one pair was unsuccessful.

Pair 1: Nested on the western side of island 16 (see Fig. 1). On 28 April four chicks were seen. Chicks remained on the shore of the island and after a few days started crossing over to island 25 and to the opposite main shoreline. By late May three chicks had fledged. This pair nested again on the same island, a short distance away from the first nest and had a second brood. It was observed incubating on 27 May. The pair was disturbed by the presence of a Grey Heron *Ardea*

cinerea, as well as by a pair of Black-winged Stilts *Himantopus himantopus* (that nested in 2011 on island 6). The adult Little Ringed Plovers were often seen trying to chase away or distract the attention of the two larger birds on island 16 by flying low above them, by alighting nearby and crouching or by putting up a broken-wing display. This was not successful with the Grey Heron, which ignored the plovers and their displays. Eventually one of the parent Little Ringed Plovers sat on the eggs with the heron very close by. Four Little Ringed Plover chicks hatched on 19 June, and were still present by 21 June. By 23 June two chicks disappeared and eventually only one chick survived. It was the only chick that fledged successfully from all second broods in 2011. At this time of the year the water level is very low and islands 16-21-23-24-25 are connected to the main shore, and the young bird was seen to move freely in this area especially island 16, island 25 and main shore.

Pair 2: Nested on island 6, and had four chicks on 6 May. By 17 May only two chicks survived. They fledged in late May/early June. Chicks crossed from island 6 to the opposite main shore and also to island 2. Their second brood of four chicks failed. This pair had a third brood of four chicks which hatched on 3 July (D. Cachia pers. comm.). The next day only three chicks were seen on the island. One chick was last seen on 6 July on island 2.

Pair 3: Nested on island 6 ca 20 metres away (more east) from pair 1. One chick hatched on 12 May and fledged in early June. This pair had a second brood on the same island and was still incubating by 21 June. However, two days later the nest was abandoned probably due to the presence of a Grey Heron and a pair of Black-winged Stilt (with young). The parents had been frequently seen earlier putting up injured bird displays attempting to chase the heron and the stilts, thus leaving the eggs exposed and unattended. The Black-winged Stilts, having their own young, were also aggressive towards the pair of Little Ringed Plovers

Pair 4: Observed incubating on island 11 in late April, and was still incubating on 17 May. Four chicks were seen on 21 May. Six days later the parents encouraged the chicks to cross over to island 10, where at least three chicks were still present on 2 June. By 6 June three chicks were on three different islands (10, 11 and 7) respectively. In spite of being 15 days old the parents were still occasionally brooding them. The chicks were very vocal. When one of them was heard continuously calling (on island 10) one of the parents immediately went to brood it. On 14 June

one chick was still on island 10 while the other two were on island 11. Eventually the three birds fledged successfully. This pair did not have a second brood.

Pair 5: Noted with three chicks on island 14 on 17 May. On 25 May there were four chicks running on the island. These remained there and eventually all four fledged. There was no second brood.

Pair 6: Noted incubating on island 7 on 25 May. Nest failed.

On 11 July four chicks were observed by D. Cachia (pers. comm.), one was last seen on 12 July. This must have been the second or third brood of one of the above pairs.

Nesting in 2012

The breeding season started later than 2011, and this was most likely due to the relatively harsh winter. A pair was seen copulating in mid-March. The first pair was observed incubating in late April. A total of four pairs nested on four different islands.

Pair 1: Nest on patch of gravel on island 16. A brood of three chicks was first observed on the 6 May (D. Cachia pers. comm.). The chicks were last seen on 8 May. The young birds were not seen again a few days after hatching; one possible reason is the chicks drowned when trying to cross to other islands. The pair nested again on the island shortly after losing the chicks. Three chicks from the second brood were seen on 13 June. Before they disappeared on 15 June they were observed moving from one island to another, the last time on island 22 where one parent was calling them. The pair had its third nest with at least three eggs on nearby island 18 and was noted incubating on 28 June. One of the parents kept incubating the eggs up until 3 September when the nest was finally abandoned. The eggs were sometimes left unattended when the adult bird went to feed, or preening nearby.

Pair 2: Nested on island 6 and four hatchlings were observed on 1 June. Two of the chicks seemed very weak and unable to stand up, as they had just hatched. These two chicks which were a short distance away from each other were brooded by one of the adults, first by attending to one young and then hurrying to brood the other, alternating between the two. Later on the same day they were observed running along the shore of the island. The next day the parents called them continuously and encouraged them to cross over to the main shoreline, and later to island 2. In the next few days

they moved from island to another (mainly islands 1, 2, 4 and 6) as well as to the main shore. Eventually they fledged successfully.

Pair 3: Four chicks were first seen on 8 July on island 14 (D. Cachia pers. comm.). From the next day they started moving to other islands as well as to the main shore and by 11 July only two chicks remained, one of which was weak and with its feet clogged with mud. Only one chick eventually survived and fledged by early August, observed flying on 8 August. This young bird kept moving between island 14, 15 and the shoreline before fledging, and was brooded in early morning even when 25 days old. It was observed running and flapping its wings on a number of occasions while still unable to fly. It is to be noted that at the time of hatching and in the next days the temperatures soared up to 45°C in mid-day.

Pair 4: Nested on island 1. Two chicks hatched on 21 May, but four chicks were observed the following day. After a few days the chicks crossed over to shoreline beneath the birdwatching hide and to island 10. Three chicks eventually crossed back to "their" island and one chick remained on island 10. They all fledged successfully by around mid-June.

Table 1. *Number of nesting pairs and breeding success in 2011 and 2012*

Year	2011	2012
Number of pairs	6	4
Number of chicks hatched	33	18
Number of chicks that fledged successfully	14	9
Percentage successful rate	42.42%	50%

Table 2. *Comparative results between first and second/third broods of fledged young in 2011 and 2012*

Year	2011	2012
Chicks hatched from first brood	17	15
Chicks survived and fledged from first brood	13	9
Percentage survival of first brood	76.47%	60%
Chicks hatched from second /third brood	16	3
Chicks survived and fledged from second/third brood	1	0
Percentage survival of second/third brood	6.25%	0%

Table 3. *Comparative results between first and second/third broods of fledged young from all chicks hatched in 2011 and 2012*

Year	2011	2012
Percentage survival of chicks of first brood from all chicks hatched	13 from 33= 39.39%	9 from 18= 50.00%

Percentage survival of chicks of second/third broods from all chicks hatched	1 from 33= 3.03%	0 from 18= 0.00%
Total	42.42 %	50%

Discussion

Territorial behaviour and chicks: The Little Ringed Plover has been observed to be a highly territorial and aggressive bird during breeding at Għadira nature reserve. It chases off other conspecifics as well as other birds including waders and Common Moorhen *Gallinula chloropus*. This territorial behaviour is also noted by Wiersma (1996) and Hayman *et al.* (1986). However, as their chicks grow, the adult birds become more tolerant although they remain aggressive to other adult and juvenile Little Ringed Plovers, and normally chase them off their territory. On the other hand, nesting Little Ringed Plovers sometimes flock together to attack predators or larger birds. On the 23 June 2011 four Little Ringed Plovers (and two Black-winged Stilts) flocked together to mob and chase off a Little Egret *Egretta garzetta* in flight. A similar behaviour was observed reported by C. Gauci (pers. comm.) on 18 June 2011 when around ten Little Ringed Plovers mobbed and chased off a Little Egret.

Hayman *et al.* (1986) also reports that the Little Ringed Plover may nest semi-colonially with nests just nine metres apart. This has not been observed at Għadira.

The number of eggs laid at Għadira is generally four which appears to be the average number for this species (Robinson, 2005). Incubation is carried out by both parents. Wiersma (1996) reports that incubation lasts 22–28 days, which is more or less similar for Għadira, where incubation was noted to begin when the last or penultimate egg is laid, and takes an average of 24–25 days (Sultana *et al.* 2011).

Wiersma (1996) also states that chicks fledge between 24–29 days old, with a fledging success of 26%-64%. Walter (1960) carried out a study and found that out of 35 Little Ringed Plover chicks, 11 or 12 of these fledged, which is a success rate of 31%–34%. Walter was unable to confirm the

cause of mortality, but a number of these chicks died a few days after hatching following a spell of bad weather. Table 1 shows that the success rates for fledged chicks for Għadira were 42.42% in 2011, and 50% in 2012, making the average success rates for these two years 46.21%. This success rate compares well with both Wiersma and Walter's estimates. However, due to the current limiting size of Għadira, the numbers of pairs nesting there will remain low; this means that the species is in danger of being exterminated as a breeding species due to inbreeding and other factors mentioned in this study.

The chicks leave the nest after hatching, and they can wander, under the guidance of the parents away from the nesting territory. The adult birds normally decide whether the chicks remain on the island were they hatched or swim to another island or to the main shore. The adult birds encourage the chicks to cross by calling them. The chicks normally start to congregate at the point of crossing, and after some hesitation they swim to join the adults. During windy days when the water can be turbulent chicks have been seen to swim with great difficulty and sometimes swim back to the original point of departure. Vegetation in the water particularly along the shore also provide extra difficulties for the young chicks. While the young are crossing the parents often engage in a low flight above them while encouraging them continuously with their calls. As soon as they reach a shore the chicks normally go immediately near one of their parents to be brooded. The parents sometimes encourage their young to leave their island because of predators or other large birds. One particular case was pair 4 nesting on island 11 in 2011. The chicks remained on the same island for a week but after the frequent presence of Common Moorhen, Grey Heron, Little Egret and Black-winged Stilt on this small island, the pair became very agitated and made the chicks cross to the nearby island 10, which had lots of vegetation where the young could hide.

Movements of adults with young can also have a regular pattern. In 2010 the pair that nested on island 11 used to take the four chicks from island 11 to the main shoreline beneath the birdwatching hide and move them along the whole length of the western shore, sometimes also taking them to island 20. This daily journey of the family party used to start in the morning. Then late in the evening the parent birds always brought them back to island 11, sometimes reaching it by almost nightfall. These chicks eventually fledged successfully.

Threats to young birds and mortality: During the two year period (2011–2012) as well as in previous years several factors were identified that could be among the causes affecting mortality of the young birds especially in their early days. These are:

- Chick crossings. This can lead to exhaustion of the chicks, especially if the chicks are encouraged to cross by the parents from one island to another by swimming shortly after they have hatched.
- Territorial conflicts. Adult birds have been seen attacking a chick of another pair, when it was not attended by its parents. This occurred in 2008 when there were eight nesting pairs. Għadira nature reserve is a relatively small area and territories overlap. This causes conflicts among the nesting pairs, which uses up efforts that could be used on chick rearing, but are instead used on chasing their conspecifics away.
- Chicks' feet clogged with mud. In summer the substrate of the centre of the islands is normally very dry and fine. This adheres very easily to the young birds' wet feet, which become clogged with mud balls, making it difficult for them to walk. This has been observed on a number of chicks, especially in later broods.
- Extremely high temperature. In summer the chicks, particularly of later broods have to face high temperatures for long periods.
- Predators. These include snakes, weasels and feral cats. The chicks are very vulnerable to predators particularly when they move away from the islands, or when the water is too shallow. Wiersma (1996) states that Little Ringed Plovers "frequently breed in the vicinity of aggressive or demonstrative species resulting in less egg loss due to predators; associations at least sometimes deliberately sought". One explanation for choosing to breed in the vicinity of potential predators is that these predators may in turn help to keep other species away from their nest, therefore providing a kind of security for the plovers.
- High salinity. The salinity levels of the water at Għadira nature reserve in summer are very high, e.g. highest average recorded in June 2011 was 77ppt (V. Falzon pers. comm.). This can cause further problems to the young chicks. Research carried out in other locations backs this up; Hannam *et al.,* 2002 stated that American Avocet *Recurvirostra americana* chicks that were raised in areas of high salinity showed signs of decreased feeding and preening, and suffered from significant weight loss and dehydration. This particular study, as well as others, conclude that waterbirds in general suffer adverse effects when living in

high saline environments, with no access to freshwater. It is important for the management of Għadira that the salinity levels of the water are closely controlled, in order to maximise the nesting survival rates of the waders there.

It has been noted that higher mortalities among chicks and nest losses occur mostly in the second or later broods. This accounts for the relatively low figures of success rates of nesting Little Ringed Plovers at Għadira (see Table 1, 2 and 3).

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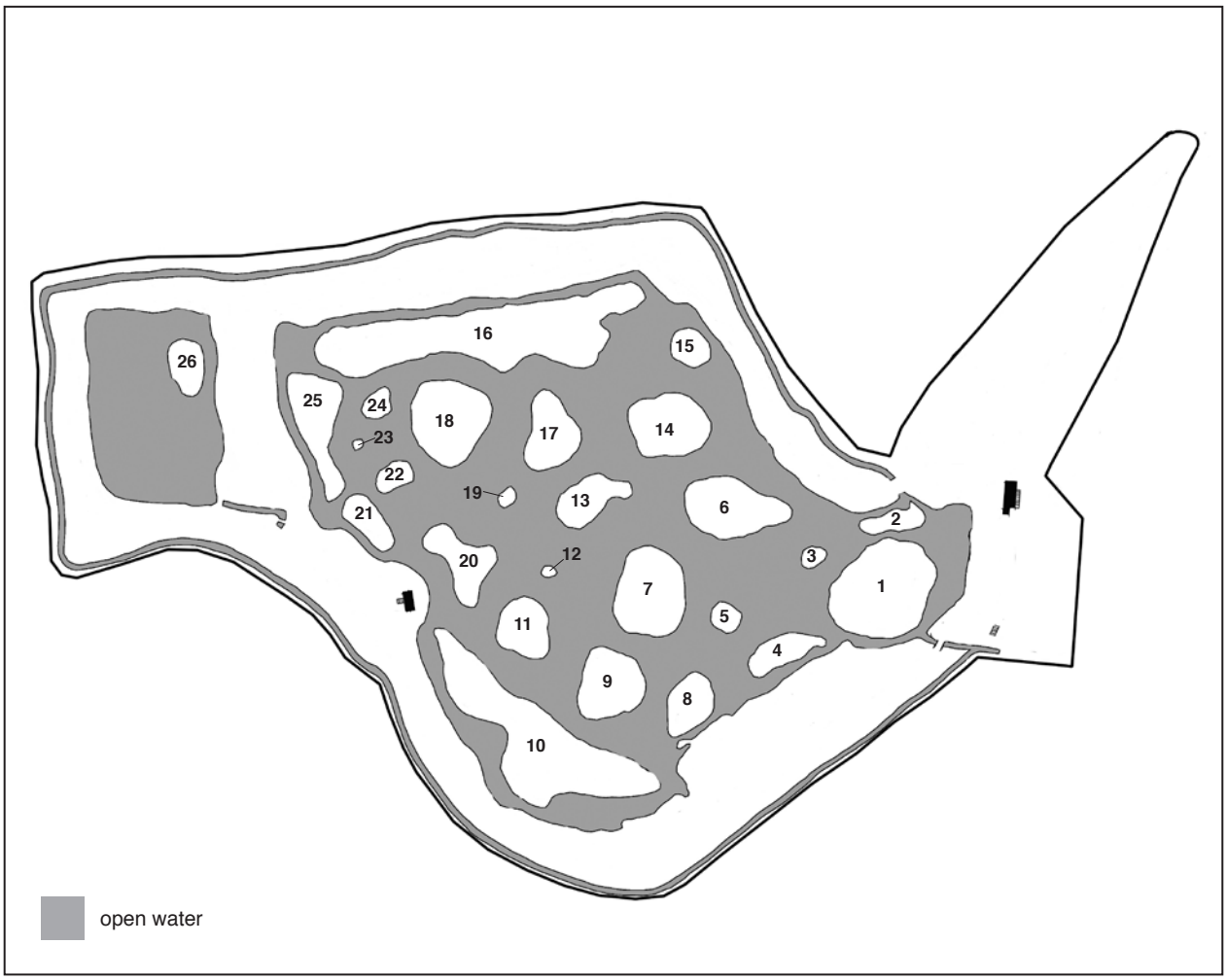

Figure 1. *Map showing layout of Għadira Nature Reserve and the islands with designated numbers*