

National censuses of the Marbled Teal *Marmaronetta angustirostris* in Spain

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National censuses of the globally threatened Marbled Teal were organized in Spain in 1994 and 1995 during the prebreeding, breeding and post-breeding periods. This is the first detailed study of the status and distribution of the species in any country. The censuses revealed a drastic decrease in Marbled Teal numbers in the Guadalquivir marshes in Andalucía (their former stronghold) but numbers in the other main subpopulation in Valencia region are not currently in decline. The average national count (excluding pulli) was 55 in 1994 and 50 in 1995. In 1994, 75% of birds and 86% of broods were recorded in Valencia region, with 23% of birds and 14% of broods in Andalucía and 3% of birds in Murcia. In 1995, 91% of birds and 95% of broods were recorded in Valencia region, with 9% of birds and 8% of broods in Andalucía. The censuses provide evidence of movements from the Guadalquivir marshes to Valencia during the breeding season, in response to severe drought in the former area.

The Marbled Teal *Marmaronetta angustirostris* is a globally threatened species categorised as IUCN Vulnerable owing to rapid population declines.^{1–3} Growing concern about its status has led to a series of recent conservation plans.^{1,4,5} Spain is the only European country west of the Black Sea which supports Marbled Teal and it holds a major part of the western Mediterranean population shared with Morocco, Algeria and Tunisia.¹ There are also records from further south in Senegal, Mali, Chad and Nigeria.¹ Winter counts suggest a regional total of some 3000 birds,⁵ with ringing recoveries linking Spanish breeding birds with wintering areas in Morocco and Algeria.^{1,6}

Spain is an important breeding area, despite high annual variation in breeding numbers associated with rainfall variations in a semi-arid climate, and possibly with conditions in alternative breeding sites in North Africa.^{1,6,7} Nesting begins in late April and broods emerge

from mid-May to the end of July.^{6,8} The most important breeding site is the Guadalquivir marshes (a large complex of wetlands, including Doñana, in western Andalucía), which formerly supported several thousand breeding pairs.^{1,6} However, drastic declines in the Spanish population have occurred this century and continue as a result of habitat loss, hunting and other factors.^{1,5,6} An estimated 30–50 pairs bred in Spain in 1993–95.⁸

This paper reports simultaneous censuses conducted at all important Marbled Teal sites in Spain prior to, during and after breeding in 1994 and 1995. It is the first such national survey of this species in any range state. Most previous information on the global status of Marbled Teal comes from midwinter waterbird surveys.^{1,9} These censuses were initiated in order to monitor the changing status of the Marbled Teal at a time when its Spanish population is extremely threatened and probably lower than ever before. They were also undertaken to study the nature of movements between different wetlands and particularly between the two major centres of

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distribution in the Guadalquivir marshes and in southern Alicante province, Valencia region.

METHODS

Overall coordination of the national censuses was carried out by AJG and JDN on behalf of the Estación Biológica de Doñana (EBD) and the Sociedad Ornitológica *Marmaronetta* (SOM). Chosen dates were communicated to a network of about 18 correspondents, who organized local surveys and transmitted the results to the coordinators. In this way, about 80 volunteers surveyed about 60 potential Marbled Teal sites in 12 different provinces of six autonomous communities: Andalucía (Almería, Cádiz, Huelva, Málaga and Sevilla provinces), Valencia (Alicante and Valencia provinces), Castilla-La Mancha (Toledo and Ciudad Real provinces), Catalonia (Girona province), Murcia Region and the Balearic Islands. These volunteers are the real authors of this article (see Acknowledgements).

Censuses of Marbled Teal sites were conducted four times in 1994 (17–18 April, 24–30 June, 24–31 July, 15–21 October) and three times in 1995 (24–30 April, 26 June–9 July and 14–22 October). The April census was designed to survey the prebreeding population and was conducted later in 1995 because of evidence that many breeding birds had not yet returned from wintering sites in North Africa at the time of the April 1994 census. The June/July censuses aimed to survey the breeding population and were reduced to one census in 1995 so as not to overburden counters. The October census was designed to survey the post-breeding population before any large-scale dispersal to North Africa. Every attempt was made to cover neighbouring wetlands at the same time to prevent duplicate counting. No winter censuses were conducted since existing national, midwinter censuses cover most Marbled Teal sites (organized by the national Ramsar committee) and most Marbled Teal winter in North Africa.⁶

The initial census site list was based on all wetlands with Marbled Teal records in the past decade,⁶ modified as records came from new wetlands and as severe drought caused many sites to dry out. The most important sites were covered in each census, although some parts of El Hondo and Salinas de Santa Pola in Alicante

were not covered because of access problems. Counts were made from the ground using binoculars and telescopes.

Correspondents were asked to provide observations of Marbled Teal made close to census dates. They were also requested to collate all observations of confirmed breeding (broods or nests) to enable a comprehensive assessment of the size and distribution of the national breeding population.

The following additional abbreviations are used in the text: PND (Parque Nacional de Doñana), PNED (Parque Natural del Entorno de Doñana).

RESULTS

Between April and October inclusive in 1994 and 1995, Marbled Teal were recorded from 27 Spanish wetlands in ten provinces of the autonomous communities of Andalucía, Valencia, Murcia and Castilla-La Mancha (Fig. 1; Table 1). During the seven coordinated censuses, Marbled Teal were recorded from 14 wetlands in seven provinces (Table 1). Wetlands surveyed without any positive counts are listed in the Appendix. There were no records from Catalonia or the Balearic Islands. There was a notable shrinkage in distribution from 1994 (with records from 24 sites in ten provinces) to 1995 (with records from only 16 sites in seven provinces). The average total count (excluding pulli) was 55 in 1994 and 50 in 1995. The numbers of Marbled Teal were underestimated during the censuses, as much larger numbers were recorded on different dates at a similar time of year (Table 1).

1994

Almost all Marbled Teal were recorded in Andalucía and Valencia with only occasional records in Murcia and Castilla-La Mancha (Table 1). During the censuses, 75% of birds were recorded in the Valencia region, 23% in Andalucía and 3% in Murcia (Table 1).

Only 28 Marbled Teal were counted in the 17–18 April 1994 census, but it is possible most birds had not returned from North African wintering grounds – larger numbers were recorded at 12 different sites in late April/May (Table 1). Summing site peak counts suggests a

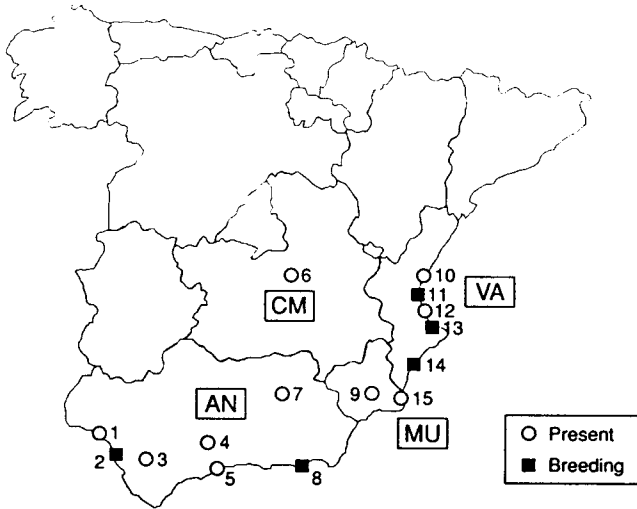


Figure 1. Map of mainland Spain showing the location of autonomous communities and wetlands where Marbled Teal were recorded and/or breeding was confirmed in 1994-95. Andalucía (AN): 1, Estero de Domingo Rubio, Lagunas de Palos; 2, Guadalquivir Marshes (including PND, PNED, Brazo del Este); 3, Embalse de Bornos; 4, Laguna del Pueblo; 5, Desembocadura del Guadalhorce; 7, Embalse de Pedro Marín; 8, Cañada de las Norias. Castilla-La Mancha (CM): 6, Charcones de Miguel Esteban. Murcia (MU): 9, Saladares del Guadalentín; 15, Mar Menor. Valencia (VA): 10, Marjal del Moro; 11, Albufera de Valencia; 12, Marjal de Xeresa-Xeraco; 13, Marjal de Pego-Oliva; 14, El Hondo, Salinas Sta. Pola, Hondo de Amorós.

total prebreeding population of around 111 birds, although this may be an overestimate given possibilities of duplicate counts. In the April census, most Marbled Teal were recorded in the Guadalquivir marshes, where numbers peaked in late April/May but reduced by June with a simultaneous increase in numbers in Valencia region (Table 1). Birds may have dispersed from western Andalucía to Valencia region as suitable habitat had dried out in the former area.

The distribution of birds during the July census was very similar to the distribution of confirmed breeding in 1994 (Tables 1, 2). Of 22 broods recorded, 86% were in Valencia region, concentrated at El Hondo, Alicante, where 16 broods were observed (Table 2). Breeding success in Andalucía was extremely poor with only three broods observed in the Guadalquivir marshes (Table 2).

In the October census, only three birds were recorded in Andalucía, whereas concentrations

remained in Alicante. More birds were recorded in Andalucía in September, although in low enough numbers to be explained by locally breeding birds (Table 1). There was no evidence of an autumn passage through Andalucía. Although Marbled Teal almost disappeared from Valencia region in November/December, there were almost no records from Andalucía at this time of year despite regular monitoring (EBD & SOM, unpubl. data).

1995

With 91% of birds censused, Valencia region held an even bigger proportion of the Marbled Teal than in 1994. In contrast, numbers in the Guadalquivir marshes were much lower than in 1994 and Veta la Palma was the only site where the species was regularly observed (Table 1). Of broods, 92% were recorded in Valencia region, where more broods were

Table 1. Censuses of Marbled Teal in Spain in 1994 and 1995.

Location	1994				1995		
	Apr/May	June	July	Sep/Oct	Apr/May	Jun/Jul	Sep/Oct
Almería, AN							
8. Cañada de las Norias	0 (7)	2 (9)	-	0	2	1 (7)	3
8. Salinas de Guardias Viejas	0 (3)	0	-	0	0	0	0
Cádiz, AN							
2. Laguna de Tarelo, PNED	0 (2)	2	0	0	0	0	0 (1)
2. Salinas de Sanlúcar, PNED	0 (3)	0	0	0	0	0	0
2. Embalse de Bornos	0	3	0	-	0	0	0
Huelva, AN							
2. Laguna Sopotón, PND	0 (2)	0	0	0	0	0	0
2. Laguna Acebuche, PNED ¹	4 (7)	1	0 (3)	0	1	0 (1)	0
1. Lagunas de Palos	0	0	0	0	0	0	- (1)
1. Estero de Domingo Rubio	0	0	0	0	0	0 (1)	-
Jáén, AN							
7. Embalse de Pedro Marín	- (1)	-	-	-	-	-	-
Málaga, AN							
4. Laguna del Pueblo	- (1)	-	-	-	-	-	-
5. Desembocadura Guadalhorce	-	0	0	0 (1)	0	0	0
Sevilla, AN							
2. Veta la Palma, PNED	11 (17)	3 (9)	4 (5)	0 (15)	0 (8)	2 (10)	2
2. Entremuros, PNED	- (4)	-	-	-	-	-	0
2. Brazo del Este	6 (15)	2 (5)	9	0 (1)	0	0	0
2. Cortijo de los Olivillos	-	-	-	0 (4)	0	0	0 (3)
2. Cañada de los Pájaros ^b	-	-	-	3	- (2)	-	2
Alicante, VA							
14. El Hondo ^c	0 (36)	17	11 (20)	15 (42)	22 (38)	31 (58 ^d)	37 (50 ^e)
14. Salinas de Santa Pola ^f	5	- (3)	67	24	3	1 (7)	0 (8)
14. Hondo de Amorós ^f	-	0 (20)	3	0 (47)	2	0 (19)	0 (10)
13. Marjal de Pego-Oliva	0	0	0 (2)	0	4	6	0 (12 ^f)
Valencia, VA							
11. L'Albufera de Valencia	2 (7)	9	12	0	3	12 (13)	3 (5)
10. Marjal del Moro	0	0 (2)	0	0	3	10	0 (6)
12. Marjales de Xeresa-Xeraco	-	-	-	-	0 (2)	-	-
Murcia, MU							
15. Mar Menor	0 (4)	0	0	0	0	0	0
9. Saladares del Guadalentín	-	-	-	6	0	0 (2)	0
Toledo, CM							
6. Charcones de Miguel Esteban	0 (2)	0	0	-	-	-	-
Total	28 (111)	39 (60)	106 (112)	48 (77)	40 (63)	63 (108)	47 (85)

Data are presented by province for four censuses in 1994 (17–18 April, 24–30 June, 24–31 July, 15–21 October) and three in 1995 (24–30 April, 26 June–9 July and 14–22 October). In cases where higher counts were made outside the dates of the censuses, maximum counts for the months indicated are given in parentheses. All figures exclude pulli. Locations are numbered as in Fig. 1 to allow cross-referencing. -, Sites not covered on the dates of the census. Regions are indicated after Province names as follows: AN Andalucía, VA Valencian Community, MU Murcia Region, CM Castilla-La Mancha. ^aSite of release of 62 captive-bred Marbled Teal in 1993. ^bLagoon holding captive Marbled Teal, plus the occasional wild bird. ^cThese wetlands are close together and peak counts made on separate dates are not summed together. ^dCount prior to release of 15 juveniles on 26 July 1995. ^eCount prior to release of 21 juveniles on 12 September 1995. ^fCount after release of six juveniles on 11 August 1995.

recorded at more sites than in 1994 (Table 2). In contrast, breeding was extremely poor in Andalucía, being confirmed only at Cañada de

las Norias, Almería (Table 2). No breeding at all was recorded in the Guadalquivir marshes.

The delayed April census led to higher bird

Table 2. Reproduction of Marbled Teal in Spain in 1994 and 1995, with the number of broods and total number of young recorded at each site.

Location	1994		1995	
	Broods	Young	Broods	Young
Almería, AN				
8. Cañada de las Norias	0	0	3	16
Huelva, AN				
2. Laguna Acebuche, PNED	1	7	0	0
Sevilla, AN				
2. Veta la Palma, PNED	1	7	0	0
2. Brazo del Este	1	12*	0	0
Alicante, VA				
14. El Hondo	16	147	25	216
14. Santa Pola	0	0	3	18
14. Hondo de Amorós	0	0	1	11
13. Marjal de Pego-Oliva	0	0	2	11
Valencia, VA				
11. L'Albufera de Valencia	3	35	4	44
Total	22	208	38	316

Regions are indicated after Province names as follows: AN Andalucía, VA Valencian Community. Locations are numbered as in Fig. 1 to allow cross-referencing. *Nest with 12 eggs, all of which hatched.¹¹

totals in 1995 than in 1994 (Table 1). There was an important influx of Marbled Teal to the Guadalquivir marshes in November/December 1995, when flocks of up to 60 birds were recorded (EBD & PND, unpubl. data). These birds must have come from either Valencia region or North Africa. Their arrival was followed by the first heavy winter rainfall since 1989–90.

DISCUSSION

Current status

The coordinated national censuses of the Marbled Teal in Spain in 1994 and 1995 show that total numbers are at a very low level. Breeding pairs were highly concentrated at one site, El Hondo in Alicante, which held 73% of broods in 1994 and 66% in 1995. More broods were recorded there in 1995 than ever before.⁶ However, broods were more likely to be observed at El Hondo than at other sites. Of these broods, 66% were rescued from drainage canals,⁸ an operation which only started in 1994. This may explain why more broods were observed here than in previous years.

Nevertheless, numbers of adults recorded at El Hondo and at neighbouring Salinas de Santa Pola and Hondo de Amorós compare favourably with previous records since 1980.^{6,8} There is no evidence of current decline in this Alicante population despite the drainage canals, lead poisoning, illegal hunting and other significant threats.^{6,8} Numbers of Marbled Teal adults and broods recorded at other sites in Valencia region also compare favourably with previous years.⁶ Breeding was not confirmed at L'Albufera de Valencia before 1994, at Hondo de Amorós before 1995 or at Marjal de Pego-Oliva before 1993 (one brood).

In contrast, Marbled Teal have undergone a drastic decline in the Guadalquivir marshes, Andalucía. In 1989, the highest count for the area was 565,⁶ and the breeding population between 1984 and 1988 was estimated at 150–250 pairs.¹⁰ There have been no records of over 100 birds since 1992.⁶ The censuses of 1994 and 1995 were the first complete surveys across the entire Guadalquivir marshes and the relatively tiny number of birds recorded shows that the Marbled Teal currently verges on local extinction and is probably much rarer than ever before. This is impossible to prove, because

ornithological activity in the area was limited until quite recently. No breeding of Marbled Teal has been recorded in the PND since 1991, a cause for concern as this is the area under the most protection from habitat transformation and other threats.

The near disappearance of Marbled Teal from the Guadalquivir marshes during this study is strongly related to the severe drought in the area from 1992 to 1995, which led to a drastic reduction in the area of potential breeding habitat available to the species, particularly within the natural, seasonal marshes of the PND. 1995 was even drier than 1994, which explains the even greater concentration of birds in Valencia region. The relative importance of Veta la Palma throughout 1994–95 reflects the permanence of this site, a complex of artificial reservoirs flooded with estuarine water.

Effectiveness of the censuses

The results suggest that at least 30% of the Marbled Teal present in Spain were missed by the censuses (Table 1; excluding the April 1994 census), although this figure could be considerably higher. Numbers of broods observed (Table 2) and behavioural evidence of breeding activity suggest about 35 breeding pairs in Spain in 1994 and about 50 pairs in 1995.⁸ This corresponds to a minimum of 70 and 100 adults, respectively, and suggests that at least 40% of birds were overlooked during the June/July censuses (excluding the late-July 1994 census, when many fledged juveniles may have been counted).

The Marbled Teal is difficult to census in the breeding season, largely because of its preference for densely vegetated microhabitats.^{1,6} Many incubating females must have been overlooked during the June/July censuses. Prior to and after breeding, Marbled Teal are gregarious and highly mobile with flocks often shifting location from one week to the next.⁶ It is therefore easy to overlook a significant fraction of the population.

Marbled Teal distribution changes considerably from April to October,⁶ so censuses at different times identify the sites important to the species at different times of the life cycle. The late-July 1994 distribution was the most accurate indicator of which wetlands

supported successful breeding. Experience in Spain and Turkey (AJG, pers. obs.) suggests that mid- to late July is the best time to conduct surveys of Marbled Teal to identify important breeding sites, when most broods have hatched and newly fledged broods appear highly faithful to their rearing areas. Given the considerable difficulties in distinguishing juveniles from adults in the field, May to mid-June is the best period for censusing the number of breeding adults. However, surveys at this time only identify *potential* breeding sites. In May–June 1994 considerable numbers of birds in Spain were recorded at sites later abandoned without breeding, largely due to site desiccation.

Patterns of movement

There is evidence of regular movements of failed or post-breeding birds from the Guadalquivir marshes to Valencia region, and of autumn migration in the other direction. The 1994 censuses suggest that birds moved from the Guadalquivir marshes to Alicante in early summer in response to deteriorating conditions in the former area (drying up of the Brazo del Este, hypersalinity in Veta la Palma etc.). In 1995, there was evidence of a movement in the opposite direction in early winter. There is also evidence of similar movements in 1992 and 1993, from asynchronous counts in the two areas.⁶

October to December is usually the time of year when the highest concentrations of Marbled Teal are observed in the Guadalquivir marshes,⁶ and it is likely that birds breeding in Valencia region pass through these marshes *en route* to North Africa. However, the data from 1994 suggest that birds breeding in Valencia sometimes move directly to North Africa (a journey of about 240 km) without passing through Andalucía. These variations illustrate the complex, semi-nomadic nature of movements in this Marbled Teal population.^{1,6}

The problems of censusing this species accurately make it difficult to study movements between different areas from counts alone. Such movements can only be confirmed by the monitoring of marked individuals. The marking of birds with coloured PVC leg rings started in 1994–95,⁸ but legs are rarely visible under field conditions. We are currently testing

wing tags in captivity and hope to be able to tag wild birds in the near future.

Future monitoring requirements

The coordinated national monitoring programme needs to be continued in coming years to clarify how Marbled Teal distribution and population size respond to changing environmental conditions. For example, 1996 was a wet year in the Guadalquivir marshes, very different to the drought years of the current study. The coordination of simultaneous censuses in Spain and North Africa is desirable.⁵ These censuses should be combined with the study of marked individuals, to clarify the nature of movements between different sites in Spain and beyond. They should also be integrated with ecological research, particularly to clarify habitat requirements throughout the life cycle.⁵

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APPENDIX

Wetlands censused in 1994 and/or 1995 where no Marbled Teal were observed are listed below by province. **Alicante:** Depuradora de Santa Pola. **Almería:** Desembocadura del Aguas, Desembocadura del Antas, Salar de los Carros, Desembocadura del Almanzora, Desembocadura de la Rambla Morales, Embalse de Cuevas del Almanzora, Salinas de Cabo de Gata, Lagunas de Oxidación de Retamar, Salinas de Cerrillos, Embalse de Benívar, Charcones de Entinas, Lagunas del campo de golf de Almerimar, Albuferas de Adra. **Baleares:** S'Albufera de Mallorca, Salobrar de Campos, Estanyes de S'Avell, Albufereta de Pollença, Laguna de Son Navata, Salines d'Eivissa, Albufera d'es Grao, Badia de Fornells, Prat de Son Bou. **Girona:** Aiguamolls de l'Empordà. **Cádiz:** Embalse de Barbate, Laguna del Taraje, Laguna del Comisario, Laguna de los Tollos, Lagunas de Espera, Laguna de Medina, Lagunas de Chiclana, Lagunas de Puerto de Santa María. **Ciudad Real:** all suitable sites. **Huelva:** PND, Laguna de las Madres, Laguna del Prado, Marismas del Odiel, Marismas del Tinto, Marismas de las Piedras, Marismas de Carreras-Guadiana. **Murcia:** Ajauque-Rambla Salada. **Sevilla:** PND, PNED, Brazo de la Torre (to north of PNED), Lagunas de Lebrija-Las Cabezas. **Toledo:** all suitable sites.

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