Ruddy Duck management in France

Technical report 2024

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Foreword

This national report is carried out within the framework of:

- Recommendation No. 185 of the Standing Committee of the Bern Convention, adopted on November 18, 2016, on the eradication of the Ruddy Duck (*Oxyura jamaicensis*) in the Western Palearctic by 2020 (Council of Europe 2016).
- EU Regulation No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species (Council of Europe 2014)
- The national plan for the control of the Ruddy Duck 2015-2025, validated by the Directorate for Water and Biodiversity on June 24, 2016 (Ministère de l'Ecologie du Développement Durable et de l'Energie 2016).
- The implementation of the IAS EU regulation listing the Ruddy Duck as a species of concern for the European Union and transposed into national law by Decree No. 2017-595 of April 21, 2017, relating to the control and management of the introduction and spread of certain animal and plant species, and by the Order of February 14, 2018, relating to the prevention of the introduction and spread of invasive alien animal species in metropolitan territory.
- The national strategy on IAS, Axis II "Species management interventions and ecosystem restoration," Objective 5 "Control widespread invasive alien species," Action 5.3 "Implement national control plans".
- The continuity of the action of the European LIFE Oxyura project led by the OFB in partnership with the SNPN, which took place between October 2018 and December 2023. This financial tool helped strengthen historical actions to achieve two objectives: eradication of the wild population by 2025 and control and eradication of the captive population by 2030 (European Commission 2018).

The report covers the period from January 1 to December 31, 2024. The information it contains comes from the results of counts, field surveys, and destruction operations carried out by the OFB and the SNPN - RNN de Grand-Lieu. Regarding observations outside Lake Grand-Lieu, this report also relies heavily on the collection of information from the naturalist community, particularly through regular consultation of ornithological data from the Visionature network.

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1 Context Reminder

1.1 A conservation issue for the White-headed Duck

The management of the Ruddy Duck is part of the conservation of a related diving duck species, the White-headed Duck, *Oxyura leucocephala* (European Commission 2018). This species consists of two geographically isolated populations. One of them, located in the Western Mediterranean, is threatened (Hughes et al. 2006; Green and Hughes 1996). Currently present only in Spain and to a lesser extent in Morocco and Tunisia, it previously nested in Italy and France, with the last sedentary pair observed in Corsica in 1966. In 1977, the population was close to disappearing, with 22 individuals recorded in southern Spain. Conservation measures have allowed its recovery, with a now fairly stable population of about 2500 individuals. This increase is associated with occasional observations of dispersing birds in France since the 1980s (Figure 1).

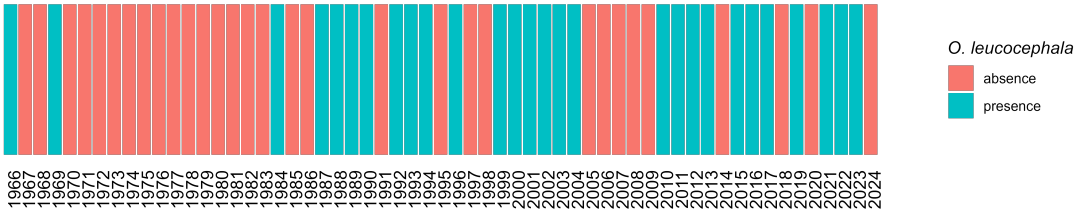


Figure 1: Evolution of the presence of the White-headed Duck in French territory

The Iberian White-headed Duck population faces a new threat since the introduction in Europe of a cousin species, the Ruddy Duck *Oxyura jamaicensis* (Gutiérrez-Expósito et al. 2020). This species, originating from North America, is a potential competitor for nesting sites and food resources. Probably differentiated for 1 to 2 million years (Muñoz-Fuentes et al. 2007), these two species nevertheless produce viable hybrids, of which 69 specimens have been observed in Spain since 1991 (Gutiérrez-Expósito et al. 2020). This genetic introgression would likely lead to the disappearance of the Iberian White-headed Duck population in favor of a hybrid population or a new core of Ruddy Ducks. This transition could be rapid because the aggressive behavior of Ruddy Duck males during the nuptial period gives them privileged access to White-headed Duck females (Figure 2) (Gutiérrez-Expósito et al. 2020).

Figure 2: Two males in nuptial plumage fighting in Mayenne, France; on the left a Ruddy Duck, on the right a White-headed Duck. © Eric Médard

To preserve the White-headed Duck, Spanish authorities carried out a systematic culling campaign of Ruddy Ducks and hybrids in their territory until 2007. Since then, a few sporadic observations have been made[1]. Initially introduced in the United Kingdom, the threat of the Ruddy Duck returning to Spain is not ruled out as long as the species is still present on the European continent. Under pressure from the White-headed Duck conservation issue, British authorities, in association with local ornithological organizations, implemented an eradication plan in 2005[2] that reduced the population from 6000 individuals to about ten individuals since 2019. Reproduction in the wild was observed annually between 1953 and 2018, with 2019 marking the end of population renewal (Henderson, pers. comm.). However, two small nuclei have permanently established themselves on the continent, one in France which remained around 200 individuals between 2004 and 2018 thanks to the efforts of the OFB and the SNPN, and one in the Netherlands of similar size[3]. To achieve the cessation of natural reproduction in France, the LIFE Oxyura project, led by the OFB, was launched in 2018 to support the 2015-2025 national control plan. It notably allowed the recruitment of four agents dedicated to Ruddy Duck control for five years and engaged throughout French territory (European Commission 2018).

[1]The last three observations date from 2011, 2014, and 2020, respectively

[2]This plan was implemented after a five-year research phase

[3]A few birds are observed in Belgium without being considered a full-fledged population. Following the 2022 meeting of the Ruddy Duck working group led by the Bern Convention, it seems that a new, smaller nucleus is establishing itself in Germany

1.2 The Ruddy Duck in summary

The Ruddy Duck is a small duck with a long tail held at a 45° angle, typical of the genus *Oxyura* (Figure 3).

- Length: 25 to 43cm
- Female weight: 450 to 845g
- Male weight: 500 to 700g

Figure 3: Pair of Ruddy Ducks in summer. © OFB

The male's plumage is predominantly reddish-brown with a black head and white cheeks (Johnsgard and Carbonell 1996). During the breeding season, its beak is blue. The female has a brown plumage with a dark brown upper head and a light brown lower head barred with dark. The undertail coverts are white. Regardless of sex, the C-shaped bill of the Ruddy Duck is the main feature that distinguishes it from the White-headed Duck, whose bill forms an S. Juveniles have a similar profile to the female, their silhouette can be confused with young Pochards. In its native range, the Ruddy Duck winters on shallow, large bodies of water (coastal bays or lowland lakes). Preferred nesting sites are smaller bodies of water with abundant riparian vegetation composed of sedges, reeds, and young willows. The Ruddy Duck feeds on aquatic plants, mollusks, worms, and insects (Woodin and Swanson 1989; Sanchez, Green, and Dolz 2000). Larval midges and pupae (*Tendipedidae*), particularly of the genus *Chironomus*, constitute the main food item during the breeding season (Siegfried 1973).

2 Control methods

2.1 Management of the wild population adapted to the Ruddy Duck's biological cycle

2.1.1 Elements of observation of the Ruddy Duck's biological cycle in France[4]

A population of Ruddy Ducks became established in France starting in 1974. With the onset of the first cold snaps, most Ruddy Ducks gather from late November on Lake Grand-Lieu in Loire-Atlantique to spend the winter there. They are then part of a group of approximately 20,000 wintering ducks of various species in the central area of the lake (Figure 4). This period is suitable for estimating the size of the French population because almost all birds are visible at this site.

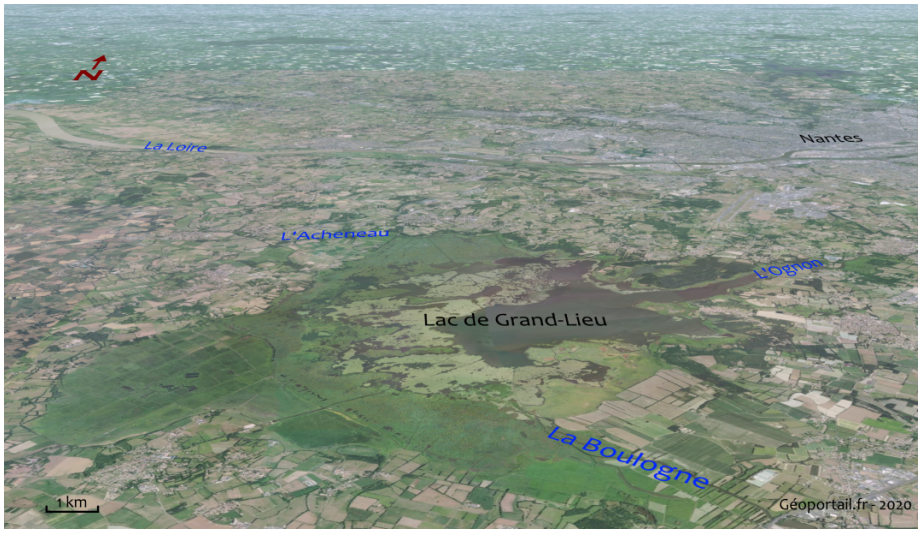


Figure 4: Geography of Grand-Lieu, a lowland lake in western France (47 05 45 north, 1° 40' 3" west). The lake has two tributaries, the Boulogne and the Ognon, and it drains into the Acheneau, which itself flows into the Loire. The light green areas are water lily beds that disappear in winter © Geoportail

Ruddy Ducks move from east to west of the central area of the lake depending on the wind and disturbance caused by potential predators or some professional fishermen (Figure 5). Until mid-February, the birds stay away from the lake's edges and exhibit escape behavior by flying if approached within 500m.

[4]The information contained in this section comes from observations made by agents of the SNPN of Grand-Lieu and the French Office for Biodiversity, as well as by numerous ornithologists.

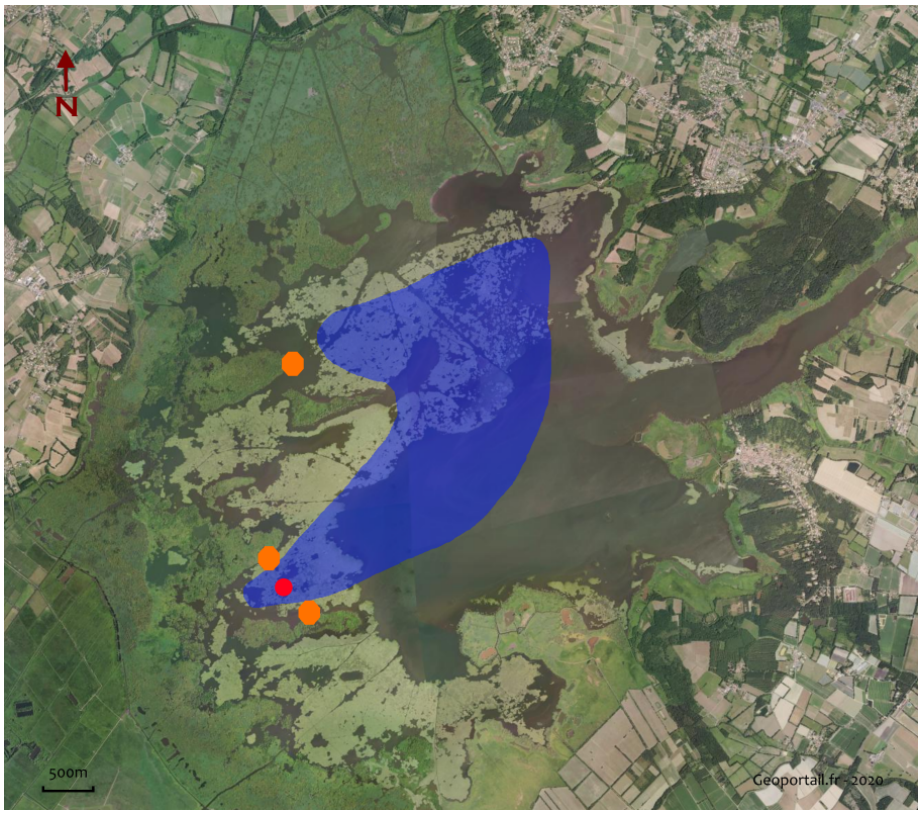


Figure 5: Area where Ruddy Ducks evolve in winter (blue). Location of blinds (orange) - Location of the decoy cage (red). © Geoportail

From mid-February, and in good weather, Ruddy Ducks show the first signs of reproductive behavior. They then approach the banks, especially in the coves bordering the riparian forest north of the wintering area and around the islands to the west (Figure 5). Males acquire their nuptial plumage at the end of winter without pair formation. Only part of the population remains on Grand-Lieu to breed, the rest gradually move to smaller ponds, mainly in the northwest quarter of France. The maximum dispersal of birds is unknown[5]. It is therefore not excluded that there are also connections with other populations in northern Europe (the Netherlands in particular).

he first courtship displays are observed from the end of winter when the weather is mild. The male sings throughout the breeding season, which extends until the end of summer, both during the day and at night (S. Reeber & A. Laroche, pers. comm.). This song is very characteristic and thus allows for the identification of the species. Ruddy Ducks build nests in herbaceous vegetation, such as sedge tussocks for example. It is common for

[5]In the Anglo-Saxon insular context, the maximum dispersion seems to be about 150 km, but it is known that continental European birds originated from the founding population in England.

Ruddy Ducks to lay eggs in the nests of other duck species. The first chicks are observed earliest in May, but the breeding peak is generally around early July.

The location of Ruddy Ducks during the molting period, which follows reproduction, is not well identified. On the one hand, the sudden gathering of the population at the wintering site suggests the existence of a potential site where Ruddy Ducks gather to molt. On the other hand, a few individuals located during the same period at very distant sites suggest that the birds molt near their nesting sites, camouflaged in the vegetation. The molting behavior of the native North American population is also poorly identified (Baldassarre 2014). Males seem to molt from August after reproduction. Some have been spotted in very open and large areas. The main hypothesis for females is that individuals molt at nesting sites, camouflaged in vegetation.

2.1.2 Winter Strategy

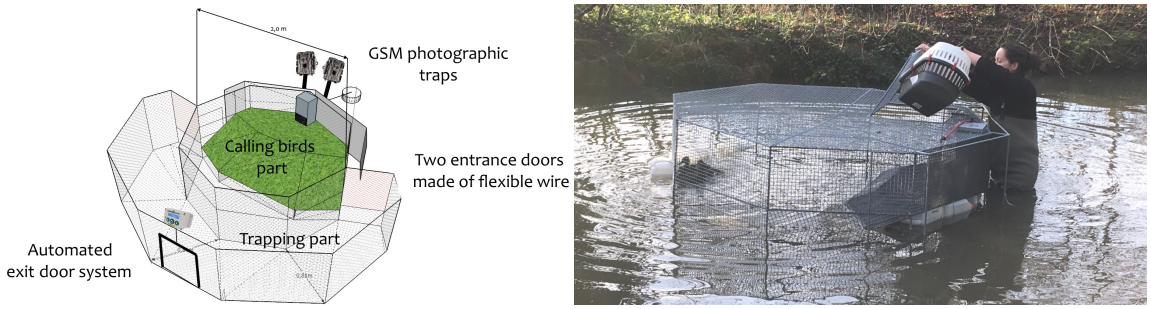
The main difficulty in winter on Lake Grand-Lieu is to approach the birds closely enough to be within shooting range. For this, several complementary tools are used. Experiments have shown that boat pursuit combined with the use of rifles is inefficient and, above all, counterproductive in terms of disturbing other species taking refuge on the lake in winter. The LIFE project allowed the construction of 3 blinds positioned on the banks as close as possible to the occupied area in winter (Figures 5 & 6). In windless conditions, these firing positions are ideal for shooting with precision rifles capable of hitting targets at long distances (300m maximum). The area occupied by the birds during winter attempts is often far from the blinds, so it is necessary to move the birds. A discreet boat can be used to gently drive the birds towards the firing positions (Figure 7). From mid-February, playback calls[6] associated with plastic decoys positioned near the firing positions are used to attract Ruddy Ducks.

[6] A sound system that broadcasts the sound of male courtship calls.

Figure 6: One of the three blinds built on Lake Grand-Lieu with funding from the LIFE Oxyura project. © OFB

Figure 7: Discreet boat with electric motor for gently driving birds. © SNPN

An alternative to shooting is to capture Ruddy Ducks using a cage trap. A bird can be attracted either with food or by using conspecifics. The first option is not selective and could disturb other species. It is also not very effective on Ruddy Ducks given their diet, which is why the use of live decoys is favored. In partnership with Branféré Zoo[7], the SNPN of Grand-Lieu and the OFB have developed two cage prototypes (Figures 8 & 9). English experience shows that cage traps are time-consuming to use. To minimize the number of visits, photo traps transmit regular images of the cages to check for the presence of captured birds.



(a) © Jean-Marc Gillier (b) © Branféré zoo

Figure 8: Decoy cage under test at Branféré Zoo

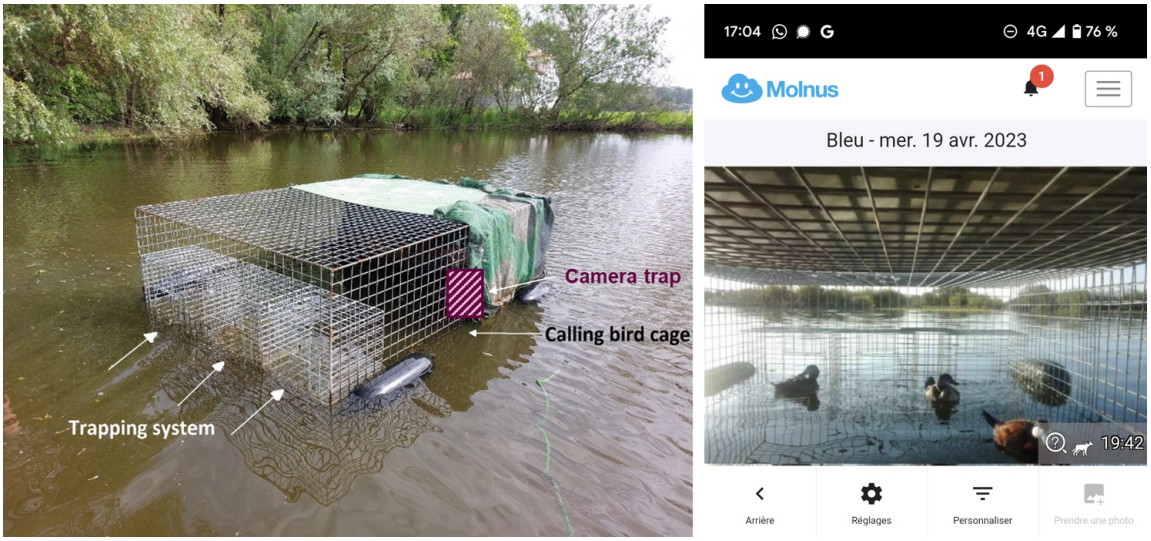


Figure 9: Second prototype with its remote capture monitoring system. © OFB

[7]Zoo located in Morbihan and member of the AFDPZ

2.1.3 Summer Strategy

From spring until late summer, some of the birds nest on Lake Grand-Lieu. Suitable areas vary with water levels and are difficult to access. The most adapted approach is by boat from the center of the lake. Males often move close to nests at the edge of vegetation and are an indicator of the presence of a female and her nest. Another method is to detect birds by their song at night using a sound amplifier. Once the birds are located, shots are fired with a precision rifle from a boat stabilized by water lilies. Nest location is also carried out occasionally during surveys in the riparian vegetation. In this case, trap cages positioned on the nests are effective for capturing females (Figure 10).

Figure 10: Trap cage system on nests, here an example with a Common Pochard. © Alain Caizergues

As in winter, an alternative on Lake Grand-Lieu is to attract birds. The sexual activity of Ruddy Ducks can be exploited to attract them near the blinds, which are still in water in spring. The combination of playback calls and Ruddy Duck decoys is the most attractive solution. Attempts to shoot with silenced rifles and night vision equipment are feasible under favorable weather conditions (little wind and clear night). In addition, the use of the decoy cage is a solution considered throughout the summer season given the continuous sexual activity during this period.

From the end of winter, another part of the birds leaves Lake Grand-Lieu to nest in smaller ponds with suitable riparian vegetation. For this part of the population, the main challenge is to locate them. The main detection method is regular surveying of historical Ruddy Duck presence sites and potential nesting sites (Figure 11). Ornithologist surveys are also used as a complement and are particularly useful for detecting birds located outside the main

Ruddy Duck occupation area in France. Once located, agents secure the site and adapt their approach to the birds and the shooting solution according to the local configuration.

Figure 11: Boat survey during the breeding season. © Valentin Boniface

2.2 Management of the captive population through dissuasive regulation

The first study on the situation of captive Ruddy Ducks in France dates from 2014, with a total of 205 birds recorded in 26 departments. Among these individuals, 105 were held by 32 amateur breeders spread across 19 different departments, 80 by 10 animal parks and zoos in nine different departments, and 20 by six professional breeders in five different departments. The new legislation in force, particularly since the Order of February 14, 2018, on the prevention of the introduction and spread of invasive alien animal species in metropolitan territory, stipulates that it is prohibited to possess, transport, sell, or buy a Ruddy Duck. With the exception of parks and zoos, which remain authorized to exhibit Ruddy Ducks, breeders who still held individuals on that date are allowed to keep them until their death, if they declared themselves to their prefecture of residence before December 31, 2019, and if they do not breed (eggs destroyed *a minima*).

To assess the evolution of the captive population, a survey on the evolution of the population recorded in 2014 was carried out at the end of 2022. It aims to judge whether the regulation is respected, and consequently to conclude whether the captive population is renewing itself and potentially threatening to supply the wild population. This survey

was conducted among the departmental services of the OFB and the Departmental Directorates for Population Protection (DDPP) of the departments where captive Ruddy Ducks had been recorded in 2014, as well as any new holders previously unknown. Information from previously identified breeding facilities could thus be updated to assess the evolution of their captive populations.

We were able to obtain information on 35 of the 48 breeding facilities identified in 2014 (73%), which provides good representativeness of the situation. Among the controlled structures, there are 22 amateur breeding facilities, four professional breeding facilities, and nine animal parks or zoos. Furthermore, two new private individuals owning one and two individuals respectively were identified in 2022; the latter had not declared the acquisition of these birds and was therefore in an illegal situation. It is therefore likely that captive birds are present on French territory without us having identified them, even if they must represent a marginal proportion of observations.

The 35 breeding facilities with data for both comparison years accounted for 156 birds in 2014 compared to 28 birds in 2022. The majority of the remaining captive birds in 2022 are held in parks and zoos for public awareness purposes, while amateur breeding facilities still account for 10 birds and commercial breeding facilities only two (Figure 12). The trend of the captive population is therefore significantly downward throughout French territory (-82%). These figures thus clearly illustrate the general compliance with the regulation. The objective of eradicating the captive population by 2030 is likely achievable.

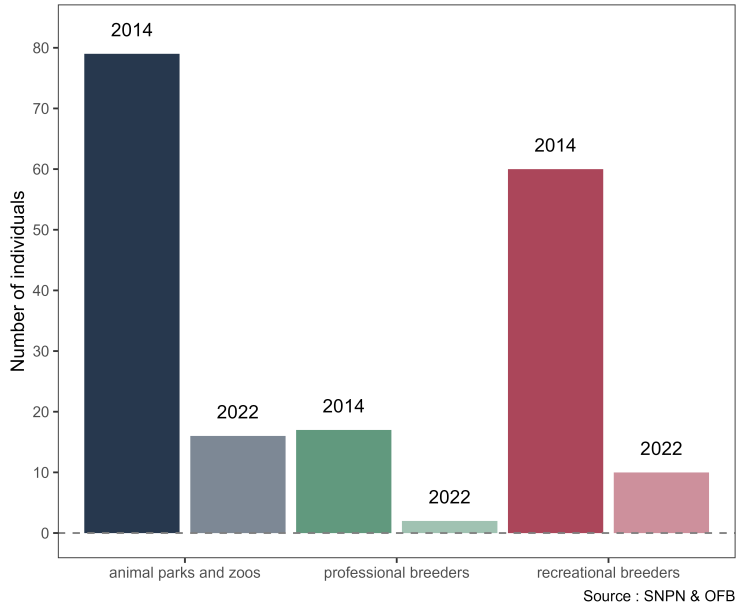


Figure 12: Number of Ruddy Ducks held by type of structure (only facilities surveyed in each survey)

Legislation may have encouraged amateur diving duck breeders to raise another species of the genus *Oxyura.* The Andean Duck or Argentine Duck (*Oxyura vittata*), native to South America, can also hybridize with other species of the genus *Oxyura* and thus with the White-headed Duck (Figure 13). Today, it is difficult to estimate the number of Andean Ducks bred in France. However, it can be assumed that in the event of introduction into the natural environment, the latter, like the Ruddy Duck, could generate the same problems related to hybridization with the White-headed Duck. It is therefore important to prevent the introduction of this species into the natural environment, particularly by encouraging regulations and preventive measures.

Figure 13: Argentine Duck, Oxyura vittata, male

3 Results in their historical context

3.1 Population status in 2024

At the beginning of 2024, the Ruddy Duck population reached 23 individuals on Lake Grand-Lieu [8]. Their evolution corresponds to an 18% decrease compared to the previous winter. At the beginning of 2025, there were 24 individuals, which corresponds to a 4% increase. One has to go back to 1995 to find a similar situation (Figure 14).

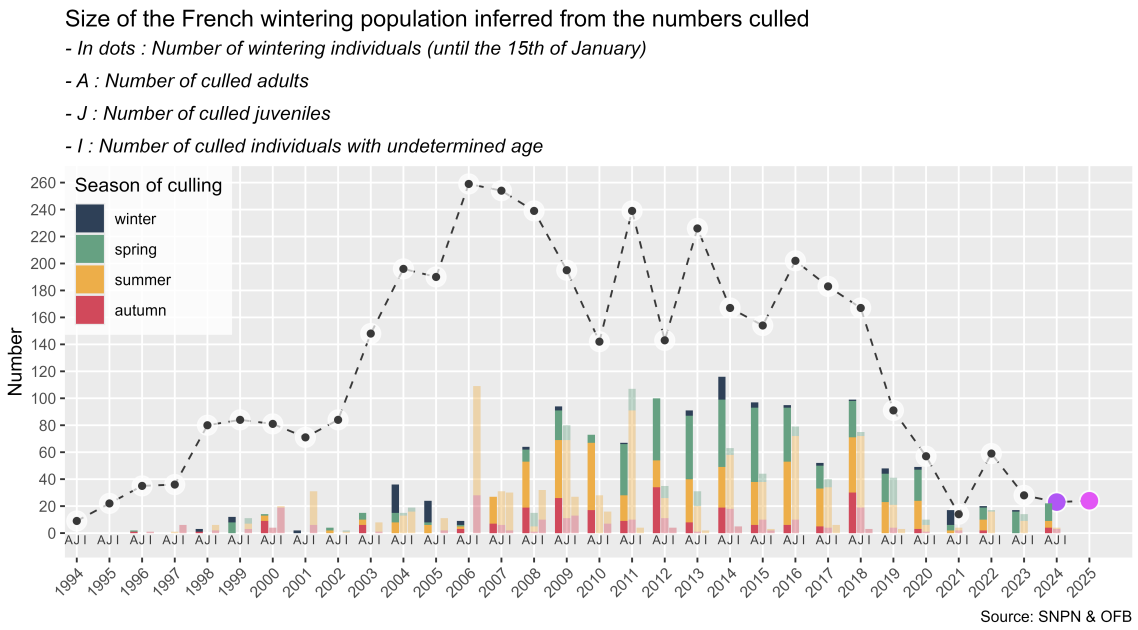


Figure 14: French wintering population figures in perspective of culls carried out. Figures before culling in mid-January 2024 in purple, and figures of the resulting population in mid-January 2025 in pink.

During the 2024 breeding season, Ruddy Ducks were observed at 32 sites, 9 more than the previous year (Figure 15). This result does not follow the population trend between early 2023 and early 2024 but is explained by the irregular presence of birds in eastern France. These birds are undoubtedly from the Dutch population or from birds present in Germany. These sites are located in the same areas as in previous years (See details by department in Section 6).

[8] It can happen that a few isolated individuals are observed elsewhere in France, but they do not necessarily belong to the French population and are therefore not counted here.

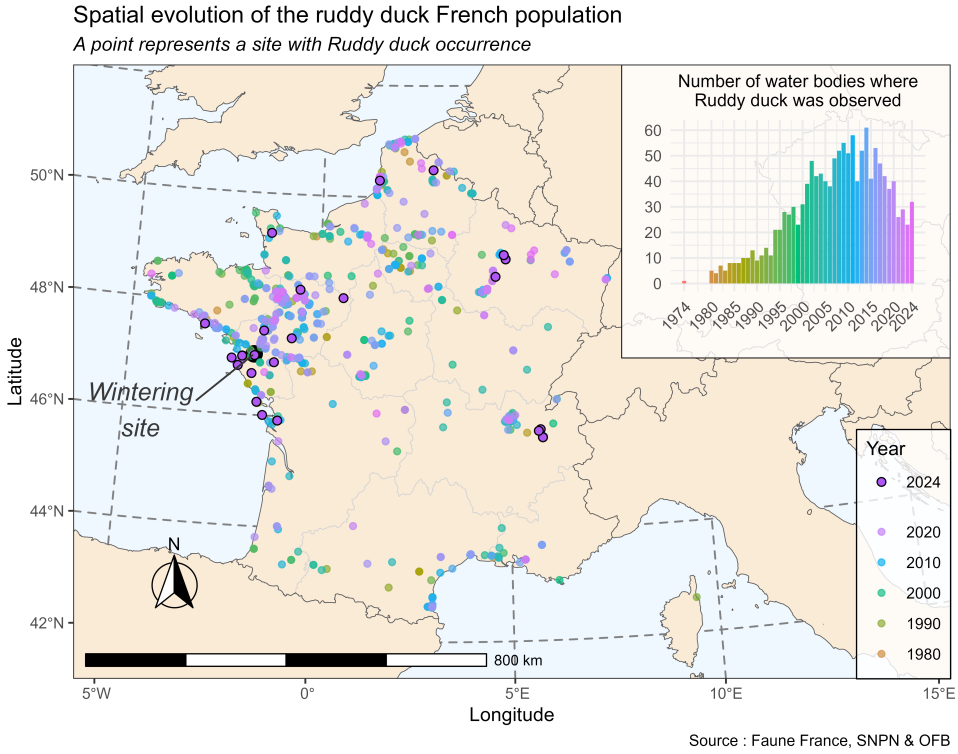


Figure 15: volution of the spatial occupation of Ruddy Ducks - for historical details by site, see **the interactive map**

3.2 Detection and culling in 2024

Ornithological platforms are routinely consulted as part of the Ligue de Protection des Oiseaux's support for Ruddy Duck management[9]. This partnership is essential because the ornithologist community can cover the entire French territory and quickly detect new areas. OFB departmental service agents complement these detections by transmitting information during their field missions. However, this effort is below what was carried out during the LIFE project due to the agents who were dedicated to this task. Lake Grand-Lieu is subject to summer monitoring carried out by its manager, the SNPN.

Following these reports, the culls carried out by SNPN and OFB agents totaled 26 individuals[10], including 22 adults (15 males and 7 females). The remaining 4 individuals are juveniles[11]. In 2024, the culling rate of adults relative to wintering birds was 96%[12].

[9] http://www.faune-france.org - http://www.observation.org

[10] During the autumn-winter period, juveniles are adult-sized but have female-like plumage; birds culled during this period are systematically sexed and aged by dissection

[11] Very few individuals are not recovered and could correspond to adults

[12] We cannot estimate the effectiveness for young birds because we do not have the number of young produced during the year

An interesting indicator is the proportion of adults culled before they reproduced. Indeed, by definition, they did not have time to produce young, and therefore to participate in population renewal, which has a significant impact on the decrease in numbers the following winter. This pre-breeding culling rate amounted to 57%. To allow for year-to-year comparison, the detailed time series of culls is presented in Figure 14.

Based on observation data from various available sources, the number of birds actually detected outside the wintering period is sought[13]. This estimation is complicated because reports occur throughout the breeding season. In the absence of distinct markings, it is therefore impossible to know whether two reports made on different dates correspond to the same individual or not. It remains interesting to calibrate an estimator that allows comparing the detection level from year to year. We then consider that two successive observations of a Ruddy Duck[14] on the same site correspond to two different individuals if more than one month has passed between the observations. Of course, significant sources of error[15] lead to an uncertain estimate. However, this approach remains an indicator of bird detectability outside the wintering period. Historical detection and culling efficiencies are presented in Figure 16.

Using the previously described method, an estimated 63 different individuals were detected. Among them, there were 46 adults, including 28 males and 18 females. The remaining 17 individuals corresponded to individuals of undetermined age (juveniles or adults). The wintering population consisted of 23 adult individuals. The estimated adult detection rate is therefore 200%[16]. The culling rate for detected adults is 48%.

[13] A Ruddy Duck may be observed several times at a site by one or more ornithologists

[14] Observations are considered to potentially correspond to a single individual only if the age and sex characteristics are identical

[15] There are two sources of error in this estimation of the number of detected birds: i) the time interval between 2 observations from which individuals are considered different, and ii) individuals who have traveled between several sites and are consequently counted as many times

[16] A detection rate greater than 100% may be due to the method overestimating the number of birds detected (if a bird stays more than one month at the same site without being culled); it is also possible that birds from a population not wintering in France have been detected.

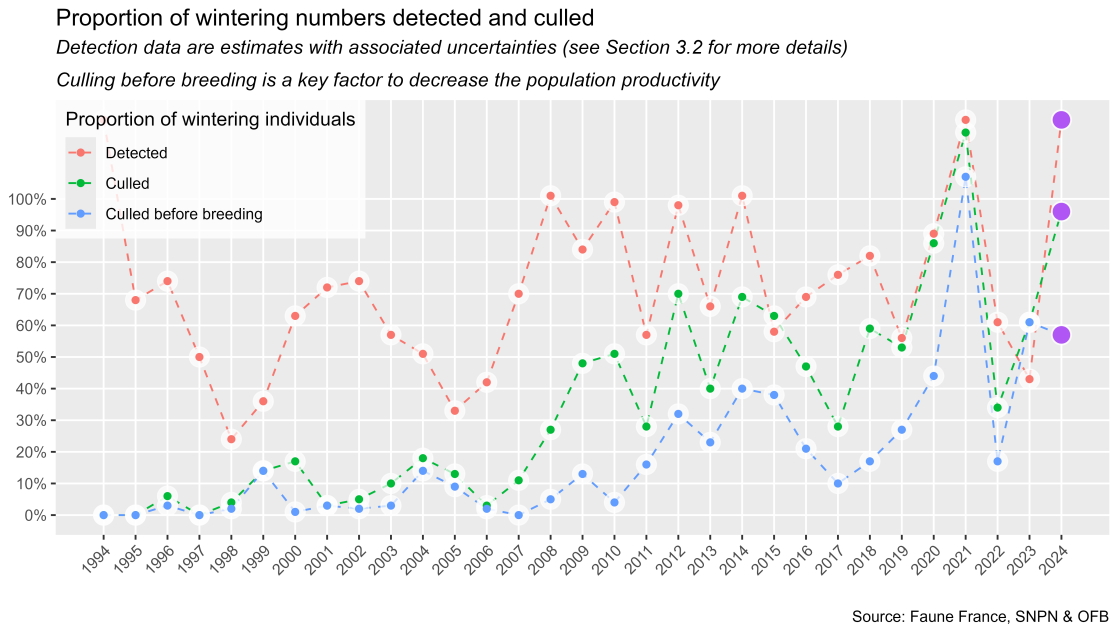


Figure 16: Proportion of wintering birds detected and culled; beware, these figures are only estimates and therefore uncertain

4 Discussion et perspectives

4.1 An encouraging but threatened trend

Over the period 2004-2017, culling efforts stabilized the French Ruddy Duck population around 190 individuals. During the LIFE period (2018-2024), the Ruddy Duck population decreased by 86%, from 167 individuals in winter 2017-2018 to 23 individuals in winter 2023-2024. With the exception of 2022, the population decreased by an average of 50% each year of the LIFE project, demonstrating the effectiveness of the control model in France. The population wintering on Lake Grand Lieu even reached a low of six individuals in early December 2021. Although the agents dedicated to Ruddy Duck control were not replaced after the end of the LIFE project (early 2024), a number of adults comparable to the wintering population was culled in 2024. Paradoxically, the population remained relatively stable between winter 2023-2024 and winter 2024-2025. Estimated detection rates tend to show that other adults not detected in winter were present in France during the 2024 breeding season. The origin of these adults remains unknown. The continuity of culling efforts following the end of LIFE is a key point for achieving eradication success. The stabilization of numbers during this first year without agents exclusively dedicated to control is reassuring, but a decrease in the coming years remains necessary.

While the LIFE objective was practically achieved[17], counts from mid-December 2021 on Lake Grand-Lieu jumped by more than 50 individuals, representing a threefold increase in numbers between 2021 and 2022. This event raised questions about the dynamics of this species. This population rebound in a context of strong culling pressure was either due to exceptional reproduction or to the arrival of individuals from another population. The first hypothesis implies that it is unlikely to control/eradicate this population because even with low numbers, it would be able to regain a significant size with a few good breeding episodes; a culling effort carried out primarily before reproduction would still buffer the effect of exceptional young production. If the explanation for the population rebound corresponds to the second hypothesis, then the French population is not isolated but connected to other populations, at least occasionally. In this case, only a synchronous culling effort across the distribution area of interconnected populations would allow for the control of the Ruddy Duck.

4.2 Origin of an exceptional increase in numbers

To better understand and manage the Ruddy Duck, it was necessary to identify the causes of the population rebound observed during winter 2021-2022. This investigation consisted of two complementary approaches. The first focused on analyzing the change in the genetic structure of the population to test the hypothesis of an exceptional migratory event. A comparison with the genetics of significant and geographically close populations aimed to

[17] Based on pre-LIFE data, the objective was to achieve a population composed of dispersed and therefore non-breeding individuals by the end of 2023.

test the connectivity between these populations. The second approach aimed to evaluate apparent adult survival rates and reproduction rates, then compare vital rates in 2021 to previous years to decide between the two hypotheses.

The development of a panel of Single-Nucleotide Polymorphism (SNP) genetic markers was carried out[18] (Pirog et al. 2025). The results show that there is no clear evolution of the genetic structure of the French population between the period preceding winter 2021-2022 and the following period. This conclusion is not incompatible with an exceptional migratory episode if the individuals from the external population have an identical genetic structure, or if the individuals returned to their original range for reproduction, during which period the culls are carried out. Furthermore, under the hypothesis of an exceptional migratory episode, the resulting population must have an intermediate genetic signature between the two source populations, which makes the analysis complex. The results also show that the genetic structuring is weak between the French and Dutch populations before winter 2021-2022 [19], so there is no clear spatial structuring [20]. The genetic proximity between these populations tends to support that these populations are historically connected, which prevents evaluating the effect of a potential recent flow of individuals. This connectivity is consistent with the hypothesis that all European Ruddy Ducks come from a single source population initially consisting of seven individuals introduced to the United Kingdom in the 1950s.

Apparent adult survival and recruitment rates can be estimated from winter counts distinguishing between individuals with male-type plumage and individuals with female-type plumage (Tableau et al. 2025). In winter 2021-2022, it is thus estimated that the wintering population was composed of approximately 25% juveniles (*i.e.*, ~15) and 75% adults (*i.e.*, ~44). With the population counting 14 individuals in winter 2020-2021, the apparent recruitment in 2021 is about one recruit produced per adult, and the apparent adult survival is 300% (Figure 17). This apparent recruitment rate is approximately double that of the best previous years. This observation alone suggests that there may have been exceptional breeding success in 2021. However, since the maximum survival for a closed population is 100%, the apparent survival of 300% demonstrates that there was a migratory event of at least 30 adult individuals. Juveniles may have accompanied these adults during this event. These individuals can explain the increase in apparent recruitment in 2021 without there having been exceptional local reproduction. The increase in the population during winter 2021-2022 is likely not due to exceptional reproduction, but most probably results from the arrival of individuals from another population. In France, it seems unlikely that such

[18] This work led to the development of 291 SNPs allowing the study of Ruddy Duck diversity; 194 French and 7 Dutch individuals were successfully analyzed.

[19] This distinction between populations may just be an artifact due to the Dutch sample not being representative of the entire population because it mostly consists of individuals from the same site and its size is small (only 7 individuals).

[20] The genetic structure is nevertheless marginally closer between the French and Dutch populations after winter 2021-2022, but this rapprochement is only due to four individuals out of 16 adults sampled in spring 2022. This is therefore not enough to conclude an exceptional migration of Dutch individuals. The small Dutch sample (seven individuals) is however limiting for definitively validating these conclusions. The culls now carried out in the Netherlands are a good opportunity to complete this genetic analysis.

a population could go unnoticed and only winter on Lake Grand-Lieu that year. Among the known European populations, only that of the Netherlands could supply so many individuals given its geographical proximity, size, and dynamism in terms of reproduction.

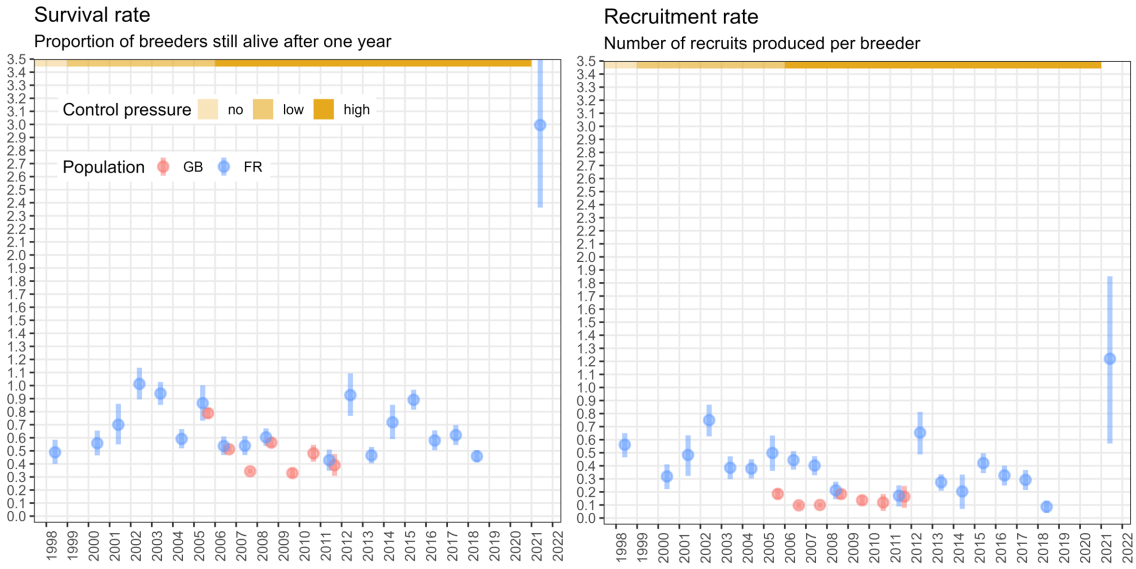


Figure 17: Estimation of the apparent vital rates of the French population; the values are exceptionally high in 2021, which tends to prove a migratory episode from a neighboring population.

4.3 Coordinated control at the distribution area scale

The reproductive behavior of individuals from an external population was a question in 2022. Would these individuals return to their original range or would they occupy nesting sites on French territory and thus contribute to the long-term renewal of the French population? The culling rate of wintering birds was approximately 30% in 2022, whereas it had always been above 50% in other years during LIFE with a constant culling effort. It therefore seems that at least some of the birds returned to their original range. When looking at the resulting population, i.e., during the winter 2022-2023 counts, it is half as low as the previous winter (28 *vs* 59 individuals). Given the low culling rate (~30%) on adults compared to other years, this clear decrease in numbers supports the hypothesis that some individuals have returned to their original range.

The historical expansion of the British Ruddy Duck population onto the European continent is probably due to one or more migratory events. The LIFE *Oxyura against Oxyura* project therefore anticipated the possibility of migratory flows from its launch and, as such, supported an initiative by the British government aimed at raising awareness among the Dutch government about the importance of controlling its Ruddy Duck population from 2020. Following this request, a meeting in the Netherlands took place in June 2022

between British managers, some of the French LIFE agents, and Dutch managers and decision-makers. The objective of this meeting was to show which effective management methods in France and the United Kingdom could be replicated in the Netherlands. Following this meeting, national coordination is now operational in the Netherlands. This international cooperation is maintained thanks to the Bern Convention's working group on Ruddy Duck management in Europe. The final seminar of LIFE Oxyura, which took place in October 2023, allowed this cooperation to be extended to countries where the White-headed Duck lives, and to share proven culling methods on the ground, whether in Spain, the United Kingdom, Belgium, or France.

4.4 Alternative methods that make a difference

Even if small, an improvement in pre-breeding culling rates can have significant impacts on the population's ability to renew itself. This is why a significant effort was made within the framework of LIFE to test alternative capture methods in winter and spring (Section 2.1). Among these, the capture method using decoys proved particularly effective. The cage prototype and the process for obtaining authorization to hold Ruddy Ducks were completed in June 2021[21]. Captive Ruddy Ducks were collected from summer 2021 thanks to collaboration with Aviornis. The avian influenza episode in France due to the H5N8 virus since autumn 2020 slowed down the launch of this experiment due to restrictions on the movement of captive birds.

In spring 2023[22], this method was successfully tested as nine adult birds were captured by cage (eight males and one female) and two other males were culled by shooting near the cage due to its attractiveness. Only four other adult males and two adult females were culled outside this device in 2023, which demonstrates the effectiveness of capture using decoy cages. The culling achieved thanks to the cage corresponds to 40% of the adults counted in winter 2022-2023. During the same period in spring 2024, five males were captured by cage, representing 23% of the adults culled that year. These results demonstrate that the decoy cage is a very effective tool and complementary to shooting. This method also has the advantage of being usable for populations where shooting is more difficult due to the urbanization of occupied sites.

[21] Capacity certificate and opening authorization

[22] The test was carried out between late March and late June, captures were carried out between April 19 and June 5

5 References

Baldassarre, Guy A. 2014. *Ducks, Geese, and Swans of North America*. Johns Hopkins University Press.

Council of Europe. 2014. "Règlement (UE) No 1143/2014 Du Parlement Européen Et Du Conseil Du 22 Octobre 2014 Relatif à La Prévention Et à La Gestion de l'introduction Et de La Propagation Des Espèces Exotiques Envahissantes." Règlement européen. Journal officiel de l'Union européenne.

———. 2016. "Recommandation Sur l'éradication de l'érismature Rousse (*Oxyura Jamaicensis*) Dans Le Paléarctique Occidental à l'horizon 2020." 36ème réunion du comité permanent, Strasbourg, 15-18 novembre 2016. Convention relative à la conservation de la vie sauvage et du milieu naturel de l'Europe.

European Commission. 2018. "Oxyura Against Oxyura - Eradicate the Ruddy Duck to Save the Endangered White-Headed Duck from Extinction - LIFE17-NAT_FR_000542." Projet LIFE Oxyura 2018-2023. Office National de la Chasse et de la Faune Sauvage & Société Nationale pour la Protection de la Nature - Réserve de Grand-Lieu.

Green, A. J., and B. Hughes. 1996. "Action Plan for the White-Headed Duck *Oxyura Leucocephala*." In *Globally Threatened Birds in Europe: Actions Plans*, edited by B. Heredia, L. Rose, and M. Painter, 119–46. Strasbourg, France: Council of Europe Publishing.

Gutiérrez-Expósito, Carlos, Claire Pernollet, Tim Adriaens, and Iain Henderson. 2020. "Ruddy Duck (*Oxyura Jamaicensis* Gmelin, 1789)." In *Invasive Birds: Global Trends and Impacts*, 200–205. CABI.

Hughes, Baz, James Robinson, Andy J. Green, David Li, and Taej Mundkur. 2006. "International Single Species Action Plan for the Conservation of the White-Headed Duck *Oxyura Leucocephala*." Edited by AEWA. *AEWA Technical Series*, no. 8.

Johnsgard, Paul A., and Montserrat Carbonell. 1996. *Ruddy Ducks & Other Stifftails: Their Behavior and Biology (Animal Natural History Series)*. Univ of Oklahoma Pr.

Ministère de l'Ecologie du Développement Durable et de l'Energie. 2016. "Plan National de Lutte Contre l'erismature Rousse (*Oxyura Jamaicensis*) 2015 - 2025 Dans Le Cadre de La Conservation de l'erismature à Tête Blanche (*Oxyura Leucocephala*)." Plan d'action, Décembre 2015. Office National de la Chasse et de la Faune Sauvage.

Muñoz-Fuentes, Violeta, C. Vilà, Andy J. Green, Juan José Negro, and Michael D. Sorenson. 2007. "Hybridization Between White-Headed Ducks and Introduced Ruddy Ducks in Spain." *Molecular Ecology* 16 (3): 629–38. https://doi.org/10.1111/j.1365-294x.2006.03170.x.

Pirog, Agathe, Sabine Rousselot, Cécile Kaerle, Jean-Marc Gillier, Sébastien Reeber, Adrien Tableau, Jean-François Maillard, and Guillaume Queney. 2025. "Development of SNP Markers for Monitoring the Genetic Diversity and Hybridization Between the Introduced Ruddy Duck and the Native White-Headed Duck in Europe." *Conservation Genetics Resources*, July. https://doi.org/10.1007/s12686-025-01396-4.

Sanchez, M. I., A. J. Green, and J. C. Dolz. 2000. "The Diets of the White-Headed Duck

Oxyura Leucocephala, Ruddy Duck *O. Jamaicensis* and Their Hybrids from Spain." *Bird Study* 47 (3): 275–84. https://doi.org/10.1080/00063650009461187.

Siegfried, W. R. 1973. "Summer Food and Feeding of the Ruddy Duck in Manitoba." *Canadian Journal of Zoology* 51 (12): 1293–97. https://doi.org/10.1139/z73-183.

Tableau, Adrien, Iain Henderson, Sébastien Reeber, Matthieu Guillemain, Jean-François Maillard, and Alain Caizergues. 2025. "Delayed Dichromatism in Waterfowl as a Convenient Tool for Assessing Vital Rates." *Peer Community Journal* 5 (February). https://doi.org/10.24072/pcjournal.531.

Woodin, Marc C., and George A. Swanson. 1989. "Foods and Dietary Strategies of Prairie-Nesting Ruddy Ducks and Redheads." *The Condor* 91 (2): 280–87. https://doi.org/10.2307/1368305.

6 Supplement: data per departement

Table 1: Table of culls and the number of sites occupied by department; for details of historical observation sites, see [**interactive map**](https://www.ofb.gouv.fr/en/life-oxyura "OFB-Oxyura" ")

		Cullings per category					
Department	Year	Female	Male	Young	Undetermined age	Total	Number of sites
44-Loire-Atlantique	**2024**	3	10	1	0	14	4
	2023	3	12	13	0	28	3
	2022	5	6	11	0	22	2
	< 2022	209	332	380	100	1021	35
53-Mayenne	**2024**	0	0	0	0	0	1
	2023	0	1	0	0	1	2
	2022	0	0	0	0	0	2
	< 2022	142	134	193	47	516	46
85-Vendée	**2024**	0	2	1	0	3	4
	2023	0	0	1	0	1	2
	2022	1	1	1	0	3	5
	< 2022	48	38	65	86	237	22
35-Ille-et-Vilaine	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	1
	2022	0	0	0	0	0	1
	< 2022	81	43	11	66	201	19
49-Maine-et-Loire	**2024**	0	0	0	0	0	1
	2023	0	1	0	0	1	1
	2022	1	0	0	0	1	2
	< 2022	18	32	28	11	89	21
80-Somme	**2024**	0	0	0	0	0	1
	2023	0	0	0	0	0	1
	2022	0	0	0	0	0	0
	< 2022	12	19	5	13	49	17
56-Morbihan	**2024**	0	0	1	0	1	1
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	9	9	6	2	26	18
72-Sarthe	**2024**	0	0	0	0	0	1
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	4	4	4	12	24	12
17-Charente-Maritime	**2024**	3	2	1	0	6	5
	2023	0	0	0	0	0	1
	2022	0	0	5	0	5	2
	< 2022	8	4	6	4	22	14

(continued)

Department	Year	Female	Male	Young	Undetermined age	Total	Number of sites
79-Deux-Sèvres	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	1	6	0	8	15	10
37-Indre-et-Loire	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	3	4	0	0	7	3
41-Loir-et-Cher	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	1	0	4	0	5	7
50-Manche	**2024**	0	0	0	0	0	1
	2023	0	0	0	0	0	1
	2022	0	0	0	0	0	1
	< 2022	0	3	0	1	4	13
13-Bouches-du-Rhône	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	1
	< 2022	1	1	0	1	3	19
59-Nord	**2024**	1	1	0	0	2	1
	2023	0	0	0	0	0	0
	2022	1	1	0	0	2	2
	< 2022	1	1	1	0	3	19
51-Marne	**2024**	0	0	0	0	0	5
	2023	0	0	0	0	0	1
	2022	0	0	0	0	0	1
	< 2022	0	2	0	1	3	14
62-Pas-de-Calais	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	2
	< 2022	0	1	0	2	3	12
27-Eure	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	3	0	0	3	2
	< 2022	1	1	0	0	2	7
61-Orne	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	1	2	0	0	3	4
33-Gironde	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	0	0	0	2	2	6

(continued)

Department	Year	Female	Male	Young	Undetermined age	Total	Number of sites
34-Hérault	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	0	1	0	1	2	6
36-Indre	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	1
	< 2022	0	0	0	1	1	10
77-Seine-et-Marne	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	1
	2022	0	0	0	0	0	0
	< 2022	0	1	0	0	1	6
89-Yonne	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	0	1	0	0	1	2
19-Corrèze	**2024**	0	0	0	0	0	0
	2023	0	0	0	0	0	0
	2022	0	0	0	0	0	0
	< 2022	0	1	0	0	1	1