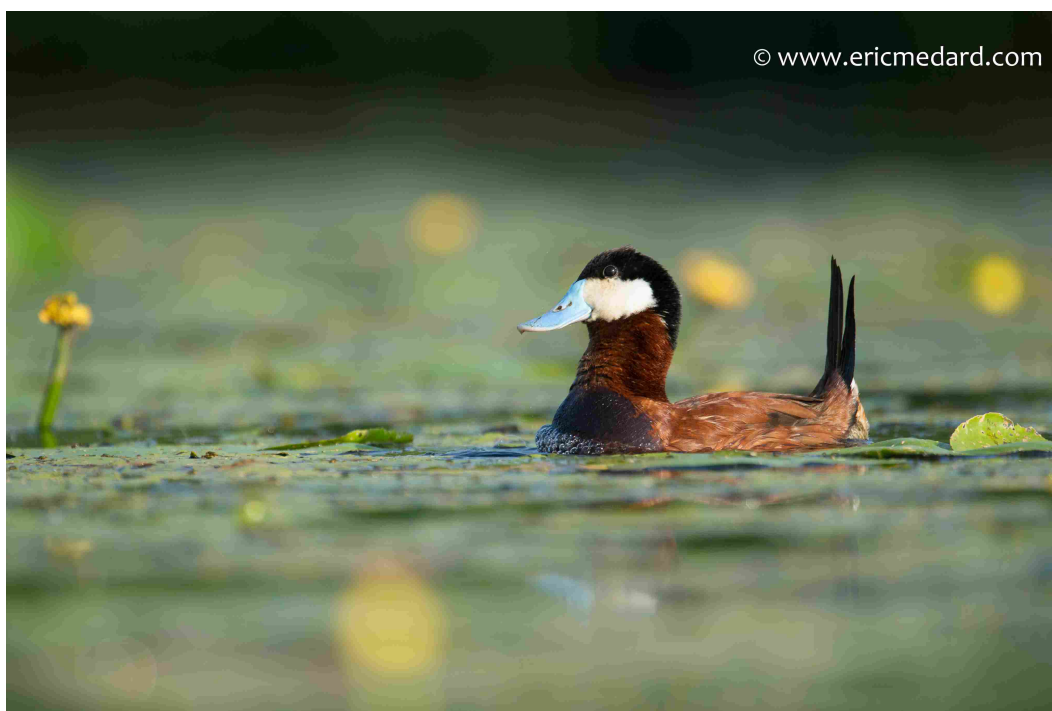


LIFE Oxyura Technique Assessment Report 2020

Techniques implemented and results



Agathe Pirog* Adrien Tableau† Jean-Marc Gillier‡ Jean-François Maillard§
Sébastien Reeber¶ Justin Potier||

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*French Biodiversity Agency (OFB) – LIFE Oxyura project manager - agathe.pirog@ofb.gouv.fr

†French Biodiversity Agency (OFB) – LIFE Oxyura coordinator - adrien.tableau@ofb.gouv.fr

‡National Society for the Protection of Nature (SNPN) - Director of the Grand-Lieu national natural Reserve - jean-marc.gillier@snpn.fr

§French Biodiversity Agency (OFB) – Project manager on Alien Invasive Species - jean-francois.maillard@ofb.gouv.fr

¶National Society for the Protection of Nature (SNPN) - Grand-Lieu national natural Reserve project manager- sebastien.reeber@snpn.fr

||French Biodiversity Agency (OFB) – LIFE Oxyura field officer - justin.potier@ofb.gouv.fr



Contents

Preface	5
1 Background	7
1.1 A conservation issue for the white-headed duck	7
1.2 The ruddy duck in brief	9
2 Management methods	10
2.1 Management methods adapted to the biological life cycle	10
2.1.1 Insights into the biological life cycle of the ruddy duck in France	10
2.1.2 The winter strategy	12
2.1.3 The summer strategy	14
2.2 Management of the captive population	15
3 Results in their historical context	18
3.1 Population status in 2020	18
3.2 Detection and culling in 2020	19
4 Discussion and perspectives	22
4.1 An encouraging trend	22
4.2 An upswing in the impact of the LIFE project	22
4.3 Alternative methods still being used	23
5 References	24
A Evidence of moulting in coastal areas?	25
B Data by department	26



Preface

This national assessment is carried out in the framework of:

- Recommendation n° 185 of the Berne Convention Permanent Committee, adopted 18 November 2016, on the eradication of the ruddy duck (*Oxyura jamaicensis*) in the Western Palearctic by 2020 (Council of Europe 2016).
- EU regulation n° 1143/2014 concerning the prevention and management of alien invasive species (AIS) introduction and propagation (Council of Europe, 2014).
- The 2015-2025 national plan to eradicate the ruddy duck, validated by the Water and Biodiversity Directorate on 24 June 2016 (Ministère de l'Écologie du Développement Durable et de l'Énergie, 2016).
- The implementation of the EU AIS regulation listing the ruddy duck as a species of concern for the European Union, transcribed into national law by Decree n° 2017-595 of 21 Avril 2017 regarding the control and management of the introduction and propagation of certain animal and plant species, and the Decree of 14 February 2018 regarding the prevention of the introduction and propagation of alien invasive animal species in Metropolitan France.
- The national strategy on AIS, Axis II “Operations for the management of gestion species and restoration of ecosystems”, Objective 5 “Control widespread alien invasive species”, Action 5.3 “Implement national combat plans”.
- The EU project LIFE Oxyura, led by the OFB in partnership with the SNPN, which lasts from October 2018 to December 2023. This financial instrument strengthens past actions in order to achieve two objectives: eradication of the population in the wild by 2025 and control and eradication of the captive population by 2030 (European Commission, 2018).

This assessment report covers the period from the 1th of January to 31 December 2020. The information it contains is derived from the results of censuses, field surveys and destruction operations carried out by the OFB and the SNPN - Grand-Lieu RNN. Concerning observations outside of Grand-Lieu Lake, this assessment report is also based, to a large extent, on information gathered from the naturalist community, in particular through regular consultation of the ornithological data of the Visionature network.



1 Background

1.1 A conservation issue for the white-headed duck

The LIFE Oxyura project responds to a conservation issue of a diving duck species, the white-headed duck - *Oxyura leucocephala* (European Commission, 2018). This species range is subdivided in two geographically isolated populations. One of them, located in the western Mediterranean, is threatened (Green & Hughes, 1996; Hughes et al., 2006). Currently only present in Spain and to a lesser extent in Morocco and Tunisia, it used to nest in Italy and France, the last sedentary pair being observed in Corsica in 1966. In 1977, the population was close to extinction, with 22 individuals recorded in southern Spain. Conservation measures have enabled it to recover, with a fairly stable population of around 2,500 individuals. This increase is associated with occasional sightings of isolated birds in France since the 1980s. (Figure 1).

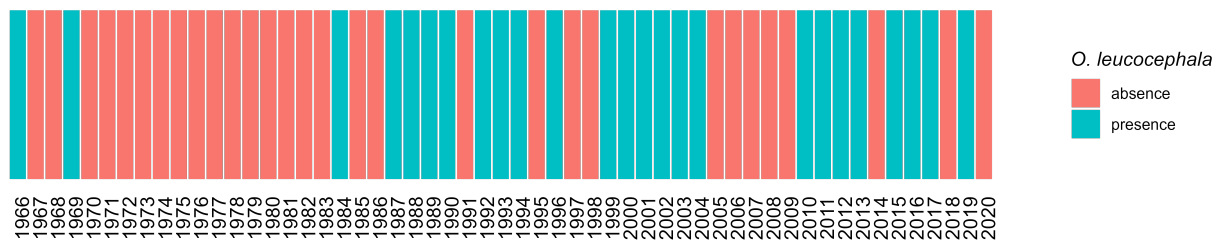


Figure 1: Evolution of the white-headed duck presence in France

The Iberian white-headed duck population faces a new threat since the introduction of a closely-related species, the ruddy duck - *Oxyura jamaicensis* (Gutiérrez-Expósito et al., 2020). This species, native to North America, is a potential competitor for nesting sites and food resources. Although they probably diverged genetically 1-2 million years ago (Muñoz-Fuentes et al., 2007), these two species nevertheless produce fertile 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 extinction of the Iberian white-headed duck population in favour of a hybrid population or a new nucleus of ruddy duck. This transition could be rapid due to the aggressive behaviour of male ruddy ducks during the breeding season, favouring their access to female white-headed ducks (Figure 2) (Gutiérrez-Expósito et al., 2020).



Figure 2: Two males in breeding plumage fighting in Mayenne - France; a ruddy duck to the left, a white-headed duck to the right. © Eric Médard

In view of conserving the white-headed duck, the Spanish authorities carried out a systematic campaign to destroy ruddy ducks and hybrids in their territory until 2007. Since then, a few occasional sightings have been made¹. Initially introduced in the UK, the threat of the ruddy duck returning to Spain cannot be ruled out as long as the species is still present on the European continent. Under pressure from the white-headed duck conservation issue, the British authorities in association with local ornithological organisations implemented an eradication plan in 2005², which reduced the population from 6000 individuals to 12 individuals in 2019 and 2020. Breeding in the wild was observed every year between 1953 and 2018, with 2019 marking the end of the population renewal (Henderson, pers. comm.). However, two small nuclei have been established on the continent, one in France remaining at around 200 individuals between 2004 and 2018 thanks to the efforts of the French Biodiversity Agency (OFB) and the French National Nature Protection Society (SNPN), and one in the Netherlands of around 80 individuals³. In order to prevent natural breeding in France, the LIFE Oxyura project, led by the OFB, was set up in 2018 to support the 2015-2025 national management plan. In particular, it enabled the hiring of four officers specifically to control the ruddy duck throughout France for five years (European Commission, 2018).

¹The last three sightings date from 2011, 2014 and 2020, respectively

²The plan was set up after a 5-years research phase

³Some birds have been observed in Belgium, but are not corresponding to an entire population

1.2 The ruddy duck in brief

The ruddy duck is a small duck with a long tail cocked at 45°, which is characteristic of the *Oxyura* genus (Figure 3).

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



Figure 3: A pair of ruddy ducks in summer. © OFB

The male's plumage is predominantly red with a black head and white cheeks (Johnsgard & Carbonell, 1996). The bill is blue in the breeding season. The female has brown plumage with dark brown on the upper parts of the head and darker-striped light brown on the lower parts. The undertail feathers are white. Regardless of sex, the C-shaped bill of the ruddy duck is the main feature distinguishing it from the white-headed duck, whose bill is S-shaped. Juveniles have a similar profile to the female and can be mistaken for young common pochard. In its native range, the ruddy duck winters on large, shallow bodies of water (coastal bays or lowland lakes). Its preferred nesting sites are smaller bodies of water with extensive riparian vegetation consisting of sedges, reeds and willow saplings. The ruddy duck feeds on aquatic plants, molluscs, worms and insects (Sanchez et al., 2000; Woodin & Swanson, 1989). Midge larvae and nymphs (*Tendipedidae*), specifically *Chironomus*, are the primary food sources during the breeding season (Siegfried, 1973).

2 Management methods

2.1 Management methods adapted to the biological life cycle

2.1.1 Insights into the biological life cycle of the ruddy duck in France ⁴

A ruddy duck population has been established in France since 1974. At the onset of the first cold weather, most of them gather as from late November on Grand-Lieu Lake, in the Loire-Atlantique department, to spend the winter. They form part of a group of about 20,000 wintering ducks of various species in the central area of the lake (Figure 4). This period is favourable for estimating the size of the French population as almost all the birds are visible at this site.

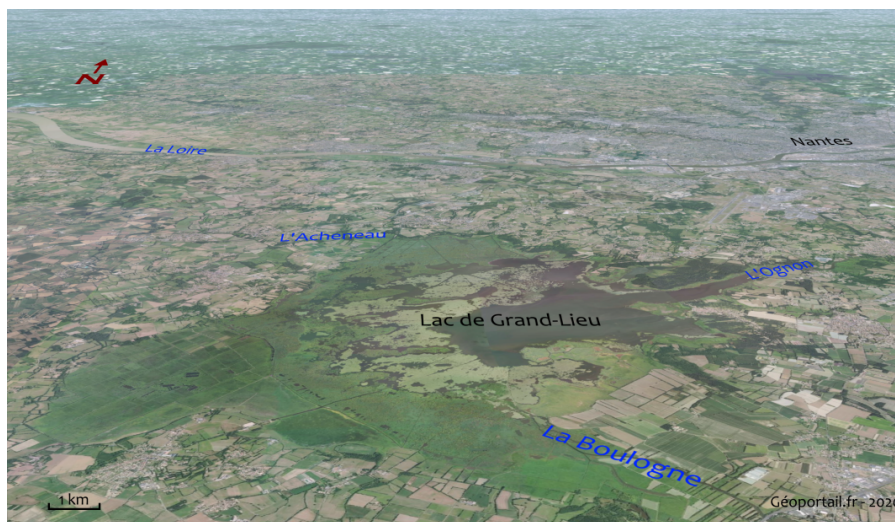


Figure 4: Geography of Grand-Lieu, a lowland lake in western France (47° 05' 45" N, 1° 40' 3" W). The lake has two tributaries, the Boulogne and the Ognon, and flows into the Acheneau which in turn flows into the Loire. The light green areas are water lily beds which disappear in winter. © Geoportail

The ducks move from the east to the west of the central area of the lake, depending on the wind and the disturbance caused by any predators present or the few professional fishermen (Figure 5). Until mid-February, the birds stay away from the edges of the lake and show fleeing behaviour as soon as they are approached within 500m.

⁴The information in Section 2.1.1 is based on observations made by staff from the Grand Lieu SNPN and French Biodiversity Agency, as well as by bird watchers and professional ornithologists.



Figure 5: Area where ruddy ducks spend the winter (blue) - Location of hides (orange) - Location of the calling cage (red). © Geoportail

From mid-February onwards, in good weather, the ruddy ducks show the first signs of breeding behaviour. They then move closer to the banks, particularly in the coves beside the riverine woodland to the north of the wintering area and around the islands to the west (Figure 5). The males acquire their breeding plumage in late winter without forming pairs. Only part of the population remains on Grand-Lieu to breed, the rest gradually moving to smaller ponds, mainly in the north-western quarter of France. The maximum dispersal of the birds is unknown⁵. It is therefore not ruled out that there are also connections with the other European populations (notably the Netherlands one).

The first nuptial displays are observed in late winter, when the weather is mild. The male calls throughout the breeding season, which lasts until the end of summer, both day and at night (S. Reeber & A. Laroche, pers. comm.). This call is very characteristic and thus enables the species to be identified. Ruddy ducks make their nests in the vegetation, for example in sedge clumps. They often lay eggs in the nests of other duck species. The first chicks are seen in May at the earliest, but the breeding peak is usually around early July.

The location of the ducks during moulting after breeding has not been clearly identified. On the one hand, the sudden gathering of the population at the wintering site suggests the existence of a potential site where the ducks gather to moult (see analysis in Appendix A). On the other hand, a few individuals located during the same period at very distant sites suggest that the birds moult, camouflaged, close to their nesting site in the vegetation. The moulting behaviour of the native North American population is also poorly identified

⁵In the British island context, maximum dispersal appears to be about 150km, but continental European birds are known to have originated from the founder population in England

(Baldassarre, 2014). Males appear to moult as early as August, after breeding. Some have been seen in large, open areas. The main hypothesis for females is that individuals moult on the nesting sites camouflaged in the vegetation.

2.1.2 The winter strategy

The main difficulty in winter on the Grand-Lieu lake is getting close enough to the birds to have them within shooting range. For this purpose, several complementary tools are used. Investigations have shown that chasing them in boats combined with the use of guns is not very effective and above all counterproductive in terms of disturbing other species that find refuge on the lake in winter. The LIFE programme has enabled the construction of 3 hides positioned on the banks as close as possible to the area occupied in winter (Figure 5 and Figure 6). In windless conditions, these shooting stands are ideal for firing high-precision rifles capable of hitting targets at long distances (300m maximum). The area occupied by the birds during winter shooting campaigns is often far from the stands, so the birds must be moved. An unobtrusive boat can be used to gently bring the birds closer to the shooting stands (Figure 7). From mid-February onwards, playbacks⁶ combined with plastic decoys positioned near the shooting stands are used to attract the ducks.



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

⁶An audio system to transmit the sound of the males' nuptial calls



Figure 7: Unobtrusive boat with electric motor for gently bringing birds towards the shooting location. © SNPN

An alternative to shooting is capturing ducks with a cage trap. A bird can be lured either with food or by using fellow ruddy ducks. The first option is not selective and may disturb other species. It is also not very effective on ruddy ducks due to their diet, so the use of live decoys is favoured. In partnership with Branféré Zoo⁷, the Grand-Lieu SNPN and OFB are developing this approach (Figure 8). The English experience shows that cage traps are time-consuming to use. In order to minimize handling time, the cage developed within the LIFE framework is fitted with an automatic trap door that opens at regular intervals. Photographic traps transmit images by telephone before the trap doors are opened. If a ruddy duck is spotted, the team arrives before it opens to capture the bird.

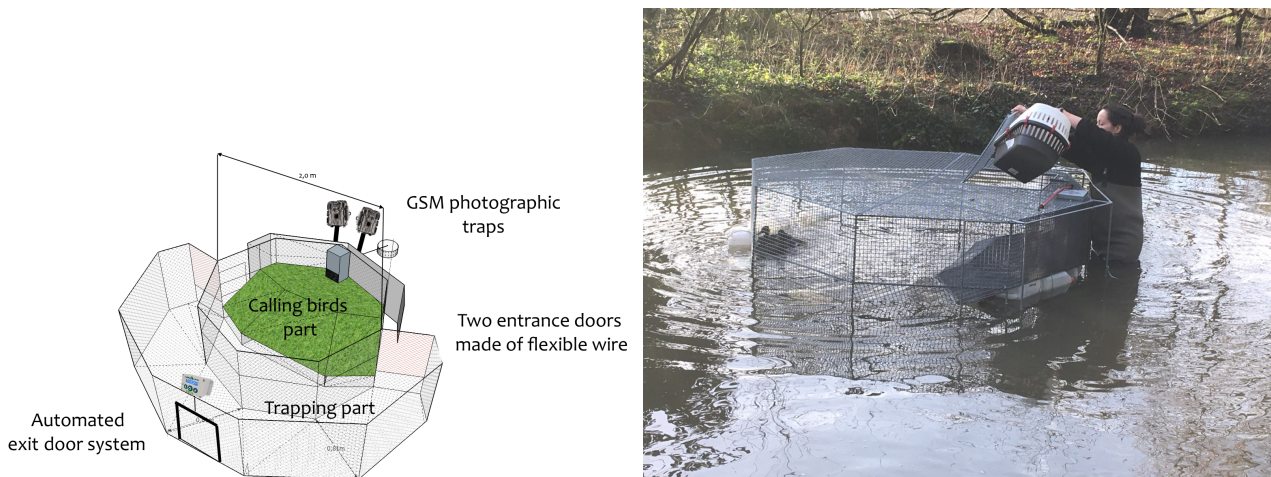


Figure 8: Calling cage under testing at Branféré Zoo. © Diagram: Jean-Marc Gillier, © Photo: Branféré Zoo

⁷Zoo located in Morbihan and member of the French Association of Zoological Parks (AFDPZ)

2.1.3 The summer strategy

Some of the birds nest on Grand-Lieu Lake from spring to the end of summer. The suitable areas vary according to water levels and are not very accessible. The most suitable approach is by boat from the centre of the lake. The males are often found near the nests on the edge of the vegetation and are an indicator of the presence of a female and her nest. Another method is to detect birds calling at night using a sound amplifier. Once the birds have been located, they are shot using a high-precision rifle from a boat stabilised by water lilies. Nests are also occasionally located during surveys in the riverine woodland. In this case, trap cages positioned on the nests are effective for capturing females (Figure 9).



Figure 9: Cage trap system on nests, here an example with a common pochard. © Alain Caizergues

As in winter, an alternative at Grand-Lieu Lake is to attract the birds. The sexual activity of the ducks can be exploited to attract them to the hides which are still situated in the water in spring. The combination of playbacks and ruddy duck-shaped decoys is the most attractive solution. Attempts to shoot with rifles fitted with silencers and night vision equipment are possible under favourable weather conditions (little wind and clear nights). In addition, the use of a calling cage is a solution considered throughout the summer season given the continuous sexual activity during this period.

At the end of winter, some birds leave Grand-Lieu Lake to nest in smaller ponds with suitable riparian vegetation. For this part of the population, the main challenge is locating them. The main detection method is regular surveying of historical sites of ruddy duck presence and potential nesting sites (Figure 10). Bird watchers and professional ornithologists observations are also used and are particularly useful for detecting birds outside the main range of ruddy duck in France. Once located, officers secure the area and adapt their approach to the birds and the shooting solution according to the local configuration.



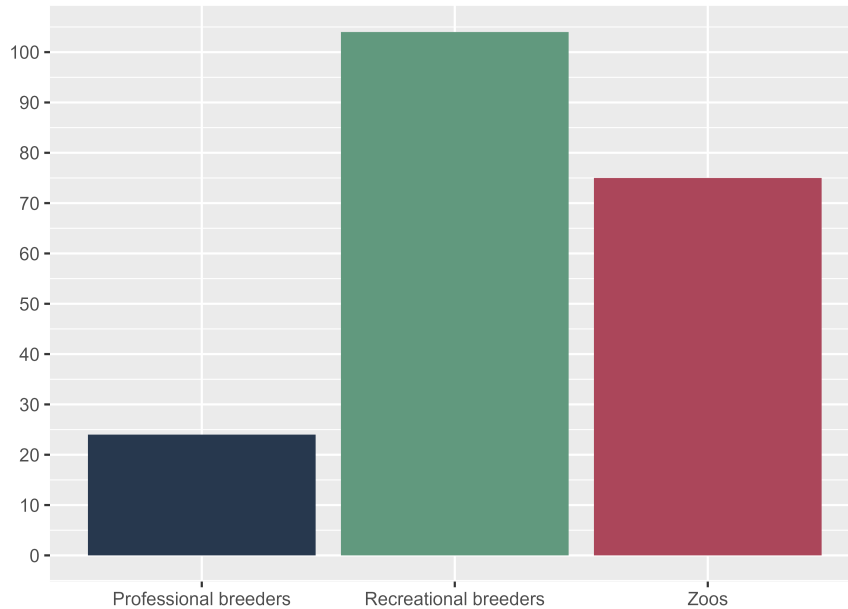
Figure 10: Boat survey during the breeding season. © Valentin Boniface

2.2 Management of the captive population

The last study focusing on the captive ruddy ducks in France dates from 2014 with a total of 203 birds counted in 26 departments. Among these individuals, 103 were held by recreational breeders in 21 departments, 80 were detained by 10 zoos in nine departments and 20 were detained by six professional breeders in five departments.



Ruddy duck numbers detained in captivity per sector
2014 data from the last national survey



Source: OFB

Figure 11: Ruddy duck numbers detained in captivity per sector

The current legislation, which is a translation of the European regulation of the 14 February 2018 on the prevention and management of the introduction and spread of invasive alien species on the metropolitan territory, forbid the detention, transportation, sale or acquisition of the ruddy duck. Except for some zoos authorized to display captive ruddy ducks, breeders who previously detained individuals at this date were authorized to keep their birds until their death, if they declare their birds to the prefecture of their residency place before the 31 December 2019 and if they don't do any breeding (at least eggs destroyed).

In order to monitor the captive population evolution, a survey on the breeders identified in 2014 will be conducted in 2022. It will allow to evaluate at which extent is the legislation respected, and thus conclude on the renewal of the captive population and its threat for the wild population.

On the other hand, the new legislation may lead recreational breeders of diving ducks to turn to another species of the *Oxyura* genus. The lake duck, also called Argentine ruddy duck (*Oxyura vittata*), native from South America, may also hybridize with other *Oxyura* species, and notably the white-headed duck. To date, it is difficult to estimate the number of captive lake ducks in France, but if some of them escape into the wild, they are likely to provoke, as the ruddy duck before, the same issues of genetic introgression in the white-headed duck. It is thus paramount to prevent this species introduction into the wild, notably by promoting new legislation or preventive actions.



Figure 12: Argentine ruddy duck, *Oxyura vittata*, male

3 Results in their historical context

3.1 Population status in 2020

At the beginning of 2020, the number of ruddy ducks reached 57 individuals on Lake Grand Lieu⁸. The trend is a decrease of 37% compared to the previous winter. We have to go back to 1997 to find similar numbers (Figure 13).

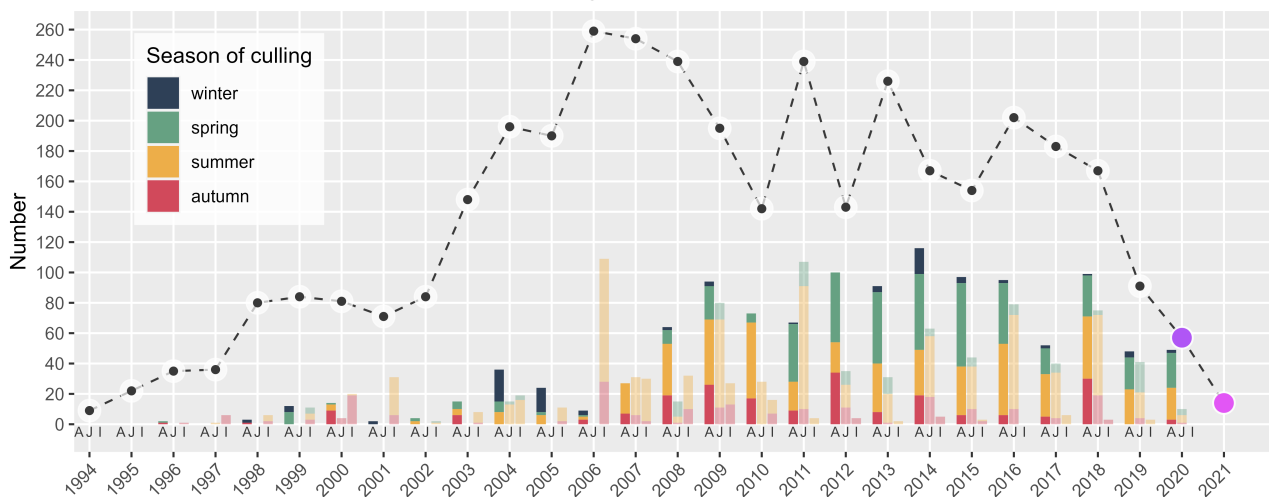
Size of the French wintering population inferred from the numbers culled

- In dots : Number of wintering individuals (until the 15th of January)

- A : Number of culled adults

- J : Number of culled juveniles

- I : Number of culled individuals with undetermined age



Source: SNPN & OFB

Figure 13: Numbers of the French wintering population with respect to the numbers culled. Numbers before culling in mid-January 2020 in purple, and numbers of the resulting population in mid-January 2021 in pink.

After the 2019-2020 wintering period, ruddy ducks were observed at 41 sites, 4 more than the previous year (Figure 14). This result does not follow the trend in numbers, but can be explained by the irregular presence of birds in eastern France. These birds probably come from the Dutch population or from birds present in Germany. These sites are located in the same areas as in previous years (See details per department in Appendix B).

⁸A few isolated individuals can be observed elsewhere in France, but they do not necessarily belong to the French population and are therefore not taken into account here

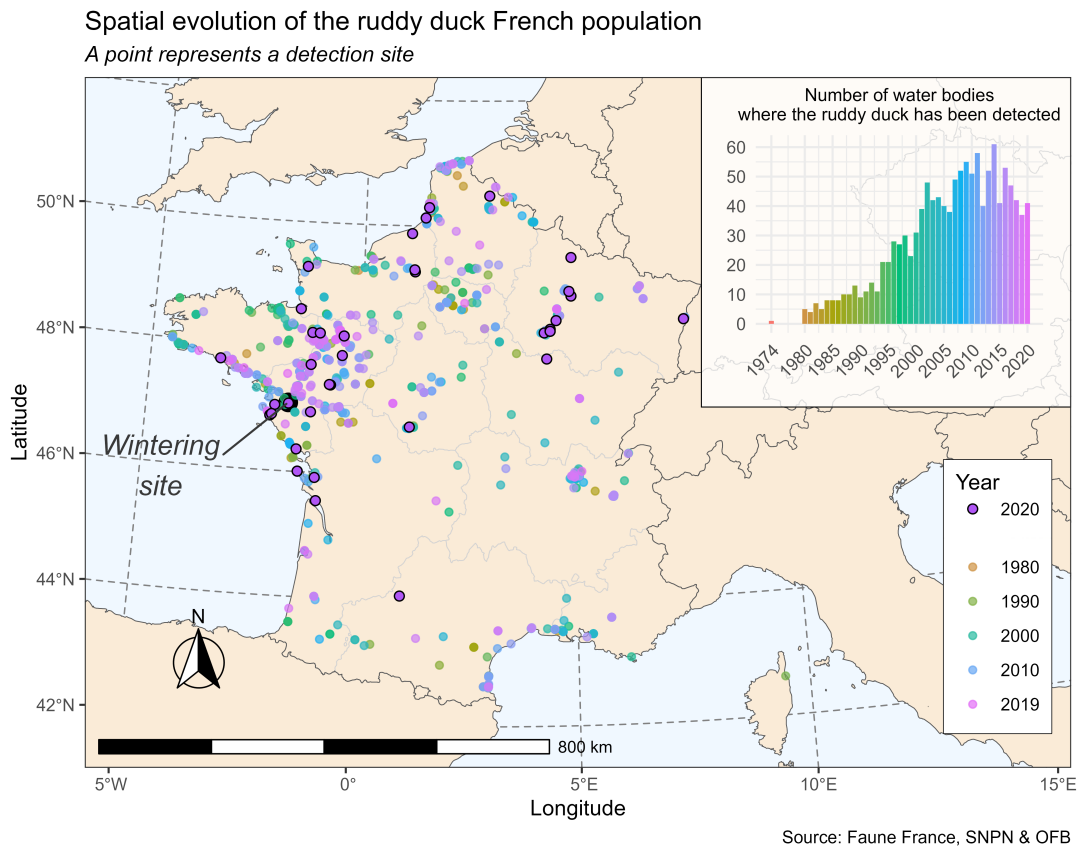


Figure 14: Trends in spatial range of ruddy ducks - See the **interactive map** for the historical details of the sites.

3.2 Detection and culling in 2020

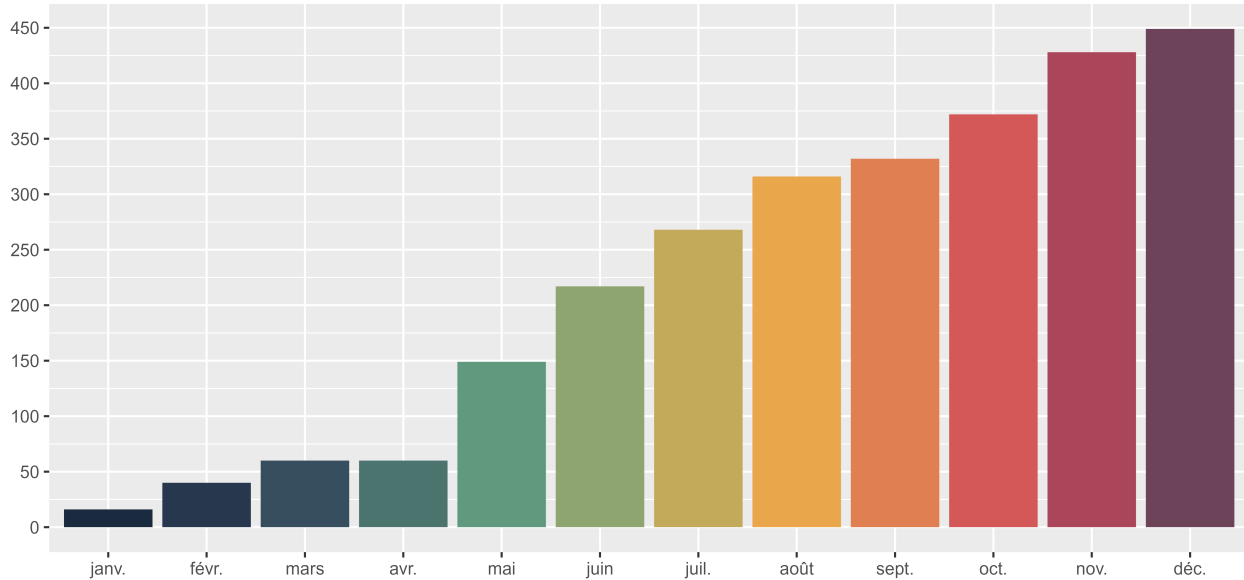
Continuous work is carried out by the LIFE project field officers who survey potential bird habitats throughout the year. Online ornithology platforms⁹ are also routinely consulted to detect part of the birds. This partnership is essential because the birdwatching community covers the whole of France and allows for the rapid recognition of new areas. Finally, the officers from the OFB's departmental units assist this detection work by transmitting information during their field missions.

Surveys by LIFE officers were divided as follows: 2/3 monitoring of historical sites of ruddy duck presence, 1/3 exploration of sites with high presence potential. This year, LIFE officers made 449 visits to 142 sites (Figure 15).

⁹<http://www.faune-france.org> - <http://www.observation.org> - BDBiodiv

Cumulative number of surveys in 2020

Note: a same site is often visited more than once in the year



Source: OFB

Figure 15: Cumulative number of surveys in 2020.

From the observation data derived from the various sources available, the number of birds actually detected without the breeding period is looked for¹⁰. To make this estimation, we assume that two successive observations of a ruddy duck¹¹ on the same site correspond to two different individuals if over one month has elapsed between observations. Naturally, major sources of error¹² result in an uncertain estimation. However, this approach remains the best indicator of bird detectability outside the wintering period.

Using the method described above, we estimate that 87 different individuals were detected. Among these, 51 adults of which 27 males and 24 females. The remaining 36 individuals were juveniles or individuals of undetermined age. The wintering population consisted of 57 individuals. The detection rate for adults that wintered in France is thus 89%¹³.

In parallel with detection, the culls performed by SNPN and OFB officers eliminated 59 individuals¹⁴, of which 49 were adults: 26 males and 23 females. The remaining 10 individuals were juveniles¹⁵ &¹⁶. The culling rate for adults that wintered in France is 86%. The culling rate for detected adults is 96%¹⁷.

¹⁰A ruddy duck may be observed repeatedly at a site by one or more bird watchers or professional ornithologists

¹¹Observations are considered to be potentially of one single individual only if the age and sex characteristics are identical

¹²There are two sources of error in this estimation of the number of birds detected: i) the time interval between two observations for which individuals are considered different, and ii) individuals that have travelled between several sites and are therefore counted as many times as they are detected

¹³A detection rate over 100% is not necessarily an error as it is likely that birds from a population not wintering in France are detected.

¹⁴During the autumn-winter period, juvenile birds are of adult size but with female plumage. Birds culled during this period are systematically sexed and aged by dissection

¹⁵Very few individuals are not retrieved and could be adults

¹⁶A higher number of juveniles culled than detected is possible due to the uncertainty in the estimation of the number detected

¹⁷We cannot estimate the effectiveness for juveniles because we do not have the number of young produced during the year

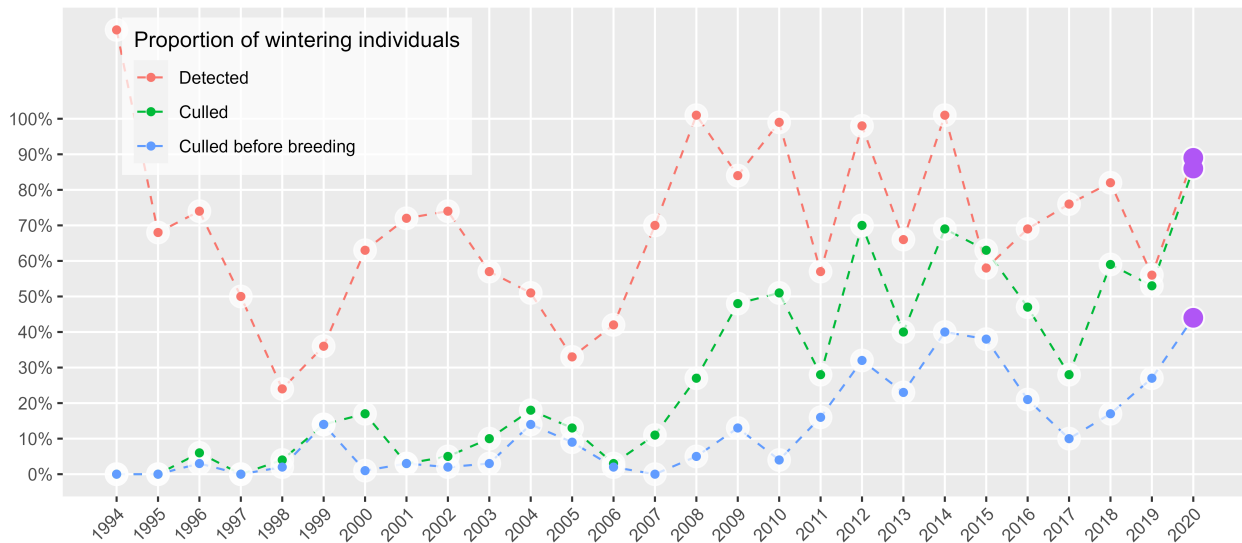
An interesting indicator is the proportion of adults culled before they have reproduced. Indeed, by definition, they have not had time to produce young and therefore contribute to population renewal, which has a significant impact on the decline in numbers the following winter. This rate of culling before reproduction amounts to 44%.

In order to make comparisons from year to year, the detailed culling time series is presented in Figure 13. Historical detection and culling efficiencies are presented in Figure 16.

Proportion of wintering numbers detected and culled

Detection data are estimates with associated uncertainties (see Section 3.2 for more details)

Culling before breeding is a key factor to decrease the population productivity



Source: Faune France, SNPN & OFB

Figure 16: Proportion of wintering numbers detected and culled. Please note that these figures are only estimates and therefore uncertain.

4 Discussion and perspectives

4.1 An encouraging trend

The reduction of the population over five consecutive years demonstrates the effectiveness of the control in France. The reduction over the past three years has been very sharp and achieved a winter population on Grand-Lieu Lake of just 14 individuals at the start of 2021. The final objective of the LIFE project has almost been reached¹⁸ while the end of the project is planned for the end of 2023. This result is a good indicator for the protection of the white-headed duck in Europe.

The presence of ruddy ducks on a greater number of sites than last year, mainly located in eastern France, suggests movements of wandering ruddy ducks from the Netherlands, Germany, Belgium or from an unidentified French population. This spread was already suspected last year and appears to be confirmed. To date, winter has not been sufficiently harsh to lead to the migration of the population wintering in the Netherlands, but this threat highlights the importance of coordinating the regulation at an European level.

While the numbers have reached a critical size, the presence of juveniles in the population demonstrates that reproduction occurred in the wild¹⁹. Conditions favourable for reproduction and for the survival of young in spring and summer produced a sharp upswing in the French population in the past. Controlling the species will therefore remain necessary as long as even a *minima* population replacement is observed. A drop in the number of various officers in the field collaborating with LIFE officers could be observed with the decrease in the frequency of operations inherent to low numbers. A decreased involvement of the network of stakeholders due to the objectives having almost been reached would also be detrimental. These aspects demonstrate the importance of communicating effectively on the input of each party and on the long-term objectives of such a project.

4.2 An upswing in the impact of the LIFE project

The overall detection rate seems to have achieved 100% this year. This percentage could be overestimated due to choices of calculation methodology²⁰, but it nevertheless reflects good detection efficacy.

The period of inactivity due to the lockdown in spring 2020 was not detrimental since rate of adults culled before reproduction was a historical record, as was the total number of adults culled. The culling rate of wintering birds exceeded 80% for the first time in France. Reaching this culling rate when the population size has decreased substantially is very positive for many reasons. It is *a priori* more difficult to detect birds present in lower densities because the groups are less detectable. This point must however be put into perspective because the decrease in numbers appears to reduce the distance travelled between wintering and nesting grounds, which facilitates surveying and therefore detection. However, officers have to deal with adult birds that are more cautious after culling campaigns in previous years. Over the long term, strong selection pressure caused by this culling level promotes the survival of the wariest discreet bird's or those which best avoid the shootings, therefore enabling the propagation of their associated genes.

Between 2016 and 2019, juveniles represented 40% of the culled individuals while in 2020 and 2021, they represented only 17% and 25% of the culled individuals, respectively. As the population decrease was the sharpest this same year²¹, this change in the population structure of culled individuals reflects a substantial

¹⁸Taking into account pre-LIFE data, we hope to reach a population of less than 10 individuals by the end of 2023

¹⁹No reproduction in the wild has been observed in the United Kingdom since 2019

²⁰Birds detected in eastern France have often stayed several months on certain sites and may have changed sites several times. Consequently, certain individuals have probably been falsely counted several times. Culling failure in the sector is often due to the size of the sites in question or insufficient safety conditions.

²¹75% decrease in population between winter 2020 and winter 2021

decrease in reproduction in the wild. Several potentially complementary factors may explain this drop in productivity. The good culling rate of adults before reproduction undoubtedly caused a first decrease in the production of young. On Grand-Lieu Lake, the main observers also noted low reproduction of common pochard (A. Caizergues & S. Reeber, pers. comm.)²². This decrease may thus be linked to the combination of several environmental factors, notably a sharp drop of the water levels in April and May and a small late flood mid-June (J.-M. Gilliers, pers. comm.). Indeed, excessively rapid shifts of water levels during the breeding season often induce clutches failures in diving ducks. On the other hand, the wetland vegetation²³ of the Grand-Lieu lake underwent delays in spring as well as an overall decline, which is another adverse factor for nesting success. Finally, the population may also have reached a critical size reducing its ability to efficiently produce numerous offspring. This process, known as the Allee effect (Kuparinen & Uusi-Heikkilä, 2020), may be due to the low encounter probability between two partners when bird density is low for example.

4.3 Alternative methods still being used

The reactivity and effectiveness of the field officers ensure that the culling rate of detected birds is good. The margin for improving bird detection and culling effectiveness is therefore low.

Even a small-scale improvement in culling rates before reproduction could have a significant impact on the capacity of the population to recover. It is for this reason that considerable effort has been implemented within the LIFE framework to test different capture methods, notably in winter (Section 2.1.2). The use of shooting stands was part of the first 2020 winter tests and enabled the culling of 2 females. The cage trap design has been completed, but the team is faced with administrative difficulties for obtaining calling females. The avian flu virus episode in France due to the H5N8 virus since autumn 2020 has also prevented the first tests from being carried out. An exemption request is still awaiting a response (05/02/2021). It is important to test this method because without undue delay it could also be applied to the Netherlands where culling by shooting is difficult due to the urbanisation of sites inhabited by the ruddy duck.

²²190 common pochard females with chicks were identified in spring 2020 compared to 385 on average over 5 previous springs and 480 over 10 years

²³Mainly aquatic or herbaceous marsh vegetation

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A Evidence of moulting in coastal areas?

The moulting season of ducks is a vulnerable period that is propitious for capturing them. If, as with other species, ruddy ducks gather together in this period of the year, it would therefore be efficient to identify the moulting sites. This aspect of ruddy duck ecology is poorly known within its natural range. The low number of sightings during this period shows that the birds are more wary at this time.

Throughout the year, ruddy ducks in France are mainly observed in areas less than 100 km from the coast (Figure 17). This could reflect the potential species' dependence on coastal habitats, notably during the moulting season. Analysis of the positions of the sites where the ruddy ducks are observed shows that the birds sighted during the moulting season²⁴ are more numerous in coastal areas than during the rest of the year. This could be evidence that some of the population moults in coastal areas. Unfortunately, this result is not significant enough to conclude that the moult occurs in coastal areas, and therefore to consider carrying out specific surveys to identify a potential moulting site. A plausible hypothesis concerning the presence of ruddy ducks in this area in autumn is the utilization of the wastewater treatment lagoons of seaside resorts as a food source and refuge area during the hunting season.

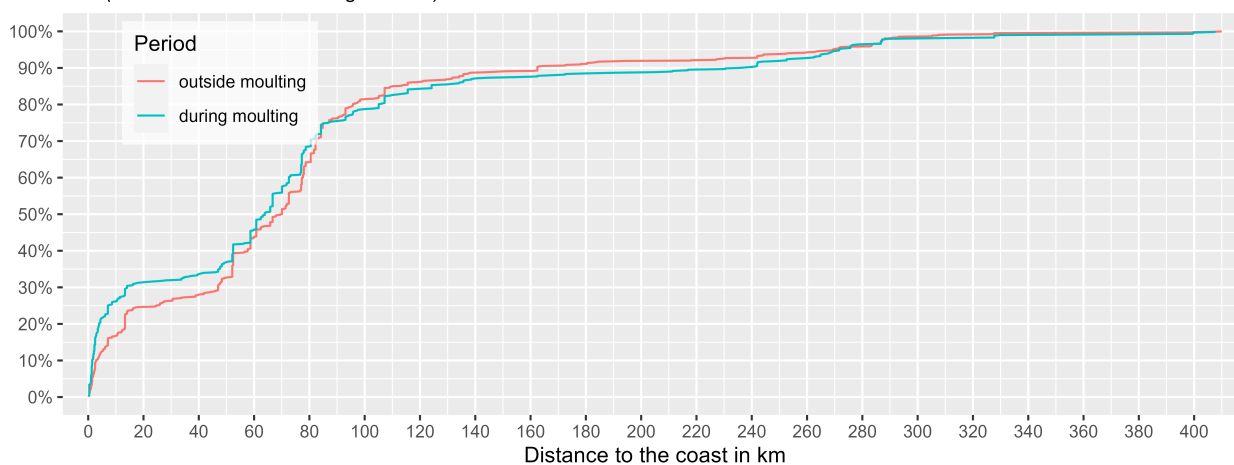
Distribution of ruddy ducks with regard to the coast during and outside the moulting season

Data correspond to proportion of observations made within a specified distance from the coast

- Aggregated data from 1994 to 2020

- 80% of the observations are within a 100km radius from the coast (100% are within a 400km radius)

- 20% of the observations are within a 5km radius from the coast during the moulting season
(12% outside the moulting season)



Source: Faune France, SNPN & OFB

Figure 17: Distribution of ruddy ducks with regard to the coast during and outside the moulting season.

²⁴This period is defined in the analysis as between the 1th of August and the 1th of December, from the evidence provided by Baldassarre (2014)

B Data by department

For the detail of the historical observation sites, see the [interactive map online](#).

Table 1: Table of individuals culled and number of sites occupied by department

Department	Year	Numbers culled by category				Total	Number of sites
		Female	Male	Young	Under-temined age		
44-Loire-Atlantique	2018	19	23	60	1	103	5
	2019	7	11	23	0	41	5
	2020	9	13	7	0	29	2
	< 2018	170	278	290	99	837	32
53-Mayenne	2018	20	16	11	0	47	10
	2019	3	4	0	0	7	4
	2020	4	0	0	0	4	3
	< 2018	114	114	181	47	456	42
35-Ille-et-Vilaine	2018	0	0	0	0	0	1
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	1
	< 2018	81	43	11	66	201	19
85-Vendée	2018	5	2	1	0	8	3
	2019	3	4	14	3	24	3
	2020	5	6	1	0	12	4
	< 2018	35	26	49	83	193	19
49-Maine-et-Loire	2018	3	5	3	2	13	3
	2019	1	3	4	0	8	4
	2020	2	2	2	0	6	4
	< 2018	12	21	17	9	59	21
80-Somme	2018	1	2	0	0	3	3
	2019	6	3	0	0	9	3
	2020	0	1	0	0	1	2
	< 2018	5	13	4	13	35	13
56-Morbihan	2018	0	0	0	0	0	1
	2019	0	0	0	0	0	2
	2020	0	0	0	0	0	1
	< 2018	9	9	6	2	26	15

Department	Year	Numbers culled by category				Total	Number of sites
		Female	Male	Young	Under-terminated age		
72-Sarthe	2018	0	0	0	0	0	1
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	4	4	4	12	24	11
17-Charente-Maritime	2018	0	0	0	0	0	3
	2019	0	0	0	0	0	1
	2020	2	1	0	0	3	4
	< 2018	6	3	6	4	19	11
79-Deux-Sèvres	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	1
	2020	0	0	0	0	0	0
	< 2018	1	6	0	8	15	9
41-Loir-et-Cher	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	1	0	4	0	5	7
37-Indre-et-Loire	2018	1	1	0	0	2	1
	2019	0	1	0	0	1	1
	2020	0	0	0	0	0	0
	< 2018	2	2	0	0	4	3
13-Bouches-du-Rhône	2018	0	0	0	0	0	1
	2019	0	0	0	0	0	1
	2020	0	0	0	0	0	0
	< 2018	1	1	0	1	3	16
59-Nord	2018	0	0	0	0	0	3
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	1
	< 2018	1	1	1	0	3	16
61-Orne	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	1	2	0	0	3	4

Department	Year	Numbers culled by category				Total	Number of sites
		Female	Male	Young	Under- temined age		
50-Manche	2018	0	0	0	0	0	1
	2019	0	0	0	0	0	1
	2020	0	2	0	0	2	2
	< 2018	0	1	0	1	2	12
62-Pas-de-Calais	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	0	0	0	2	2	11
34-Hérault	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	0	1	0	1	2	6
33-Gironde	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	1
	2020	0	0	0	0	0	0
	< 2018	0	0	0	2	2	5
36-Indre	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	1
	< 2018	0	0	0	1	1	9
51-Marne	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	3
	2020	0	1	0	0	1	1
	< 2018	0	0	0	1	1	7
77-Seine-et-Marne	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	0	1	0	0	1	6
27-Eure	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	3
	2020	1	0	0	0	1	2
	< 2018	0	1	0	0	1	5

Department	Year	Numbers culled by category				Total	Number of sites
		Female	Male	Young	Under- temined age		
89-Yonne	2018	0	0	0	0	0	0
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	0	1	0	0	1	2
19-Corrèze	2018	0	1	0	0	1	1
	2019	0	0	0	0	0	0
	2020	0	0	0	0	0	0
	< 2018	0	0	0	0	0	0