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# Report on ingress of seabirds at the rehabilitation centre

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# Report on ingress of seabirds at the rehabilitation centre (action D3)

## Project LIFE Ilhas Barreira

RIAS/ALDEIA – Centro de Recuperação e Investigação de Animais Selvagens

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# Summary / Resumo

This report describes the results obtained at RIAS during the project regarding the reception and treatment of injured or weakened seabirds from Deserta Island.
Between January 1st of 2020 and December 31st of 2024, 347 birds were admitted at RIAS from Deserta Island (161 alive and 186 dead), and it was possible to release 107 birds (release rate of 69%). The most common species from Deserta Island were Yellow-legged Gull (50%) and Audouin's Gull (25%). The main causes of admittance at RIAS hospital from the Deserta Island were *Paretic Syndrome* (54%) and *Unknown* (28%).

Este relatório descreve os resultados obtidos no RIAS durante a duração do projeto, relativamente à receção e tratamento de aves marinhas feridas ou debilitadas, provenientes da Ilha Deserta.
De 1 de janeiro de 2020 a 31 de dezembro de 2024 foram recebidas no RIAS 347 aves marinhas provenientes da Ilha Deserta (161 vivas e 186 mortas), tendo sido possível recuperar e libertar 107 dessas aves (taxa de libertação de 69%). A espécie mais comum neste caso foi a gaivota-de-patas-amarelas (50% dos casos) e a gaivota-de-audouin (25%). Por fim, as principais causas de ingresso destas aves foram de causa *Síndrome Parético* (54%) e *Desconhecida* (28%).

# 1 | Introduction

In 2008, the Portuguese Marine IBA (Important Bird Area) inventory (published by SPEA) identified a marine IBA at Ria Formosa. The existing baseline information proved to be insufficient, and this IBA never became legally binding. Between 2012 and 2015, Portugal made an important step towards the implementation of the Natura 2000 Network in the marine environment, by establishing new marine SPAs (Special Protection Areas). Nevertheless, this process was not aimed towards the conservation of Audouin's Gull (*Ichthyaetus audouinii*). At the time, the breeding information and distribution data for this species in Portugal was considered insufficient. Since then, further work has been developed and new insights indicate that, nowadays, there is a stable meta-population breeding in the uninhabited Barreta/Deserta Island. Climate change and derived sea-level rise are global scale problems threatening most of the coastal habitats, among which the barrier islands are not an exception and, as holders of unique ecosystems, they need urgent attention. These islands are also threatened by human pressure, and it is urgent to implement measures that can reduce these threats. LIFE Ilhas Barreira aims to characterize the local ecological requirements and conservation threats of the target species and habitats in Ria Formosa, and particularly at Deserta Island, to implement effective conservation actions. This project represents an important step towards the present and future sustainable management of the SPA at Ria Formosa.

## 1.1 Project objectives

The main objectives of the project were:

1. Understand the main threats to the target species, namely Audouin's Gull (*Ichthyaetus audouinii*) and Little Tern (*Sternula albifrons*), and habitats, both on land and at sea;
2. Recover the Grey Dunes habitat and assess the effect of gulls on this habitat;
3. Promote the sustainable use of the Ria Formosa barrier islands and marine area, focusing on fisheries and tourism;
4. Evaluate the effect of climate change and other drivers of change on the eco-morphology of the barrier islands system;
5. Understand the breeding ecology, foraging behaviour and spatial distribution of Audouin's Gull and Little Tern;
6. Evaluate and mitigate bycatch impacts on seabirds and assess the future effect of the discard ban policy on Audouin's Gull local population, engaging the local fisherman community;
7. Evaluate possible competitive interactions and predation from Yellow-legged Gull (*Larus michahellis*) towards the target species;
8. Protect breeding areas for Audouin's Gull and Little Tern (restricting tourist access, controlling predators, increasing surveillance and implementing environmental awareness campaigns);
9. Review the marine IBA limits and update the marine area of the SPA.

## 1.2 Contextualization of RIAS in the project

RIAS – Wildlife Rehabilitation and Research Centre is the only wildlife hospital in Algarve and it is in Ria Formosa Natural Park, in Olhão. Near 2.500 animals are admitted every year in RIAS. As expected, the higher numbers derive from most common seabird species in the area, e.g. Yellow-legged Gulls, Lesser Black-backed Gulls, Northern Gannets and Black-headed Gulls. Since 2009, RIAS has received more seabird species of conservation concern, namely Audouin's Gulls, Balearic Shearwaters (*Puffinus mauretanicus*) and Little Terns. However, rehabilitation success was extremely low for these three species, being 27%, 0% and 0%, respectively. The requirements of these three species (ecology and handling) together with the lack of specialized enclosures, and the critical body condition of the birds were the main factors for such low success rate. All injured seabirds found during the fieldwork activities performed under other actions during the project (e.g. A4, A5, C1, C3, C5, etc.) were transported to RIAS by the project team.

Admittances in RIAS increased along the lifetime of the project due to the intensive fieldwork occurring in the area. Improving the centre responsiveness through an upgrade of rehabilitation facilities and improve training of RIAS staff was essential. One of the main aims of this project was to specialize RIAS in the recovery of seabirds by improving technical skills and rehabilitation facilities adapted to the reception, treatment, and recovery of this group of birds. A dedicated rehabilitation area for seabirds has been created at RIAS. Two properly equipped pools allow seabirds a better and faster recovery. The improvement of the necropsy room allowed for a more in-depth study of the causes of mortality in these birds and enabled RIAS to store a greater number of carcasses during periods of high activity, to be analyzed later during calmer times.

# 2 | Improve seabirds' facilities

## 2.1 Creation of Necropsy laboratory

During the project, improvements were made to increase RIAS and its staff capacity to rehabilitate seabird species. New container house was installed to improve the necropsy lab, including some important materials such as a desktop and freezers (Fig.1). This container was used daily by RIAS' staff to perform necropsies and collect samples, within the scope of the project.

**Figure 1 |** Necropsy Lab in the container house.

## 2.2 Creation of Intensive care unit

Also, a new intensive care unit was created in the clinic building, to accommodate birds in critical condition or more sensitive species (Fig.2). This unit allowed RIAS to improve the responsiveness for the recovery of the project's target species.

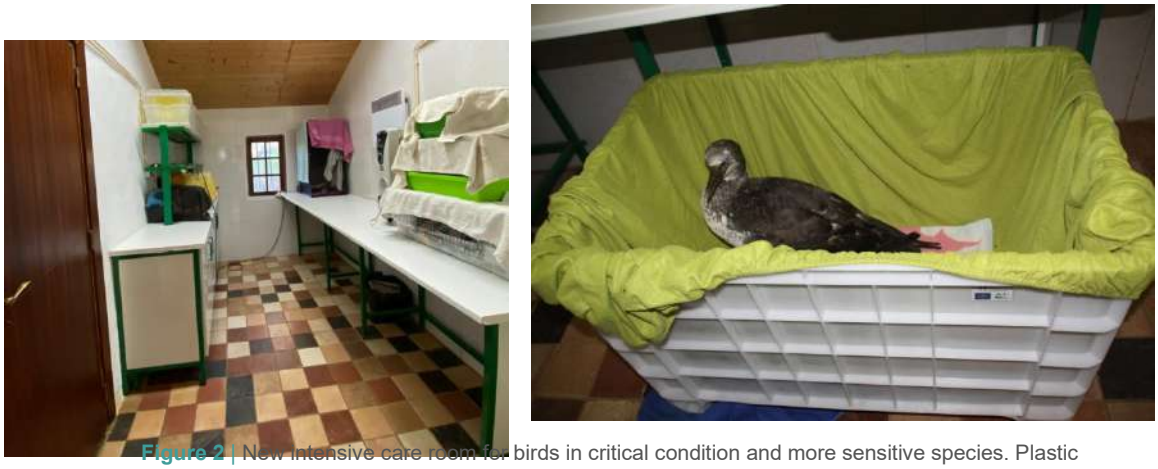


**Figure 2** | New intensive care room for birds in critical condition and more sensitive species. Plastic box adapted to seabirds; Northen gannet while recovering.

## 2.3 Facilities for seabirds' recovery

During the project it was also possible to upgrade the exterior facilities for seabirds' recovery. Pools, water tanks and filter systems were installed and adapted to receive seabirds while recovering (Fig. 3). These enclosures were used daily for the recovery of these animals.


**Figure 3** | Pool, filter and water tanks for seabirds' recovery.

# 3 | Seabirds admittances at RIAS from Deserta Island

This report gives an overall analysis of seabird admittances at RIAS hospital from the Deserta Island, during the period of the project.

Between January 1st of 2020 and December 31st of 2024, 347 birds were admitted at RIAS from Deserta Island (161 alive and 186 dead), and it was possible to release 107 birds (release rate of 69%). The most common species from Deserta Island were Yellow-legged Gull (50%) and Audouin's Gull (25%). The main causes of admittance at RIAS hospital from the Deserta Island were *Paretic Syndrome* (54%) and *Unknown* (28%).

## 3.1 Species

The most common seabirds admitted at RIAS hospital from Deserta Island were gulls (Table 1). Yellow-legged Gull was the most common species (50%), followed by Audouin's Gull with 25% and Lesser Black-backed Gull with 12% of admittance (Fig. 4). Atlantic puffins and Razorbills (*Alca torda*) were also admitted in smaller numbers.

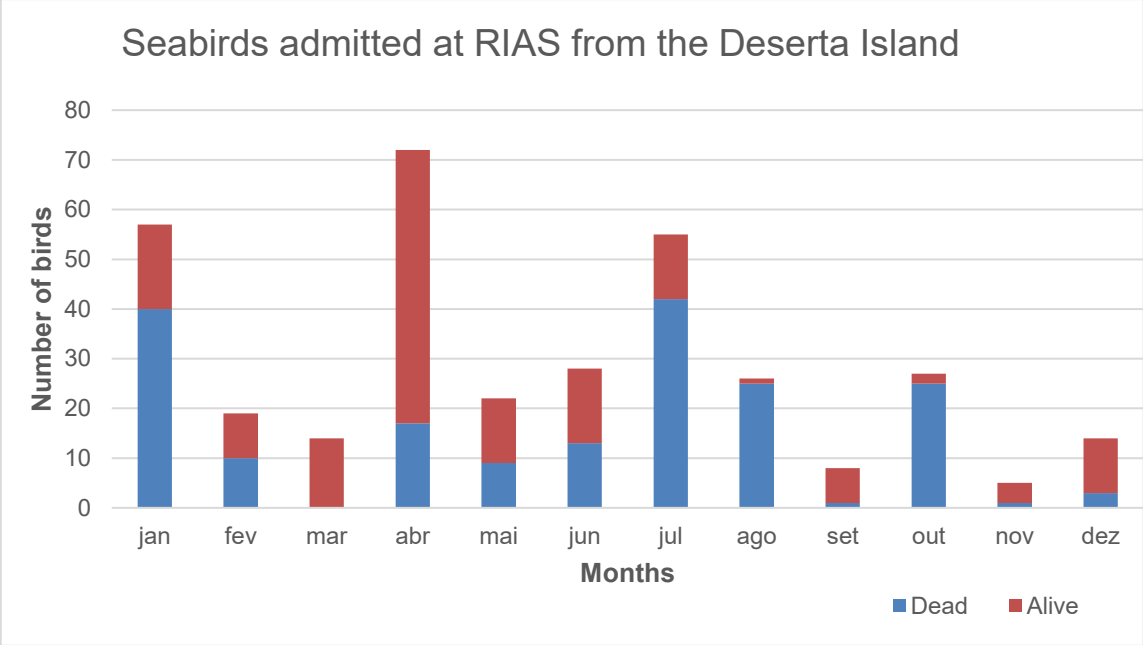
**Figure 4** | Gulls in recovery at RIAS

**Table 1** | Birds species admitted at RIAS hospital from the Deserta Island.

| | Deserta Island | |
|---|---|---|
| **Species** | **Alive admittance** | **Dead admittance** |
| *Alca torda* | 0 | 3 |
| *Burhinus oedicnemus* | 2 | 0 |
| *Calidris alba* | 8 | 1 |
| *Chroicocephalus ridibundus* | 2 | 0 |
| *Fratercula arctica* | 1 | 1 |
| *Ichthyaetus audouinii* | 17 | 71 |
| *Larus fuscus* | 27 | 14 |
| *Larus michahellis* | 101 | 72 |
| *Mareca strepera* | 1 | 0 |
| *Morus bassanus* | 1 | 6 |
| *Puffinus gravis* | 0 | 17 |
| *Puffinus mauretanicus* | 0 | 1 |
| *Sternula albifrons* | 1 | 0 |
| **TOTAL** | **161** | **186** |
| | **347** | |

Assessing the admissions from Deserta Island (Graphic 1), there is a peak in the months of April and July. April's peak corresponds, mostly, to the admittance of Yellow-legged Gull with *Paretic* Syndrome (63 individuals). The August peak refers to Audouin's Gulls collected by the teams (SPEA, ICNF and Universidade de Coimbra), during fieldwork (23 individuals). It should be noted that the effort of collecting birds on the Deserta Island varies according to the presence of the project technicians and is not constant throughout the year.

**Graphic 1** | Monthly distribution of admittances of seabirds at RIAS from the Deserta Island.




## 3.2 Admittance causes

The main cause of admittance of seabirds at RIAS from Deserta Island was *Paretic Syndrome* with 54% of the animals (for more information see the topic 5.1 Paretic Syndrome). The second most relevant cause of admittance was *Unknown* with 28%, followed by *Fishing nets and hook with* 8% of the cases. All the admission causes are listed in Table 2. These three admission causes represent 89% of all arrivals.

To refer that the carcasses classified as *Unknown* were in an advanced state of decomposition, being impossible to determine the cause of dead (for more information see the topic 5.2 *Unknown* cause of dead).

**Table 2** | Causes of admittance of seabirds at RIAS from the Deserta Island.

| | Deserta Island |
|---|---|
| **Admittance cause** | **Number of admittances** |
| *Paretic syndrome* | 186 |
| *Unknown* | 97 |
| *Fishing nets and hook* | 27 |
| *Weakness* | 26 |
| *Trauma* | 4 |
| *Predation* | 2 |
| *Infectious diseases* | 2 |
| *Oil spill/Contamination* | 1 |
| *Collision* | 1 |
| *Orphan* | 1 |
| **TOTAL** | **347** |

## 3.3 Destination

During the project, 347 seabirds were admitted from Deserta Island (161 alive and 186 dead (Graphic 2). From the alive ones, 11 were euthanized, 33 died within 48 hours, 10 died after 48 hours and 107 were released back to nature (Fig.5), which represents a weighted release rate of 69%

**Graphic 2** | Destination of seabirds admitted at RIAS from the Algarve region.

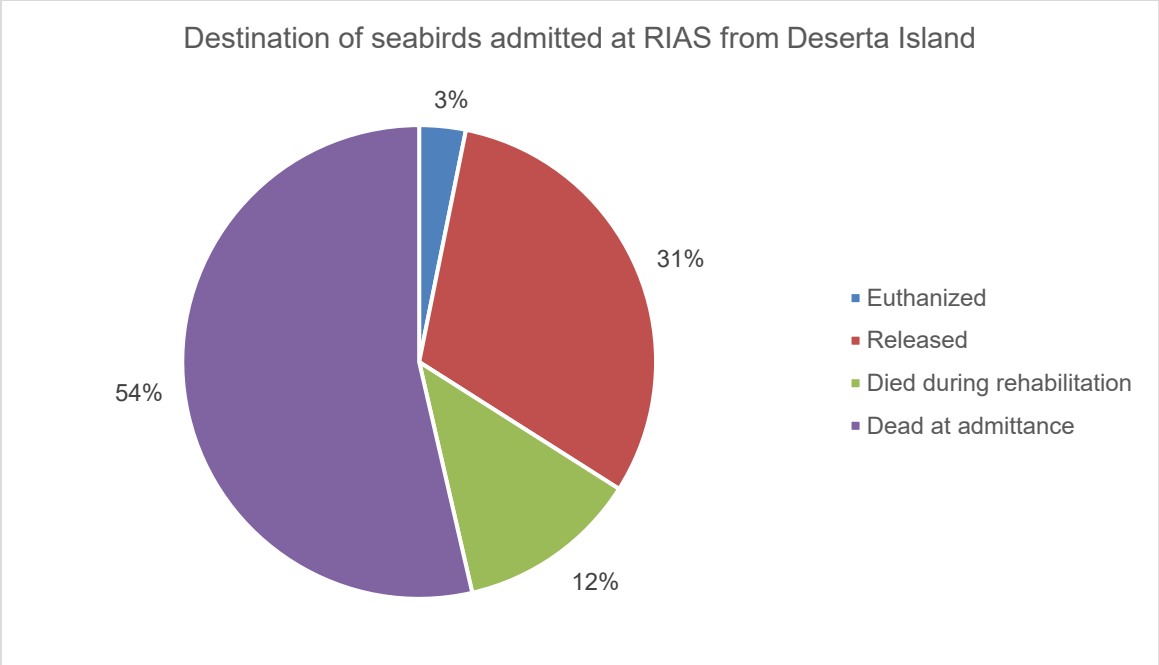


**Figure 5** | Release back to nature of seabirds, namely Yellow-legged gull, Great shearwater and Atlantic puffin.

## 3.4 Entities involved

Regarding the entities that delivered seabirds to RIAS (Table 3), it was found that 37% of the seabirds collected were delivered by the project team of SPEA with 37% of the deliveries, followed by ICNF Park Rangers with 34% and 11% by RIAS staff (related with a master thesis development).

**Table 3** | Entities that delivered seabirds to RIAS from the Algarve region.Deserta Island

| Entities | Number of admittances |
|---|---|
| SPEA | 127 |
| ICNF | 119 |
| RIAS | 37 |
| CCMAR | 28 |
| Coimbra University | 25 |
| Animaris | 7 |
| Citizens | 3 |
| GNR | 1 |

In Table 4 are listed the species that the different entities delivered at RIAS hospital, from Deserta Island.

**Table 4** | Entities that delivered seabirds to RIAS from the Deserta Island.

| Number of birds delivered per entity from Deserta Island | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **ICNF** | **Animaris** | **SPEA** | **Citizens** | **RIAS** | **SEPNA** | **CCMA R** | **Coimbra University** |
| *Larus michahellis* | 78 | 4 | 61 | 1 | 10 | | 2 | 17 |
| *Ichthyaetus audouinii* | 15 | 2 | 44 | 1 | 24 | | 1 | 1 |
| *Larus fuscus* | 20 | | 12 | 1 | 3 | | 4 | 1 |
| *Puffinus gravis* | | | | | | | 17 | |
| *Calidris alba* | | | 3 | | | 1 | | 5 |
| *Morus bassanus* | 2 | 1 | 1 | | | | 3 | |
| *Alca torda* | | | 3 | | | | | |
| *Burhinus oedicnemus* | | | 2 | | | | | |
| *Chroicocephalus ridibundus* | 2 | | | | | | | |
| *Fratercula arctica* | 1 | | 1 | | | | | |
| *Mareca strepera* | 1 | | | | | | | |
| *Puffinus mauretanicus* | | | | | | | 1 | |
| *Sternula albifrons* | | | | | | | | 1 |

# 4 | Results

## 4.1 Paretic Syndrome

*Paretic Syndrome* represents the main cause of admission for the Deserta Island birds. *Paretic Syndrome* is a set of symptoms characterized by different levels of ascendent flaccid paralysis, dyspnea and diarrhea that affect wild birds linked to aquatic ecosystems (Fig. 6). The main differential diagnoses of paralytic and paretic conditions in wild birds comprise nutritional deficiencies, infectious diseases, biotoxins and pollutants. To find etiology, during the project, more than 700 samples have been tested for different biotoxins groups (botulinum toxin, paralytic shellfish toxins, domoic acid, anatoxin-a, cylindrospermopsin, tetrodotoxins and microcystins) and viruses (adenovirus, Newcastle virus disease and highly pathogenic avian influenza virus). Our results support the relevant contribution of botulinum toxin in the outbreaks of *Paretic Syndrome* observed in several species of aquatic birds in the last decades in southern Portugal.
During 2024, was tested the use of *C.botulinum* Type C antiserum to improve the recovery rate of birds with *Paretic Syndrome*. The preliminary results showed a faster recovery, but more data are necessary to have strong conclusions. The future perspectives include finding the source of botulism and preventing outbreaks, among others. This research is included in a PhD thesis.

**Figure 6** | Black-headed Gull with *Paretic Syndrome.*

## 4.2 Unknown cause of dead

During the project, 186 birds have been admitted dead from the Deserta Island, and necropsies were performed to determine the cause of death. The cause of death kept *Unknown* in 52% of them, because of the advanced state of decomposition of the carcasses (Fig. 7). Even so, it was possible to determinate the absence of signs of fishing lines or hooks or *antemortem* trauma.

**Figure 7** | Mummified Yellow-legged gull.

## 4.3 Bycatch and interactions with fisheries

During the project, 27 seabirds have been admitted with signs of interaction with fisheries from Deserta Island. In 2022, *18 Razorbills*, 4 Northern gannet (*Morus bassanus)* and 3 *Gulls* were found dead in gillnets. In 2021, one Audouin's Gull was also caught in one (Fig. 8). A deep study of the carcasses was performed, and it was possible to find out that the birds died by drowning trapped in the nets.

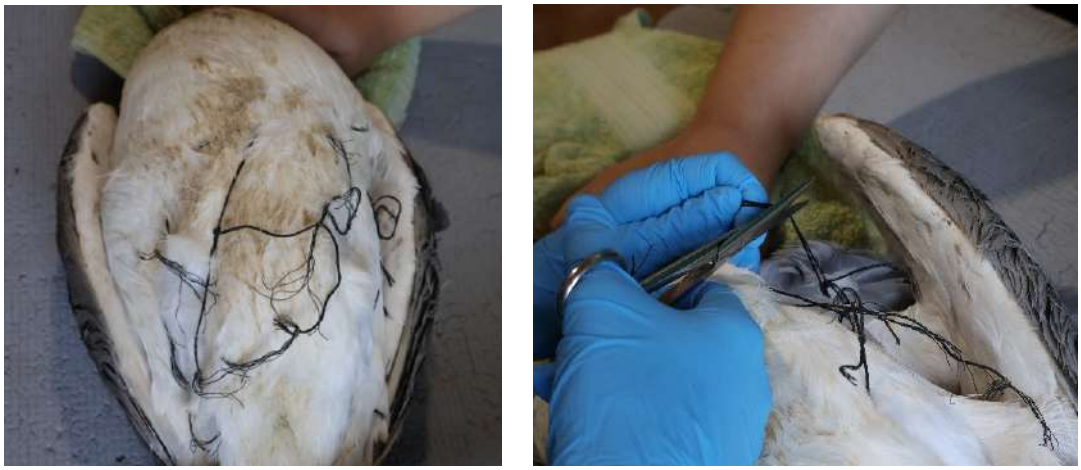


**Figure 8** | Gull wrapped in a net.

## 4.4 Emaciated seabirds

The fourth main cause of admission of seabirds from Deserta Island is weakness, mostly juveniles during migration periods. These birds present severe states of emaciation and short survival periods, so their rehabilitation has been a challenge for the RIAS staff. To improve the success, in 2021, a protocol for emaciated sea birds was developed and applied. This protocol was developed after the Workshop on seabird recovery held in Olhão in the context of Ilhas Barreira LIFE project. It includes euthanizing birds at points of no return (with blood values described in the literature as unrecoverable), invasive management with frequent intubations and an improvement in the food, among others.
Birds with severe emaciation usually die during the first 3 days of hospitalization and the necropsies performed showed signs of severe weakness and cachexia as poor body condition, opportunistic infections, or gastric ulcers. Unfortunately, the good results shown with the protocol aren't reflected in the release rate because of chronic dead events (for more information see topic 4.6 Capture myopathy).

## 4.5 Predation

One of the main threats of wild birds' colonies is the predation by wild and/or feral animals. A deep analysis of the carcasses with signs of predation has been carried out to clarify the kind of predator responsible for it. The necropsies performed in the animals that arrived because of this cause, showed absence of feathers and muscle with extremely clean bones and beak marks on the keel. These findings are consistent with predation by a bird of prey (Fig. 9).

**Figure 9** | Yellow-legged Gull victim of predation by a bird of prey.

## 4.6 Capture myopathy

Some birds admitted due to weakness that are stabilized and strong have presented sudden deaths without apparent cause after transfer to the pool (in some cases close to release decision). The necropsies performed revealed muscular, kidney and cardiac abnormalities. Samples were collected and sent for histopathology analysis. Laboratory results were compatible with capture myopathy.

Capture myopathy is a complex metabolic disease characterized by metabolic acidosis, muscle necrosis and myoglobinuria that affect wild and domestic animals. It may lead to significant morbidity and mortality. It is commonly a consequence of pursuit, capture, restraint, and transportation but also there are some predisposing factors such as species, temperature and nutritional factors.

To improve the survival rate of these birds, attempts have been made for early diagnosis and treatment of this condition. For early diagnosis, blood levels of LDH, CPK and AST were run. Treatment of birds with high levels of these parameters was performed with corticoids, fluid therapy and analgesia. Also, prevention measures like improvement of the facilities, shorter periods of rehabilitation and food supplemented with Vitamin E, Selenium and L-carnitine have been implemented. Unfortunately, other new conditions have appeared, and the veterinary team is still working to improve the release rate.

## 4.7 The case of Juvenile Audouin's Gull mortality

RIAS receive significant numbers of first-year juvenile Audouin's Gulls from Faro Water Treatment Plant (Faro WTP). Having in consideration that the Faro WTP is close to the Audouin's Gulls' colony in Deserta Island and the admission normally occurs after breading season (July and August), these birds have been considered as individuals from the colony and, therefore, analyzed and studied as a part of the LIFE project.

Most of these gulls were admitted dead. Also, most of the gulls admitted alive died during recovery or were euthanized. Only 1 of these birds was released.

The necropsies revealed cachexia, arthritis, joint ankylosis in the wings and kidney abnormalities. Samples were collected and sent for histopathology analysis. Laboratory results are compatible with severe atherosclerosis and visceral gout at the renal level (Fig. 10), and joint gout, which in turn appears to present disorganization and advanced joint degeneration and para-articular deposits. Visceral urate deposits are due to renal failure, the causes of which could be ureter obstruction, renal damage, or dehydration. The diagnosis and the causes behind this process were studied in the context of a master's thesis with no definitive conclusions.

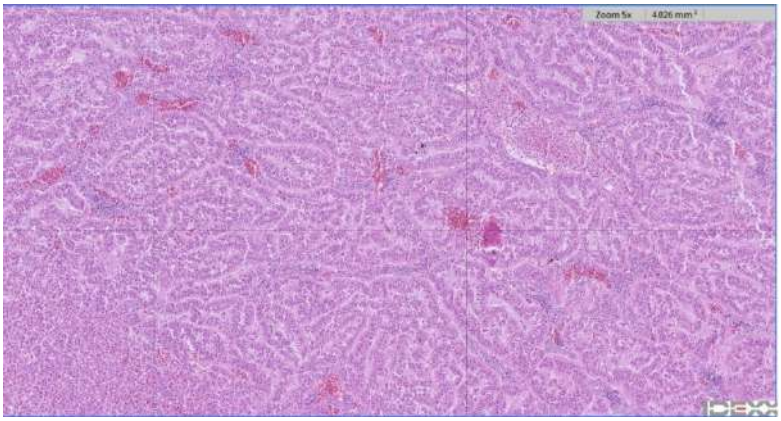


**Figure 10** | Kidney histopathology in Audouin's Gull.

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