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Fourth annual reporting on ingress of seabirds at RIAS (action C6)

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Fourth annual reporting on ingress of seabirds at RIAS (action C6)

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 2023 regarding the reception and treatment of injured or weakened seabirds from the Algarve region.
Between January 1st and December 31st of 2023, 1.017 seabirds (741 alive and 276 dead) were admitted at RIAS hospital from Algarve region.
The most common seabirds admitted at RIAS hospital were gulls. Yellow-legged Gull was the most common species, followed by Lesser Black-backed Gull and Audouin's Gull. The main causes of admittance of seabirds at RIAS hospital was *Paretic Syndrome* with 45% of the animals, *Trauma* with 20% of the individuals and *Weakness* with 14%. During 2023, it was possible to release back to nature 386 seabirds, which correspond to a weighted release rate of 65% (the weighted release rate is calculated excluding primary euthanasia, since they represent cases where recovery is considered impossible). The release rate doesn't include the 36 birds that are still in rehabilitation by the end of 2023.
Focusing on Deserta Island, 59 birds were admitted at RIAS (12 alive and 47 dead), and it was possible to release 7 birds (release rate of 58%). The most common species were Audouin's Gull (50%) and Yellow-legged Gull (39%). The main causes of admittance at RIAS hospital from the Deserta Island were *Unknown* (44%) and *Paretic Syndrome* (34%).

Este relatório descreve os resultados obtidos no RIAS durante 2023, relativamente à receção e tratamento de aves marinhas feridas ou debilitadas, provenientes da região do Algarve.
De 1 de janeiro a 31 de dezembro de 2023 foram recebidas no RIAS 1.017 aves marinhas (741 vivas e 276 mortas).
As espécies de aves marinhas mais comuns foram gaivota-de-patas-amarelas, gaivota-d'asa-escura e gaivota-de-audouin (21%).As principais causas de ingresso de aves marinhas no RIAS em 2023 foram *Síndrome Parético* com 45% dos casos, *Trauma* com 12% e *Debilidade* com 14% dos casos.
Ao longo de 2023, foi possível devolver à natureza 386 aves marinhas recuperadas, o que representa uma taxa de libertação ponderada de 65% (a taxa de libertação ponderada é calculada excluindo as eutanásias primárias, uma vez que representam casos de recuperação considerada impossível). Esta taxa de libertação não inclui 36 indivíduos que ainda se encontravam em fase de recuperação até o final de 2023.
Relativamente aos indivíduos provenientes da Ilha Deserta, foi possível devolver à natureza 7 aves (taxa de libertação de 58%) das 59 aves ingressadas no RIAS. A espécie mais comum neste caso foi a gaivota-de-audouin (50% dos casos) e a gaivota-de-patas-amarelas (39%). Por fim, as principais causas de ingresso destas aves foram de causa *Desconhecida* (44% dos casos) e *Síndrome Parético* (34%).

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 (*L. 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 Barreta 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 are:

1. Understand the main threats to the target species (Audouin's Gull and Little Tern) 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 (*L. 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 located in Ria Formosa Natural Park, in Olhão. Near 1.500 seabirds are admitted every year in RIAS. As expected, the higher numbers derive from most common species, 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 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.) will be brought to RIAS by the project team.

Admittances in RIAS are expected to significantly increase 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 increase training of RIAS staff is the first step. The main aim of this action is 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 will be set in RIAS. A properly equipped pool allows seabirds a better and faster recovery. Seabird adapted fence will limit this area. Finally, an upgrade on the necropsy's lab is foreseen. Better knowledge on mortality causes is urgent. This improvement will enable RIAS to preserve higher numbers of dead carcases during busier seasons to be analysed later during calm periods.

Since the project will focus on seabird species that have a concerned conservation status, successful rehabilitation will have a significant positive impact at the population level. During the first year of the project, new equipment will be acquired, and RIAS facilities will be upgraded. In the second year, a seabird recovery course will be organized for the project team. By the end of the project, we expect to increase by 20% the success rate of seabird's rehabilitation in RIAS hospital.

2 | Objectives of Action C6

The main purpose of this action is to specialize RIAS hospital in the rehabilitation of seabirds by improving technical skills and facilities adapted to the reception, treatment and rehabilitation of this group of birds.

Since the project will focus on bird species that have a high conservation status, rehabilitation and releasing them back to nature will have a positive impact on the populations of birds.

During the first year of the project, the structures for the recovery of seabirds and the acquisition of new equipment for the clinic were improved.

In the second year of the project, a practical workshop on seabird recovery was organized for project technicians and partners, significantly improving the practical skills of the team.

The recovery of seabirds will take place throughout all the project.

3| Improve seabirds' facilities

During 2023, the new container house, installed in 2020 to improve the necropsy lab (Fig. 1), was used daily to perform necropsies and collect samples.

Figure 1 | Necropsy Lab in the container house.

The new intensive care room for birds in critical condition (Fig. 2), created in 2020, was used daily, which allowed us to improve our response capacity 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, Atlantic puffin while recovering.

During 2023, the pool continued to be used to recover seabirds. The exterior facilities for seabirds' recovery were improved with a new and bigger pool (donated by a citizen). It was necessary to acquire a new filter system for this pool (Fig. 3), which will be ready in 2024.

Figure 3 | New pool under construction and new filter system.

4| Seabirds admittances at RIAS

Between January 1st and December 31st of 2023, RIAS received a total of 2.529 animals (1.960 alive and 569 dead). Of these, 1.017 were seabirds from all over the Algarve and, more specifically, 59 birds were from Deserta Island. Most of the birds from the Algarve region were admitted alive (73%). By contrast, most of the birds from the Deserta Island were admitted dead (80%).

This report gives an overall analysis of seabird admittances at RIAS hospital during 2023, always giving special emphasis to birds coming from Deserta Island.

4.1 Species

During 2023, the most common seabirds admitted at RIAS hospital from Algarve region were gulls (Table 1). Yellow-legged Gull was the most common species (67%), followed by Lesser Black-backed Gull with 19% of admittance and Audouin's Gull with 5% (Fig. 4).

Table 1 | Seabird species admitted at RIAS hospital from the Algarve region.

	Algarve Region	
Species	**Alive admittance**	**Dead admittance**
Larus michahellis	527	155
Larus fuscus	160	35
Larus audouinii	7	45
Morus bassanus	16	11
Fratercula arctica	6	15
Alca torda	10	8
Chroicocephalus ridibundus	10	1
Hydrobates pelagicus	1	4
Phalacrocorax carbo	2	1
Larus melanocephalus	1	0
Sterna hirundo	0	1
Sternula albifrons	1	0
TOTAL	**741**	**273**

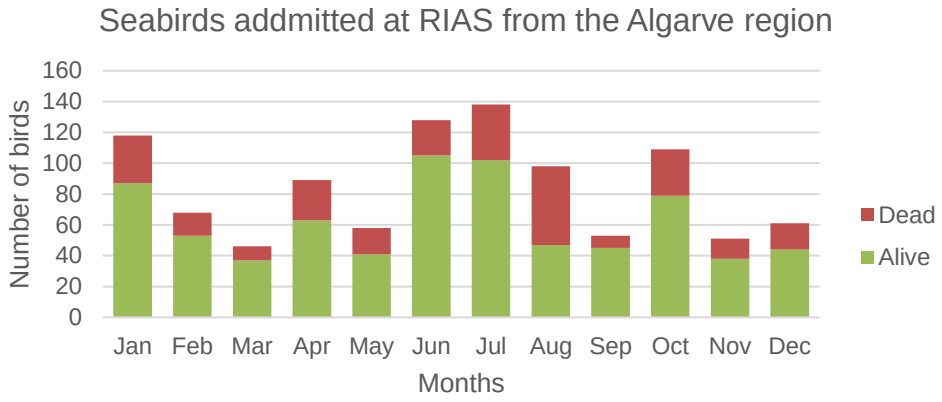
Figure 4 | Gulls in recovery.

From Deserta Island, the most common seabird species were also gulls (Table 2): Audouin's Gull (50%) and Yellow-legged Gull (39%). Atlantic puffin and Razorbill were also admitted in smaller numbers (5% both).

Table 2 | Seabird species admitted at RIAS hospital from the Deserta Island.

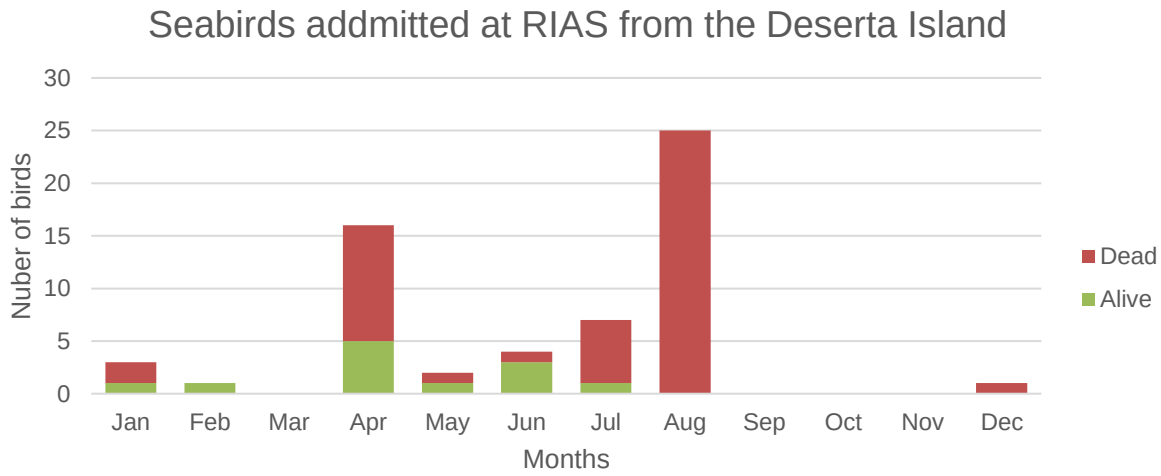
	Deserta Island	
Species	**Alive admittance**	**Dead admittance**
Larus audouinii	2	28
Larus michahellis	8	15
Fratercula arctica	1	1
Alca torda	0	1
Larus fuscus	0	1
Mareca strepera	1	0
Calidris alba	0	1
TOTAL	**12**	**47**

Most seabirds admitted at RIAS during the winter are migratory or wintering species, which justifies the increase on the seabird's inflow in January. The seabirds admitted during the summer are mostly hatchlings, nestlings, and fledglings due to *Weakness*, *Trauma* or *Orphaning*, among others. Furthermore, this year, the occurrence of *Paretic Syndrome* was in January and April (Graphic 1). The mortality of juvenile Audouin's Gull that occurred in previous years was not observed during 2023. The cause behind this event is under study in the context of a master's thesis (for more information see the topic 5.3 Juvenile Audouin's Gull mortality).



Graphic 1 | Monthly distribution of admittances of seabirds at RIAS from the Algarve region.

Assessing the admissions from Deserta Island (Graphic 2), there is a peak in the months of April and August. The April's peak corresponds to the admittance of gulls with *Paretic Syndrome* and dead Audouin's Gulls collected by the project team. The August peak refers to Audouin's Gulls collected by the master' student in fieldwork.
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 2 | Monthly distribution of admittances of seabirds at RIAS from the Deserta Island.

4.2 Admittance causes

In 2023, the main cause of admittance of seabirds at RIAS hospital was *Paretic Syndrome* with 45% of the animals (for more information see the topic 5.1 Paretic Syndrome). The second most relevant cause of admittance was *Traumatic Injuries* with 20% of the individuals and *Weakness* with 14%. All the admission causes are listed in Table 3. These three admission causes represent 80% of all arrivals.

Table 3 | Causes of admittance of seabirds at RIAS from the Algarve region.

	Algarve Region
Admittance cause	**Number of admittances**
Paretic syndrome	462
Trauma	209
Weakness/malnutrition	144
Orphan	88
Unknown	47
Infectious diseases	27
Fishingnet and hook	21
Run over	12
Accidental capture	2
Ilegal Captivity	2
Gun shot	2
Electrocution	1
TOTAL	1.017

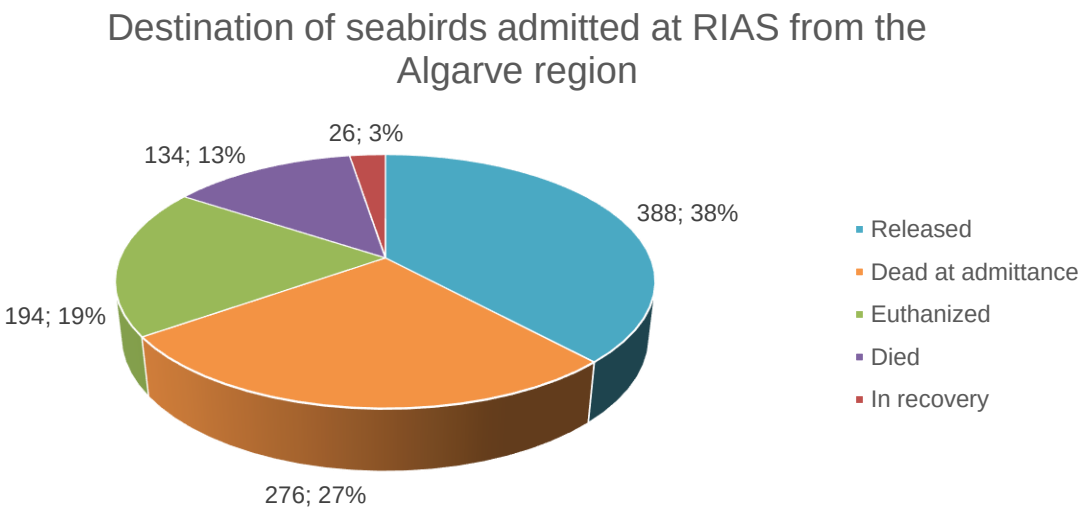
Regarding admittances from Deserta Island, in 2023 the main cause of admittance of seabirds at RIAS hospital was *Unknown* with 44% of the animals (Table 4). The carcasses classified as *Unknown* were in an advanced state of decomposition, being impossible to determine the cause of dead (for more information see the topic 5.6 Unknown cause of dead). The second most relevant cause of admittance with 33% of the individuals was *Paretic Syndrome*.

Table 4 | Causes of admittance of seabirds at RIAS from the Deserta Island.

	Deserta Island
Admittance cause	**Number of admittances**
Unknown	26
Paretic syndrome	20
Weakness / malnutrition	9
Trauma	2
Collision with structure	1
Orphan	1

4.3 Destination

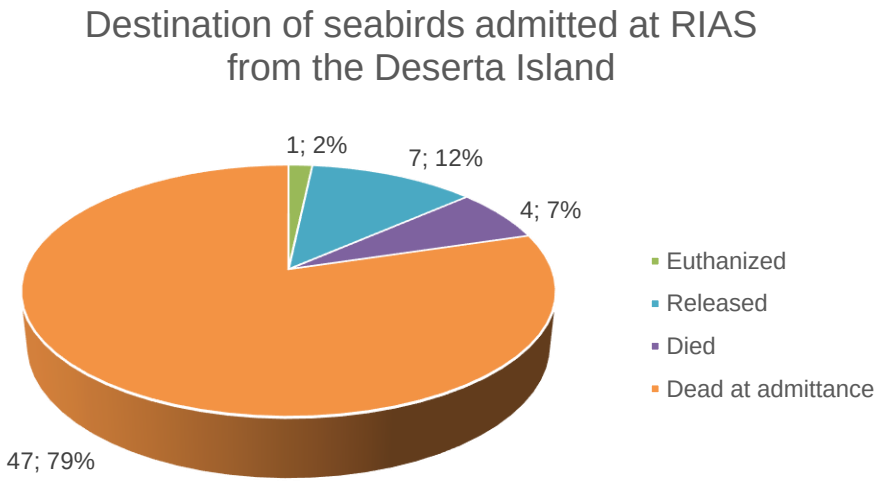
Between January 1st and December 31st of 2023, 1.017 seabirds (741 alive and 276 dead) were admitted at RIAS hospital from the Algarve region (Graphic 3). Of the 741 seabirds admitted alive, 194 were euthanized, 102 died within 48 hours, 32 died after 48 hours and 26 birds were still in recovery at the end of 2023 and transited to 2024. During 2023, it was possible to return 387 seabirds back to nature (Fig. 6), which represents a weighted release rate of 65%.



Graphic3 | Destination of seabirds admitted at RIAS from the Algarve region**.**

Figure 6 | Release back to nature of an Atlantic Puffin.

From the Deserta Island, 59 seabirds (12 alive and 47 dead) were admitted at RIAS hospital during 2023 (Graphic 4). Of the 12 seabirds admitted alive, 1 was secondarily euthanized and 4 died within 48 hours. During 2023, it was possible to return seven seabirds back to nature, which represents a release rate of 58.3% (2020: release rate of 50%; 2021: release rate of 75%; 2022: release rate of 68%).



Graphic4 | Destination of seabirds admitted at RIAS from the Deserta Island.

4.4 Entities involved

Regarding the entities that delivered seabirds to RIAS during 2023 from the Algarve region (Table 5), it was found that 71% of the seabirds collected were delivered by ICNF Park Rangers and 19% by citizens.

Table 5 | Entities that delivered seabirds to RIAS from the Algarve region.

Entities	Number of admittances
ICNF	723
Citizens	196
RIAS	52
LIFE SPEA	17
SEPNA	16
Firefighters	9
Municipality	3
LIFE Animaris	1

Regarding the seabirds collected in Deserta Island during 2023 (Table 6), 44% were collected by RIAS staff (inside of a master thesis fieldwork), 28% were delivered at RIAS by SPEA staff and 20% by ICNF Park Rangers.

Table 6 | Entities that delivered seabirds to RIAS from the Deserta Island.

	Number of birds delivered per entity from Deserta Island					
Species	**ICNF**	**LIFE Animaris**	**LIFE SPEA**	**Citizens**	**RIAS**	**SEPNA**
Larus audouinii			5	1	24	
Larus michahellis	9	1	10	1	2	
Fratercula arctica	1		1			
Alca torda			1			
Calidris alba						1
Larus fuscus	1					
Mareca strepera	1					

4.5 Geographical origin

In 2023, most of the seabirds received at RIAS came from 4 cities in the Algarve region (Table 7): Portimão (21%), Albufeira (17%), Loulé (16%) and Faro (13%).

Birds collected at Deserta Island (Faro) represent 5.8% of the annual total received at RIAS from the Algarve region in 2023.

Table 7 | Geographical origin of the seabirds received at RIAS from the Algarve region.

Cities	N.º of seabirds
Portimão	213
Albufeira	170
Loulé	159
Faro	135
Lagos	92
Lagoa	74
Silves	56
Olhão	55
Vila Do Bispo	17
Aljezur	16

Vila Real de Santo António	13
Castro Marim	9
Tavira	7
Monchique	1

5| Results

5.1 Paretic Syndrome

Between 2020 and 2023, 3.474 seabirds with *Paretic Syndrome* have been admitted at RIAS hospital from the Algarve region, being the main cause of admission. It also 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 affects wild birds linked to aquatic ecosystems (Fig. 7). The main differential diagnoses of paralytic and paretic conditions in wild birds comprise nutritional deficiencies, infectious diseases, biotoxins and pollutants. To find the 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 2023, the improvement of the rehabilitation rates with *C.botulinum* Type C antiserum treatment and more diagnosis test have been done but we are still waiting for the results. The future perspectives include finding the source of botulism and preventing outbreaks, among others. This research is included in a PhD thesis.

Figure 7 | Black-headed Gull with *Paretic Syndrome.*

5.2 Bycatch and interactions with fisheries

During the project, 27 seabirds have been admitted with signs of interaction with fisheries from the Deserta Island. In 2022, *18 Puffinus sp*. were found dead in gillnets. 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.
Furthermore, Gulls and Gannets have been admitted with fishing lines, nets and hooks (Fig. 8).

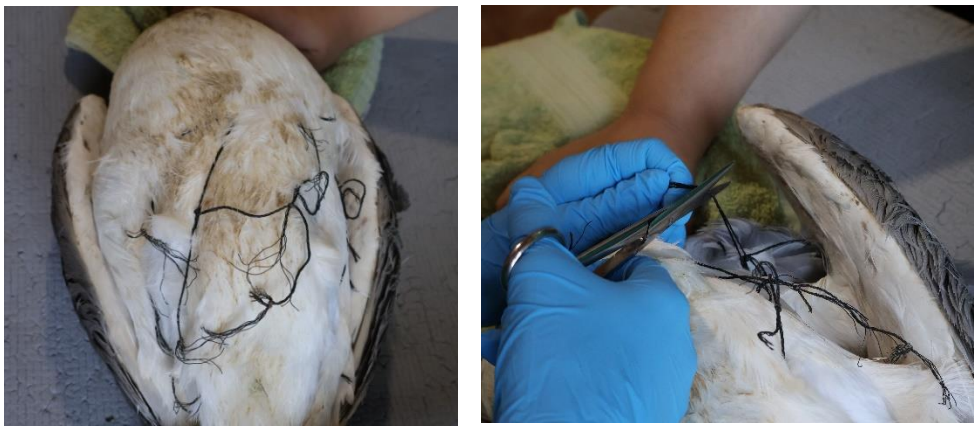


Figure 8 | Gull wrapped in a net.

5.3 Juvenile Audouin's Gull mortality

Between 2019 and 2023, 751 first year juvenile Audouin's Gull have been admitted at RIAS. Most of the gulls came from the Faro Water Treatment Plant (Faro WTP). Having in consideration that the Faro WTP is close to the Audouin's Gulls' colony, and the admission happened 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 (94%). Also, most of the gulls admitted alive died during recovery or were euthanized (5%). Only 1 of these birds was released.
The necropsies revealed cachexia, arthritis, joint ankylosis in the elbows 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. 9), and joint gout, which in turn appears to present disorganization and advanced joint degeneration and the para-articular deposits. Visceral urate deposits are due to renal failure, the causes of which could be ureter obstruction, renal damage, or dehydration. The final diagnosis and the causes behind this process are still under study in the context of a master's thesis.

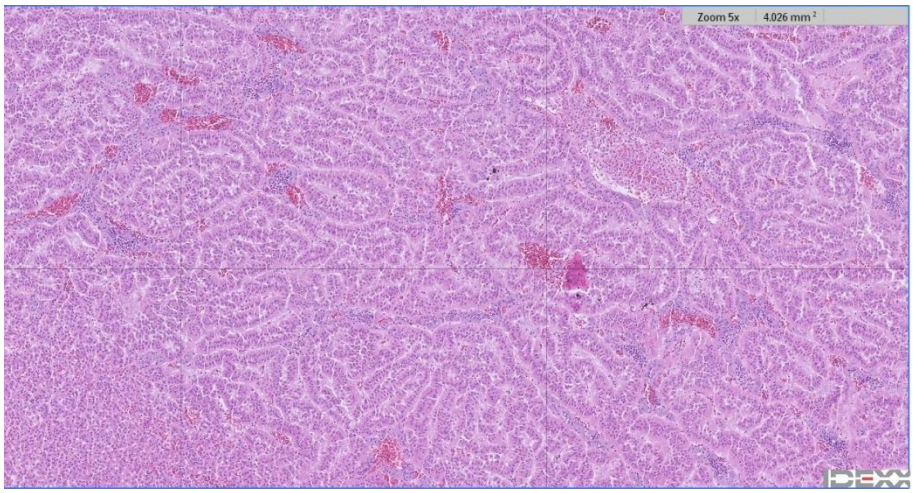


Figure 9 | Kidney histopathology in Audouin's Gull.

5.4 Emaciated seabirds

The second main cause of admission of seabirds 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. In order 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 showed with the protocol aren't reflected in the release rate because of chronic dead events (for more information see topic 5.7 Capture myopathy).

5.5 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 performed to clarify the kind of predator responsible for it. The necropsies performed 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. 11).

Figure 11 | Yellow-legged Gull victim of predation by a bird of prey.

5.6 Unknown cause of dead

During the project, 187 birds have been admitted dead from the Deserta Island, and necropsies were performed to determine the cause of death. The cause of death kept *Unknow* in 51% of them, because of the advanced state of decomposition of the carcasses (Fig. 12). Even so, it was possible to determinate the absence of signs of fishing lines or hooks, trauma or predation.

Figure 12 | Mummified Yellow-legged gull.

5.7 Capture myopathy

Some of the 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 affects 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 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, we have not yet had any positive results.

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