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**Reproductive aspects and occurrence of kelp gull (*Larus dominicanus*) in
south-central São Paulo's coastline, Southeast, Brazil**

SÃO VICENTE

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Trabalho de conclusão apresentado ao Instituto de Biociências da Universidade Estadual Paulista “Júlio de Mesquita Filho”, Instituto de Biociências Campus do Litoral Paulista como parte dos requisitos para a obtenção do título de Bacharel em Ciências Biológicas – Habilitação em Gerenciamento Costeiro.

Orientadora: Prof^a Dr^a Carolina Pacheco Bertozzi

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S586a	Silva, Amanda Bezerra Aspectos reprodutivos e ocorrência do gaivotão (<i>Larus dominicanus</i>) no litoral centro-sul de São Paulo, Sudeste, Brasil. / Amanda Bezerra Silva. -- São Vicente, 2023 40 p. : fotos, mapas Trabalho de conclusão de curso (Bacharelado - Ciências Biológicas) - Universidade Estadual Paulista (Unesp), Instituto de Biociências, São Vicente Orientadora: Carolina Pacheco Bertozzi 1. Ave marinha. 2. Reprodução animal. 3. Encalhe. I. Título.
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Abstract

Larus dominicanus (Lichtenstein, 1823) is a widely distributed marine bird and one of the most common birds on the Brazilian coastline. *São Paulo's* coastline abrigates around 2,000 individuals in reproductive sites - nidification takes place in *Ilhabela, São Sebastião, Santos, Itanhaém, Peruíbe* and *Cananéia* cities. Despite its distribution along the state, studies of its reproductive biology are still sparse and are most performed outside Brazil. Ecological pressures performed by *L. dominicanus* negatively affect other species of marine birds, therefore rapid growth of *L. dominicanus* populations is a matter of management politics. Reproductive biology studies are a form to understand periods of reproduction, gonadal development, number of laid eggs, immigration, and nesting areas. Gonad analysis of seabirds is rarely developed and shows a new form of reproductive studies in wild birds. Samples were collected in *Itanhaém, Peruíbe, Mongaguá* and *Praia Grande* (24°01'07"S, 46°23'56"W – 24°22'43"S, 47°01'02"W), located in the Metropolitan Region of *Baixada Santista* (MRBS). The data used in this study were obtained through the stranding monitoring program "PMP-BS" (Projeto de Monitoramento de Praias da Bacia de Santos).

INTRODUCTION

The kelp gull, *Larus dominicanus* (Lichtenstein, 1823) is a widely distributed marine bird, with an estimated population of between 3,300,000 and 4,300,000 individuals in the world (“BirdLife International”, 2023) - and one of the most common birds on the Brazilian coastline. As regard of its distribution, the species occurs on the coasts of South America, Africa, New Zealand, and Antarctic (Sick, 1997; Watson, Angle, & Harper, 1975). Brazil’s breeding populations adds up to 2,270 pairs (Yorio et al., 2016), Campos et al. (2004) estimated around 2,000 individuals in reproductive sites throughout *São Paulo’s* coastline, but the number of individuals may have increased over the last two decades. In contrast, demographic studies of *L. dominicanus* populations in *Patagonia*, Argentina, found over 72,000 pairs in reproductive colonies – demonstrating population increase during the realization period of the research (Lisnizer, Garcia-Borboroglu, & Yorio, 2011).

Concentrated distribution in coastal regions intensifies kelp gull interaction with humans, causing changes in behavior, mainly affecting its diet. As also observed in other species of *Larus* genus, *L. dominicanus*, is generalist and opportunist – the species also presents predatory and kleptoparasite behavior (Hockey & Steele, 1990; Steele & Hockey, 1995; Yorio et al., 2013). Its presence is common near fishing boats for alimentation, it’s possible to find solid residues, fish, crustaceans, and gastropods in its digestive content (Coulson & Coulson, 1993; Yorio et al., 2013, 2020).

Ecological pressures performed by *L. dominicanus* negatively affect other species of marine birds (Yorio, 2005), therefore rapid growth of *L. dominicanus* populations is a matter of management politics. To address this issue properly, reproductive studies of the species are needed to understand periods of reproduction,¹

¹ O manuscrito foi formatado segundo a revista: ACTA Zoologica

gonadal development, number of laid eggs, immigration, and nesting areas. Although the species is widely distributed across the southern hemisphere coastline, studies of its reproductive biology are still sparse, and are most performed outside Brazil (Chávez-Villavicencio, 2014; Garcia-Borboroglu & Yorio, 2004; Kasinsky, Suárez, & Yorio, 2022; Lisnizer, Garda-Borboroglu, & Yorio, 2014; Yorio, 2005; Yorio et al., 1998, 2016).

Kelp gull's reproduction occurs mainly on oceanic islands, and Brazil's colonies are located between *Rio de Janeiro* and *Santa Catarina* (Sick, 1997). In *São Paulo's* coast, *L. dominicanus* colonies are present in majority of islands and islets – nidification takes place in *Ilhabela*, *São Sebastião*, *Santos*, *Itanhaém*, *Peruíbe* and *Cananéia* cities (Campos et al., 2004). Despite its reproduction being centered on islands, there are records of urban reproduction of *L. dominicanus* in Brazil (Branco, Azevedo Júnior, & Achutti, 2008), as was previously observed in other regions for *Larus* genus (Raven & Coulson, 1997). Reproductive periods in Brazil present few variations between reproductive sites due to local climatic characteristics. In general, breeding season occurs between June and November (Branco et al., 2009; Carniel & Krul, 2010; Dantas & Morgante, 2010; Prellvitz et al., 2009).

Reproductive biology studies of seabirds are focused on nidification areas, number and size of eggs, nesting construction, and other active observations. Gonad analysis of seabirds is rarely developed, and this kind of work promotes innovation. A less direct approach can facilitate and expand reproductive studies in all seabird species.

MATERIALS AND METHODS

1. Study area

This work was conducted in south-central São Paulo's coastline, Southeast, Brazil. Samples were collected in *Itanhaém*, *Peruíbe*, *Mongaguá* and *Praia Grande* (24°01'07"S, 46°23'56"W – 24°22'43"S, 47°01'02"W), located in the Metropolitan Region of *Baixada Santista* (MRBS) (Figure 1). The MRBS is a densely populated area with over 1,800,000 inhabitants ("IBGE", 2023) and comprehends 9 coastal cities of São Paulo's State. Due to its location it's a tourist destination, which can triplicate the number of inhabitants around summer (Zündt, 2006). Besides tourism, other economic activities take place in the region – it holds the place of the largest port in Latin America and *Cubatão's* petrochemical complex. The MRBS is localized in Santos Basin – the main area of gas and petroleum exploration in Brazil, conducted by Petrobras company (Moreira et al., 2023).

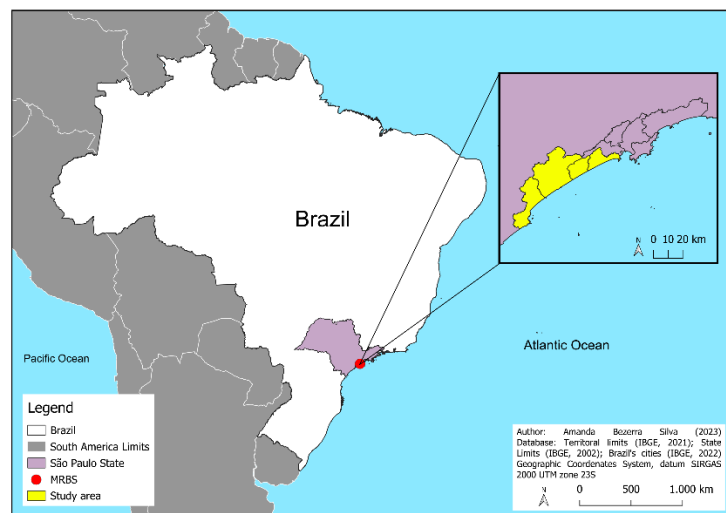


Figure 1. Brazil's map, São Paulo's state and study area in highlight.

1.1. Data collection

The data used in this study were obtained through the stranding monitoring program “PMP-BS” (Projeto de Monitoramento de Praias da Bacia de Santos), which is subject to environmental constraints under the federal environmental license granted by IBAMA (RET No 1169/2019 - ABIO No 1169/2019 - 1st renewal). *Biopesca* Institute (BI) executes the PMP-BS on the local of the study and provided access to the samples used in this work. Samples were collected from September 2015 to April 2023.

The animals used in this study died after stabilization at the institute's dependencies or were found dead during beach monitoring. Animals were preserved in a cold chamber until necropsy. Gonads were collected during necropsy at *Biopesca* Institutes, preserved in 10% formalin solution for 24 hours and then transferred to 70% alcohol. Tissue was processed in histological routine at BI, slides were stained with hematoxylin-eosin and observed using an optical microscope. Data information used in occurrence analysis was also provided by BI.

1.2. Data analysis

Data analysis and graphics were made in Microsoft Excel version 2310. Sex and gonadal development were performed via microscopic analysis using available literature on other bird species (Aire, 1997; Aire & Ozegbe, 2007; Bacha & Bacha, 2012; Baraldi Artoni et al., 1997,1999; Dharani et al., 2017; Eroschenko & Wilson, 1974; González-Morán et al., 2008; Gupta & Maiti, 1986; Islam et al., 2010; Madekurozwa & Kimaro, 2008; Mafunda et al., 2021; Morais et al., 2012; Orsi et al., 2005; Pandey & Mohanty, 2023; Parizzi et al., 2007). Gonads were classified in 5 categories: immature and mature in resting; recovery; reproduction (active); regressing.

In males, we evaluated the size of seminiferous tubules, abundance of interstitial tissue, thickness of tunica albuginea and lumen light. Females were evaluated on the presence of primordial, previtellogenic, vitellogenic, atretic and ovulated follicles. Atretic follicles were not distinguished by type.

RESULTS

2. Occurrence

In total, 199 samples were used in this study for occurrence analysis. Samples were collected from September 2015 to April 2023, all animals were found stranding during beach monitoring. From 199 specimens, 47 were classified as male, 60 as female and 92 did not have sex determined due to poor conservation conditions of gonadal tissues (Figure 2).

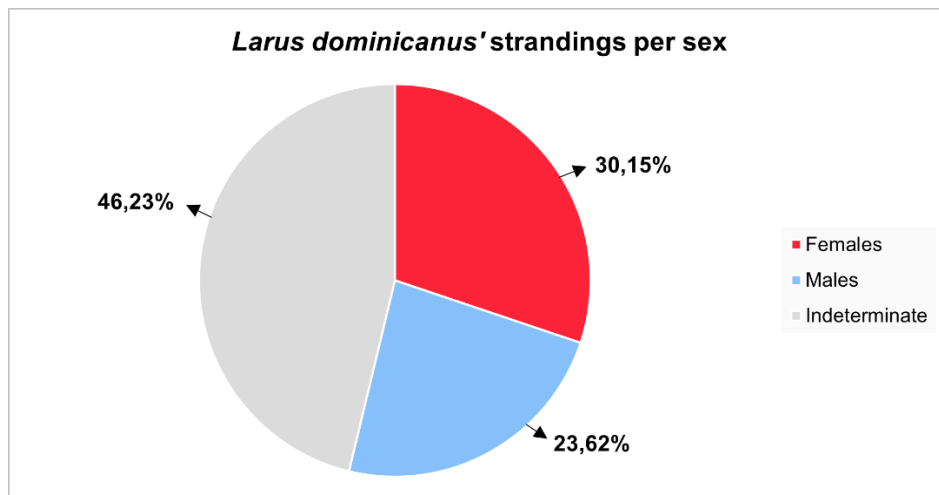


Figure 2. Strandings per sex of *Larus dominicanus*. Sampled from September 2015 to April 2023.

The city with the highest number of *L. dominicanus* was Peruíbe (n=89), followed by Praia Grande (n=47), Itanhaém (n=36) and Mongaguá (n=27) (Figure 3). Fluctuations in the number of individuals happened throughout the months and years of the study. Most specimens collected in the study areas were classified as

indeterminate sex. The females were the most common sex sampled in the majority of the cities, except from Mongaguá (Figure 3). December holds the highest number of individuals found (n=30), October was the second higher month (n=26) (Figures 4 and 5). June and July presented the lowest number of *L. dominicanus* (n=6), followed by September (n=9) (Figures 4 and 5).

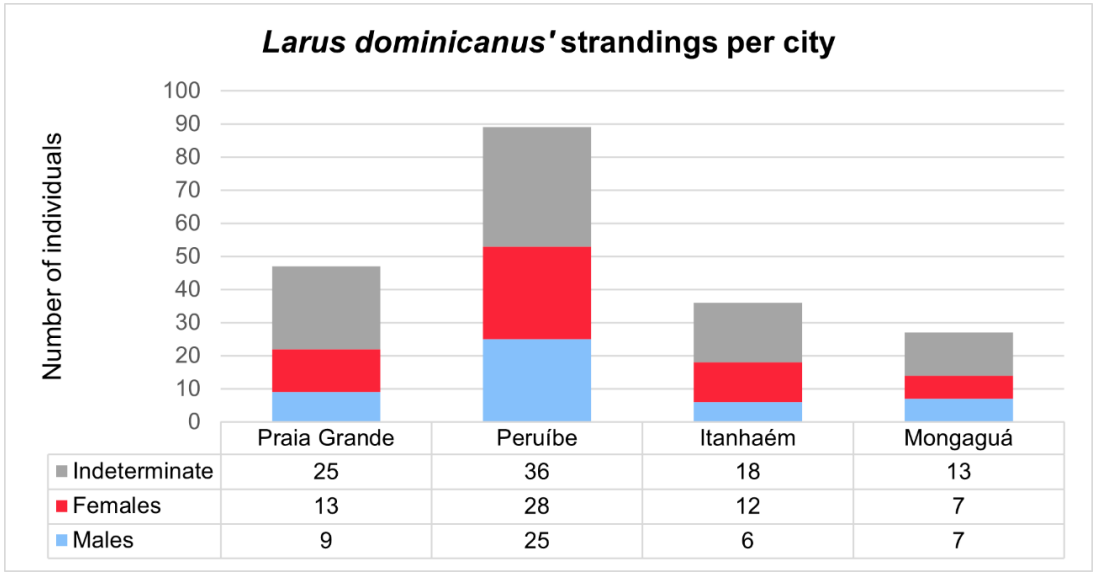


Figure 3. Strandings per city of *Larus dominicanus*. Sampled from September 2015 to April 2023.

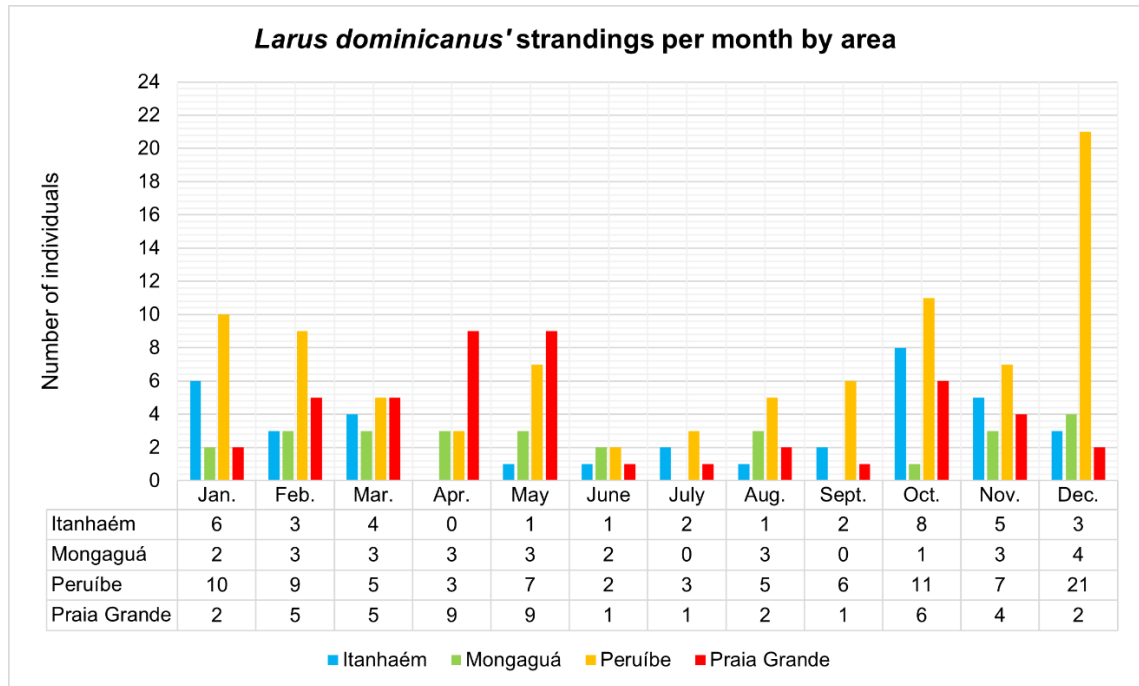


Figure 4. Strandings per month by area of *Larus dominicanus*. Sampled from September 2015 to April 2023.

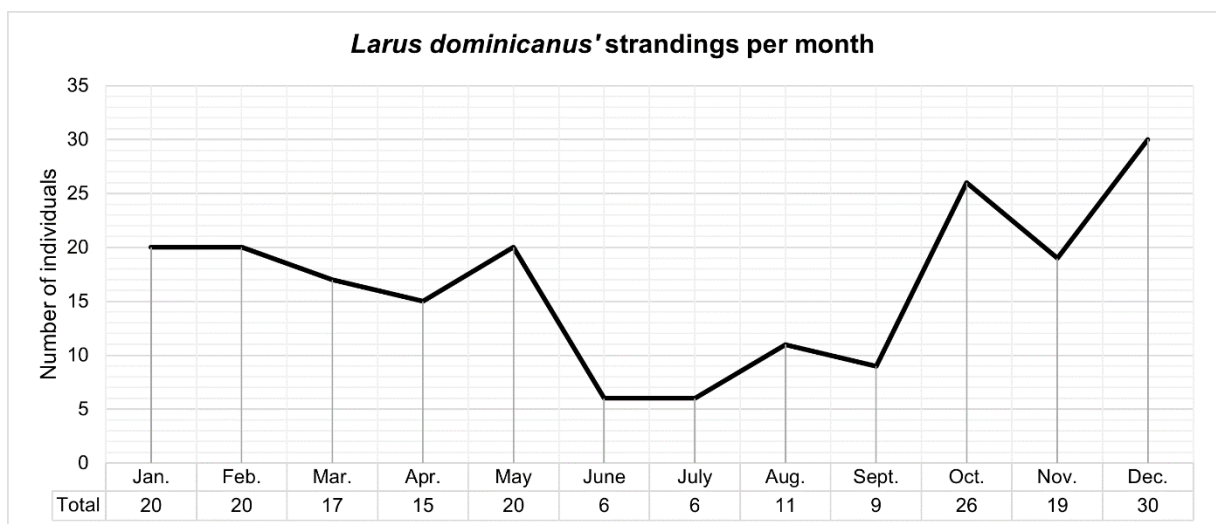


Figure 5. Strandings per month of *Larus dominicanus*. Sampled from September 2015 to April 2023.

The year with the most strandings was 2022 ($n=40$), in contrast with 2017 that recorded the lowest values ($n=10$) (Figures 6 and 7). The amount of strandings had

been showing an increase until 2023 – it's important to reinforce that samples of the present work don't comprehend months before September 2015 and after April 2023.

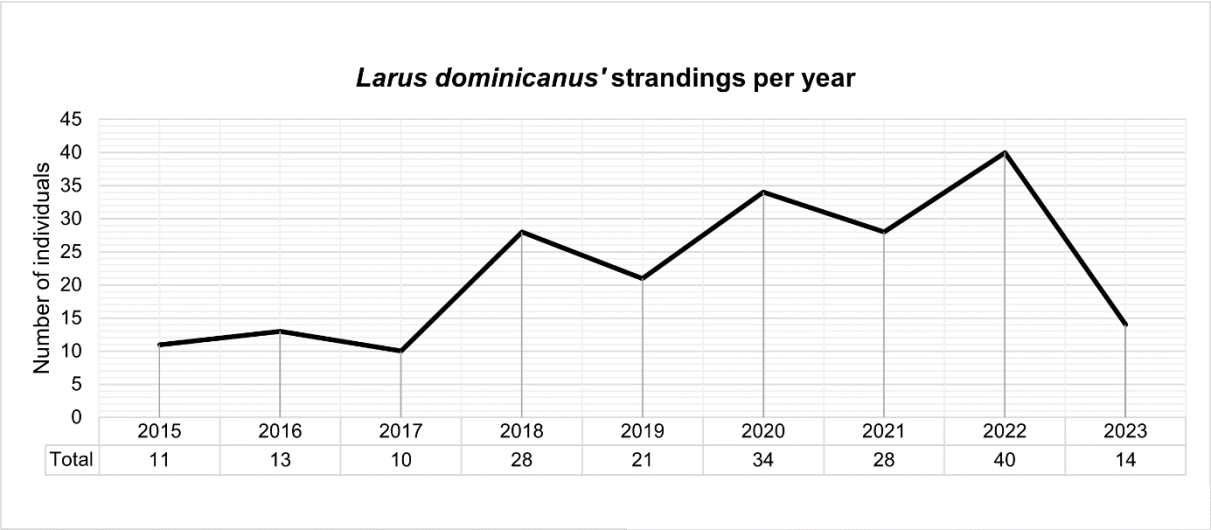


Figure 6. Strandings per year of *Larus dominicanus*. Sampled from September 2015 to April 2023.

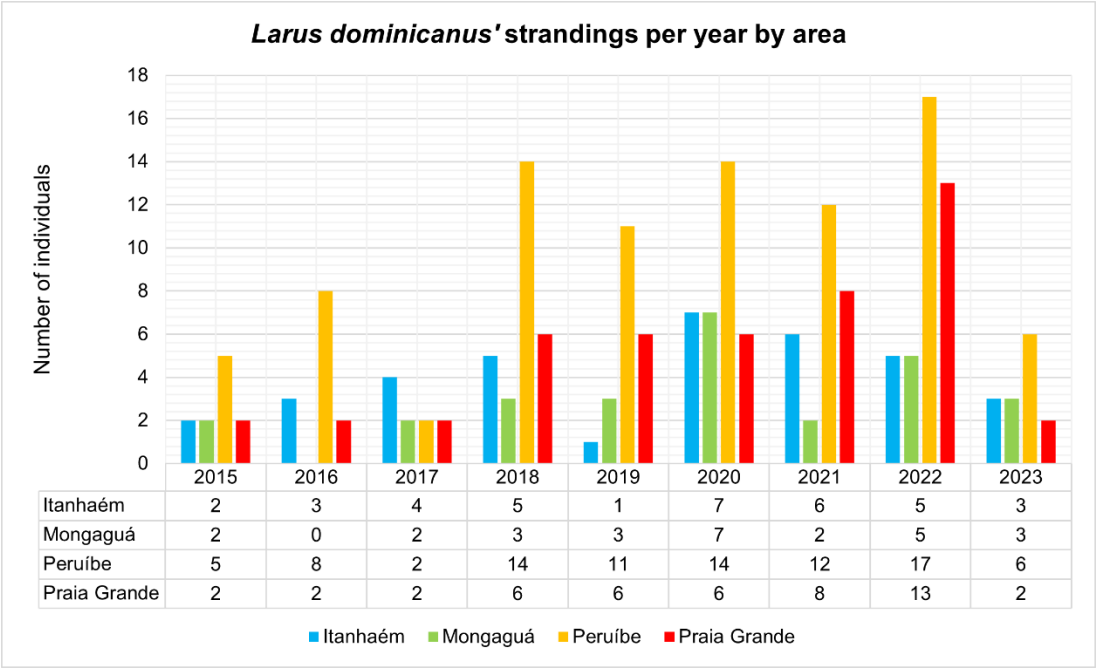


Figure 7. Strandings per year by area of *Larus dominicanus*. Sampled from September 2015 to April 2023.

Males were mainly found in January and May (n=7), while females in February (n=9) and November (n=8) (Figure 8). In June and July, no males were collected during monitoring, and only one and two females were found, respectively – individuals classified as indeterminate were left out of analysis regarding sex (Figure 8). Females were the most representative sex in 2020 (n=15), while males in 2022 (n=15) (Figure 9). In 2015, no female was collected. Only one male was found in 2017 (Figure 9).

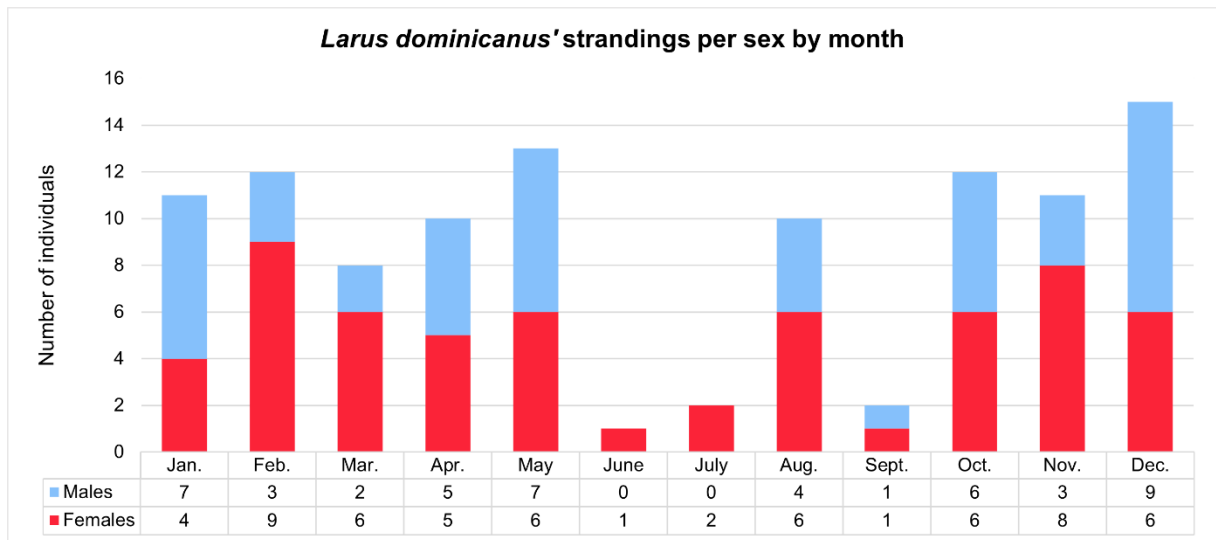


Figure 8. Strandings per sex by month of *Larus dominicanus*. Sampled from September 2015 to April 2023.

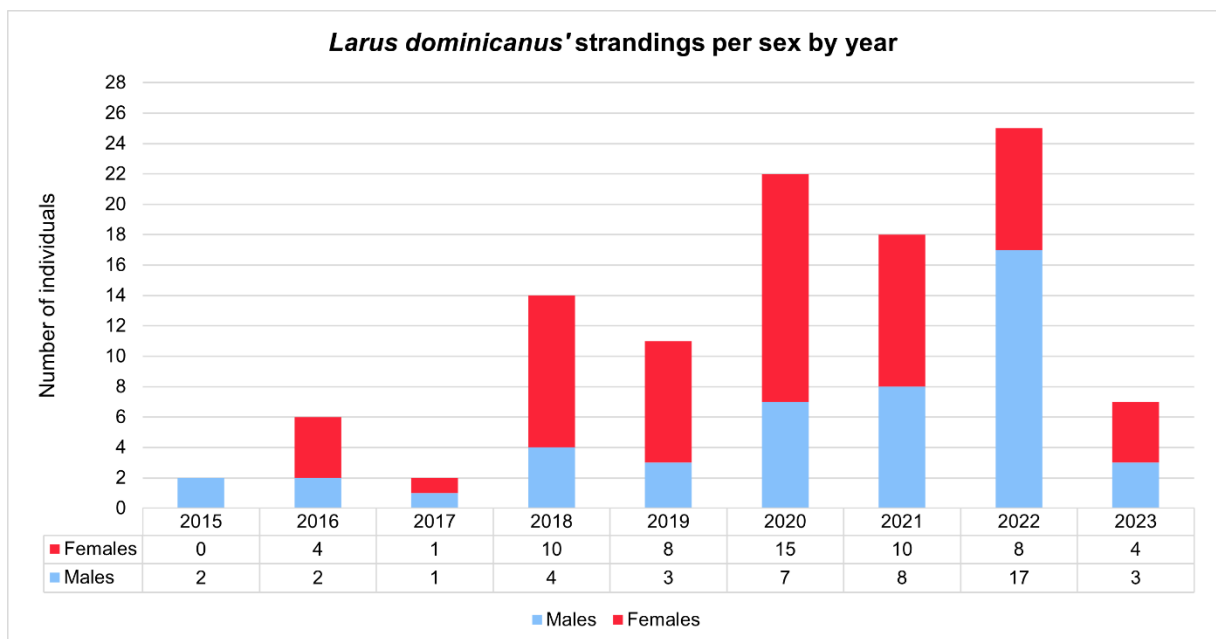


Figure 9. Strandings per sex by year of *Larus dominicanus*. Sampled from September 2015 to April 2023.

Most of the individuals were found stranded alive and sent for rehabilitation (n= 131) (Figure 10).

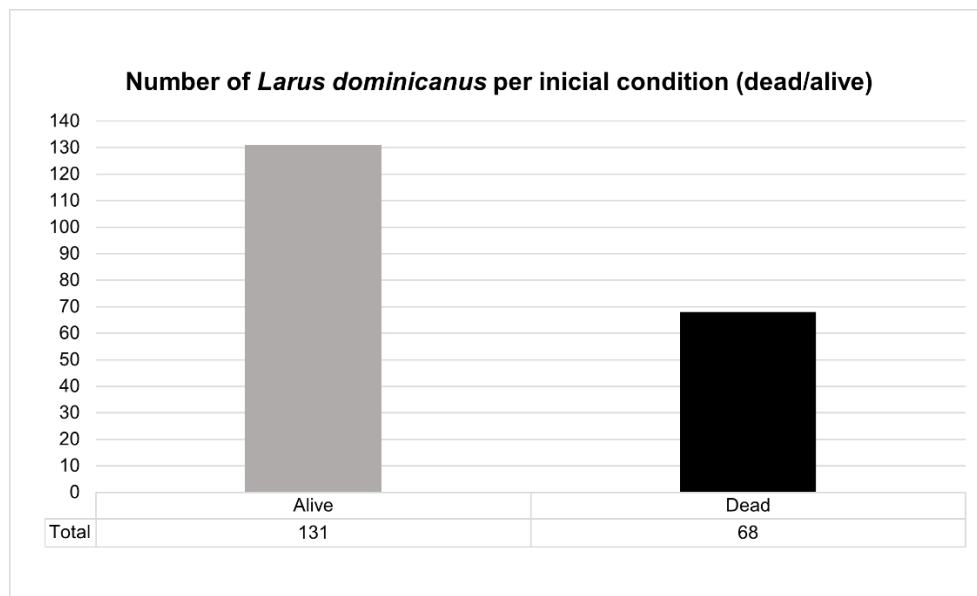


Figure 10. Number of *Larus dominicanus* per initial condition (dead/alive). Sampled from September 2015 to April 2023.

2.1 Reproductive biology

In total, 72 individuals were analyzed for reproductive biology studies – 38 females and 34 males. Tissues in advanced autolyze were discarded. Of these samples, 21 were classified as immature (12 females and 9 males); 20 as resting (11 females and 9 males); 6 as recovery (4 females and 2 males); 11 as reproduction (6 females and 5 males); and 14 as regressing (5 females and 9 males). In June and July, there are no gonad samples of males, as well as September for females. The reproductive period was between May and October, regressing in September-November, resting in December-April, and recovery in May-July (Figure 11).

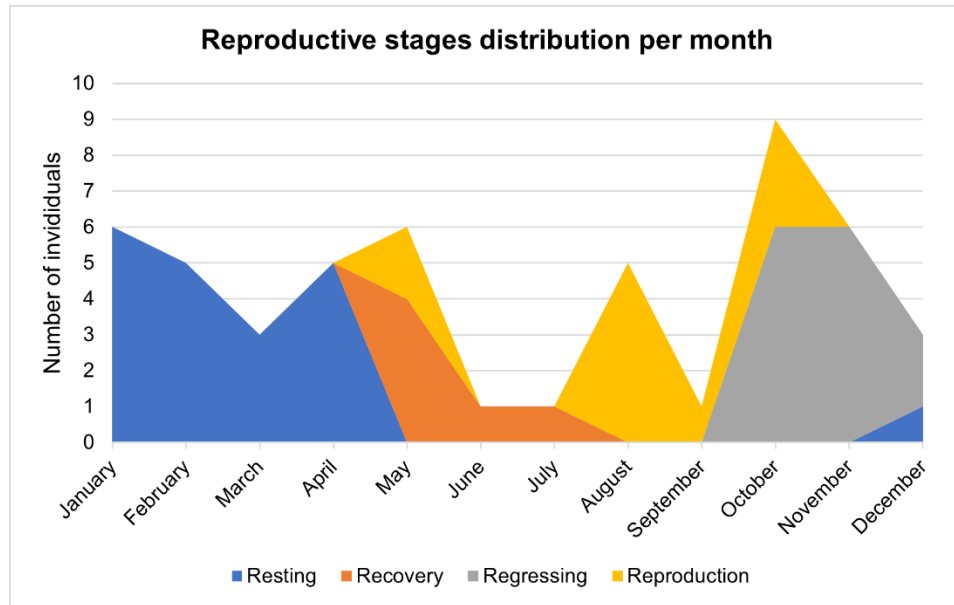


Figure 11. Reproductive stages distribution of *Larus dominicanus* per month. Sampled from September 2015 to April 2023.

Females and males presented some differences in the period of reproductive stages. Males started reproduction stages in May, while females in August. Females' regressing period was from October to November, and resting period was from December to April (Figures 12 and 13). Males' regressing period was between October-December, and resting period in January-April. For both sexes, recovery started in May.

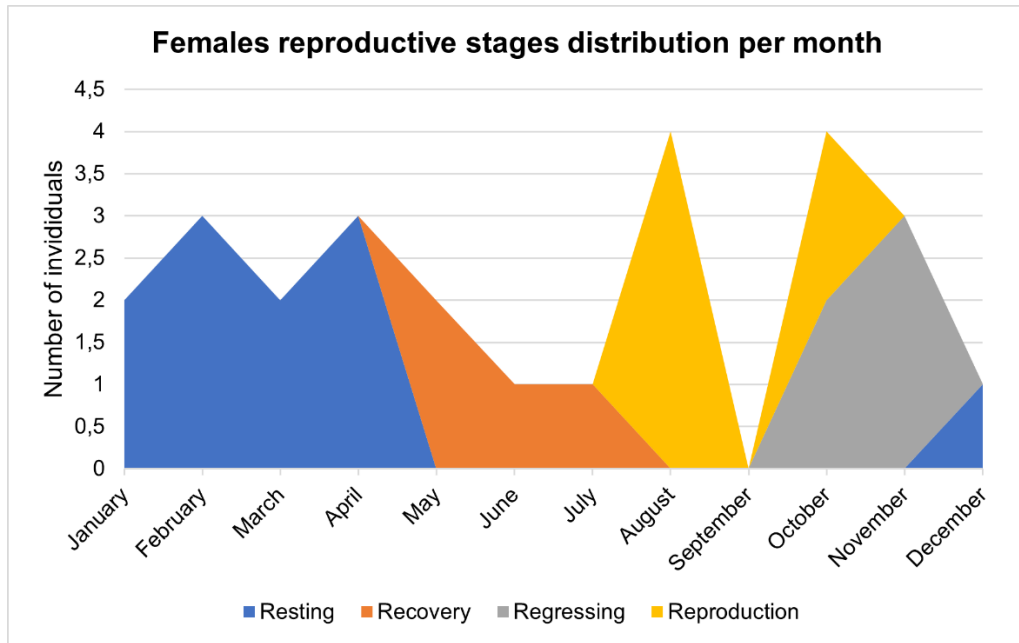


Figure 12. Reproductive stages distribution of *Larus dominicanus*' females per month. Sampled from September 2015 to April 2023.

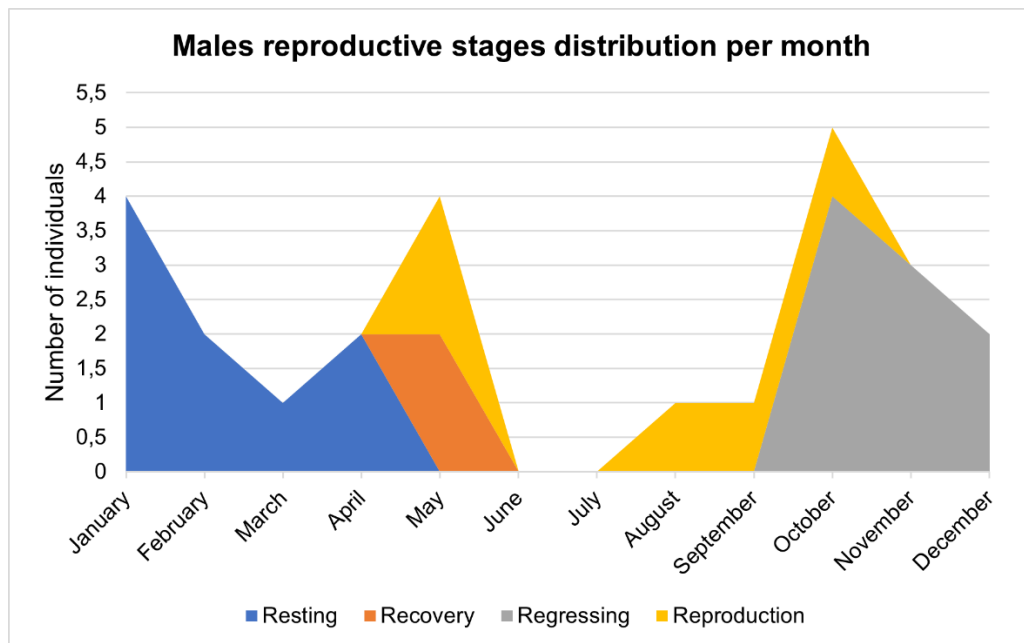


Figure 13. Reproductive stages distribution of *Larus dominicanus*' males per month. Sampled from September 2015 to April 2023.

Histologically, the ovary is composed of medulla - consisting of loose vascularized connective tissue - and cortex, which is covered with a layer of germinal epithelium (Figure 14). Germinal epithelium is followed by tunica albuginea - consisting

of dense connective tissue - and stroma. Follicles are produced in the cortex, they are divided into primordial (immature), previtellogenic (primary), vitellogenic (secondary) and preovulatory (mature) – all types of follicles were found in *L. dominicanus*' ovary. Postovulatory and atretic follicles were also present – atretic follicles could be found in immature and mature individuals. Follicles are formed by an oocyte filled with yolk, which is surrounded by four layers: theca externa, theca interna, membrana granulosa and perivitelline membrane. The type and quantity of follicles varied depending on reproductive stage.

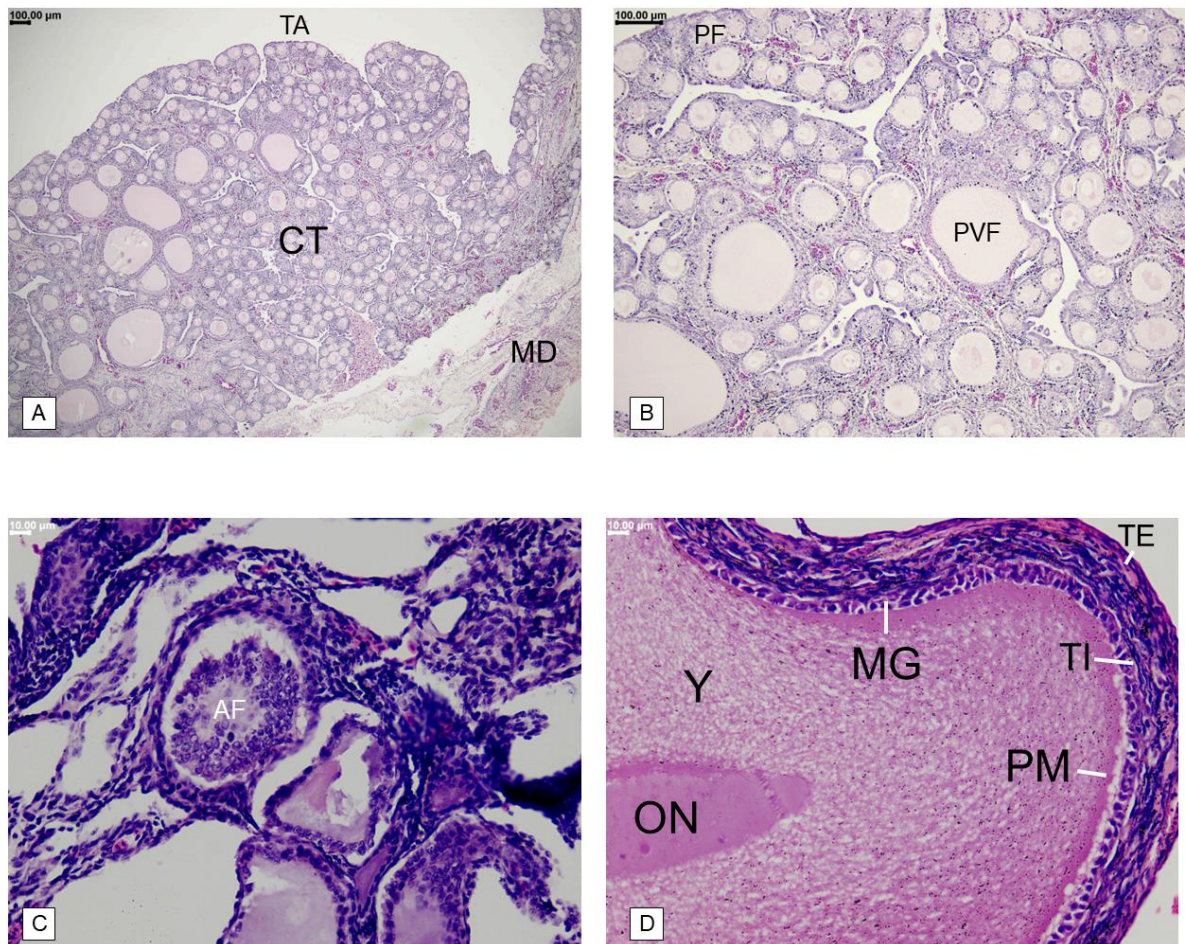


Figure 14. Photomicrography of *Larus dominicanus*' female gonad slides. A - 40x magnification; it's possible to observe the ovary structures medulla (MD) and cortex (CT); tunica albuginea (TA) is thin and difficult to differentiate. B – 100x magnification, previtellogenic (PVF) and primordial (PF) follicles are highlighted; immature individuals don't present later development follicles. C – 400x magnification;

atretic follicles also happen in immature individuals, in this case membrana granulosa's cells proliferate and invade the interior of the follicle. D – 400x magnification; in this picture it's possible to differentiate the layers of the follicles: theca externa (TE), theca interna (TI), membrana granulosa (MG) and perivitelline membrane (PM); yolk (Y) and oocyte nucleus (ON) are also highlighted.

Immature individuals presented only primordial, previtellogenic and atretic follicles (A and B, figure 14). Mature individuals in the reproduction stage presented primordial, previtellogenic, vitellogenic and atretic follicles, preovulatory and postovulatory follicles were found in some of the individuals. The principal difference between the recovery and reproduction stages was the number of primordial and vitellogenic follicles – vitellogenic follicles outnumbered previtellogenic follicles in reproduction while primordial follicles were more common in recovery (A, figure 15). The reproduction stage was characterized by abundance of vitellogenic follicles and the presence of postovulatory follicles (B and C, figure 15). At the regressing stage (A and B, figure 16), there's a growth in atretic follicles, while previtellogenic and vitellogenic follicles can also be spotted. The resting stage is mainly occupied with atretic follicles, with few primordial follicles, previtellogenic and vitellogenic follicles were not found at this stage (C and D, figure 16).

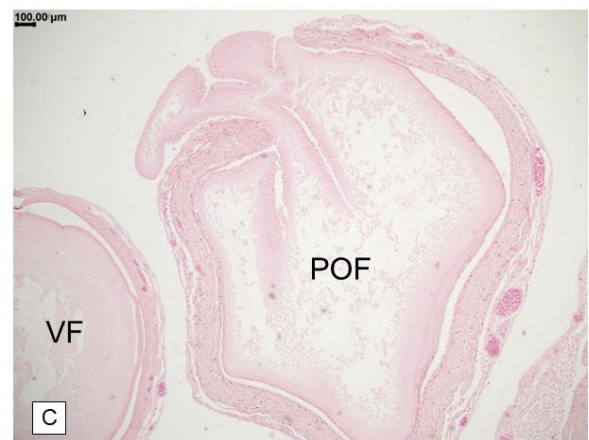
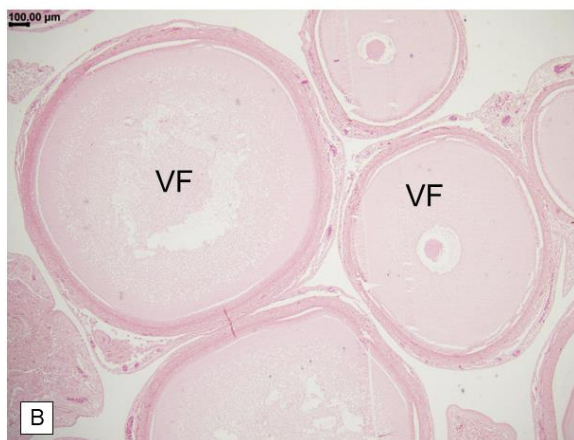
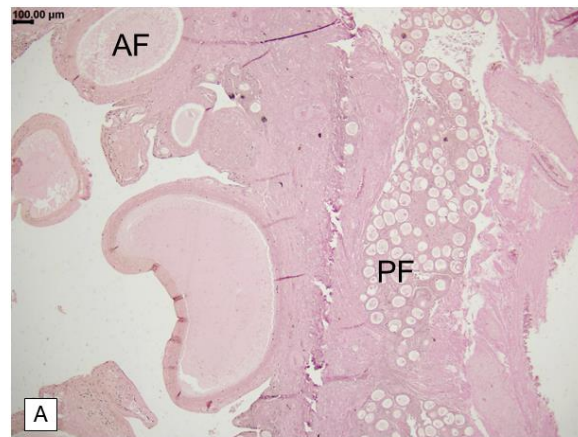


Figure 15. Photomicrography of *Larus dominicanus*' female gonad slides. A – 40x magnification; recovery stage is characterized by the growth increase of primordial follicles (PF); atretic follicles (AF) are present in large numbers. B and C – 40x magnification; in reproduction stage, vitellogenic follicles (VF) represent majority of follicles in the ovary; it's possible to see a postovulatory follicle (POF) in B with rupture membranes and yolk projected to the exterior.

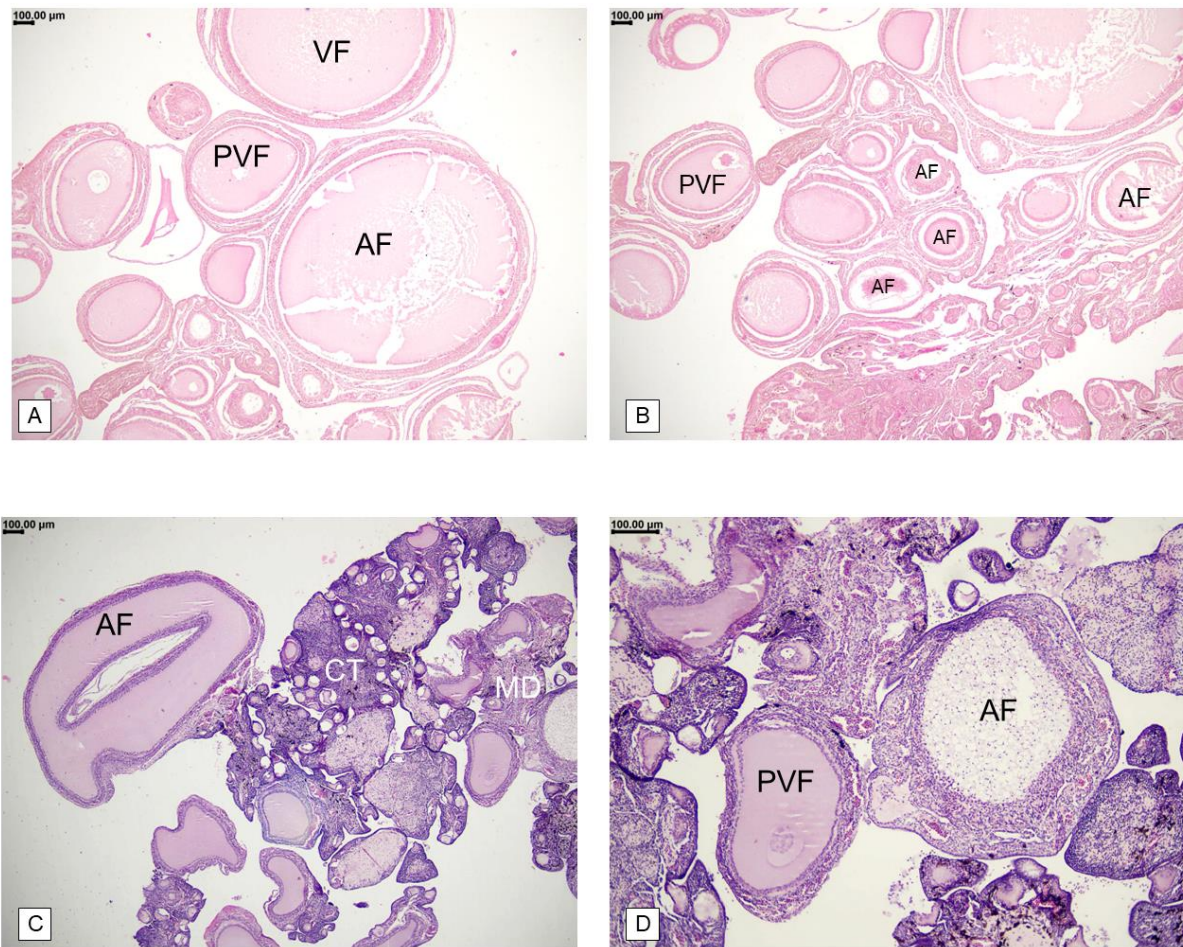


Figure 16. Photomicrography of *Larus dominicanus*' female gonad slides. A and B – 40x magnification; regressing stage initiates after breeding season, a large number of previtellogenic (PVF) and vitellogenic (VF) follicles can still be found; different types of atresia take place – atretic follicles are an increasing class in this stage. C and D – 40x and 100x magnification, respectively; in resting stage, few previtellogenic (PVF) and vitellogenic follicles are found, and atretic follicles (AF) are the most representative group of follicles – the atretic follicle in D is invaded by vacuolar lipidic cells; cortex (CT) and medulla (MD) are highlighted.

In males, the testes are not divided into lobules, and are covered by a tunica albuginea – consisting of thin connective tissue. They are filled with seminiferous tubules – Sertoli cells, spermatogonia, primary spermatocyte, secondary spermatocyte, spermatids, and spermatozoa are distributed in seminiferous tubules epithelium (A and B, figure 20). The type and quantity of cells, and the diameter of

seminiferous tubules varied depending on reproductive stages. Spermatogenesis occurs independently in each cell, organized in thin columns. Outside the seminiferous tubules we encountered interstitial tissue, Leydig cells and blood vessels. The thickness of the tunica albuginea and interstitial tissue also varied along the reproductive stages.

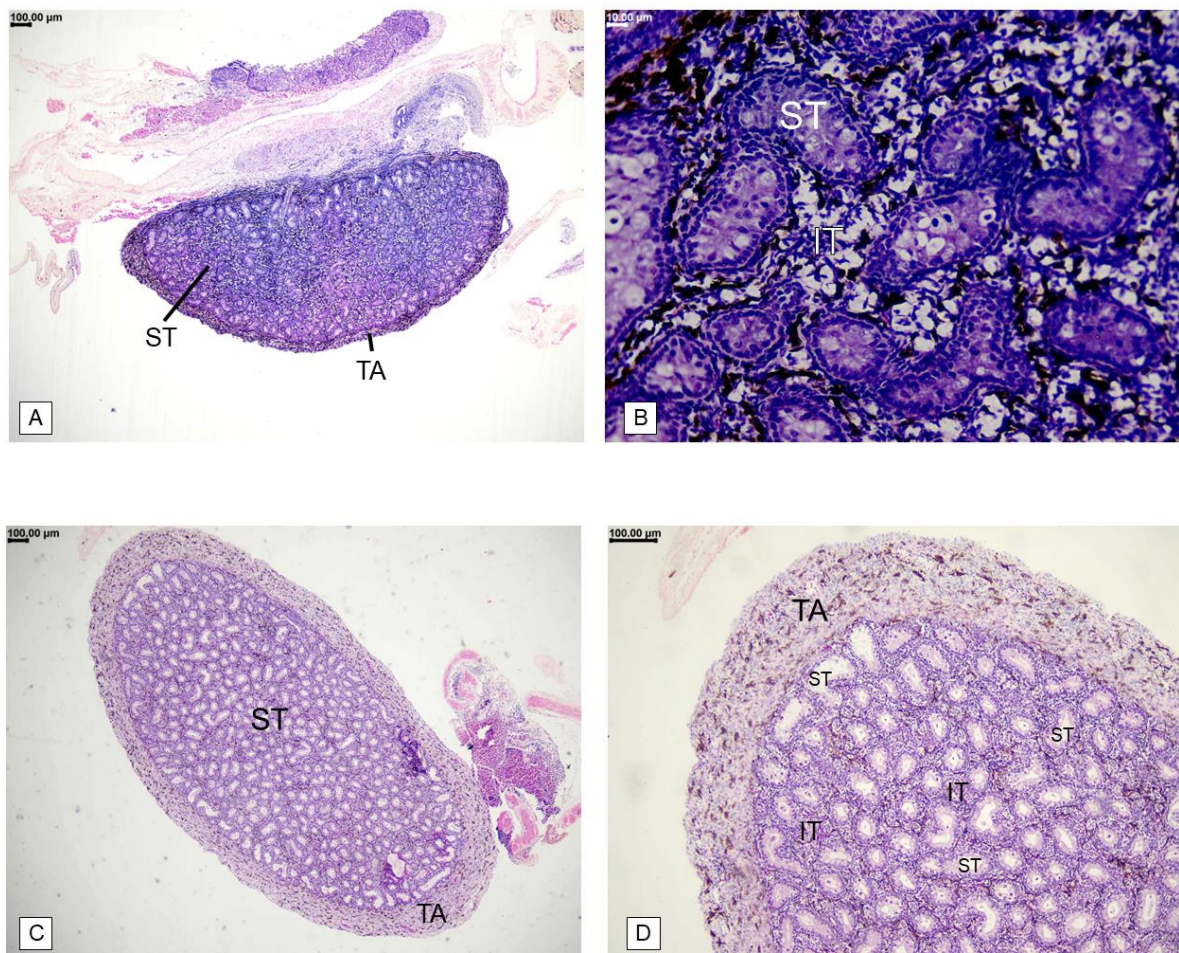


Figure 17. Photomicrography of *Larus dominicanus*' male gonad slides. A and B – 40x and 400x magnification, respectively; gonads of immature individuals show a thicker tunica albuginea (TA) when compared to regressing and reproduction stages; seminiferous tubules (ST) have small diameters and interstitial tissue (IT) is abundant; only spermatogonia and Sertoli cells can be found. C and D – 40x and 100x magnification; resting gonads are a lot similar to immature; tunica albuginea (TA) is thick and seminiferous tubules (ST) have reduced in diameter; interstitial tissue (IT) is less abundant than immature gonads, but more voluminous when compared to regressing and reproduction stages.

Immature males showed a higher presence of spermatogonia and Sertoli cells, thick tunica albuginea and abundance of interstitial tissue, seminiferous tubules were also smaller (A and B, figure 17). Resting stage testes were similar to immature individuals in thickness of tunica albuginea and the size of seminiferous tubules, although interstitial tissue was less abundant (C and D, figure 17). The regressing stage was characterized by degradation of germinal epithelium – with incomplete spermatogenesis – all types of seminiferous cells could be found, but late spermatids and spermatozoa were sparse (A and B, figure 18). In this phase, occurred thickening of the tunica albuginea, that during the reproduction stage became thin. The recovery stage showed the development of seminiferous epithelium, primary and secondary spermatocytes, and early spermatids were present (A and B, figure 19). In the reproduction stage, spermatogenesis is complete, and spermatozoa are easily found, tunica albuginea is thin, seminiferous tubes are large and interstitial tissue is inconspicuous. In this phase, spermatozoa could be found in the epididymis (C and D, figure 19).

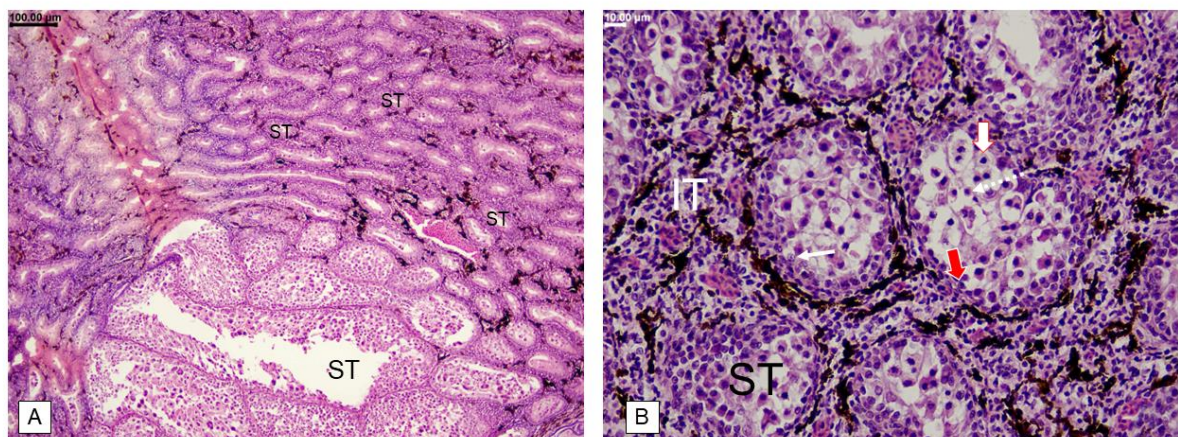


Figure 18. Photomicrography of *Larus dominicanus*' male gonad slides. A and B – 100x and 400x magnification, respectively; A is a perfect example of how seminiferous tubules (ST) reduce in diameter

during regressing period, it's possible to see side by side seminiferous tubules in different stages of the seminiferous epithelium's degradation. B shows the process of degradation closer, spermatogenesis is incomplete and some types of cells are still present in the seminiferous tubules; Sertoli cell (thin white arrow), spermatogonia (thick red outlined with white arrow), primary spermatocyte (thick white outlined with red arrow), and early spermatid (dashed white arrow) are spotted; interstitial tissue (IT) starts to regrowth.

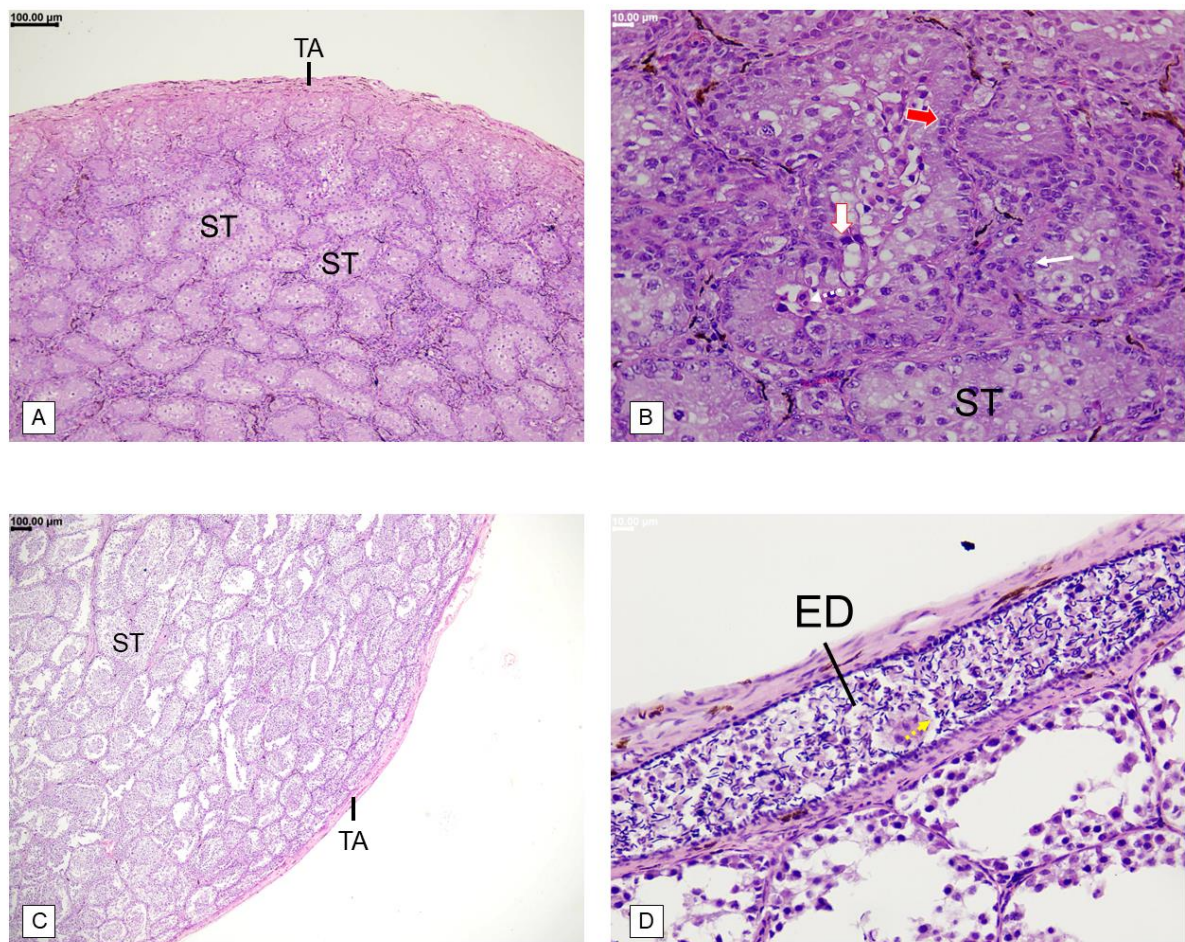


Figure 19. Photomicrography of *Larus dominicanus*' male gonad slides. A and B – 100x and 400x magnification, respectively; recovery stage is characterized with a thinner tunica albuginea (TA) and enlarger of seminiferous tubules (ST); in B, initial moments of spermatogenesis are observed; Sertoli cell (thin white arrow), spermatogonia (thick red outlined with white arrow), primary spermatocyte (thick white outlined with red arrow), and early spermatid (dashed white arrow) are spotted. C and D – 40x and 400x magnification, respectively; reproduction stage is the apex of gonad development, seminiferous tubules (ST) are the largest they can be and it's almost impossible to spot interstitial tissue; tunica albuginea (TA) is thin and will only start to regain volume in regressing stage; in D, numerous

spermatozoa (dashed yellow arrow) are seen inside of epididymis (ED), a fact that can only happen during reproductive periods.

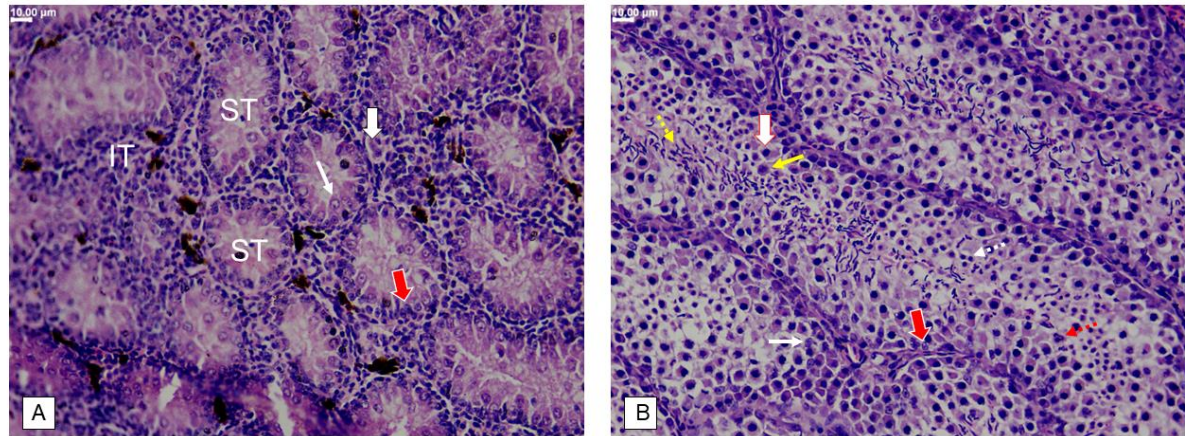


Figure 20. A and B, 400x magnification; A figure is a gonad from a resting individual, and B from an active individual; seminiferous tubules (ST) in A are small and haven't initiate spermatogenesis yet; interstitial tissue (IT) is easily spotted; Sertoli cell (thin white arrow), spermatogonia (thick red outlined with white arrow), Leydig cell (thick white outlined with black arrow) are highlighted. The B figure shows all steps in spermatogenesis: Sertoli cell (thin white arrow), spermatogonia (thick red outlined with white arrow), primary spermatocyte (thick white outlined with red arrow), secondary spermatocyte (thin yellow arrow), early spermatid (dashed white arrow), late spermatid (dashed red arrow) and spermatozoa (dashed yellow arrow) are observed.

DISCUSSION AND CONCLUSION

Occurrence studies based on beachcast mortality are important to evaluate anthropogenic and environmental impacts on populations. In the present study, 199 individuals of *Larus dominicanus* were collected along the research area, of those, 131 were found alive and sent to rehabilitation. Females represented 30,15% individuals, males 23,62% and indeterminate sex 46,23%. Sex distribution fluctuated throughout the months and years of the study. Further statistics analysis are necessary to infer

significance in the sex ratio per month and year, biased sex-specific ratios are observed in seabird bycatch (Beck et al., 2021; Gianuca et al., 2017).

The number of strandings varied among the cities, a lot of variables could have caused this fact. One of the factors that could have influenced this variation is the different beach extensions in the study's cities. *Peruíbe*, that had most of the strandings, has a coastline extension of 32 km, followed by *Itanhaém* with 26 km, *Praia Grande* with 23 km and *Mongaguá* with 13 km. In this study area, beach morphodynamics doesn't seem to impact the number of beachcasts in each city, since this region has intermediate and high-energy dissipative beaches, with homogenous beach profiles during the year (Souza & Suguio, 1996).

The study period demonstrated an increase in strandings, previous studies associated increasing of *L. dominicanus* strandings with environmental factors – proximity to breeding colonies, elevation of sea surface temperatures, and increase of storm events (Tavares, De Moura, & Siciliano, 2016). Environmental effects affect beachcasts of marine animals (Brusius et al., 2021; Brusius, de Souza, & Barbieri, 2020; Newton et al., 2009), and intense climate events such as El Niño and La Niña play an important role in oscillation of climate variables (Cai et al., 2021; Timmermann et al., 2018). Although, increasing of strandings in seabirds can be associated with environmental causes other agents are usually involved in. The interaction between gulls and fisheries is associated with mortality growth (Christensen-Dalsgaard et al., 2022; Simeone et al., 2021). Infectious diseases can also be the cause of strandings in some cases in Brazil (Mariani et al., 2019). More studies are necessary to better understand the causes of *L. dominicanus*' strandings increase in *São Paulo's* coastline over the years.

Results also showed a decrease in *L. dominicanus* beachcasts during June-September, this corroborates with the breeding season of the species in Brazil (Branco et al., 2009; Carniel & Krul, 2010; Dantas et al., 2010, Prellvitz et al., 2009). The increase in the number of individuals during October suggests the end of breeding season, which happens between October and early November. Reproductive biology results in the present study also indicate a similar reproductive period, reproduction period was between May-October.

Gonadal development results in the current research suggests that males are ready to reproduce earlier than females. This might happen due to difference in energetic investments between males and females (Vézina & Salvante, 2010). Recuperation stage matches *L. dominicanus*' return to reproductive sites around March-April for nest construction (Branco et al., 2009; Prellvitz et al., 2009). Histologically, *L. dominicanus* gonads are very similar to what as described for domestic and wild birds (Aire, 1997; Aire and Ozegbe, 2007; Bacha and Bacha, 2012; Baraldi Artoni et al., 1997, 1999; Dharani et al., 2017; Eroschenko and Wilson, 1974; González-Morán et al., 2008; Gupta and Maiti, 1986; Islam et al., 2010; Madekurozwa and Kimaro, 2008; Mafunda et al., 2021; Morais et al., 2012; Orsi et al., 2005; Pandey and Mohanty, 2023; Parizzi et al., 2007). Most reproductive biology studies of seabirds involve active monitoring of breeding colonies, so there's little information of gonad's histologic description. The present work shows a new promising study area and an indirect form of reproduction season's evaluation. To better evaluate *L. dominicanus*' and other seabirds' reproductive biology, further studies are necessary.

Even though *L. dominicanus* populations and distribution tend to expand in South America (Yorio et al., 2016), the species may face some reduction in reproductive success because of environmental and anthropogenic factors. Kelp gulls

tend to reproduce in periods of lower temperature, due to mortality of embryos above 40.5°C (Gill & Prum, 2019). Lyra et al. (2018) suggested that lower temperature periods would be shortened until the end of the century, this issue directly affects reproductive periods of *L. dominicanus*. Another study performed by Carroll et al. (2015) described how increases in sea surface temperatures impacts on reproductive success – productivity decline is related to higher sea surface temperatures, which leads to the reduction of prey availability.

Management policies of the Kelp Gull *Larus dominicanus* are complex and should consider a variety of factors. *L. dominicanus* is a generalist and opportunistic species, that preys on other birds and presents kleptoparasite behavior – these features negatively affect other species (Hockey et al., 1989; Steele & Hockey, 1995; Yorio, 2005; Yorio et al., 2013). Rapid population and distribution growth may lead to serious declines in other species populations. But, on the other hand, *São Paulo's* colonies are significantly smaller than *Patagonia's* (Campos, 2004; Lisnizer et al., 2011) and have shown an increase in the number of strandings per year. Environmental and anthropogenic causes of beachcasting and reduction of reproductive success need to be monitored to evaluate the threats this species may endure or provoke. More research is necessary to accommodate this issue properly.

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Título: "Ocorrência e aspectos reprodutivos do gaivotão (*Larus dominicanus*) no litoral centro-sul de São Paulo, Sudeste, Brasil"

Orientador: Profa. Dra. Carolina Pacheco Bertozzi

Curso/Habilitação: Bacharelado em Ciências Biológicas/Gerenciamento Costeiro

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São Vicente, 04 de dezembro de 2023.

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