Patos Lagoon Estuary and Adjacent Marine Coastal Biodiversity Long-term data

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Abstract. Estuaries are among the most productive aquatic ecosystems and provide important ecological and economic services in coastal areas. However, estuarine systems have been threatened worldwide by natural and anthropogenic impacts acting on local, regional and global scales. Long-term ecological studies contribute to the understanding and management of estuarine functioning, and provide the baseline information for detection changes and modeling of predictive scenarios. Here, we describe long-term data on the biodiversity and physico-chemical parameters obtained from 1993 to 2016 for the Patos Lagoon estuary and adjacent marine coast-PLEA, in southern Brazil. We report eight datasets containing 6,972 sampling events with the occurrence and abundance records of 275 species (Kingdoms: Bacteria, Protozoa, Chromista, Plantae and Animalia) of functional groups plankton, benthos and nekton. Datasets also include 22,190 abiotic records. The dDatabase is published in the Global Biodiversity Information Facility (GBIF) repository (see Data availability in Sect 3). The present compendium represents one of the most comprehensive and longest datasets from primary producers to top predators in an estuarine-coastal system in South America and their availability will be an important contribution to the understanding and predictability of estuarine dynamics around the world.

1 Introduction

Coastal and marine biodiversity are facing an unprecedented worldwide threat from climate change, pollution, overfishing, habitat destruction, and invasive species (Lotze et al., 2006; Christian and Mazzilli, 2007; Halpern et al., 2008; Kennish and Paerl, 2010; Doney and Schimel, 2015) impairing the ecosystem functions and the delivery of goods and services to society. The comprehension of most of those threats requires knowledge of the long-term variability of both biological and environmental variables, which are the baseline for ecological studies and for the detection of early warning signals of natural and anthropogenic impacts and the modeling of predictive scenarios (Vihervaara et at., 2013; Muelbert et al., 2019). The establishment and maintenance of ecological observations of coastal ecosystems are crucial to support scientists and stakeholders with the necessary information to quantify environmental changes and their impact on the biodiversity and the sustainable use of the seas and coasts (Muelbert et al., 2019). That information is crucial to implement conservation and sustainable development targets (e.g. evaluating progress toward Aichi Targets of the Convention on Biological

Diversity (CBD) (Dreujou et al., 2020) and several of the U.N. Sustainable Development Goals), and to enable global assessments such as those by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) and the UN World Ocean Assessment (Duffy et al., 2013).

Our current understanding of marine ecosystem responses to human activities is limited by the availability of data, particularly long-term series of physical, chemical, and biological conditions (Carstensen, 2014). Despite the important global initiatives (e.g. International Long-Term Ecological Research - ILTER) long-term, integrated, ecosystem-level monitoring efforts are still scarce for most coastal and marine ecosystems (Kennish and Paerl, 2010; Duffy et al., 2013; Vihervaara et at., 2013; Muelbert et al., 2019), particularly in the Southern Hemisphere (Odebrecht et al., 2017). The scarcity of time seriestemporal data series from coastal ecosystems hampers the assessment of the impacts and undermines our ability to respond effectively to these threats (Turra and Denadai, 2016).

Estuaries and nearshore coastal regions are some of the most productive ecosystems on earth (McLusky and Elliott, 2004), yet among the most affected by human activities and climate changes (Ruiz et al., 2000). In southern Brazil, the Patos Lagoon Estuary and adjacent marine coast (PLEA) have been long recognized (Von Ihering, 1885) by their high biological productivity, together with human interference (Odebrecht et al., 2017). Considered the largest choked lagoon in the world (Kjerfve, 1986), the Patos Lagoon connects the continental waters to the western South Atlantic Ocean and performs a critical role on the regional economy (Seeliger, 2001). The favorable natural conditions and strategic position led to the development of local and regional economic activities associated with artisanal and industrial fisheries (Kalikoski and Vasconcellos, 2012; Haimovici et al., 2014; Haimovici and Cardoso, 2017), port activities, industry and tourism (Newton et al., 2018).

The PLEA has been a Site of the Brazilian Long-Term Ecological Research Program (LTER) since 1998, although oceanographic and ecological studies started in the 1970s (Odebrecht et al., 2017). The LTER-PLEA (PELD-ELPA, in Portuguese) is a well-established and consolidated monitoring program, producing amongst the longest datasets on estuarine/marine biota and abiotic parameters in the South Hemisphere (Odebrecht et al., 2010; 2017). Together with other ILTER coastal and marine sites (about 120 around the globe) (Muelbert et al., 2019), LTER-PLEA has a great potential to contribute to global coastal and ocean observation.

The LTER-PLEA contributes with information about the biota composition, distribution, and abundance at seasonal, interannual and decadal time scales, providing the basis to understand the estuarine ecological processes and their driving forces. Many studies have demonstrated how the variability in climate and hydrology influences the ecology of estuarine and marine biodiversity and production (Seeliger and Odebrecht, 2010; Odebrecht et al., 2010; 2017). PLEA is affected by large-scale and remote phenomena, the most important being the El Niño Southern Oscillation (ENSO), which strongly influences southern South America precipitation and fluvial discharge discharge (Robertson and Mechoso, 1997; Grimm et al., 1998). The interactions among climate and hydrology directly affect the dynamics of plankton (Muxagata et al., 2012; Haraguchi et al., 2015; Odebrecht et al., 2015; Abreu et al., 2016; Teixeira-Amaral et al., 2017; Salvador and Muelbert, 2019), macroalgae, seagrasses, benthic invertebrates (Colling et al., 2010; Lanari and Copertino, 2017; Lanari et al., 2018) and fish (Garcia et al., 2001; 2003; Vieira et al., 2010; Moraes et al., 2012; Garcia et al., 2017), with implications for species conservation (Costa et al., 2016), including fishing resources (Castello and

Möller, 1978; Odebrech and Castello, 2001; Vieira et al., 2008). Impacts of human activities such as overfishing and dredging, combined with the ENSO, have the potential to affect biodiversityto result in changes in biodiversity and ecological functions. Therefore, the PLEA is an ideal environment to test hypotheses about changes in biodiversity and their functioning at several temporal scales.

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Here, we describe a database comprising biological parameters within plankton, benthos, and nekton communities, from primary producers to top predators, and associated water physical-chemical parameters. The compendium represents one of the most robust and longest databases of biological diversity in an estuarine-coastal system of South America. The dataset is the framework for understanding the structure and functioning of PLEA and can be an important tool for environmental management and decision-making. Furthermore, the data provide information for the modeling of predictive scenarios of climate changes impacts, which are fundamental for local adaptation and mitigation strategies, but also to a better understanding of coastal environments dynamics and functioning.

2 Data and methodology

2.1 Geographical coverage

The Patos Lagoon Estuary is part of the Patos-Mirim Lagoon system located in the subtropical coastal plain of southern Brazil (Fig. 1). The geographical coverage of the dataset ranges from 32°10'12" S to 31°57'36" S Latitude latitude and from 52°15'36" W to 52°0'36" W Longitudelongitude. The estuarine region (~10,360 km^2) consists mainly of shallow areas (i.e., 75 % of the total area is < 2 m), except for natural channels (3–5 m deep) and the main navigation channel (~ 14 m deep). The estuary receives freshwater from a 200,000 km^2 drainage basin and is under the influence of a microtidal regime (~ 0.47 m) strongly attenuated by the single and narrow entrance channel (0.5 to 3 km wide). Hydrology is driven mainly by fluvial discharge and wind patterns and on an annual basis, the estuary can be river dominated, display a salt wedge, become partially mixed or even a well mixed system (Möller et al., 2001). Marine and euhaline conditions occur in summer/autumn whereas oligohaline conditions in general prevail in winter/spring (Möller et al., 2001).

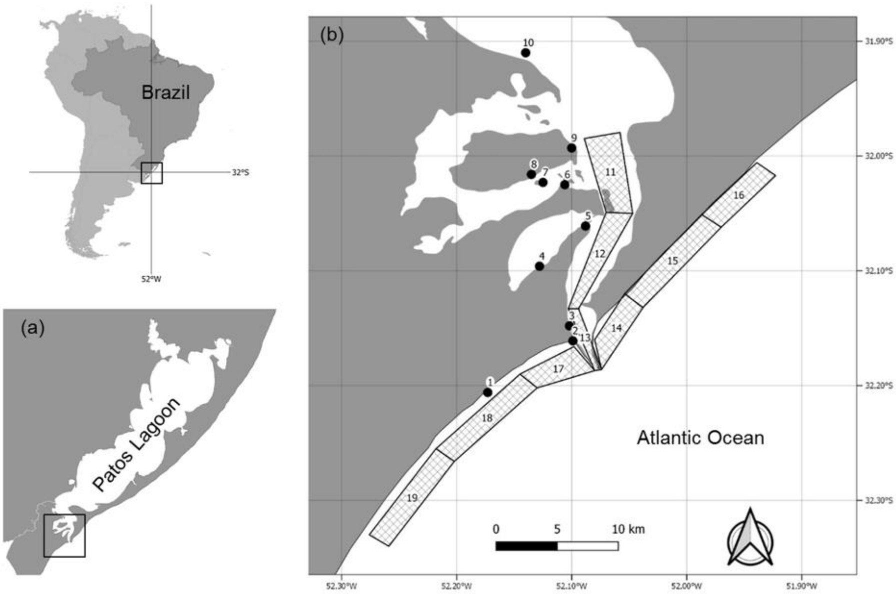

Figure 1: Study area. (a) Patos Lagoon, South of Brazil. (b) Map of the sampling points in the Patos Lagoon estuary and adjacent marine coast (PLEA) for the LTER-PLEA´s datasets samplings. The sampling points are described in Table 1.

Interannual variability in hydrological patterns is largely associated with ENSO remote effects on regional precipitation, with anomalous high/low freshwater run-off occurring during El Niño/La Niña years, respectively (Odebrecht et al., 2010). Overall, high levels of nutrients in the water column (up to 40 µM $NO_2^-+NO_3^-$, 40 µM NH_4^+ and 8.7 µM PO_4^{3-}) and sediment (up to 710.7 µM NH_4^+ and 14.6 µM PO_4^{3-}) are maintained through inputs from the watershed, macrophytes and anthropogenic sources (Baumgarten and Niencheski, 2010; Odebrecht et al., 2010).

2.2 Data description

The data described is a product of the Brazilian Long-Term Ecological Research Program in the Patos Lagoon estuary and adjacent marine coast - LTER-PLEA established in 1998. The program aims to investigate the main natural and anthropic impacts on biotic and abiotic components of this ecosystem. Distinct areas of the PLEA have been monitored generating a core set of measurements repeated over time across spatial gradients (Fig. 1, Table 1). Eight datasets, covering the biota (phyto-, zoo-, and ichthyoplankton, benthic macrofauna, seagrasses, macroalgae, pink shrimp, fishes and marine mammals - dolphins) and associated physical and chemical water parameters (salinity, temperature, transparency, chlorophyll *a*, inorganic dissolved nutrients, and seston) was obtained by several research groups and laboratories that systematically and almost simultaneously monitor the ~~estuary~~ PLEA (Fig. 2a) at different temporal scales (daily, monthly, and seasonal) (Table 2). Some datasets include sampling since 1993, prior to the start of the LTER-PLEA (Fig. 2a).

Table 1. Geographic locations at sampling stations of the Brazilian Long Term Ecological Research in the Patos Lagoon estuary and adjacent marine coast - LTER-PLEA.

Station number	Location	Latitude	Longitude	Dataset
1	Beach station / Cassino beach / EMA	-32.206	-52.173	I, II, III,VI and VII
2	Molhes	-32.161	-52.099	III,VI and VII
3	Bar station / Channel / Prainha	-32.148	-52.102	I, II, III,VI and VII
4	Mangueira	-32.096	-52.128	III,VI and VII
5	Franceses	-32.061	-52.088	III,VI and VII
6	Museum station / Inner estuary	-32.025	-52.106	I and II
7	Pombas / Ponto 1	-32.023	-52.125	IV and V
8	Porto Rei	-32.016	-52.135	III,VI and VII
9	Marambaia	-31.993	-52.100	III,VI and VII
10	Torotama	-31.91	-52.14	VI and VII
11	E3. Inner estuary	POLYGON (-31.981 -52.071 -32.05 -52.047, -31.977 -52.054 -32.049 -52.070, -31.981 -52.071 -32.049 -52.070, -31.977 -52.054 -32.05 -52.047)		VIII
12	E2. Medium estuary	POLYGON (-32.049 -52.070 -32.133 -52.094, -32.05 -52.047 -32.133 -52.103, -32.049 -52.070 -32.133 -52.103, -32.05 -52.047 -32.133 -52.094)		VIII
13	E1. Mouth of estuary	POLYGON (-32.133 -52.103 -32.186 -52.074, -32.133 -52.094 -32.187 -52.080, -32.133 -52.103 -32.187 -52.080, -32.133 -52.094 -32.186 -52.074)		VIII
14	N1. Adjacency north	POLYGON (-32.160 -52.080 -32.132 -52.038, -32.186 -52.074 -32.12 -52.054, -32.160 -52.080 -32.12 -52.054, -32.186 -52.074 -32.132 -52.038)		VIII
15	N2. Medium north	POLYGON (-32.12 -52.054 -32.062 -51.970, -32.132 -52.038 -32.051 -51.987, -32.12 -52.054 -32.051 -51.987, -32.132 -52.038 -32.062 -51.970)		VIII
16	N3. Further north	POLYGON (-32.051 -51.987 -31.995 -51.899, -32.062 -51.970 -31.983 -51.915, -32.051 -51.987 -31.983 -51.915, -32.062 -51.970 -31.995 -51.899)		VIII
17	S1. Adjacency south	POLYGON (-32.166 -52.098 -32.202 -52.130, -32.187 -52.080 -32.19 -52.145, -32.166 -52.098 -32.19 -52.145, -32.187 -52.080 -32.202 -52.130)		VIII
18	S2. Medium south	POLYGON (-32.19 -52.145 -32.266 -52.202, -32.202 -52.130 -32.255 -52.218, -32.19 -52.145 -32.255 -52.218, -32.202 -52.130 -32.266 -52.202)		VIII
19	S3. Further south	POLYGON (-32.255 -52.218 -32.340-52.259, -32.266 -52.202 -32.330 -52.276, -32.255 -52.218 -32.330 -52.276, -32.266 -52.202 -32.340 -52.259)		VIII

Datasets: I. Phytoplankton and water quality parameters in the Patos Lagoon estuary and adjacent marine coast; II. Continuous monitoring of the micro and mesozooplankton of the Patos Lagoon estuary and adjacent coastal area; III. Interannual variability of ichthyoplankton diversity in the Patos Lagoon estuary Southern Brazil; IV. Dynamics of submerged aquatic vegetation in the Patos Lagoon estuary; V. Temporal data series of Benthic macrofauna abundance and composition from the Patos Lagoon estuary; VI. Ecology of the pink-shrimp *Penaeus paulensis* in Patos Lagoon estuary; VII. Species composition and abundance patterns of fish assemblages at shallow waters of Patos Lagoon estuary; VIII. Ecology of Lahille's bottlenose dolphin *Tursiops truncatus gephyreus* in the Patos Lagoon estuary and adjacent marine coast. WGS84 Geodetic Datum.

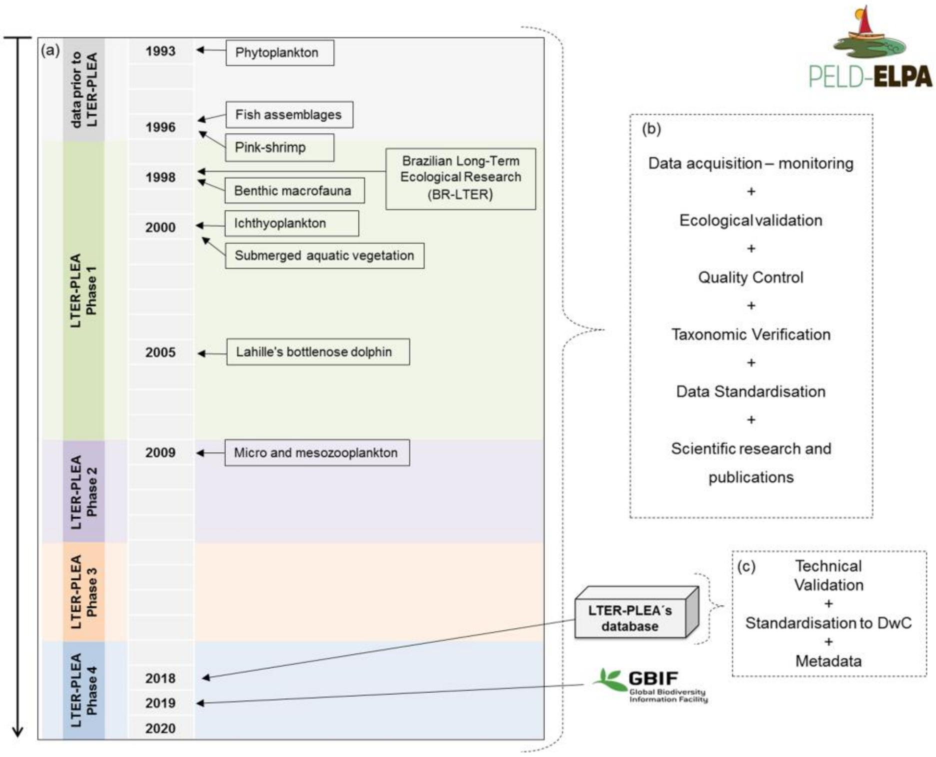

Figure 2: Stages of the LTER-PLEA's database life cycle: from data collection to integration in GBIF. (a) LTER-PLEA timeline, (b) Quality Assurance and Control process, (c) Technical validation process, formatting and registration of the LTER-PLEA's database in Global Biodiversity Information Facility (GBIF).

Table 2. Temporal coverage of the LTER-PLEA´s datasets.

DataSet	Biotic components	Temporal Coverage	Sampling frequency
I	Phytoplankton	January, 1993 to December, 2016	Monthly
II	Micro and mesozooplankton	April, 2009 to December, 2016	Monthly
III	Ichthyoplankton	October, 2000 to December, 2016	Monthly
IV	Submerged Aquatic Vegetation	January, 2000 to May, 2016	Monthly
V	Benthic macrofauna	March, 1998 to August, 2016	Semiannually
VI	Pink-shrimp *Penaeus paulensis*	October, 1996 to December, 2016	Monthly
VII	Fish	August, 1996 to December, 2016	Monthly
VIII	Lahille's bottlenose dolphin *Tursiops truncatus gephyreus*	August, 2005 to December, 2016	Weekly

Datasets: I. Phytoplankton and water quality parameters in the Patos Lagoon estuary and adjacent marine coast; II. Continuous monitoring of the micro and mesozooplankton of the Patos Lagoon estuary and adjacent coastal area; III. Interannual variability of ichthyoplankton diversity in the Patos Lagoon estuary Southern Brazil; IV. Dynamics of submerged aquatic vegetation in the Patos Lagoon estuary; V. Temporal data series of Benthic macrofauna abundance and composition from the Patos Lagoon estuary; VI. Ecology of the pink-shrimp *Penaeus paulensis* in Patos Lagoon estuary; VII. Species composition and abundance patterns of fish assemblages at shallow waters of Patos Lagoon estuary; VIII. Ecology of Lahille's bottlenose dolphin *Tursiops truncatus gephyreus* in the Patos Lagoon estuary and adjacent marine coast.

2.3 Data sources and sampling protocol

The eight datasets was based on the use of distinct sampling strategies and methods, according to the goals and specific characteristics of the biotic and abiotic components investigated. Consistency in data collection was continually emphasized, and was assisted by continued participation of the same researchers over the time period.

2.3.1 Phytoplankton (Dataset - I)

Sampling description: Phytoplankton was sampled monthly at two stations located in the ~~estuary of the Patos Lagoon and one at Cassino Beach~~PLEA (Fig. 1, Table 1). Phytoplankton for qualitative analysis was sampled by horizontal tows using a 20 µm-mesh size plankton net and stored in glass bottles fixed with fomaldehyde (4 %) neutralized with hexamethylentetramine. For phytoplankton quantitative (cells counting) analysis, surface water samples were stored in ambar glass bottles and fixed with lugol's solution (2 %). Phytoplankton composition and abundance were obtained using the classical Utermöhl sedimentation method and described elsewhere (Odebrecht et al., 2010; Haraguchi et al., 2015). Six persons (graduate students, technician, researcher) counted phytoplankton over the whole study period using the same procedure, i.e., screening of half (density of predominant species > 100 units) or the entire sedimentation chamber for organisms larger than 50 µm under low magnification (100 x) using an optical microscope (Inverted microscope Zeiss). Smaller organisms were counted according to the cell density, under magnification of 200 x and/or 400 x, in strips or at least 30 fields.

The routine identification of phytoplankton morpho-species was conducted under optical microscopy (inverted and transmitted light, Zeiss) and followed classical literature (Balech, 1988; Tomas, 1993;

1996; Hoppenrath et al., 2009) and specific taxonomic articles. Electron microscopy was used for the identification of some species, e.g. *Skeletonema* (Bergesch et al., 2009), *Pseudo-nitzschia* (Hagström et al., 2011). *Thalassiosira*, however, was identified and counted to genus level due to identification difficulties using the optical microscope (Garcia and Odebrecht, 2009). Other difficulties to identify species were grouped at higher taxonomic levels (i.e., centric and pennate diatoms, armored or unarmoured gymnodinioid dinoflagellates). Also, small flagellates (< 20 µm) and coccoid cells were grouped and counted in size classes. Molecular biology tools were applied to species of *Asterionellopsis* (Franco et al., 2016) and *Pseudo-nitzschia* (Hagström et al., 2011). Non-identifiable or damaged specimens associated with the phytoplankton sample, were annotated as NA (not available). The autotrophic ciliate *Mesodinium* was included in the present dataset.

The physical water parameters were obtained in situ: temperature (mercury thermometer), salinity (optical refractometer or conductivity meter Yellow Spring, mod. 33 SCT) and water transparency (Secchi disk). Surface water samples were obtained using a bucket, stored in plastic bottles and maintained in dark~~,~~ for the analysis of dissolved inorganic nutrients and chlorophyll *a* (Abreu et al., 2010; 2016). In the laboratory, 50–100 mL water aliquots were filtered (Whatman GF/F glass fibre filters) and frozen (- 40° C) for the analysis of dissolved inorganic silicate, phosphate and nitrite + nitrate, while ammonium and chlorophyll *a* (material retained on the filters) analysis were conducted right away. The concentration of the former nutrients was measured according to the methods described by Strickland and Parsons (Strickland and Parsons, 1972), and that of ammonium followed the method of UNESCO (1983). For the chlorophyll *a* concentration analysis, pigments were extracted (acetone solution 90 % v/v) in the dark and cold for 24 h, and measured using a calibrated Turner Design fluorometer with correction for degradation products (Strickland and Parsons, 1972; Welschmeyer, 1994).

Quality Assurance and Control (QA/QC): Same researchers and methods were employed since the beginning of the study period. Thus, methodology influence is minimal. People involved in sampling activities and technical assistance for nutrient analysis and of phytoplankton counting changed during the years (six persons), but always under supervision of the same responsible researchers. However, each change of personnel responsible for the determination in cells abundance occurred after training and under the supervision of a senior researcher in this area. When technical assistance changed, duplicated analyses were carried on for quality control that guaranteed the high quality of the data along all project. ~~Technical assistance for sampling and nutrient analysis changed during the years, and of phytoplankton counting (six persons), but always under supervision of the same responsible researchers. However, every time a new methodology was applied, duplicated analyses were carried on with the old and new methods in order to determine the error levels of measurements.~~ The species nomenclature was updated following the evolution of taxonomic and systematic new studies.

2.3.2 Micro and mesozooplankton (Dataset - II)

Sampling description: Zooplankton samples were collected monthly at three stations located in the PLEA ~~estuary of the Patos Lagoon and Cassino Beach~~ (Fig. 1, Table 1). Zooplankton samples at the estuary were collected from sub-superficial horizontal tows of ~ 3 min using mini bongo frames of 30

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cm of diameter fitted with 200 and 90 µm-meshes with calibrated Hydro-Bios flowmeters attached to the mouth of each net were used. For adjacent marine coast (Cassino Beach), were used a conventional 30 cm diameter frame fitted with a 200 µm-mesh and a calibrated TSK flowmeter. All samples were immediately preserved in a 4 % borax buffered formaldehyde solution (Steedman, 1976) until processing.

All zooplankton organisms present on subsamples of 1.25 to 50 % of the 200 µm-mesh samples, were counted on a stereoscopic microscope and identified to the lowest taxonomic level possible. All results are expressed in numbers of organisms.m^{-3}. Copepod species were identified according to Rose (1933), Björnberg (1981) and Bradford-Grieve (1999), barnacle nauplii according to Lang (1979; 1980), and the remaining species and/or groups using specific references on Boltovskoy (1981; 1999). Non-identifiable or damaged specimens were recorded as NA (not available).

On each station water samples of 20 to 100 mL were collected and filtered through 2.5 cm glass microfiber filters (Whatman GF/F) using a syringe with a filter holder attachment (Swinnex). Each filter paper was then folded in half, wrapped in foil and frozen until processing. Chlorophyll a was extracted with 90 % acetone and readings were made on a calibrated Turner Designs Fluorometer (TD 700) according to Welschmeyer (1994). Temperature and salinity were also measured on each station using a thermosalinometer (Hanna HI 9828), refractometers and a mercury thermometer depending on availability.

Quality Assurance and Control (QA/QC): All samples were collected under the supervision of planktologists or graduate students of the zooplankton laboratory, and the taxonomic quality of the data was checked before uploading to the database.

2.3.3 Ichthyoplankton (Dataset - III)

Sampling description: Ichthyoplankton samples were collected monthly at seven stations located in the PLEA estuarine margins of the Patos Lagoon and adjacent marine coast of Cassino Beach (Fig. 1, Table 1). Sampling of fish eggs and larvae was made with a 50 cm diameter 300 µm-mesh conical net equipped with a flowmeter. The net was manually hauled on the beach area by two people during two minutes at the seven stations. In the laboratory, samples were concentrated in 300 ml jars and all fish eggs and larvae were sorted from the remainder zooplankton. All the collected material was preserved in formaldehyde 4 %.

In the laboratory, the material was screened and identified. Fish eggs and larvae were identified to the lowest taxonomic level possible according to Weiss (1981), Fahay (1983), Moser (1996), Olivar et al. (1999) and Richards (2005). Non-identifiable or damaged specimens were recorded as NA (not available). Total abundance was recorded by taxa as an absolute number and standardized to a volume of 100 m^3.

Temperature and salinity were registered with a YSI Thermosalinometer with precision of 0.01° C and of 0.01 salinity units.

Quality Assurance and Control (QA/QC): Sampling and laboratory procedure was were conducted under the same supervision and with the same standardized technique during this period. Taxonomic determination ~~was~~ were done by the same qualified technical expert for the entire period so far. Data ~~was~~ were double checked for typing errors and inadequate values.

2.3.4 Submerged aquatic vegetation (Dataset - IV)

Sampling description: The submerged aquatic vegetation (SAV) was monitored monthly ~~monitored~~ in a shallow area historically occupied by *Ruppia maritima* meadows and drift green macroalgae, at an inner and protected shoal within the mesomixohaline region of Patos Lagoon Estuary (Fig. 1, Table 1). The sampling design aimed to cover the center of the meadow and their ending limits, covering approximately 1500 m^2. The meadow was surveyed across a 500 m fixed transect parallel to the coast and distant 500 m of Pombas Island. The permanent transect was marked by six fixed wooden posts' ~~wooden~~, buried two-three meters into the sediment. Surrounding each fixed post, the percentage cover of rooted plants and macroalgae were quantified within randomized 25 x 25 cm quadrats (N=3). Within each quadrat, the plant biomass was sampled by using cylindrical cores, buried into the sediment (ø 10 cm, 15 cm depth) (N=3 per plot; total N=18). The samples previously washed in the field with the help of sieves, were packed and transported to the laboratory with ice.

In the laboratory, the biomass samples were washed and cleaned from sediments, debris, and associated fauna. The plant biomass was split into functional groups: rooted plants, macroalgae and epiphyte algae. The rooted plants were divided into belowground and aboveground fractions. Plant development and phenology was recorded. Epiphyte algae were removed, by scraping the leaves with a surgical blade. Demographic parameters were obtained for the rooted plants such as: hast length, leaf length, number of shoots, total rhizome length, number of nodes along the rhizome. The dry weight (48 h at 60° C) was obtained for each functional group and rooted plant compartments (belowground and aboveground).

Quality Assurance and Control (QA/QC): Samples were always collected by researchers or trained students. Soon after sample trial and parameters measures, data ~~was~~ were compiled and basic statistics (average, standard deviations) were ~~applied~~calculated. Data were visualized and analyzed by graphical exploration approaches for detecting anomalies and errors. In addition, new data were always checked against historical data for comparison and identification of patterns.

Technical information: With the drastic reduction in seagrasses abundance, detected in Patos Lagoon and across the Brazilian coast (Copertino et al., 2016), the methodology was re-evaluated to integrate a national network approach. Therefore, this particular SAV data set was discontinued in 2016 and a new field protocol was initiated according to the Benthic Monitoring Network (known as ReBentos protocol in Brazil) (Copertino et al., 2015). The ReBentos protocol includes surveys and observations in three sites within Patos Lagoon estuary, exposed to different environmental conditions (salinity, transparency, nutrient input, anthropogenic impacts). In addition to percentage cover, biomass and demographic parameters recorded across three transects (in each site), the ReBentos protocol includes information about sediment and water parameters, and seagrass meadow area.

2.3.5 Benthic macrofauna (Dataset - V)

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Sampling description: The Benthic macrofauna samples were collected at four stations located in the estuary of the Patos Lagoon (Fig. 1, Table 1). Data have been acquired twice a year, comprising winter (August) and summer (March) samplings. The samples were taken with a 10 cm diameter PVC corer (0.0078 m^2) buried 20 cm into the substrate and sieved through a 300 µm-mesh (Gray and Elliott, 2009). All collected material was fixed in formaldehyde 4 % and preserved in ethanol (70 %).

The macrofauna specimens were identified to the lowest taxonomic level (Amaral and Nonato, 1996; Buckup and Bond-Buckup, 1999; Rios, 2009) and quantified with the aid of stereomicroscopes (40 x) in the ~~Laboratory~~laboratory. The abundance data for each point represent the number of organisms for each species collected by the PVC corer.

Quality Assurance and Control (QA/QC): Sampling was done by qualified technical experts continuously trained to use the same techniques and methods. The quality of data was checked monthly before the uploading ~~in the data bank~~to the database. Data ~~is~~ were checked for typing errors under supervision of experienced researchers.

2.3.6 Pink-shrimp *Penaeus paulensis* (Dataset - VI)

Sampling description: The pink-shrimp samples were collected monthly at eight stations (Fig. 1, Table 1) located in the ~~estuary of the Patos Lagoon and Cassino Beach~~PLEA with five replicates each. The gear used to obtain biological samples was a beach seine (9 m in length, 13 mm (adjacent knots) and 5 mm in the center), an active net designed to operate in shallow regions (average depth lower than 1.5 m). The pink-shrimp samples were preserved in 10 % formalin and later identified in the laboratory according to Buckup and Bond-Buckup (1999).

~~The w~~Water temperature (mercury thermometer), salinity (refractometer) and transparency (Secchi disk) data were collected at each sampling ~~station~~occasion.

Quality Assurance and Control (QA/QC): Researchers and the classical methods were the same employed since the beginning of the time series. Thus, the methodology influence is minimal. Sampling was always performed under supervision of experienced researchers.

2.3.7 Fish assemblages (Dataset - VII)

Sampling description: The ichthyofauna samples were collected monthly at eight stations located in the ~~estuary of the Patos Lagoon and the adjacent marine coast (Cassino Beach)~~PLEA (Fig. 1, Table 1). Fishes were sampled using a 9 m beach seine (13 mm bar mesh in the wings and 0.5 mm mesh adjacent knots in the 3 m center section) that was pulled to cover an area of about 60 m^2 during each haul. Five hauls were made monthly (usually in the first week of each month) at each sampling station. After sampling, fishes were euthanized using Eugenol (CONCEA, 2013) and stored in plastic bags with 10 % formalin. In the laboratory, fishes were transferred to 70 % alcohol. Fishes were then identified to the lowest taxonomic level possible according to specialized literature, such as Figueiredo (1977), Menezes and Figueiredo (1980; 1985), Figueiredo and Menezes (1978; 1980; 2000), Fischer et al. (2004), and Fishbase (Froese and Pauly, 2019).

Concomitant with fish sampling, the water temperature (mercury thermometer), salinity (refractometer) and transparency (Secchi disk) data were collected at each station. The datasets VI and VII are subsets of the same sampling scheme and the associated environmental variables are exactly the same.

Quality Assurance and Control (QA/QC): Principal investigators and fishing gears were the same since the beginning of the time series. Fish sampling in one of the sampling stations (Marambaia) had to be discontinued in 2013 due to physical changes in the site that prevented beach seining. Sampling and species identification methods were consistent across the years of the study and occurred under the supervision of the same principal investigators.

2.3.8 Lahille's bottlenose dolphin *Tursiops truncatus gephyreus* (Dataset - VIII)

Sampling description: The area sampled is 140 km^2 and encompasses the lower portion of the Patos Lagoon estuary (40 km^2) and adjacent marine coast (50 km^2 south and 50 km^2 north of Patos Lagoon estuary in the coastal zone) (Fig. 1, Table 1).

Distribution patterns and habitat use: All field work was carried out onboard a 5.6 m-long inflatable boat equipped with a 90 hp outboard engine, VHF radio, echo sounder and GPS. Boat-based surveys were conducted year-round on the core area of Patos Lagoon estuary dolphin community. Surveys in estuarine waters were conducted following predefined zigzag transects whereas in the adjacent marine coast either zigzag or parallel-to-shore transects up to 20 km north and south of the estuary mouth were run, depending on the sea conditions and objective of the sampling occasion. This variation, however, does not interfere in the nature and quality of data inserted in the database. Surveys ~~were~~ was halted when the sea state (Beaufort scale) were > 3. Transects were run at speeds between 18 and 22 km/h. Two observers positioned in the bow searched for dolphins visually. Whenever a dolphin group was sighted, the survey route was abandoned to approach the animals for photo-identification, for skin/blubber biopsy sampling and to obtain data of group size and composition, sighting depth and geographical position. After a sufficient number of good-quality digital photographs of the dorsal fins of presumably all animals were taken, the survey was resumed.

Quality Assurance and Control (QA/QC): Principal investigators and major sampling protocols remained the same since the beginning of the study. Adaptations to sampling procedures were eventually made for specific research questions but do not interfere in the content and quality of the dataset presented in this compendium.

2.4 Data management and standardization

LTER-PLEA´s database sharing was performed based on the FAIR principles, which ensures that all data are easily findable, accessible, interoperable and reusable (Wilkinson et al., 2016; Tanhua et al., 2019). Thus, the potential of these data is summarized in: Findable, by the integration and dissemination of data and metadata through Global Biodiversity Information Facility (GBIF; www.gbif.org) with unique and persistent identifiers assigned (Table 3); Accessible, by open and free access to the data and metadata through friendly tools; Interoperable, by standardizing data in an internationally, widely accepted controlled vocabulary and spreadsheets structure; and Reusable: by providing a complete description of the dataset in GBIF metadata sections and in the presented data descriptor. Data management followed the steps below (Fig. 2b and 2c):

1. Data holders supplied their datasets to database manager in digital format (e.g., spreadsheets, csv files);

2. Data were checked by the researchers responsible for data and by the data manager for automatic and manual corrections (see Quality Assurance and Control in Section 2.3 for more details) section for more details);

3. Datasets were formatted according to the Darwin Core (DwC) standard (TDWG, 2015) and the OBIS-ENV-DATA format (De Pooter et al., 2017);

4. Technical validation process (Taxonomic and Structural validation);

5. The metadata were described and verified by the responsible researchers;

6. The resulting database was published in the GBIF platform through the Integrated Publishing Toolkit (IPT) provided by the Information System on Brazilian Biodiversity (SIBBr; www.sibbr.gov.br), which is the Brazilian node of GBIF.

Table 3. Description of the LTER-PLEA´s datasets.

Dataset	Dataset Name	Description
I	Phytoplankton and water quality parameters in the Patos Lagoon estuary and adjacent marine coast (https://doi.org/10.15468/xmlvxm) (Odebrecht and Abreu, 2020)	The long-term information enabled the evaluation of environmental and phytoplankton variability in the PLEA.
II	Continuous monitoring of the micro and mesozooplankton of the Patos Lagoon estuary and adjacent coastal area (https://doi.org/10.15468/1xkowr) (Muxagata and Teixeira-Amaral, 2020)	The long-term information enabled the monitor seasonal and inter-annual changes in the composition, distribution, abundance and production of zooplanktonic species related to climatic events and antropogenic causes.
III	Interannual variability of ichthyoplankton diversity in the Patos Lagoon estuary Southern Brazil (https://doi.org/10.15468/noeqwa) (Muelbert, 2020)	Fish eggs and larvae were sampled to study temporal variability of the dynamics of recruitment and diversity of ichthyoplankton in the PLEA.
IV	Dynamics of Submerged Aquatic Vegetation in the Patos Lagoon estuary (https://doi.org/10.15468/bjzlnb) (Copertino, 2020)	The annual and interannual variability of the biomass, demographic parameters and composition of submerged aquatic vegetation was analyzed in relation to the regional climate, hydrology and physical chemical parameters obtained by LTER – PLEA.
V	Temporal data series of Benthic macrofauna abundance and composition from the Patos Lagoon estuary (https://doi.org/10.15468/lsoc2v) (Colling and Cavalca Bom, 2020)	Species composition and densities of benthic macrofauna were seasonally recorded in mudflats, aiming to evaluate the relationship between the biota and hydrological scenarios of the Patos Lagoon estuary.
VI	Ecology of the pink-shrimp *Penaeus paulensis* in Patos Lagoon estuary (https://doi.org/10.15468/ovayhc) (Dumont, 2020)	This data provides unique long-term information enabling the evaluation of natural and anthropic impacts in the estuarine and coastal region in southern Brazil, for an intensively exploited fishery resource, such as the pink-shrimp *Penaeus paulensis* .
VII	Species composition and abundance patterns of fish assemblages at shallow waters of Patos Lagoon estuary (https://doi.org/10.15468/kci8zb) (Vieira et al., 2020)	Species composition, size structure, relative abundance and diversity patterns of fish have been monitored in shallow waters (< 2 m) aiming to evaluate the relationship between the biota and hydrological scenarios, climatic events and antropogenic causes.
VIII	Ecology of Lahille's bottlenose dolphin *Tursiops truncatus gephyreus* in the Patos Lagoon estuary and adjacent marine coast (https://doi.org/10.15468/4nh9ng) (Secchi et al., 2020)	*Tursiops truncatus gephyreus* have been systematically and intensively monitored in the PLEA. This long-term surveys allowed estimating on the distribution, abundance, reproductive and survival rates, genetic and social structures, contamination load and detecting temporal and gender-related variation in diet of the Lahille's bottlenose dolphin.

2.5 Datasets structure

All datasets are available as a Darwin Core Archive (DwC-A) and all fields were named compliant with Darwin Core Standard (DwC) (TDWG, 2015). The DwC offers a stable and flexible framework to store all fields available in original data sources. Each dataset is published as a Sampling event data being formatted using a star-scheme based on the OBIS-ENV-DATA format (De Pooter et al., 2017), which includes an Event Core (event sampling data), Occurrence (taxonomic data) and Extended Measurement-or-Fact (environmental variables and taxa abundances) (Fig. 3).

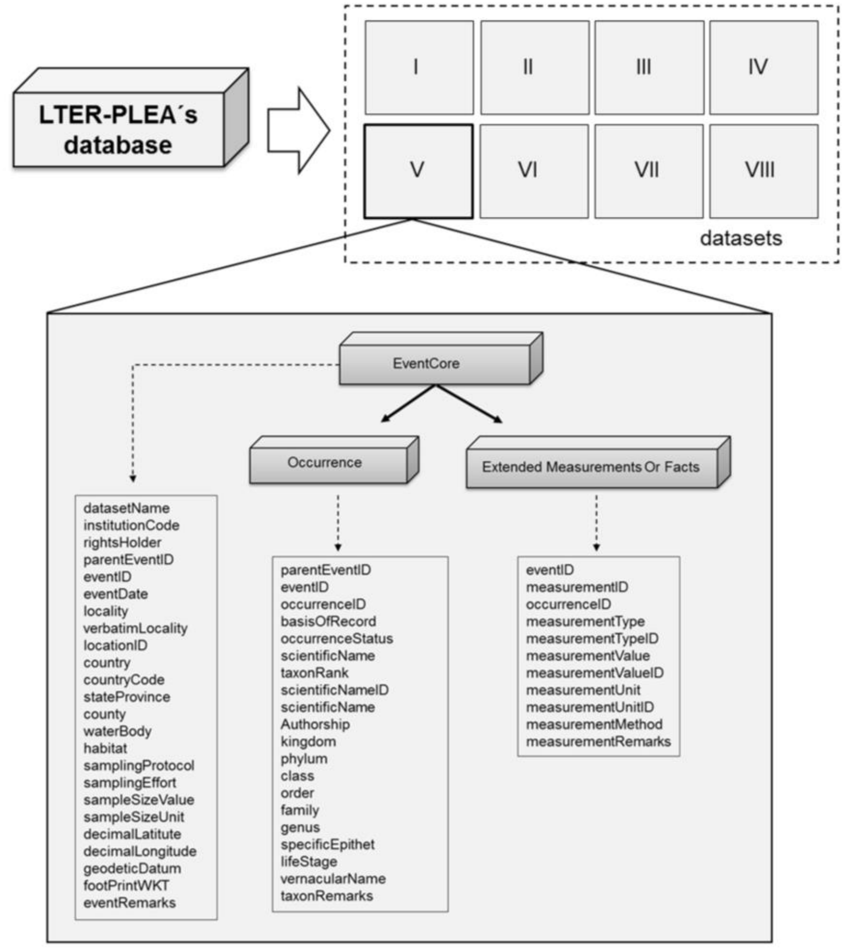

Figure 3: LTER-PLEA´s dataset structure. LTER-PLEA´s dataset structure based on the OBIS-ENV-DATA format. Darwin Core terms (https://dwc.tdwg.org/terms/) used in each extension are described in the boxes. Dataset: I- Phytoplankton and water quality parameters in the Patos Lagoon estuary and adjacent marine coast; II- Continuous monitoring of the micro and mesozooplankton of the Patos Lagoon estuary and adjacent coastal area; III- Interannual variability of ichthyoplankton diversity in the Patos Lagoon estuary Southern Brazil; IV- Dynamics of submerged aquatic vegetation in the Patos Lagoon estuary; V- Temporal data series of benthic macrofauna abundance and composition from the Patos Lagoon estuary; VI- Ecology of the pink-shrimp *Penaeus paulensis* in Patos Lagoon estuary; VII- Species composition and abundance patterns of fish assemblages at shallow waters of Patos Lagoon estuary; VIII- Ecology of Lahille's bottlenose dolphin *Tursiops truncatus gephyreus* in the Patos Lagoon estuary and adjacent marine coast.

Each sampling event formed one row in the Event Core data table and was identified by an eventID code that is an unique identifier of each sampling event (something that occurs at a place and time) (TDWG, 2015) and was built according to the following information: (1) The standard code for the country (Brazil-Br), (2) project name, i.e., the source organization (i.e., in Portuguese: PELD-ELPA), (3) the identifier for the institution having custody of the information referred to in the record

(Universidade Federal de Rio Grande - FURG), (4) locality name (Patos Lagoon), (5) dataset name, (6) year, (7) month and (8) identifier of sampling station.

The LTER-PLEA´s database contains a total of 6,972 sampling event records unequally distributed across the research groups during the monitoring period (Fig. 4). Sampling events encompassed 106,155 taxa occurrences and 22,190 abiotic measurements (Fig. 5) in the Patos Lagoon estuary and adjacent marine coast.

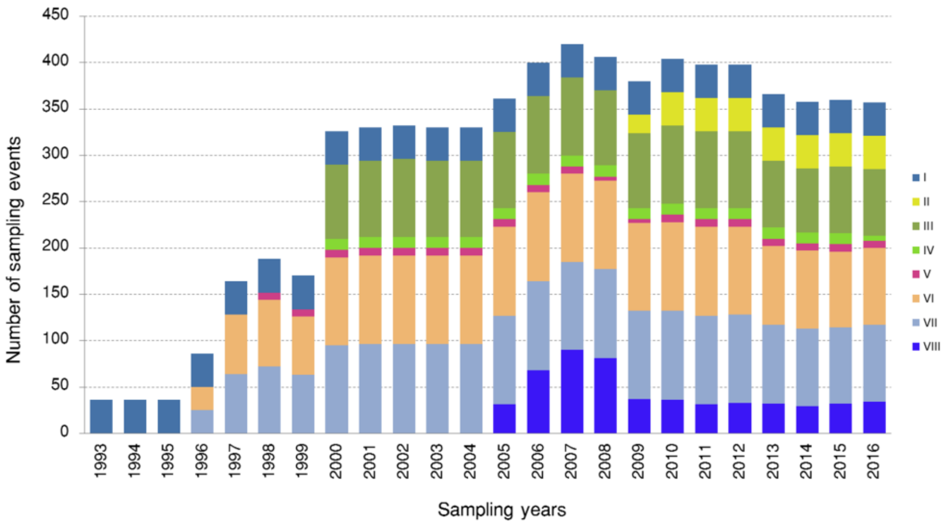

Figure 4: Number of sampling events for dataset (biota monitoring) in the Patos Lagoon estuary and adjacent marine coast from 1993 to 2016. Plot shows the number of sampling events collected at each year, for each dataset. Dataset: I- Phytoplankton and water quality parameters in the Patos Lagoon estuary and adjacent marine coast; II- Continuous monitoring of the micro and mesozooplankton of the Patos Lagoon estuary and adjacent coastal area; III- Interannual variability of ichthyoplankton diversity in the Patos Lagoon estuary Southern Brazil; IV- Dynamics of submerged aquatic vegetation in the Patos Lagoon estuary; V- Temporal data series of benthic macrofauna abundance and composition from the Patos Lagoon estuary; VI- Ecology of the pink-shrimp *Penaeus paulensis* in Patos Lagoon estuary; VII- Species composition and abundance patterns of fish assemblages at shallow waters of Patos Lagoon estuary; VIII- Ecology of Lahille's bottlenose dolphin *Tursiops truncatus gephyreus* in the Patos Lagoon estuary and adjacent marine coast.

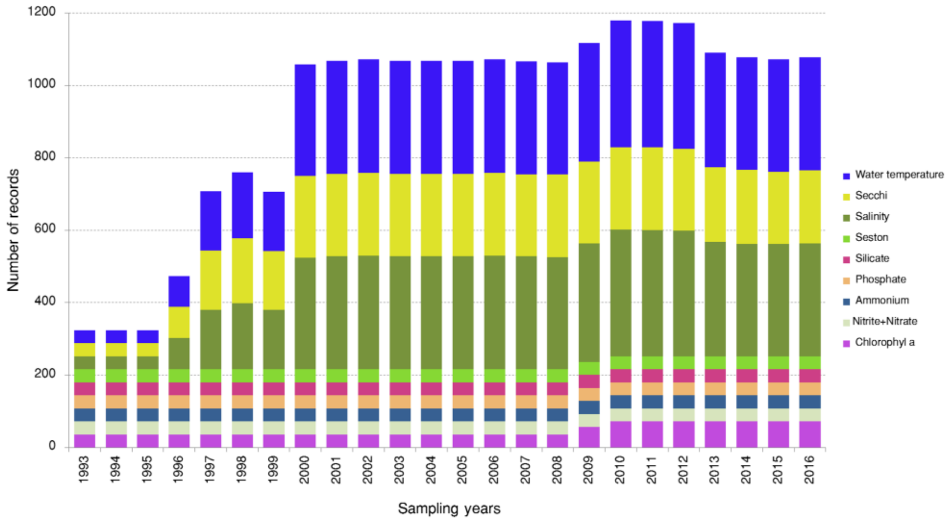

Figure 5: Abiotic records from the LTER-PLEA's database. Sampling events to measure water salinity, water temperature, water transparency, suspended particulate matter, chlorophyll-a, and dissolved inorganic nutrients in Patos Lagoon estuary and adjacent marine coast from 1993 to 2016.

2.6 Taxonomic coverage

General taxonomic coverage description: The eight datasets comprise the description of the occurrence of 21 Phyla, 30 Classes, 78 Orders, 142 Families, 232 Genera and about 275 Species from the five Kingdoms: Bacteria, Protozoa, Chromista, Plantae and Animalia (appendix A).

2.7 Datasets taxonomic coverage:

2.7.1 Phytoplankton (Dataset - I)

Taxonomic ranks: Kingdoms: Bacteria, Chromista, Plantae and Protozoa.

Phyla: Charophyta, Chlorophyta, Ciliophora, Cryptophyta, Cyanobacteria, Euglenozoa, Myzozoa and Ochrophyta.

Class: Bacillariophyceae, Chlorophyceae, Conjugatophyceae, Cryptophyceae, Cyanophyceae, Dictyochophyceae, Dinophyceae, Euglenoidea, Litostomatea, Prasinophyceae, Pyramimonadophyceae, Raphidophyceae, Trebouxiophyceae and Ulvophyceae.

Orders: Aulacoseirales, Bacillariales, Chaetocerotanae incertae sedis, Chattonellales, Chroococcales, Coscinodiscales, Cyclotrichiida, Cymatosirales, Dictyochales, Dinophysiales, Eutreptiida, Fragilariales, Gonyaulacales, Gymnodiniales, Halosphaerales, Hemiaulales, Leptocylindrales, Lithodesmiales, Melosirales, Naviculales, Noctilucales, Nostocales, Oscillatoriales, Paraliales, Peridiniales, Prorocentrales, Rhizosoleniales, Surirellales, Synechococcales, Thalassionematales, Thalassiosirales, Triceratiales and Ulotrichales.

Families: Aphanizomenonaceae, Aphanothecaceae, Aulacoseiraceae, Bacillariaceae, Ceratiaceae, Chaetocerotaceae, Coscinodiscaceae, Cymatosiraceae, Dictyochaceae, Dinophysiaceae, Diploneidaceae, Entomoneidaceae, Eutreptiaceae, Fragilariaceae, Gloeotilaceae, Gonyaulacaceae, Gymnodiniaceae, Hemiaulaceae, Leptocylindraceae, Leptolyngbyaceae, Lithodesmiaceae, Melosiraceae, Merismopediaceae, Mesodiniidae, Microcystaceae, Naviculaceae, Noctilucaceae, Nostocaceae, Paraliaceae, Peridiniaceae, Pleurosigmataceae, Polykrikaceae, Prorocentraceae, Protoperidiniaceae, Pseudanabaenaceae, Pterospermataceae, Rhizosoleniaceae, Skeletonemaceae, Stephanopyxidaceae, Surirellaceae, Thalassionemataceae, Thalassiosiraceae and Triceratiaceae.

Genus: Akashiwo, Alexandrium, Amphidinium, Aphanocapsa, Asterionellopsis, Aulacoseira, Bacillaria, Bacteriastrum, Binuclearia, Campylosira, Cerataulina, Ceratoneis, Chaetoceros, Coscinodiscus, Dactyliosolen, Detonula, Dictyocha, Dinophysis, Diploneis, Ditylum, Entomoneis, Guinardia, Gyrodinium, Gyrosigma, Hemiaulus, Leptocylindrus, Leptolyngbya, Lithodesmium, Melosira, Mesodinium, Meuniera, Microcystis, Neocalyptrella, Nitzschia, Noctiluca, Paralia, Peridinium, Planktolyngbya, Pleurosigma, Polykrikos, Proboscia, Prorocentrum, Protoperidinium, Pseudo-nitzschia, Pseudosolenia, Pterosperma, Raphidiopsis, Rhizosolenia, Scrippsiella, Skeletonema, Stephanopyxis, Surirella, Synedra, Thalassionema, Thalassiosira, Torodinium, Trieres and Tripos.

Subgenus: Chaetoceros (Hyalochaeta) and Chaetoceros (Phaoceros).

Species: *Akashiwo sanguínea*, *Alexandrium fraterculus*, *Asterionellopsis guyunusae*, *Aulacoseira granulata*, *Bacillaria paxillifera*, *Binuclearia lauterbornii*, *Campylosira cymbelliformis*, *Cerataulina bicornis*, *Ceratoneis closterium*, *Chaetoceros subtilis*, *Coscinodiscus wailesii*, *Dactyliosolen fragilissimus*, *Detonula pumila*, *Dictyocha fibula*, *Dinophysis acuminata*, *Dinophysis caudata*, *Ditylum brightwellii*, *Guinardia delicatula*, *Guinardia flaccida*, *Gyrodinium fusus*, *Leptocylindrus danicus*, *Leptocylindrus minimus*, *Melosira moniliformis*, *Meuniera membranacea*, *Neocalyptrella robusta*, *Noctiluca scintillans*, *Paralia sulcata*, *Peridinium quinquecorne*, *Polykrikos schwartzii*, *Prorocentrum compressum*, *Prorocentrum cordatum*, *Prorocentrum micans*, *Prorocentrum scutellum*, *Pseudosolenia calcar-avis*, *Rhizosolenia setigera*, *Scrippsiella trochoidea*, *Skeletonema costatum*, *Skeletonema tropicum*, *Stephanopyxis turris*, *Thalassionema nitzschioides*, *Trieres chinensis*, *Trieres mobiliensis*, *Tripos furca and Tripos muelleri.*

2.7.2 Micro and mesozooplankton (Dataset - II)

Taxonomic ranks: Kingdom Animalia.

Phyla: Annelida, Arthropoda, Chaetognatha, Chordata, Cnidaria, Ctenophora, Echinodermata, Mollusca, Phoronida and Rotifera.

Class: Appendicularia, Bivalvia, Branchiopoda, Gastropoda, Hexanauplia, Hydrozoa, Ichthyostraca, Malacostraca, Ostracoda, Polychaeta, Sagittoidea and Thaliacea.

Orders: Amphipoda, Anomopoda, Aphragmophora, Arguloida, Calanoida, Copelata, Ctenopoda, Cumacea, Cyclopoida, Decapoda, Euphausiacea, Harpacticoida, Isopoda, Mysida, Onychopoda, Salpida, Sessilia, Siphonophorae, Siphonostomatoida and Tanaidacea.

Families: Acartiidae, Balanidae, Bosminidae, Calanidae, Centropagidae, Chydoridae, Clausocalanidae, Corycaeidae, Cyclopidae, Daphniidae, Diaptomidae, Ditrichocorycaeus, Ectinosomatidae, Ergasilidae, Eurycercidae, Heterorhabdidae, Ilyocryptidae, Kalliapseudidae, Lubbockiidae, Luciferidae, Macrothricidae, Miraciidae, Moinidae, Oikopleuridae, Oithonidae, Oncaeidae, Onychocorycaeus, Paracalanidae, Peltidiidae, Podonidae, Pontellidae, Pseudodiaptomidae, Sagittidae, Sapphirinidae, Scolecitrichidae, Sididae, Subeucalanidae, Tachidiidae and Temoridae.

Genus: Acanthocyclops, Acartia, Alona, Amphibalanus, Argyrodiaptomus, Belzebub, Biapertura, Boeckella, Bosmina, Bosminopsis, Calanoides, Calanus, Camptocercus, Centropages, Ceriodaphnia, Chydorus, Clausocalanus, Clytemnestra, Corycaeus, Ctenocalanus, Daphnia, Diaphanosoma, Ephemeroporus, Ergasilus, Eucyclops, Euryalona, Euterpina, Evadne, Flaccisagitta, Halicyclops, Heterorhabdus, Ilyocryptus, Kalliapseudes, Labidocera, Lubbockia, Macrosetella, Macrothrix, Mecynocera, Mesocyclops, Metacyclops, Microsetella, Moina, Nannocalanus, Notoalona, Notodiaptomus, Oikopleura, Oithona, Oncaea, Paracalanus, Parasagitta, Parvocalanus, Penilia, Pleopis, Podon, Pontellopsis, Pseudevadne, Pseudodiaptomus, Pseudosagitta, Pseudosida, Sapphirina, Scolecithrix, Simocephalus, Subeucalanus, Temora and Undinula.

Species: *Acanthocyclops robustus robustos*, *Acartia (Acanthacartia) tonsa*, *Acartia (Odontacartia) lilljeborgi*, *Alona costata*, *Alona monacantha*, *Amphibalanus improvisus*, *Argyrodiaptomus denticulatus*, *Biapertura affinis*, *Boeckella bergi*, *Bosmina (Bosmina) longirostris*, *Bosminopsis deitersi*, *Calanoides carinatus*, *Camptocercus australis*, *Centropages furcatus*, *Ceriodaphnia cornuta*, *Ceriodaphnia dubia*, *Chydorus eurynotus*, *Chydorus parvireticulatus*, *Chydorus sphaericus*, *Clausocalanus furcatus*, *Clausocalanus parapergens*, *Corycaeus speciosus*, *Ctenocalanus citer*, *Ctenocalanus vanus*, *Daphnia (Daphnia) ambigua*, *Diaphanosoma brachyurum*, *Diaphanosoma brevireme*, *Diaphanosoma fluviatile*, *Diaphanosoma spinulosum*, *Ditrichocorycaeus amazonicus*, *Eucyclops ensifer*, *Euryalona orientalis*, *Euterpina acutifrons*, *Evadne nordmanni*, *Flaccisagitta enflata*, *Goniopsyllus rostratus*, *Heterorhabdus papilliger*, *Ilyocryptus spinifer*, *Labidocera fluviatilis*, *Lubbockia squillimana*, *Macrosetella gracilis*, *Macrothrix spinosa*, *Mecynocera clausi*, *Mesocyclops longisetus longisetus*, *Metacyclops mendocinus mendocinus*, *Microsetella norvegica*, *Microsetella rosea*, *Moina micrura*, *Moina minuta*, *Nannocalanus minor*, *Notoalona sculpta*, *Notodiaptomus incompositus*, *Oithona nana*, *Oithona oswaldocruzi*, *Oithona plumifera*, *Oithona similis*, *Oithona simplex*, *Oncaea curvata*, *Oncaea lacinia*, *Oncaea mediterranea*, *Oncaea venusta*, *Oncaea waldemari*, *Onychocorycaeus giesbrechti*, *Paracalanus aculeatus*, *Paracalanus indicus*, *Paracalanus parvus*, *Paracalanus quasimodo*, *Parasagitta tenuis*, *Parvocalanus crassirostris*, *Penilia avirostris*, *Pleopis polyphemoides*, *Pleopis schmackeri*, *Pontellopsis brevis*, *Pseudevadne tergestina*, *Pseudodiaptomus richardi*, *Pseudosagitta lyra*, *Pseudosida bidentata*, *Scolecithrix danae*, *Simocephalus latirostris*, *Simocephalus serrulatus*, *Simocephalus vetulus*, *Subeucalanus pileatus*, *Temora stylifera*, *Temora turbinata* and *Undinula vulgaris.*

2.7.3 Ichthyoplankton (Dataset - III)

Taxonomic ranks: Kingdom Animalia.

Phylum: Chordata.

Class: Actinopterygii.

Orders: Anguilliformes, Atheriniformes, Beloniformes, Characiformes, Clupeiformes, Cyprinodontiformes, Elopiformes, Gobiesociformes, Perciformes, Pleuronectiformes, Siluriformes and Syngnathiformes.

Families: Achiridae, Anablepidae, Atherinidae, Atherinopsidae, Blenniidae, Carangidae, Characidae, Clupeidae, Engraulidae, Gerreidae, Gobiesocidae, Gobiidae, Hemiramphidae, Mugilidae, Paralichthyidae, Pimelodidae, Poeciliidae, Sciaenidae, Stromateidae, Syngnathidae and Trichiuridae.

Genus: Anchoa, Atherinella, Blennius, Brevoortia, Catathyridium, Cynoscion, Engraulis, Eucinostomus, Gobiesox, Gobionellus, Gobiosoma, Hyporhamphus, Jenynsia, Lycengraulis, Macrodon, Menticirrhus, Micropogonias, Mugil, Odontesthes, Paralichthys, Paralonchurus, Parapimelodus, Parona, Peprilus, Poecilia, Ramnogaster, Syngnathus, Trachinotus and Trichiurus.

Species: *Anchoa marinii*, *Brevoortia pectinata*, *Catathyridium garmani*, *Catathyridium jenynsii*, *Engraulis anchoita*, *Eucinostomus gula*, *Eucinostomus melanopterus*, *Gobiesox strumosus*, *Gobionellus oceanicus*, *Gobiosoma parri*, *Hyporhamphus roberti*, *Lycengraulis grossidens*, *Macrodon atricauda*, *Menticirrhus americanus*, *Micropogonias furnieri*, *Mugil curema*, *Mugil liza*, *Paralichthys orbignyanus*, *Paralonchurus brasiliensis*, *Parapimelodus nigribarbis*, *Parona signata*, *Poecilia vivipara*, *Ramnagaster arcuata*, *Syngnathus folletti*, *Trachinotus goodei and Trichiurus lepturus.*

2.7.4 Submerged aquatic vegetation (Dataset - IV)

Taxonomic ranks: Kingdom Plantae.

Subkingdoms: Biliphyta and Viridiplantae.

Division: Chlorophyta, Rhodophyta and Tracheophyta.

Class: Florideophyceae, Magnoliopsida and Ulvophyceae.

Orders: Acrochaetiales, Alismatales, Ceramiales, Cladophorales and Ulvales.

Families: Acrochaetiaceae, Cladophoraceae, Rhodomelaceae, Ruppiaceae and Ulvaceae.

Genus: Acrochaetium, Chaetomorpha, Cladophora, Polysiphonia, Rhizoclonium, Ruppia and Ulva.

Species: *Ruppia maritima* (common name = *widgeon grass)*, *Chaetomorpha antennina*, *Chaetomorpha sp.*, *Cladophora spp.*, *Rhizoclonium riparium*, *Ulva clathrata*, *Ulva compressa*, *Ulva intestinalis*, *Ulva ramulosa* and *Ulva sp*.

2.7.5 Benthic macrofauna (Dataset - V)

Taxonomic ranks: Kingdom Animalia.

Phyla: Annelida, Arthropoda and Mollusca.

Class: Bivalvia, Gastropoda, Malacostraca and Polychaeta.

Orders: Cumacea, Isopoda, Littorinimorpha, Myida, Phyllodocida and Tanaidacea.

Families: Capitellidae, Cochliopidae, Corbulidae, Diastylidae, Hyssuridae, Kalliapseudidae, Munnidae, Nephtyidae, Nereididae, Sphaeromatidae and Tanaididae.

Genus: Alitta, Diastylis, Erodona, Heleobia, Heteromastus, Kupellonura, Laeonereis, Monokalliapseudes, Nephtys, Sinelobus, Sphaeromopsis and Uromunna.

Species: *Alitta succinea*, *Diastylis sympterygiae*, *Erodona mactroides*, *Heleobia australis*, *Heleobia charruana*, *Heteromastus similis*, *Laeonereis culveri*, *Monokalliapseudes schubarti*, *Nephtys fluviatilis*, *Sinelobus stanfordi*, *Sphaeromopsis mourei* and *Uromunna peterseni*.

2.7.6 Pink-shrimp *Penaeus paulensis* (Dataset - VI)

Taxonomic ranks: Kingdom Animalia.

Phylum: Arthropoda.

Class: Malacostraca.

Order: Decapoda.

Family: Penaeidae.

Genus: Penaeus.

Species: *Penaeus paulensis.*

Common name**:** pink-shrimp.

2.7.7 Fish assemblages (Dataset - VII)

Taxonomic ranks: Kingdom Animalia.

Phylum: Chordata.

Class: Actinopterygii.

Orders: Albuliformes, Anguilliformes, Atheriniformes, Batrachoidiformes, Beloniformes, Characiformes, Clupeiformes, Cyprinodontiformes, Elopiformes, Gobiesociformes, Perciformes, Pleuronectiformes, Scorpaeniformes, Siluriformes, Syngnathiformes and Tetraodontiformes.

Families: Achiridae, Albulidae, Anablepidae, Ariidae, Atherinidae, Atherinopsidae, Batrachoididae, Callichthyidae, Carangidae, Characidae, Cichlidae, Clupeidae, Curimatidae, Cynoglossidae, Elopidae, Engraulidae, Erythrinidae, Gerreidae, Gobiesocidae, Gobiidae, Haemulidae, Hemiramphidae, Heptapteridae, Loricariidae, Monacanthidae, Mugilidae, Ophichthidae, Paralichthyidae, Percophidae, Pimelodidae, Pleuronectidae, Poeciliidae, Pomacentridae, Pomatomidae, Sciaenidae, Serranidae, Syngnathidae, Tetraodontidae, Trichiuridae and Triglidae.

Genus: Abudefduf, Albula, Anchoa, Astyanax, Atherinella, Bathygobius, Brevoortia, Bryconamericus, Caranx, Catathyridium, Charax, Cheirodon, Chloroscombrus, Cichlasoma, Citharichthys, Cnesterodon, Corydoras, Crenicichla, Ctenogobius, Cyanocharax, Cynoscion, Cyphocharax, Diapterus, Elops, Engraulis, Epinephelus, Eucinostomus, Genidens, Geophagus, Gobiesox, Gobionellus, Gymnogeophagus, Harengula, Hemiramphus, Hippocampus, Hoplias, Hyphessobrycon, Hyporhamphus, Jenynsia, Lagocephalus, Loricariichthys, Lycengraulis, Macrodon, Macropsobrycon, Menticirrhus, Micropogonias, Mugil, Odontesthes, Oligoplites, Oligosarcus, Oncopterus, Ophichthus, Opisthonema, Orthopristis, Paralichthys, Paralonchurus, Parapimelodus, Percophis, Phalloceros, Phalloptychus, Phalloptychus, Pimelodella, Pimelodus, Platanichthys, Poecilia, Pogonias, Pomadasys, Pomatomus, Porichthys, Prionotus, Ramnogaster, Rhamdia, Sardinella, Selene, Stellifer, Stephanolepis, Symphurus, Syngnathus, Trachinotus, Trichiurus, Ulaema and Umbrina.

Species: *Abudefduf saxatilis, Albula vulpes, Amoya gracilis, Anchoa marinii, Astyanax dissensus, Astyanax eigenmanniorum, Astyanax fasciatus, Astyanax henseli, Astyanax lacustris, Atherinella brasiliensis, Bathygobius soporator, Brevoortia pectinata, Bryconamericus iheringii, Caranx hippos, Caranx latus, Catathyridium garmani, Charax stenopterus, Cheirodon ibicuhiensis, Cheirodon interruptus, Chloroscombrus chrysurus, Cichlasoma portalegrense, Citharichthys spilopterus, Cnesterodon decemmaculatus, Corydoras paleatus, Crenicichla lepidota, Ctenogobius shufeldti, Cyanocharax alburnus, Cynoscion leiarchus, Cynoscion striatus, Cyphocharax saladensis,* *Cyphocharax voga, Diapterus rhombeus, Elops saurus, Engraulis anchoita, Eucinostomus argenteus, Eucinostomus gula, Eucinostomus melanopterus, Genidens barbus, Genidens genidens, Genidens planifrons, Geophagus brasiliensis, Gobiesox strumosus, Gobionellus oceanicus, Gymnogeophagus gymnogenys, Harengula clupeola, Hemiramphus brasiliensis, Hippocampus patagonicus, Hoplias malabaricus, Hyphessobrycon anisitsi, Hyphessobrycon bifasciatus, Hyphessobrycon boulengeri, Hyphessobrycon igneus, Hyphessobrycon luetkenii, Hyphessobrycon meridionalis, Hyphessobrycon reticulatus, Hyphessobrycon togoi, Hyporhamphus unifasciatus, Jenynsia multidentata, Lagocephalus laevigatus, Loricariichthys anus, Lycengraulis grossidens, Macrodon ancylodon, Macrodon atricauda, Macropsobrycon uruguayanae, Menticirrhus americanus, Menticirrhus littoralis, Micropogonias furnieri, Mugil brevirostris, Mugil curema, Mugil liza, Odontesthes argentinensis, Odontesthes bonariensis, Odontesthes perugiae, Oligoplites saliens, Oligoplites saurus, Oligosarcus jenynsii, Oligosarcus robustus, Oncopterus darwinii, Ophichthus gomesii, Opisthonema oglinum, Orthopristis ruber, Paralichthys orbignyanus, Paralonchurus brasiliensis, Parapimelodus nigribarbis, Percophis brasiliensis, Phalloceros caudimaculatus, Phalloptychus eigenmanni, Phalloptychus januarius, Pimelodella australis, Pimelodus maculatus, Platanichthys platana, Poecilia vivipara, Pogonias courbina, Pomadasys corvinaeformis, Pomatomus saltatrix, Porichthys porosissimus, Prionotus punctatus, Ramnogaster arcuata, Rhamdia quelen, Sardinella brasiliensis, Selene setapinnis, Selene vomer, Stellifer brasiliensis, Stellifer rastrifer, Stellifer stellifer, Stephanolepis hispidus, Stephanolepis setifer, Symphurus jenynsi, Syngnathus folletti, Trachinotus carolinus, Trachinotus falcatus, Trachinotus goodei, Trachinotus marginatus, Trichiurus lepturus, Ulaema lefroyi and Umbrina canosai*.

2.7.8 Lahille's bottlenose dolphin *Tursiops truncatus gephyreus* (Dataset - VIII)

Taxonomic ranks: Kingdom Animalia.

Phylum: Chordata.

Class: Mammalia.

Order: Cetartiodactyla.

Family: Delphinidae.

Genus: Tursiops.

Species: *Tursiops truncatus gephyreus*

Common name: Lahille’s bottlenose dolphins.

2.8 Technical validation

All datasets have reliable sampling properties (same sampling methodology over time), have been thoroughly checked, have broad temporal and taxonomic coverage, and are ready-to-use for analyses (accompanied with metadata information). The data management, including data validation process consisted of (i) data acquisition and ecological validation, (ii) taxonomic validation and (iii) structural validation:

(i) All data collection and ecological validation steps were carried out by the researchers responsible for the datasets (see Quality Assurance and Control in Sect 2.3).

(ii) Taxonomic validation: Taxonomic nomenclature control was performed through the taxon match tool of the World Register of Marine Species (WoRMS, 2021), an authoritative and comprehensive list of marine organisms' taxonomy edited and reviewed by an international team of more than 240 taxonomic editors world-wide. Every species has a unique identifier known as Life Sciences Identifier (LSID), a persistent and globally unique. This identifier links the species name to an internationally accepted standardized name and associated taxonomic information, and also redirects to the most accurate information on the species taxonomy, (e.g. accepted names and synonyms).

(iii) Structural validation: Prior to publication, all datasets technical information~~'s~~ has been ~~have been~~ individually reviewed regarding the use of the DwC terms and taxonomic validity during upload in the Integrated Publishing Toolkit (IPT) provided by the SiBBr and subsequent GBIF registration (datasets were validated by the tool Data Validator available from GBIF). The Darwin Core was standardized according to the practices recommended by the TDWG guidelines (https://dwc.tdwg.org/terms/). Sampling dates formatted according to the ISO 8601 standard (i.e., YYYY-MM-DD). All files are available in Unicode (UTF-8) format.

3 Data availability

The LTER-PLEA's database policy follows the best practices of open data principles by releasing validated datasets on primary biodiversity and associated environmental data. The datasets were published in the GBIF repository through the Integrated Publishing Toolkit (IPT) provided by the Brazilian node SiBBr and can be accessed in the GBIF repository (Table 3). This publication refers to the most recent dataset published in the IPT. Monitoring is currently still being carried out and the database will be updated and published every four years. All datasets presented here are identified by unique persistent identifiers such as Digital Object Identifiers (DOIs) and are published under the Creative Commons Attribution-NonCommercial 4.0 International License (CC-BY-NC). Therefore, all datasets must be cited when used in scientific papers, presentations, reports or any other by-product generated by researchers~~;~~ governmental agencies and the general public. Furthermore, is desirable that LTER-PLEA be included in the acknowledgements. When referring to the LTER-PLEA´s database or sampling strategies and methodologies, please cite the present paper. The custodian of all the information collected is the Oceanography Institute of Federal University of Rio Grande.

4 Potential use and Conclusions

LTER-PLEA's is the first publicly available long-term database describing the abundance and composition of several components of planktonic, benthic, and pelagic biota from protists to mammals, associated with environmental data in an estuarine-coastal system of South America. The LTER-PLEA's database has been the basis for several studies that investigate estuarine and coastal dynamics over time and has provided insights on the impacts of major anthropogenic and natural drivers, particularly the remote climate phenomena ENSO, across distinct taxonomic groups and trophic levels (Odebrecht et al., 2010; 2017).

The LTER-PLEA's database enabled the comprehension of the magnitude and drivers of short and long-term changes in the abundance and composition of phytoplankton (Haraguchi et al., 2015), submerged aquatic vegetation (Copertino and Seeliger, 2010; Lanari and Copertino, 2017), benthic macrofauna (Collin et al., 2007; 2010) micro and mesozooplankton assemblages (Muxagata et al., 2012; Teixeira-Amaral et al., 2017), the most relevant ichthyoplankton species (Bruno & Muelbert, 2009; Costa et al., 2013), fish fauna (Garcia et al., 2001; 2003; 2004), pink shrimp and Lahille's bottlenose dolphin population parameters (Fruet et al., 2011; 2015; Genoves et al., 2018; 2020). All this information has enabled the understanding of the dynamics of ichthyoplankton transport and recruitment into the estuary (Franzen et al., 2019) and the influence of environmental dynamics on the health of fish larvae (Gouveia et al., 2015; Salvador and Muelbert, 2019), the influence of climatic and local factors on fish abundance, diversity and trophic organization (Garcia et al., 2003; 2012; 2017; Possamai et al., 2018), the evaluation of the secondary production of copepods and its main contributors (Muxagata et al., 2012; Teixeira-Amaral et al., 2017), occurrence of potentially harmful microalgae groups (e.g., cyanobacteria and dinoflagellates) (Haraguchi et al., 2015), diatom accumulation in surf zone influenced by drastic events like mud deposition freshwater output (Odebrecht et al., 2010; 2013), phase-shifts in the SAV (Copertino and Seeliger, 2010; Lanari and Copertino, 2017), the recognition of the main nursery grounds for commercial species (D'Incao, 1991; Haimovici and Cardoso, 2017), overfishing impacts through analysis of Lahille's bottlenose dolphin (Fruet et al., 2011; 2014; Secchi et al., 2017), assessments of the conservation status and adaptive capacity and resilience of estuarine and marine organisms to anthropogenic changes and global warming (Bernardino et al., 2015; Copertino et al., 2016), among other relevant ecological processes.

ILTER datasets have subsidized meta-analyses of multidecadal biodiversity trends, hence corroborating the importance of long-term monitoring programmes to offer insights on changes in natural systems (e.g., Pilotto et al., 2020). In general, long-term biodiversity data have been biased towards few taxonomic groups and lacking associate environmental data, hindering the understanding of the drivers of detected changes (Pilotto et al., 2020). Our database thus provides a comprehensive view on the biota´s spatio-temporal dynamics and its environmental drivers in a subtropical coastal marine system in the Southwestern Atlantic Ocean. Considering the over-representation of temperate regions in estuarine biodiversity and functioning studies (e.g., Vieillard et al., 2020), it allows to test for generalizations of previous findings across distinct biogeographical areas.

LTER-PLEA is one of the 115 globally distributed Coastal and Marine ILTER Sites (ILTER-CMS), a network that provides several opportunities to the study and monitoring of these ecosystems. ILTER-CMS constitutes an observation platform for the Global Ocean Observing System (GOOS) defined Essential Ocean Variables (EOVs) and several regional and global programs (Muelbert et al., 2019). Comparisons of our datasets obtained in the southern hemisphere with other estuaries worldwide, would contribute to broaden our understanding on the role of the distinct signals (human versus climatic) in the biodiversity and functioning of these ecosystems (Paerl et al., 2015).

Our datasets can also contribute to analyses of emergent environmental issues over large temporal scale and geographic areas such as harmful algal blooms (Lyons et al., 2014) and overfishing (Brett et al., 2020). On a global scale, LTER-PLEA´s long-term data have already supplied data to analyses of range-shifts in species distributions and abundance driven by climate changes (Hastings et al., 2020). Despite the wide range of variables monitored, we acknowledge that several components that are key to assess ecosystem quality are missing from our dataset. We have plans to monitor contaminants and heterotrophic prokaryotes in the near future. The environmental data such as water temperature and nutrient concentration time series may foster assessments of global warming and nutrient pollution in coastal marine systems. Despite the coastal nutrient pollution reported worldwide, little data is available for tropical and subtropical estuarine systems (Vieillard et al., 2020) and our data may help to fulfill this knowledge gap.

The sustainable use of ecosystem services can only be devised on a solid scientific basis (Carstensen, 2014). Thus, the information about the biological and physical properties of the system could be also used towards integrative, interdisciplinary, and transversal approach, which may better link estuary, coastal zone, and the ocean to its ecosystem services. Furthermore, such high-quality information adds to conservation, management and restoration efforts of coastal and estuarine ecosystems (Costa et al., 2016), contributing to recommendations for public policies, at local, national and global levels.

Appendix A - General taxonomic coverage of the LTER-PLEA´s database.

Table A1. Taxonomic coverage of the LTER-PLEA´s database.

kingdom	Subkingdon	Phylum/Division	Class	Order	Family	Genus	Specie
Bacteria		Cyanobacteria	Cyanophyceae	Chroococcales	Aphanothecaceae		
					Microcystaceae	Microcystis	
				Nostocales	Aphanizomenonaceae		
					Nostocaceae	Raphidiopsis	
				Oscillatoriales			
				Synechococcales	Leptolyngbyaceae		
					Merismopediaceae	Aphanocapsa	
					Pseudanabaenaceae	Leptolyngbya	
						Planktolyngbya	
Protozoa		Euglenozoa	Euglenoidea	Eutreptiida	Eutreptiaceae		
Chromista		Ciliophora	Litostomatea	Cyclotrichiida	Mesodiniidae	Mesodinium	
		Cryptophyta	Cryptophyceae				
		Myzozoa	Dinophyceae	Dinophysiales	Dinophysiaceae	Dinophysis	*Dinophysis acuminata*
							Dinophysis caudata
				Gonyaulacales	Ceratiaceae	Tripos	*Tripos furca*
							Tripos muelleri
					Ostreopsidaceae	Alexandrium	*Alexandrium fraterculus*
				Gymnodiniales	Gymnodiniaceae	Akashiwo	*Akashiwo sanguinea*
						Amphidinium	
						Gyrodinium	*Gyrodinium fusus*
						Torodinium	
					Polykrikaceae	Polykrikos	*Polykrikos schwartzii*
				Noctilucales	Noctilucaceae	Noctiluca	*Noctiluca scintillans*
				Peridiniales	Peridiniaceae	Peridinium	*Peridinium quinquecorne*
						Scrippsiella	*Scrippsiella trochoidea*
					Protoperidiniaceae	Protoperidinium	
				Prorocentrales	Prorocentraceae	Prorocentrum	*Prorocentrum compressum*
							Prorocentrum cordatum
							Prorocentrum micans
							Prorocentrum scutellum
		Ochrophyta	Bacillariophyceae	Aulacoseirales	Aulacoseiraceae	Aulacoseira	*Aulacoseira granulata*
				Bacillariales	Bacillariaceae	Bacillaria	*Bacillaria paxillifera*
						Nitzschia	
						Pseudo-nitzschia	
				Chaetocerotanae incertae sedis	Chaetocerotaceae	Bacteriastrum	
						Chaetoceros	*Chaetoceros* Hyalochaeta
							Chaetoceros Phaoceros
							Chaetoceros subtilis
				Coscinodiscales	Coscinodiscaceae	Coscinodiscus	*Coscinodiscus wailesii*
				Cymatosirales	Cymatosiraceae	Campylosira	*Campylosira cymbelliformis*
				Fragilariales	Fragilariaceae	Asterionellopsis	*Asterionellopsis guyunusae*
						Ceratoneis	*Ceratoneis closterium*
						Synedra	
				Hemiaulales	Hemiaulaceae	Cerataulina	*Cerataulina bicornis*
						Hemiaulus	
				Leptocylindrales	Leptocylindraceae	Leptocylindrus	*Leptocylindrus danicus*
							Leptocylindrus minimus
				Lithodesmiales	Lithodesmiaceae	Ditylum	*Ditylum brightwellii*
						Lithodesmium	
				Melosirales	Melosiraceae	Melosira	*Melosira moniliformis*
					Stephanopyxidaceae	Stephanopyxis	*Stephanopyxis turris*
				Naviculales	Diploneidaceae	Diploneis	
					Naviculaceae	Meuniera	*Meuniera membranacea*
					Pleurosigmataceae	Gyrosigma	
						Pleurosigma	
				Paraliales	Paraliaceae	Paralia	*Paralia sulcata*
				Rhizosoleniales	Rhizosoleniaceae	Dactyliosolen	*Dactyliosolen fragilissimus*
						Guinardia	*Guinardia delicatula*
							Guinardia flaccida
						Neocalyptrella	*Neocalyptrella robusta*
						Proboscia	
						Pseudosolenia	*Pseudosolenia calcar-avis*
						Rhizosolenia	*Rhizosolenia setigera*
				Surirellales	Entomoneidaceae	Entomoneis	
					Surirellaceae	Surirella	
				Thalassionematales	Thalassionemataceae	Thalassionema	*Thalassionema nitzschioides*
				Thalassiosirales	Skeletonemaceae	Detonula	*Detonula pumila*
						Skeletonema	*Skeletonema costatum*
							Skeletonema tropicum
					Thalassiosiraceae	Thalassiosira	
				Triceratiales	Triceratiaceae	Odontella	
						Trieres	*Trieres mobiliensis*
		Ochrophyta	Dictyochophyceae	Dictyochales	Dictyochaceae	Dictyocha	*Dictyocha fibula*
			Raphidophyceae	Chattonellales			
Plantae	Viridiplantae	Charophyta	Conjugatophyceae				
		Chlorophyta	Chlorophyceae				
			Prasinophyceae	Halosphaerales	Pterospermataceae	Pterosperma	
					Trebouxiophyceae		
			Pyramimonadophyceae				
			Trebouxiophyceae				
			Ulvophyceae	Ulotrichales	Gloeotilaceae	Binuclearia	*Binuclearia lauterbornii*
				Cladophorales	Cladophoraceae	Chaetomorpha	*Chaetomorpha antennina*
							Chaetomorpha sp.
						Cladophora	*Cladophora ssp*
						Rhizoclonium	*Rhizoclonium riparium*
				Ulvales	Ulvaceae	Ulva	*Ulva clathrata*
							Ulva compressa
							Ulva intestinalis
							Ulva ramulosa
							Ulva sp
		Tracheophyta	Magnoliopsida	Alismatales	Potamogetonaceae	Ruppia	*Ruppia maritima*
	Biliphyta	Rhodophyta	Florideophyceae	Acrochaetiales	Acrochaetiaceae	Acrochaetium	
				Ceramiales	Rhodomelaceae	Polysiphonia	

Table A1. Continued.

Animalia	Annelida	Polychaeta	Phyllodocida	Capitellidae	Heteromastus	*Heteromastus similis*
				Nephtyidae	Nephtys	*Nephtys fluviatilis*
				Nereididae	Alitta	*Alitta succinea*
					Laeonereis	*Laeonereis culveri*
	Arthropoda	Branchiopoda	Anomopoda	Bosminidae	Bosmina	*Bosmina (Bosmina) longirostris*
					Bosminopsis	*Bosminopsis deitersi*
				Chydoridae	Alona	*Alona costata*
						Alona monacantha
					Biapertura	*Biapertura affinis*
					Chydorus	*Chydorus eurynotus*
						Chydorus parvireticulatus
						Chydorus sphaericus
					Ephemeroporus	
					Euryalona	*Euryalona orientalis*
					Notoalona	*Notoalona sculpta*
				Daphniidae	Ceriodaphnia	*Ceriodaphnia cornuta*
						Ceriodaphnia dubia
					Daphnia	*Daphnia (Daphnia) ambigua*
					Simocephalus	*Simocephalus latirostris*
						Simocephalus serrulatus
						Simocephalus vetulus
				Eurycercidae	Camptocercus	*Camptocercus australis*
				Ilyocryptidae	Ilyocryptus	*Ilyocryptus spinifer*
				Macrothricidae	Macrothrix	*Macrothrix spinosa*
				Moinidae	Moina	*Moina micrura*
						Moina minuta
			Ctenopoda	Sididae	Diaphanosoma	*Diaphanosoma brachyurum*
						Diaphanosoma brevireme
						Diaphanosoma fluviatile
						Diaphanosoma spinulosum
					Penilia	*Penilia avirostris*
					Pseudosida	*Pseudosida bidentata*
			Onychopoda	Podonidae	Evadne	*Evadne nordmanni*
					Pleopis	*Pleopis polyphemoides*
						Pleopis schmackeri
					Podon	
					Pseudevadne	*Pseudevadne tergestina*
		Hexanauplia	Calanoida	Acartiidae	Acartia	*Acartia (Acanthacartia) tonsa*
						Acartia (Odontacartia) lilljeborgi
				Calanidae	Calanoides	*Calanoides carinatus*
					Calanus	
					Nannocalanus	*Nannocalanus minor*
					Undinula	*Undinula vulgaris*
				Centropagidae	Boeckella	*Boeckella bergi*
					Centropages	*Centropages furcatus*
				Clausocalanidae	Clausocalanus	*Clausocalanus furcatus*
						Clausocalanus parapergens
					Ctenocalanus	*Ctenocalanus citer*
						Ctenocalanus vanus
				Diaptomidae	Argyrodiaptomus	*Argyrodiaptomus denticulatus*
					Notodiaptomus	*Notodiaptomus incompositus*
				Heterorhabdidae	Heterorhabdus	*Heterorhabdus papilliger*
				Paracalanidae	Mecynocera	*Mecynocera clausi*
					Paracalanus	*Paracalanus aculeatus*
						Paracalanus indicus
						Paracalanus parvus
						Paracalanus quasimodo
					Parvocalanus	*Parvocalanus crassirostris*
				Pontellidae	Labidocera	*Labidocera fluviatilis*
					Pontellopsis	*Pontellopsis brevis*
				Pseudodiaptomidae	Pseudodiaptomus	*Pseudodiaptomus richardi*
				Scolecitrichidae	Scolecithrix	*Scolecithrix danae*
				Subeucalanidae	Subeucalanus	*Subeucalanus pileatus*
				Temoridae	Temora	*Temora stylifera*
						Temora turbinata
			Cyclopoida	Corycaeidae	Corycaeus	*Corycaeus speciosus*
				Cyclopidae	Acanthocyclops	*Acanthocyclops robustus robustus*
					Eucyclops	*Eucyclops ensifer*
					Halicyclops	
					Mesocyclops	*Mesocyclops longisetus longisetus*
					Metacyclops	*Metacyclops mendocinus mendocinus*
				Ditrichocorycaeus	Corycaeus	*Ditrichocorycaeus amazonicus*
				Ergasilidae	Ergasilus	
				Lubbockiidae	Lubbockia	*Lubbockia squillimana*
				Oithonidae	Oithona	*Oithona nana*
						Oithona oswaldocruzi
						Oithona plumifera
						Oithona similis
						Oithona simplex
				Oncaeidae	Oncaea	*Oncaea curvata*
						Oncaea lacinia
						Oncaea mediterranea
						Oncaea venusta
						Oncaea waldemari
				Onychocorycaeus	Corycaeus	*Onychocorycaeus giesbrechti*
				Sapphirinidae	Sapphirina	
			Harpacticoida	Ectinosomatidae	Microsetella	*Microsetella norvegica*
						Microsetella rosea
				Miraciidae	Macrosetella	*Macrosetella gracilis*
				Peltidiidae	Clytemnestra	*Goniopsyllus rostratus*
				Tachidiidae	Euterpina	*Euterpina acutifrons*
			Sessilia	Balanidae	Amphibalanus	*Amphibalanus improvisus*
			Siphonostomatoida			

Table A1. Continued.

		Ichthyostraca	Arguloida			
		Ostracoda				
		Malacostraca	Amphipoda			
			Cumacea	Diastylidae	Diastylis	*Diastylis sympterygiae*
			Decapoda	Luciferidae	Belzebub	
				Penaeidae	Penaeus	*Penaeus paulensis*
			Euphausiacea			
			Isopoda	Hyssuridae	Kupellonura	
				Munnidae	Uromunna	*Uromunna peterseni*
				Sphaeromatidae	Sphaeromopsis	*Sphaeromopsis mourei*
			Mysida			
			Tanaidacea	Kalliapseudidae	Kalliapseudes	
					Monokalliapseudes	*Monokalliapseudes schubarti*
				Tanaididae	Sinelobus	*Sinelobus stanfordi*
	Chaetognatha	Sagittoidea	Aphragmophora	Sagittidae	Flaccisagitta	*Flaccisagitta enflata*
					Parasagitta	*Parasagitta tenuis*
					Pseudosagitta	*Pseudosagitta lyra*
	Chordata	Actinopterygii	Albuliformes	Albulidae	Albula	*Albula vulpes*
			Anguilliformes	Ophichthidae	Ophichthus	*Ophichthus gomesii*
			Atheriniformes	Atherinidae	Odontesthes	*Odontesthes argentinensis*
						Odontesthes bonariensis
						Odontesthes perugiae
				Atherinopsidae	Atherinella	*Atherinella brasiliensis*
			Batrachoidiformes	Batrachoididae	Porichthys	*Porichthys porosissimus*
			Beloniformes	Hemiramphidae	Hemiramphus	*Hemiramphus brasiliensis*
					Hyporhamphus	*Hyporhamphus roberti*
						Hyporhamphus unifasciatus
			Characiformes	Characidae	Astyanax	*Astyanax dissensus*
						Astyanax eigenmanniorum
						Astyanax fasciatus
						Astyanax henseli
						Astyanax lacustris
					Bryconamericus	*Bryconamericus iheringii*
					Charax	*Charax stenopterus*
					Cheirodon	*Cheirodon ibicuhiensis*
						Cheirodon interruptus
					Cyanocharax	*Cyanocharax alburnus*
					Hyphessobrycon	*Hyphessobrycon anisitsi*
						Hyphessobrycon bifasciatus
						Hyphessobrycon boulengeri
						Hyphessobrycon igneus
						Hyphessobrycon luetkenii
						Hyphessobrycon meridionalis
						Hyphessobrycon reticulatus
						Hyphessobrycon togoi
					Macropsobrycon	*Macropsobrycon uruguayanae*
					Oligosarcus	*Oligosarcus jenynsii*
						Oligosarcus robustus
				Curimatidae	Cyphocharax	*Cyphocharax saladensis*
						Cyphocharax voga
				Erythrinidae	Hoplias	*Hoplias malabaricus*
			Clupeiformes	Clupeidae	Brevoortia	*Brevoortia pectinata*
					Harengula	*Harengula clupeola*
					Opisthonema	*Opisthonema oglinum*
					Platanichthys	*Platanichthys platana*
					Ramnogaster	*Ramnogaster arcuata*
					Sardinella	*Sardinella brasiliensis*
				Engraulidae	Anchoa	*Anchoa marinii*
					Engraulis	*Engraulis anchoita*
					Lycengraulis	*Lycengraulis grossidens*
			Cyprinodontiformes	Anablepidae	Jenynsia	*Jenynsia multidentata*
				Poeciliidae	Cnesterodon	*Cnesterodon decemmaculatus*
					Phalloceros	*Phalloceros caudimaculatus*
					Phalloptychus	*Phalloptychus januarius*
						Phalloptychus eigenmanni
					Poecilia	*Poecilia vivipara*
			Elopiformes	Elopidae	Elops	*Elops saurus*
			Gobiesociformes	Gobiesocidae	Gobiesox	*Gobiesox strumosus*
			Perciformes	Blenniidae	Blennius	
				Carangidae	Caranx	*Caranx hippos*
						Caranx latus
					Chloroscombrus	*Chloroscombrus chrysurus*
					Oligoplites	*Oligoplites saliens*
						Oligoplites saurus
					Parona	*Parona signata*
					Selene	*Selene setapinnis*
						Selene vomer
					Trachinotus	*Trachinotus carolinus*
						Trachinotus falcatus
						Trachinotus goodei
						Trachinotus marginatus

Table A1. Continued.

			Cichlidae	Cichlasoma	*Cichlasoma portalegrense*
				Crenicichla	*Crenicichla lepidota*
				Geophagus	*Geophagus brasiliensis*
				Gymnogeophagus	*Gymnogeophagus gymnogenys*
			Gerreidae	Diapterus	*Diapterus rhombeus*
				Eucinostomus	*Eucinostomus argenteus*
					Eucinostomus gula
					Eucinostomus melanopterus
				Ulaema	*Ulaema lefroyi*
			Gobiidae	Bathygobius	*Bathygobius soporator*
					Amoya gracilis
				Ctenogobius	*Ctenogobius shufeldti*
				Gobionellus	*Gobionellus oceanicus*
				Gobiosoma	*Gobiosoma parri*
			Haemulidae	Orthopristis	*Orthopristis ruber*
				Pomadasys	*Pomadasys corvinaeformis*
			Mugilidae	Mugil	*Mugil brevirostris*
					Mugil curema
					Mugil liza
			Percophidae	Percophis	*Percophis brasiliensis*
			Pomacentridae	Abudefduf	*Abudefduf saxatilis*
			Pomatomidae	Pomatomus	*Pomatomus saltatrix*
			Sciaenidae	Cynoscion	*Cynoscion leiarchus*
					Cynoscion striatus
				Macrodon	*Macrodon ancylodon*
					Macrodon atricauda
				Menticirrhus	*Menticirrhus americanus*
					Menticirrhus littoralis
				Micropogonias	*Micropogonias furnieri*
				Paralonchurus	*Paralonchurus brasiliensis*
				Pogonias	*Pogonias courbina*
				Stellifer	*Stellifer brasiliensis*
					Stellifer rastrifer
					Stellifer stellifer
				Umbrina	*Umbrina canosai*
			Serranidae	Epinephelus	
			Stromateidae	Peprilus	*Peprilus paru*
			Trichiuridae	Trichiurus	*Trichiurus lepturus*
		Pleuronectiformes	Achiridae	Catathyridium	*Catathyridium garmani*
					Catathyridium jenynsii
			Cynoglossidae	Symphurus	*Symphurus jenynsi*
			Paralichthyidae	Citharichthys	*Citharichthys spilopterus*
				Paralichthys	*Paralichthys orbignyanus*
			Pleuronectidae	Oncopterus	*Oncopterus darwinii*
		Scorpaeniformes	Triglidae	Prionotus	*Prionotus punctatus*
		Siluriformes	Ariidae	Genidens	*Genidens barbus*
					Genidens genidens
					Genidens planifrons
			Callichthyidae	Corydoras	*Corydoras paleatus*
			Heptapteridae	Pimelodella	*Pimelodella australis*
				Rhamdia	*Rhamdia quelen*
			Loricariidae	Loricariichthys	*Loricariichthys anus*
			Pimelodidae	Parapimelodus	*Parapimelodus nigribarbis*
				Pimelodus	*Pimelodus maculatus*
		Syngnathiformes	Syngnathidae	Hippocampus	*Hippocampus patagonicus*
				Syngnathus	*Syngnathus folletti*
		Tetraodontiformes	Monacanthidae	Stephanolepis	*Stephanolepis hispidus*
					Stephanolepis setifer
			Tetraodontidae	Lagocephalus	*Lagocephalus laevigatus*
	Appendicularia	Copelata	Oikopleuridae	Oikopleura	
	Mammalia	Cetartiodactyla	Delphinidae	Tursiops	*Tursiops truncatus gephyreus*
	Thaliacea	Salpida			
Cnidaria	Hydrozoa	Siphonophorae			
Ctenophora					
Echinodermata					
Mollusca	Bivalvia	Myida	Corbulidae	Erodona	*Erodona mactroides*
	Gastropoda	Littorinimorpha	Cochliopidae	Heleobia	*Heleobia australis*
					Heleobia charruana
Phoronida					
Rotifera					

Author contributions

M.C. and M.L. conceived the data paper. V.M.L, M.L and M.C wrote the manuscript. M.C., E.M., P.C.A., J.H.M., F.C.D., E.R.S., J.P.V., A.M.G., A.C., C.O. coordinated the monitoring studies, provided metadata and data, reviewed the information on occurrence, abundance, taxonomic status of the species, and abiotic data. V.M.L. formatted the data and published the LTER-PLEA´s database in GBIF. All authors commented on the paper and contributed to the quality check.

Competing interests

The authors declare that they have no conflict of interest.

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