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A georeferenced dataset of freshwater crustaceans and associated environmental variables across Chile.

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Abstract

We present a comprehensive georeferenced dataset of freshwater crustaceans across continental Chile, integrating species occurrence records with associated environmental variables. The dataset includes representatives from major crustacean groups inhabiting inland waters, such as Branchiopoda and Copepoda, compiled from multiple literature sources and field studies. For each record, we provide taxonomic identification, geographic coordinates, habitat type, and physicochemical parameters including conductivity, salinity, chlorophyll concentration, altitude, and depth where available.

This dataset spans a broad latitudinal gradient, encompassing diverse climatic and ecological regions, making it a valuable resource for studies on biodiversity patterns, biogeography, ecological modelling, and climate change. All records were curated, standardized, and validated to ensure consistency and usability. The dataset is openly available in a public repository and is

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intended to support future ecological and environmental research, that may support future ecological research and evidence-based environmental management.

Background & Summary

Freshwater ecosystems in Chile are characterized by strong environmental gradients driven by latitudinal variation, topography, and climatic heterogeneity[1]. These systems host diverse crustacean assemblages, including microcrustaceans and macroinvertebrates such as…, which play key role in ecosystem functioning and trophic dynamics[1,2].

Despite their ecological importance, data on freshwater crustacean distribution and associated environmental conditions in Chile remain fragmented across studies[1,3]. This limits large-scale analyses of biodiversity patterns, ecological responses to environmental gradients, and long-term monitoring efforts[1].

To address this gap, we compiled a comprehensive dataset integrating species occurrence records with environmental variables across Chilean inland waters. The dataset includes georeferenced records for multiple crustacean taxa and associated physicochemical parameters, enabling analyses of species-environment relationships and supporting reproducible ecological research.

By consolidating dispersed information into a standardized and curated format, this dataset provides a valuable resource for researchers working in ecology, biogeography, conservation, and environmental sciences.

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Methods

Data compilation

Data were compiled from published literature, technical reports, and available datasets focusing on freshwater crustaceans in Chile[4-96] (Fig. 1) in a range from 1974 to 2018. Records were included when they contained at least taxonomic identification and geographic information. Occurrence records were compiled through a systematic search of the available scientific literature and biodiversity repositories. Literature searches were conducted using Web of Science Core Collection, Scopus, Google Scholar and SciELO. Additional occurrence records were obtained from GBIF and original taxonomic publications cited in the retrieved literature.

Searches were performed using combinations of taxonomic and geographic keywords, including, "freshwater crustaceans", "Copepoda","Branchiopoda" and "Chile", connected using Boolean operators (AND, OR) where appropriate. Reference lists of retrieved publications were also examined to identify additional relevant studies.

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Records were included when they represented freshwater crustacea occurring within continental Chile and provided sufficient taxonomic and locality information to allow georeferencing. Marine records, duplicate occurrences, records lacking interpretable locality information, and taxonomically ambiguous records were excluded from the final dataset.

Taxonomic standardization

Species names were standardized and validated using recognized taxonomic backbones, including GBIF Backbone Taxonomy ("https://www.gbif.org/es/"; accessed March 2026); World Register of Marine Species ("https://www.marinespecies.org/"; WoRMS, accessed March 2026); Integrated Taxonomic Information System ("https://www.itis.gov/"; ITIS, accessed March 2026). Synonyms were resolved, and invalid or ambiguous names were excluded or corrected when possible (see Supplementary Material)

Georeferencing

Geographic coordinates (latitude and longitude) were recorded directly from source materials or inferred when necessary. All coordinates were standardized to decimal degrees (WGS84 datum).

Original geographic information was obtained from published literature and biodiversity repositories and was reported in heterogeneous formats, including decimal degrees, degrees–minutes–seconds (DMS), Universal Transverse Mercator (UTM) coordinates, and descriptive locality names. To ensure consistency across the dataset, all geographic information was standardised to decimal latitude and longitude referenced to the World Geodetic System 1984 (WGS84; EPSG:4326), which is the coordinate reference system adopted by Darwin Core and GBIF. Coordinate conversions from DMS and UTM to decimal degrees were performed using QGIS (version 3.x) and independently verified in Google Earth Pro.

When original publications did not provide geographic coordinates, occurrence records were georeferenced manually using the locality descriptions reported by the original authors. Coordinates were inferred by locating sampling sites through Google Earth Pro, GeoNames, official Chilean cartographic resources provided by the Instituto Geográfico Militar (IGM), hydrographic maps, and other authoritative geographic gazetteers. Whenever precise sampling positions could not be determined, coordinates were assigned to the centroid of the reported locality or water body. All inferred coordinates were visually inspected against the original locality descriptions to minimise georeferencing errors and ensure geographic consistency.

To improve data transparency and facilitate future reuse, each occurrence record was assigned an estimate of spatial uncertainty following Darwin Core recommendations. Records containing original geographic coordinates were considered to have relatively low positional uncertainty, whereas records georeferenced from locality descriptions were assigned larger uncertainty values according to the spatial precision of the available information. These uncertainty estimates are

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reported in the field *coordinateUncertaintyInMeters*, allowing users to evaluate the suitability of individual records for spatial analyses.

The published dataset retains coordinates in the geographic coordinate reference system WGS84 (EPSG:4326), expressed as decimal latitude and longitude, following the GBIF and Darwin Core standards. Users requiring projected coordinate systems for spatial modelling (e.g. UTM or World Mercator projections) may readily transform the coordinates into alternative coordinate reference systems using standard GIS software according to the objectives of their analyses.

Environmental variables

Environmental parameters associated with each record were compiled when available, including:

- decimalLatitude
- decimalLongitude
- Surface (km2)
- Maximum depth (m)
- Altitude (m a.s.l)
- Salinity (g/L)
- Conductivity (mS/cm)
- Chlorophyll concentration (µg/L)

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All variables were standardized to consistent units.

Habitat classification

Habitat types were categorized into standardized classes (coastal ephemeral lagoons, lagoon, lake, reservoirs, salt works, shallow lagoon, shallow saline lagoon, wetland) to ensure comparability across records.

Data Records

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- The complete dataset has been deposited in Zenodo[97] and is publicly available at https://doi.org/10.5281/zenodo.19702727. The repository contains the CSV file including the following fields:
- Phyllum
- Subphyllum
- Class
- Order
- Family
- Genus
- Specie
- Geographical distribution
- Site
- decimalLatitude
- decimalLongitude
- Surface (km^2)
- Maximum depth (m)
- Altitude (m a.s.l)
- Salinity (g/L)
- Conductivity (mS/cm)
- Chlorophyll (μg/L)
- Kind of habitat
- Reference

Each row represents a unique occurrence record with associated environmental data when available.

All occurrence records were compiled exclusively from openly accessible scientific publications, biodiversity repositories and publicly available data sources. Data reuse complies with the corresponding terms of use and licensing conditions established by the original providers. Appropriate attribution is provided through the bibliographic references and the reference field associated with each occurrence record.

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Each occurrence record is directly linked to its original bibliographic source through the Darwin Core field bibliographicCitation, allowing complete traceability of every occurrence included in the dataset.

Technical Validation

Several quality control procedures were implemented to ensure data reliability:

1. **Taxonomic validation**

   Species names were cross-checked against authoritative taxonomic databases (GBIF, WoRMS, and ITIS) to ensure validity and consistency.

2. **Geographic validation**

   Coordinates were inspected for errors (e.g., impossible values, outliers) and verified against known species distributions where possible.

3. **Environmental consistency**

   Environmental variables were checked for unrealistic values and standardized across all records.

4. **Missing data handling**

   Missing values were retained as NA and documented to preserve dataset integrity.

Usage Notes

This dataset can be used for:

- Biodiversity and biogeographic analyses
- Species distribution modeling
- Ecological niche modeling
- Climate change impact assessments
- Comparative freshwater ecology

Users should consider that not all environmental variables are available for every record, and sampling effort may vary across regions.

Data Availability Statement

The dataset is publicly available in Zenodo (DOI: https://doi.org/10.5281/zenodo.19702727)

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Code Availability

No custom code was used in the generation of this dataset. Standard data processing and curation procedures were applied.

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Author contributions

These authors contributed equally

Competing interests

The authors declare no competing interests.

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Figure caption:

Figure 1. Geographical distribution of freshwater crustacean occurrence records included in the dataset across continental Chile.

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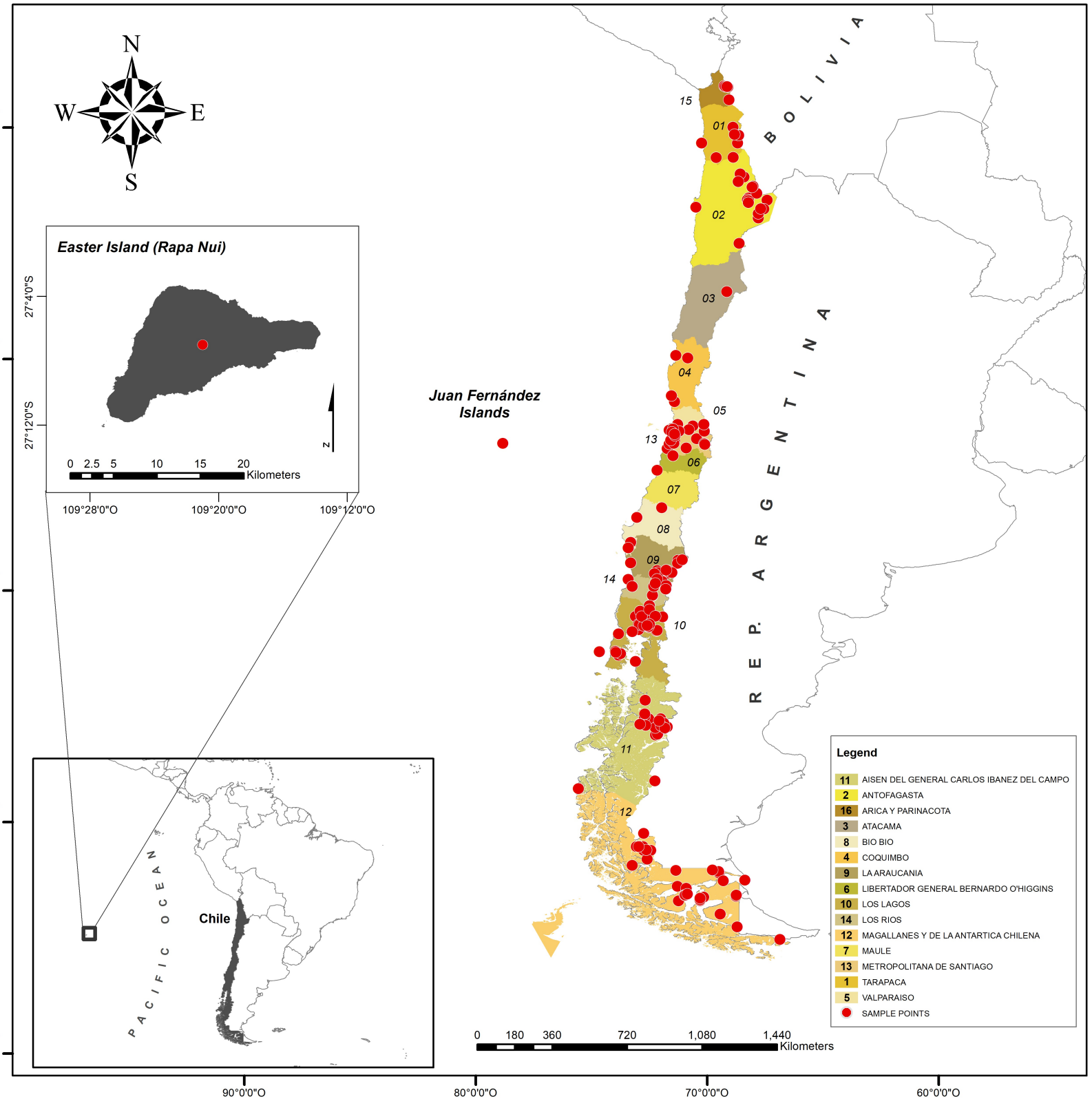
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2 ANTOFAGASTA
16 ARICA Y PARINACOTA
3 ATACAMA
8 BIO BIO
4 COQUIMBO
9 LA ARAUCANIA
6 LIBERTADOR GENERAL BERNARDO O'HIGGINS
10 LOS LAGOS
14 LOS RIOS
12 MAGALLANES Y DE LA ANTARTICA CHILENA
7 MAULE
13 METROPOLITANA DE SANTIAGO
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