

Data Paper

Spider assemblages (Arachnida: Araneae) in the eulittoral zone of the northern shore of Lake Constance (Germany)

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Introduction

Lake Constance is one of the last perialpine lakes with a near-natural water level fluctuation. Its eulittoral zone is a habitat for highly specialized and often endangered species. Well studied examples are the endemic *Deschampsietum rhenanae* ("Strandschmielengesellschaft") or ground beetles (Carabidae) (Strang et al. 2012, Bräunicke & Trautner 2002). While ground beetles have been inventoried by Bräunicke & Trautner (2002) and the characteristic plant species of the *Deschampsietum rhenanae* are monitored on a regular base, some species groups are almost completely neglected so far. This also includes spiders (Arachnida: Araneae). To our knowledge there are only a few studies providing lists of spider species from the shore of Lake Constance. Besides investigations in the nature reserves Rheindelta (Steinberger 1993) and Eriskircher Ried (Miotk 1983), there are some studies as part of the monitoring procedures of shoreline restoration measures (Kiechle & Götz 2014, Kiechle & Götz 2016, Kiechle et al. 2018) and reports of unsystematic findings that recorded spiders (e.g. Wunderlich 1973, Frömel et al. 1980). These studies have in common that they are focussing on a distinct section or area. A systematic inventory of spider species living on the shore of Lake Constance is still missing. With the present data paper we want to give an insight into the spider fauna of ten sections on the northern shore of Lake Constance and thereby contribute to the shore-wide recording of the spider fauna.

We collected spiders with pitfall traps from April 24th until May 5th 2019. While most of the trap positions were located on gravel shores with little or without vegetation, we also included reedbeds, sedge meadows or riparian bushes into the investigation. The data set includes 744 spiders (596 adults) of 37 species and 8 families. The most common species by far were *Oedothorax agrestis* (Blackwall, 1853) (290 individuals) and *Oedothorax apicatus* (Blackwall, 1850) (157 individuals). All species have been recorded for Baden-Württemberg, however, three species were new findings for the shores of Lake Constance: *Gongylidiellum vivum* (O. Pickard-Cambridge, 1875), *Pardosa wagleri* (Hahn, 1822) and *Tenuiphantes tenuis* (Blackwall, 1852) (Arachnologische Gesellschaft 2024). With one specimen each of *Pardosa wagleri* and *Gongylidiellum vivum*, the proportion of species listed on the Red List of Baden-Württemberg was slightly above 5 % (Nährig & Harms 2003).

Keywords: biodiversity, ecotone, lakeshore, pitfall traps, retaining walls

METADATA

Data set identity: Data on spider assemblages (Arachnida: Araneae) in the eulittoral zone of Lake Constance (Baden-Württemberg, Germany)

Overall data set description

Objectives of original study: Assessment of ecological impacts of retaining walls on several arthropod taxa in reference and test sites along shores of a large lake

Principal Investigator(s): Jens Peter Armbruster

Involved persons: Julian Eberhardt, Wolfgang Ostendorp

Data Source Institution: University of Konstanz

Period of study or time extent: 24.04.2019 to 07.05.2019

Survey design

Site description: The study sites were located along the northern shore of Lake Constance (Bodenseekreis, Baden-Württemberg, Germany). The westernmost shore section was located close to Überlingen-Goldbach, the easternmost in Friedrichshafen. All trap positions were located in the eulittoral zone. A total of five shore stretches were chosen (UEBW – Überlingen, UMMP – Untermaurach, UUHE – Unteruhldingen, KIPP – Kippenhorn, FNSC – Friedrichshafen), each consisting of one near-natural section (REF) and one anthropogenically modified section (TEST).

The near-natural sections (REF) were natural or revitalised shore sections. The vegetation on these sections consisted of dense reed beds (UMMP), sparse reed beds with low-growing riparian vegetation (UEBW and KIPP) or loose vegetation consisting out of *Phalaris arundinacea* L. (UUHE). The near-natural shore section of FNSC was covered with artificial gravel fill from shore revitalisation. The five anthropogenically modified sections were separated from land by vertical retaining walls. The retaining walls consisted out of concrete (UUHE) or grouted sandstone (UEBW, UMMP, KIPP & FNSC). In UEBW and UMMP, the base of the retaining walls was just below the long-term mean water level (395.26 m a. s. l.). In UUHE, KIPP and FNSC, the base of the wall was above it. At the start of the trap exposition, the shore at REF had an average width of 6.8 m (ranging from 2.4 m to 11.9 m, measured from the waterline to the edge of the terrestrial vegetation). At TEST, the shore was on average 7.0 m wide (ranging from 2.0 m to 12.3 m, measured from the waterline to the base of the retaining wall).

Three pitfall traps were deployed per section. The position data of the pitfall traps is given in Table 1. Three of the thirty pitfall traps were flooded before sampling and not included in the study.

Table 1: Characterization of the trap positions by description of the habitat, coordinates and altitude. Coordinates are given in decimal degree (WGS84).

Trap ID	Habitat	Latitude	Longitude	Altitude (m a. s. l.)
UEBW_REF_MITTE	reeds	47.777192	9.129842	395.3
UEBW_REF_OST	sedge meadow	47.777092	9.129866	395.4
UEBW_REF_WEST	sandy gravel bank	47.777245	9.129796	395.3
UEBW_TEST_MITTE	sandy gravel bank	47.768715	9.143391	395.3
UMMP_REF_OST	sedge meadow	47.742843	9.220347	395.5
UMMP_REF_WEST	reeds	47.742959	9.220095	395.3
UMMP_TEST_MITTE	gravel bank	47.743505	9.218978	395.3
UMMP_TEST_OST	sedge meadow	47.743453	9.219007	395.3
UMMP_TEST_WEST	gravel bank	47.743559	9.218829	395.2
UUHE_REF_MITTE	shrubs	47.705756	9.246826	396.0
UUHE_REF_OST	reeds	47.705480	9.247094	395.3
UUHE_REF_WEST	gravel bank	47.705715	9.246600	395.6
UUHE_TEST_MITTE	sandy gravel bank	47.708939	9.241885	395.5
UUHE_TEST_OST	sandy gravel bank	47.708882	9.241971	395.5
UUHE_TEST_WEST	sandy gravel bank	47.709028	9.241759	395.4
KIPP_REF_MITTE	gravel bank	47.662527	9.345109	396.5
KIPP_REF_OST	reeds	47.662445	9.345271	395.5
KIPP_REF_WEST	shrubs	47.662573	9.345027	396.2
KIPP_TEST_MITTE	gravel bank	47.664058	9.341640	395.5
KIPP_TEST_OST	gravel bank	47.663988	9.341715	396.0
KIPP_TEST_WEST	gravel bank	47.664118	9.341482	395.8
FNCS_REF_MITTE	reeds	47.651552	9.458834	395.5
FNCS_REF_OST	gravel bank	47.651441	9.459451	395.3
FNCS_REF_WEST	gravel bank	47.651459	9.458813	395.3
FNCS_TEST_MITTE	gravel bank	47.648411	9.463961	395.5
FNCS_TEST_OST	gravel bank	47.648375	9.464097	395.6
FNCS_TEST_WEST	gravel bank	47.648422	9.463727	395.5

Methods of data collection: As traps we used plastic cups with an opening diameter of 11 cm. To prevent small mammals, amphibians and reptiles from being caught, a wire mesh with a mesh size of 3.5 cm was mounted above the traps. The traps were protected against rainfall by a non-transparent tile (17 x 17 cm) positioned on three steel stilts. 250 ml Renner solution

(mixture of ethanol, water, glycerine and acetic acid in a ratio of 4:3:2:1, Renner 1980) were used as a preservative. The distance between the pitfall traps on one shore section was about 10 m.

Methods of sample processing, storage and identification: The sampled spiders were stored in Renner solution. All adult spiders were determined to species level. Identification was done by J. Eberhardt, using Heimer & Nentwig (1991), Roberts (1985, 1987), Stäubli (2013) and Nentwig et al. (2024). Nomenclature follows World Spider Catalog (2024).

Vouchers/Material deposited: Voucher specimens are deposited in the collections SMNK-ARA and SMNK-STUD of the State Museum of Natural History Karlsruhe.

Significance of data set: A total of three species were identified as new records for the shores of Lake Constance. A brief description of their distribution and occurrence within the region is provided below.

Pardosa wagleri

P. wagleri is distributed throughout Europe, Turkey, the Caucasus, Russia, and extends into Central Asia and China (World Spider Catalog 2024). Within Germany, the species has predominantly been recorded along the banks of Alpine rivers (Arachnologische Gesellschaft 2024). It primarily colonizes gravelly shores and gravel banks of mountain rivers. To date, no occurrences have been reported from the shores of Lake Constance. Nearby records originate from a gravel pit near Radolfzell and from Jestetten. For the record from Überlingen, no detailed information regarding the location or habitat characteristics is available (Arachnologische Gesellschaft 2024). In our investigations we found one female at the shore revitalisation in Friedrichshafen (FNSC_REF_WEST).

Gongylidiellum vivum

G. vivum is distributed across the Palearctic region, with records from Europe, Morocco, Algeria, Turkey, the Caucasus and Iran (World Spider Catalog 2024). In Germany, the majority of records originate from the North German Plain and the Central Uplands. It is striking that records from Baden-Württemberg and southern Bavaria are almost entirely absent. To date, *G. vivum* has not been recorded along the shores of Lake Constance. The closest known records in proximity to Lake Constance are from Feldberg and the Gründlenmoos area near Kißlegg (Arachnologische Gesellschaft 2024). In our investigations we found one female on the near-natural sections in Untermaurach (UMMP_REF_WEST).

Tenuiphantes tenuis

T. tenuis is distributed from Europe to Central Asia, Macronesia and Northern Africa. The species has been introduced to the USA, South America and New Zealand (World Spider Catalog 2024). *T. tenuis* occurs throughout Germany with almost no distribution gaps (Arachnologische Gesellschaft 2024). Its current population situation is assessed as 'very common' (Blick et al. 2016). In Arachnologische Gesellschaft 2024, several records for *T. tenuis* are provided from the Lake Constance area. However, due to the absence of precise data regarding the exact locations of these records (such as coordinates or habitat type), it can be assumed that the finding represents a new record for the shores of Lake Constance. In order to confirm whether the species had been previously documented in the shore zone prior to our study, it would be necessary to consult the authors of the original records. In our investigations we found *T. tenuis* in Überlingen (UEBW_REF_OST) and Kippenhorn (KIPP_REF_WEST & KIPP_TEST_OST).

The evaluations comparing near-natural and anthropogenically modified shore sections are still in progress. In addition to spiders (Arachnida: Araneae), beetles (Coleoptera) were also identified to species level if possible.

DATA SET STATUS AND ACCESSIBILITY

Status

Data submitted: 2024-11-25, **Data accepted:** 2025-05-13

Academic editor: Tobias Bauer

Data editor: Florian Raub

Latest data update: May 2025

Latest metadata update: May 2025

Accessibility

Storage location and medium. Metadata and data files are stored by Arachnologische Gesellschaft, data are included in the ARAMOB database using the database framework Diversity Workbench (<https://diversityworkbench.net/>), data are accessible via <https://aramob.de/en/data/data-exploitation/> Filter: Project ARAMIT_Armbruster2025

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DOI: 10.30963/aramit6901

Citation. Armbruster JP & Eberhardt J 2024 [Data Paper](#). Spider assemblages (Arachnida: Araneae) in the eulittoral zone of the northern shore of Lake Constance (Germany). Arachnologische Mitteilungen 69: 1

DATA STRUCTURAL DESCRIPTORS

Data Set Files:

Armbruster2025_obsdata.csv, 34 KB, spider abundance data set

Armbruster2025_plotdata.csv, 7 KB, location and description of the sampling sites

Authentication procedures:

MD5 Checksum generated by WinHash v.1.6.6787:

Armbruster2025_obsdata.csv: 20A326EA56527518798A7572D53B6F91

Armbruster2025_plotdata.csv: 88D740A0DB8D0DCF38E7A59F9B9B864D

SUPPLEMENTAL DESCRIPTORS

Publications using the data set: none

ACKNOWLEDGEMENTS

We would like to thank Sina Wiegand from Landratsamt Bodenseekreis (Umweltschutzamt, Sachgebiet Naturschutz) for granting us a special permit. We would also like to thank Hubert Höfer for feedback on the manuscript.

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