sDiv working group meeting report
"sARDINE III"

Working group meeting report

The third working group meeting for the "sARDINE – spatial tRenDs IN fish Ethodiversity" project took place from November 25-28, 2025 at iDiv. The working group is focusing on advancing our understanding of behavioural diversity using fish movement, measured in the wild with acoustic telemetry, as a study system. The group aims to develop new techniques to extract measures of behavioural diversity from fish movement data and to test whether behavioural diversity follows the same spatial trends as other biodiversity metrics. To support these goals the working group has also drafted a review paper covering the basis of behavioural diversity in fishes as well as its role in conservation and management. The group also has compiled a database of fine-scale acoustic telemetry datasets in Europe to assess the hypotheses, and created a simulation tool to generate movement with known underlying diversity for performance testing our quantitative methods. Prior to this meeting our working group had submitted our review paper to Fish and Fisheries and received the reviews and revisions in mid-November. The working group has also received an invitation for a conceptual piece on behavioural diversity to TREE, which was in review at the time of the meeting. Additionally, the database was populated with 213,199,502 positions from 1723 individual fish after the second meeting. Accordingly, we aimed to use the third meeting to focus on five goals – 1) advance the project database by generating a new list of potential projects to include, 2) finalize the conceptual paper revision, 3) discuss the hypotheses behind possible spatial trends in intraspecific behavioural diversity, 4) advance the quantitative methods benchmarking and 5) plan future steps to continue the work beyond the sDiv framework. As this was our third meeting, the participation was focused on the key members needed to be present for these goals (7 in person and 2 online).

The meeting structure resembled the previous meeting, splitting into two focused subgroups to tackle writing and analysis related objectives respectively, using the start and end of each day to coordinate. After a brief update at the beginning of the meeting, the writing subgroup began to work through the reviewer comments. The manuscript itself was quite long, which led to extensive, but highly constructive, reviews from three reviewers. We drafted responses to the reviews and designated individuals responsible for handling each comment. This task was then finished by the end of the first day, though one attached PDF from a reviewer was missing, which we were able to acquire from the editor and address on the third meeting day. It was highly valuable and efficient for the group to be seated together and to find an agreement on how to handle each reviewer

comment together during the meeting. The working group also began to compile a new list of fine-scale acoustic telemetry projects external to the working group that would be beneficial for the database.

We realized that we had not spent sufficient time truly developing our ideas behind why intraspecific behavioural diversity would track latitudinal gradients or ecosystem size. We therefore spent the second day building our expectations. We pulled numerous hypothesized mechanisms driving latitudinal gradients or area relationships for biodiversity more generally and examined how they would apply to behavioural diversity. When combining a number of mechanisms clear expected curves of behavioural diversity vs latitude or ecosystem area began to emerge. These relationships and the literature covered will provide a much stronger basis for our empirical papers, and it was a much-needed exercise.

The analysis team implemented a new clasp-and-cluster method on our shared JupyterHub and has refined our machine-learning time-series classification method, speeding up the workflow. In addition to refining the methods to extract diversity, the team needed to revisit precisely how diversity is scored, in particular comparing the states in our simulation to real datasets. In addition to working with the simulated datasets, the team began to explore the workflow to apply our methods on various datasets in the database.

On the last day of the meeting we spent most of a morning discussing how to move forward with our work. We compiled a list of potential sources to bring individuals together, or find financial support for continued effort on the project. Individuals and external collaborators were flagged as leaders for funding applications to continue this work. Additionally, the data analysis team decided to regularly meet online, and aim for one in person meeting in Germany in spring 2026. Generally, the group sentiment is that this meeting was more productive than expected, and that the overall working group has been a valuable project, generating many stimulating new ideas (including publication and database outputs); however, the work to finalize the empirical aspects of the project will require much effort still.

As with the previous two meetings, the organization of the meeting structure by iDiv was fantastic, and the structure of the sDiv concept enabled a setting to advance our ideas. The sARDINE working group is very grateful to the entire sDiv team for their continual, friendly support throughout the entirety project.