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Conference Abstract

Ecosystem Services provided by streams to adjacent agricultural terrestrial ecosystems

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Abstract

Streams are traditionally viewed as receptacles rather than sources of energy with regard to nutrient and energy cycles. For a long time, terrestrial-aquatic interactions have focused on studying the impact of terrestrial ecosystems on aquatic ecosystems, but more and more studies are highlighting the role of aquatic ecosystems on terrestrial ecosystems. Numerous studies have shown that freshwater ecosystems are an important source of energy for the terrestrial environment, mainly through the emergence of winged aquatic insects, recognized as providing nutritional subsidies to terrestrial consumers. They represent a substantial source of fertilization for soils and an important resource for terrestrial organisms. Plants near wetlands where food webs contain fewer insect predators or flying insects receive more pollinator visits and are less pollen limited. Thus, dense hydrographic networks could suggest a strong impact in terms of ecosystem services in adjacent terrestrial ecosystems. The objective of our project is to evaluate three ecosystem services provided by aquatic insects in adjacent agricultural environments following a gradient of agricultural intensification and to analyze their impacts in terms of integration in the management policies of the territories. Five sites

located along a gradient of agricultural intensification and in different agricultural contexts where agricultural practices are informed, were selected within three Zones Ateliers from the French Long Term Socio-Ecological Research network. On each site, a headwater stream and its adjacent landscape (1 Km²) will be monitored at the same time (spring and summer) with 13 protocols. The first work package focuses on three ecosystem services provided and mediated by emerging aquatic insects (soil fertilization, pollination and crop pest control). These ecosystem services cannot be studied without an accurate quantification of biodiversity of streams (i.e. emerging aquatic insects and aquatic vegetation), riparian habitats (floral diversity, emerging aquatic insects and terrestrial predators), adjacent agricultural areas (i.e. emerging aquatic insects, terrestrial predators and type of crops) and the quantification of biological flux between aquatic and terrestrial environment. The second WP focuses on the governance of riparian areas. Its objective is to study the history of the governance of French riparian areas, to examine current management practices and their associated representations. This WP will also address recent improvements in the governance of these areas and aims to increase the adoption of ecologically responsible practices by stakeholders. The last WP aims to map Essential Biodiversity Variables (EBVs) of streams and floodplains with high-resolution data and remote sensing techniques and artificial intelligence modelling approach to estimate the respective contribution of various drivers (e.g. landscape features and their arrangement including 3D modelling) . This information is crucial for understanding and linking WP1 and WP2 (i.e. explaining ecosystem services distribution in relation with anthropogenic practices and land uses). Preliminary results suggested a possible important role of aquatic insects in fertilization but a relatively small contribution to direct pollination. We have also highlighted a succession of major changes in river management over the last 100 years, which have profoundly altered the functioning of aquatic ecosystems. However, headwater and riparian habitats are rarely considered in social sciences and limit our ability to integrate their specificities or to mitigate conflicts among users and managers. Ongoing research based a previous discussions with stakeholders, has highlighted that our project should help us to better quantify, in a spatially explicit manner, the relative contribution of freshwaters to ecosystem services in agricultural landscapes, and to better identify leverage points for integrating our results into agricultural practices and environmental management.

Keywords

meta-ecosystem, aquatic-terrestrial interactions, nature based solution, socioecological approach.

Presenting author

Christophe Piscart is a freshwater ecologist working on aquatic invertebrates. He is also involved in transdisciplinary researches in the French Zone Atelier network.

Presented at

Poster

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Conflicts of interest

The authors have declared that no competing interests exist.