Lake researchers find fishermen a good resource for limnology

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Image: Wikipedia.

(Phys.org) -- By studying lakes and streams, limnologists are able to learn how water systems work which is vital in a world where human population increases cause such resources to become ever more valuable. Thus, any new source of reliable information that can add to the overall understanding of how such a system works can become invaluable over time. It is for this reason that a trio of researchers from the Center for Water Research and Anthropology and Sociology at the University of Western Australia, found themselves enlisting the help of local fishermen when studying Lake Como in the Italian Alps. In so doing, they found, as they describe in their paper published in the *Proceedings of National Academy of Sciences*, that knowledge fishermen gain both from their ancestors and through experience can be used to expand on

scientific studies to provide a much more thorough analysis of a lake's flow patterns.

After initial analysis, the research team found that approximately thirty fishermen made a living by catching fish using large floating nets in the lake. Of those, they interviewed twenty two. In so doing they discovered that the fishermen had a much deeper understanding of both the underwater topology of the lake and the currents that occur as a result of that topology as well as seasonal temperature variations, than was expected. They learned for example, that the fishermen could describe the bottom of the lake without ever having seen a map of it. They were also able to describe in great detail different kinds of currents at different depths and could pinpoint where eddies occurred and where sometimes the current flowed backwards.

The research team then built a model that simulated lake conditions using traditional methods such as monitoring wind speed and temperature variations of the water at various points along with a topological map. The model estimated lake currents at different locations and depths, and as it turned out, very closely matched the mental model the fishermen had built in their heads.

In comparing the amount of data that could be collected via traditional methods versus that garnered from speaking with the fishermen, the team discovered that because of their histories and backgrounds, the fishermen were able to provide a much richer and more complex picture of the lake system than they were able to obtain using simple measurements and thus have concluded that future research efforts should include interviews with fishermen whenever possible. Doing so, they say, will likely result in better models.

More information: Contributions of local knowledge to the physical limnology of Lake Como, Italy, *PNAS*, Published online before print

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Abstract

This article shows how local knowledge may be valuably integrated into a scientific approach in the study of large and complex hydrological systems where data collection at high resolution is a challenge. This claim is supported through a study of the hydrodynamics of a large lake where qualitative data collected from professional fishers was combined with theory to develop a hypothesis that was then verified by numerical modeling. First the fishermen's narratives were found to describe with accuracy internal wave motions that were evident in water column temperature records, which revealed their practical knowledge of the lake's hydrodynamics. Second, local knowledge accounts emphasized the recurrent formation of mesoscale gyres and return flows in certain zones of the lake in stratified conditions, which did not appear in the physical data because of limitations of sampling resolution. We hypothesized that these features developed predominantly because of the interaction of wind-driven internal motions with the lake's bathymetry, and the Earth's rotation in the widest areas of the basin. Numerical simulation results corroborated the fishers' descriptions of the flow paths and supported the hypothesis about their formation. We conclude that the collaboration between scientific and local knowledge groups, although an unusual approach for a physical discipline of the geosciences, is worth exploring in the pursuit of a more comprehensive understanding of complex geophysical systems such as large lakes.