New study provides insight into the history of the Killarney Shad

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Killeany National Park situated in the southwest of Ireland is famous for some unusual species not found elsewhere in the country. These include the Kerry spotted slug (Geomalacus maculosus) - a small snail also found in Ibèria, but absent from Britain. The park also contains some of the oldest natural woodlands in Ireland; the yew and oak are of international significance. It is surrounded by Ireland’s highest mountain peaks (Magllicuddy’s Reeks) and the Killarney Lakes attract thousands of visitors annually.

**ECOLOGICAL INDEPENDENCE**
The three lakes while interconnected are surprisingly ecologically independent of one another, each containing its own ecosystem. The largest of these lakes, Lough Leane, contains the fish species, Killarney shad (Alosa fallax killernensis), a subspecies of twaite shad and is unique to the area. Ireland has three species of shad; two others - the twaite shad (Alosa fallax) and the allis shad (Alosa slow) - are also present.

Shads are known as anadromous species as they spend most of their lives in the sea and only migrate to freshwater sites to spawn. The best known example is the salmon.

Of the Irish shads, the only landlocked example is the Killarney shad; the species is currently listed as ‘critically endangered,’ according to the IUCN (International Union for the Conservation of Nature) Red List. Shads occur along the northeast Atlantic coast and can be found from Morocco to Iceland; however they are among the rarest breeding fish in Ireland. Although there are no barriers preventing the shad from leaving Lough Leane today, there is evidence of historical barriers, possibly thousands of years ago.

**TAXONOMIC STATUS**
It likely that the Killarney shad adapted to live in fresh water permanently over time, but how this occurred is poorly understood. There is also some debate on the taxonomic status of the Killarney shad species, and if it is indeed a subspecies.

These are questions that Ilaria Coscia has attempted to address in a new study just published in the *Journal of Molecular Phylogenetics and Evolution*. Coscia examined the genetics of the species. The results gave additional support for the separation of the Killarney shad from the twaite shad, a separation which was statistically similar to the separation of allis from twaite (both recognized species).

Interestingly, the data also shows that at one time, the two twaite lineages established in the lake. This event likely occurred many thousands of years apart, with the population becoming isolated in Killarney and the two lineages then beginning to breed and formed a single population. Coscia also showed that the two divergent lineages in Lough Leane have successfully admixed over the years so that no contemporary signature of genetic subdivision remains evident in the species. Her research conservatively points to various characteristics such as size, behaviour, morphological and physiological changes that the Killarney shad has undergone due to thousands of years of isolation from its closest related ancestor, the twaite shad. Coscia suggests that combined with the genetic evidence this could support the subspecies status for the Killarney shad.

Interestingly, the data also shows that the Killarney shad is critically endangered, and the closest extant relative, the twaite shad (also quite rare) would not be suitable to supplement the population through translocations due to differences such as life history traits. In order to conserve this unique species, Coscia recommends that the species and the surrounding environment needs to be closely monitored to prevent eutrophication (addition of nutrients) and the establishment of invasive species. She advises that such measures should be of paramount importance, given the uniqueness of species shown in this study.