# The mangrove nursery paradigm revisited: otolith stable isotopes support nursery-to-reef movements by Indo-Pacific fishes.

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## Abstract

Mangroves and seagrass beds have long been perceived as important nurseries for many fish species. While there is growing evidence from the Western Atlantic that mangrove habitats are intricately connected to coral reefs through ontogenetic fish migrations, there is an ongoing debate of the value of these coastal ecosystems in the Indo-Pacific. The present study used natural tags, viz. otolith stable carbon and oxygen isotopes, to investigate for the first time the degree to which multiple tropical juvenile habitats subsidize coral reef fish populations in the Indo Pacific (Tanzania). Otoliths of three reef fish species (Lethrinus harak, L. lentjan and Lutjanus fulviflamma) were collected in mangrove, seagrass and coral reef habitats and analyzed for stable isotope ratios in the juvenile and adult otolith zones. δ13C signatures were significantly depleted in the juvenile compared to the adult zones, indicative of different habitat use through ontogeny. Maximum likelihood analysis identified that 82% of adult reef L. harak had resided in either mangrove (29%) or seagrass (53%) or reef (18%) habitats as juveniles. Of adult L. fulviflamma caught from offshore reefs, 99% had passed through mangroves habitats as juveniles. In contrast, L. lentjan adults originated predominantly from coral reefs (65–72%) as opposed to inshore vegetated habitats (28–35%). This study presents conclusive evidence for a nursery role of Indo-Pacific mangrove habitats for reef fish populations. It shows that intertidal habitats that are only temporarily available can form an important juvenile habitat for some species, and that reef fish populations are often replenished by multiple coastal habitats. Maintaining connectivity between inshore vegetated habitats and coral reefs, and conserving habitat mosaics rather than single nursery habitats, is a major priority for the sustainability of various Indo Pacific fish populations.

**Key word** mangrove, isotopes support