

Exploring adaptive and plastic variability in growth and maturation for the cutlassfish *Trichiurus japonicus* in subtropical Pacific

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Abstract

Determination of life history variation informs sustainable fisheries management. Given that increasing warming trends and intensive fishing likely distress subtropical and tropical fishes, it is urgent to understand the environmental and fishing effects on life history traits for these species. To this end, we investigated variation in growth and maturation and elucidated the underlying plastic and adaptive mechanisms for a subtropical cutlassfish species subject to commercial fishery, *Trichiurus japonicus*. We conducted monthly sampling at two primary cutlassfish landing sites at NE (Kengfang) and SW (Tsukuan) Taiwan during 2013-2015. Habitat temperatures were slightly lower (by about 1-4°C) in Kengfang than Tsukuan. We found that the length-at-age of fish showed a reverse pattern with temperature (Kengfang > Tsukuan). Estimates of the probabilistic maturation reaction norms (PMRNs) were similar for fish between locations and sexes. However, comparing the PMRN estimates with growth data revealed plastic variation in maturation ages between locations (Kengfang > Tsukuan). Differential length distributions of catch suggested that mortality varied between locations (Kengfang < Tsukuan). Together, these results suggest that differential mortality might counteract the effect of temperature between locations, resulting in a countergradient growth pattern. The countergradient growth pattern followed the predicted adaptive response to fishing.

Keywords: cutlassfish, countergradient growth, probabilistic maturation reaction norms, fisheries exploitation

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