

The Ecological Roles of Cleanerfishes in Temperate Reef Communities

Master of Philosophy (MPhil)



Marine Biology

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ABSTRACT

In marine ecosystems, cleaner fish play a critical role in maintaining biodiversity by removing parasites and dead tissue from client species. While the ecological significance of tropical cleaners is well established, less is known about cleaner fish in temperate systems. This Mphil project investigates the role of *Centrolabrus melanocercus* in Mediterranean reef communities through behavioural observations and stable isotope analyses. Underwater surveys at Ustica showed that *C. melanocercus* occurs at low densities within temperate reef fish assemblages.

Behavioural observations revealed that *C. melanocercus* regularly engages in cleaning behaviour, with consistent daily activity patterns, supporting the idea that cleaning serves as a primary food source. The species preferentially cleaned *Serranus scriba* and *Symphodus tinca*, with cleaning time and feeding bites increasing with client size. Cheating and aggressive responses were rare. These patterns indicate that temperate cleaning interactions share similarities with tropical systems, while showing limited use of conflict-management behaviours.

In *S. scriba*, parasite load increased with host size, and stable isotope analyses ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) showed that parasites, mainly gnathiids, had lower isotopic values than their hosts, with high variability. *C. melanocercus* occupies a unique isotopic niche with higher $\delta^{15}\text{N}$ values than clients, indicative of its parasitic diet. Mixing models revealed that classical trophic enrichment factors were not suited in this case. A negative trophic enrichment factor for $\delta^{13}\text{C}$ led to the identification of gnathiid parasites from *S. scriba* as the dominant component of the cleaner's diet. Additionally, a comparison of muscle and fin membrane tissues supported the use of fin tissue as a non-lethal proxy for stable isotope analysis, though species-specific corrections may be required.

Overall, these findings expand our understanding of cleaning mutualisms beyond tropical reefs, highlighting the importance of cleanerfish in temperate ecosystems and providing a baseline for future behavioural and trophic studies of cleaner–client interactions in Mediterranean reefs.