

Ontogenetic Changes in Gut Dimensions and Macroalgal Digestibility in the Marine Herbivorous Fish, *Aplodactylus punctatus*

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Summary

1. Even though herbivorous fish have longer digestive tracts than carnivorous fish, a fact which agrees with optimal digestion theory, the existence of a relation between relative length of the digestive tract and capacity to digest and assimilate algal material has not been experimentally demonstrated.
2. We tested whether an increase in gut dimensions during ontogeny was associated with an increase in capability of fish to digest macroalgae in *Aplodactylus punctatus*.
3. Total gut length of this temperate marine fish increased from 43 to 237 cm as body length increased from 22 to 42 cm total length (TL).
4. Macroalgae, mainly fronds of the brown kelp *Lessonia trabeculata*, were the principal item found in their guts.
5. Individuals smaller than 30 cm had a higher proportion of invertebrate biomass in their gut than larger fish (40.6% and 0.3% of total content, respectively).
6. Transit time for *Lessonia* fronds increased as a function of body size, ranging between 20 h in fish 26.6 cm TL and 52 h in 40.0 cm fish.
7. Apparent digestibility of organic matter and total nitrogen increased as a function of body size from 38% to 80% when feeding on a *Lessonia* diet, and from 57% to 96% on a *Ulva* sp. diet.
8. These results explain why small herbivorous fish need to consume animal prey to satisfy their high mass-specific protein demands.
9. This study constitutes the first experimental demonstration in fish that an increase in relative gut length is associated with an increase in the capability to digest macroalgae. This allows larger fish to meet their energetic demands by consuming algae owing to their capability to digest low-quality food.