Ocean Wolf

What lives in and on the shell of Pāua? Epibionts on *Haliotis iris* from Kaikōura.

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Cost of epibiont to industry

Fouling organisms can be problematic for aquacultural infrastructure by adding weight to equipment, blocking pumps and increasing energy costs. Those organisms and shell-infesting species, like worms, sponges, and others, adversely affect the cultured species and reduce their market value. From the USA, we know that the mitigation of fouling organisms to shellfish aquaculture averages around 15% (21 million USD) of the annual cost. Depending on shellfish species, the cost of managing epibionts can increase to 30% of the final product [1–7].

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Figure 1. *Haliotis iris* with an eroded shell

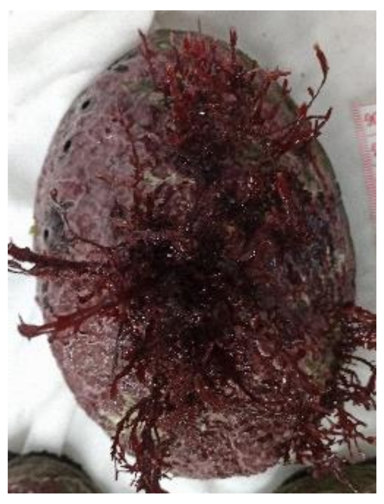

Figure 2. *Haliotis iris* encrusted by sessile organism

The work

Prior to being a taxonomist at Cawthron, I was involved in recovery projects in Kaikoura. During this time, I adopted methods in abalone shell cleaning from literature [2,4]. Colleagues and I carefully cleaned the shells off of 120 individuals that we brought in from the wild. The cleaning was done by gently scraping off encrusting species and covering holes in the shell with surf wax to kill boring worms. This procedure had no noticeable effects on the behaviour and general health of the abalone. Remarkably, the removal of epibionts reduced the drip weight of the individual by up to 30%, suggesting a significant load of epibiota was present. A few months after the cleaning, the individuals seemed to be in good physical condition.

Figure 3. *Haliotis iris* after shell cleaning. Wholes caused by worms closed up with wax to suffocate the infesting organism

Effects of epibionts on shelfish

Shell fouling and shell-infesting species (epibionts) can be detrimental to the shellfish's survival, growth and reproduction. With rising temperatures, effects like shell weakening (fig. 1), limited mobility, and increased weight caused by native and non-indigenous epibionts (fig. 2) will substantially increase energetic requirements for the shellfish while reducing survival and reproductive output [8–13]. Particular epibionts from foreign shores present further substantial threats to local shellfish populations as they can be vectors for other diseases and parasites [14–17]. Many knowledge gaps remain, not least because bio-fouler/mollusc interactions have not yet been studied in New Zealand. Gaps range from basic biology to interactions between epibionts and their combined impact on shellfish. Particular for abalone such as *Haliotis iris* (Gmelin, 1791) are studies limited to a few worm and sponge species and their distribution along our coastline. Given the commercial and cultural importance of pāua, the lack of knowledge in epibiont and shellfish interaction is astonishing.

First results

A subsample of removed organisms was analysed for species composition and abundance. Eleven taxa were identified, with limpets and chitons being the commonest. Various sessile and mobile polychaete worms were abundant (Table 1), including several individuals of Polydora spp. (shell-infesting worms, fig. 4). With these first results, I hope to encourage further research into epibionts, parasite-host association and which affect these organisms have on shellfish. Such work provides a baseline for hatchery managers to know what sort of marine species they may be bringing into their hatcheries and will inform strategies to optimise broodstock health. As well as understand the association between epibiont species to the host organisms.

Figure 4. Two individuals of *Polydora* spp. removed from pāua shells

Table 1. Subsample of taxa with individual count removed from *Haliotis iris* shells

Species	count
Syllidae	2
Phyllodocidae	5
Dodecaceria berkeleyi Knox, 1972	1
Perinereis spp.	2
Polydora spp.	5
Spirobis	6
Sabellida	1
Patelloida spp.	57
Chiton glaucus Gray, 1823	10
Limpet	1

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