

Diet of the *Partula* species of Moorea

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During the dissection of 342 specimens of Moorean *Partula* for taxonomic research a study was made of the diet of these wild collected specimens. Gut contents were dissected out of 58 specimens, representing each species from several different valleys. The specimens were collected by Bryan Clarke and Jim Murray in 1962-7 and are preserved in the Mollusca Department of the Natural History Museum, London.

The results of the dietary analysis are summarised here.

General pattern

Some geographical variation was recorded, which is noted in the species accounts below. The species diets could be placed into four main ecological groups (with some overlap):

Fungal feeders – *olympia*

Detritivore – *tohiveana*, *mooreana*

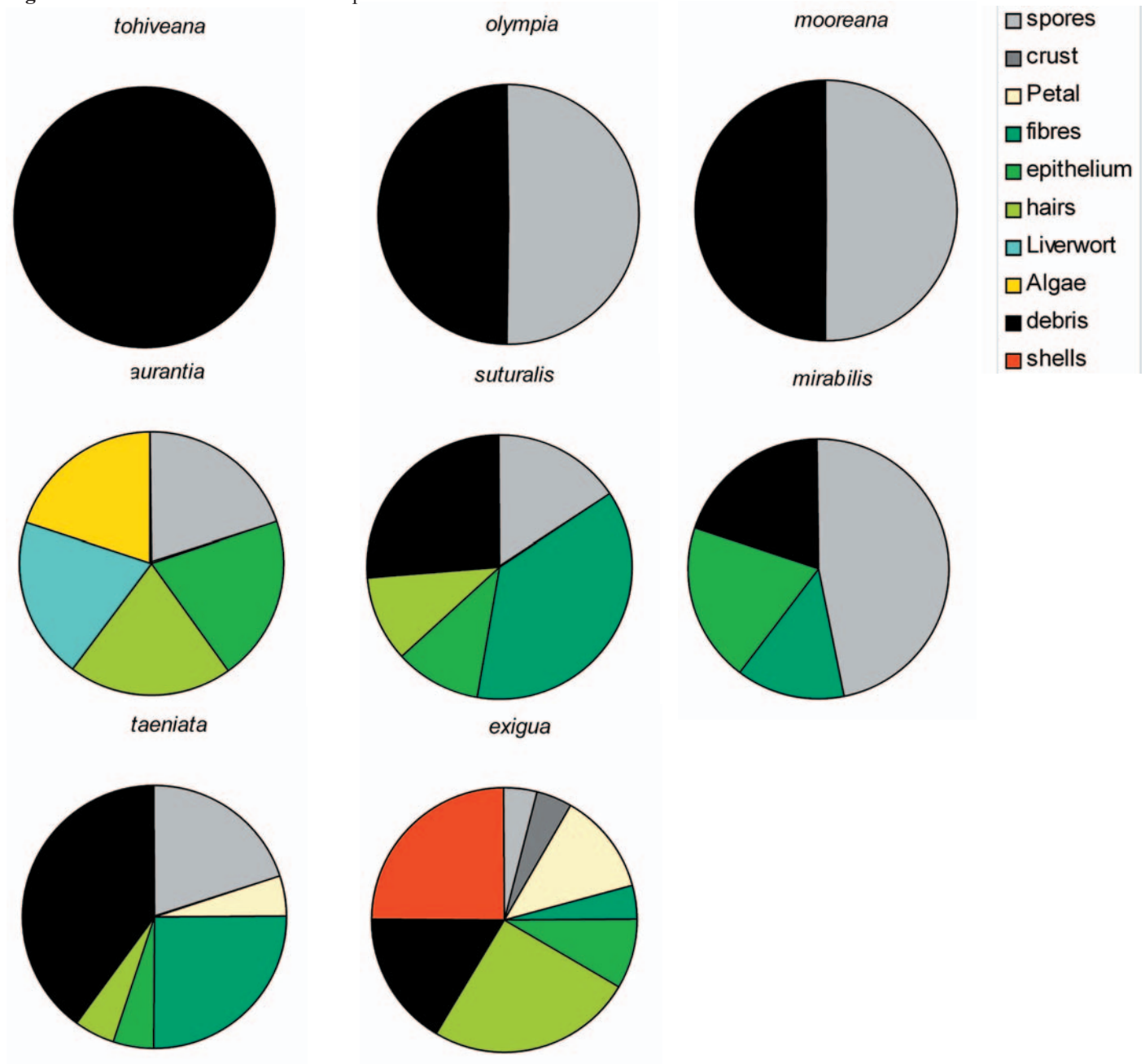
Detritivore / plant grazer – *taeniata*, *suturalis*

Plant grazers – *aurantia*

Omnivore (fungus, plant tissue, debris) – *mirabilis*

Omnivore & carnivore - *exigua*

Fig. 1. Diets of each Moorean *Partula* species.



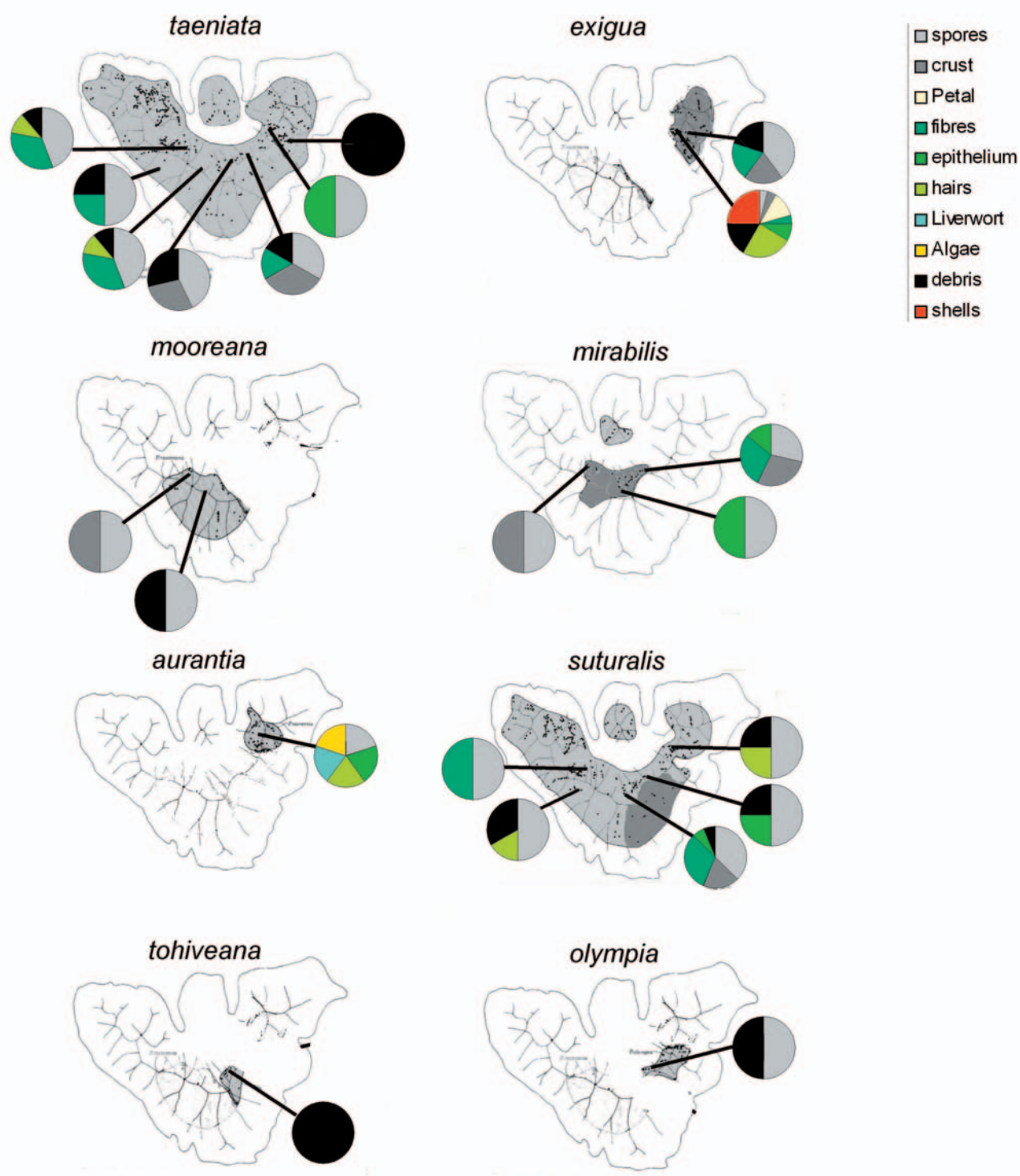
Geographical variation in diet

Samples from different valleys contained different proportions of the dietary components. In the case of *P. taeniata* plant fibre and hairs were largely found in western valleys and epidermal cells only in the east. In the latter region the snails were sympatric with *P. exigua*. Where the two species are sympatric *P. taeniata*'s broad diet appears to be pushed to extremes of detritivory and leaf grazing, while *P. exigua* occupies the omnivorous niche.

Geographical variation is also seen in *P. mirabilis* although the range of this species is relatively restricted. In the west of its main range it is a fungal feeder, in the east its diet is broader, including plant tissue. There are no apparent reasons for this local difference and may be sampling error.

The second most widespread species after *P. taeniata* is *P. suturalis*. In this species there is no clear geographical pattern. The sympatric presence of its close relative *P. aurantia* does not appear to cause the same displacement seen in *P. taeniata-exigua*.

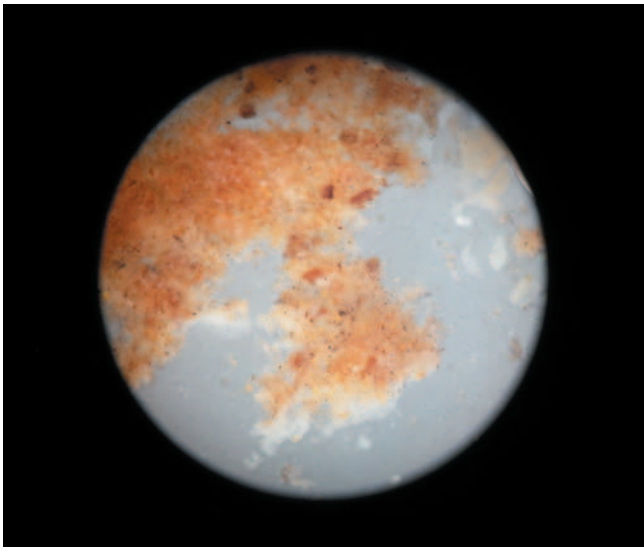
Fig. 2. Geographical variation in Moorean *Partula* diet.



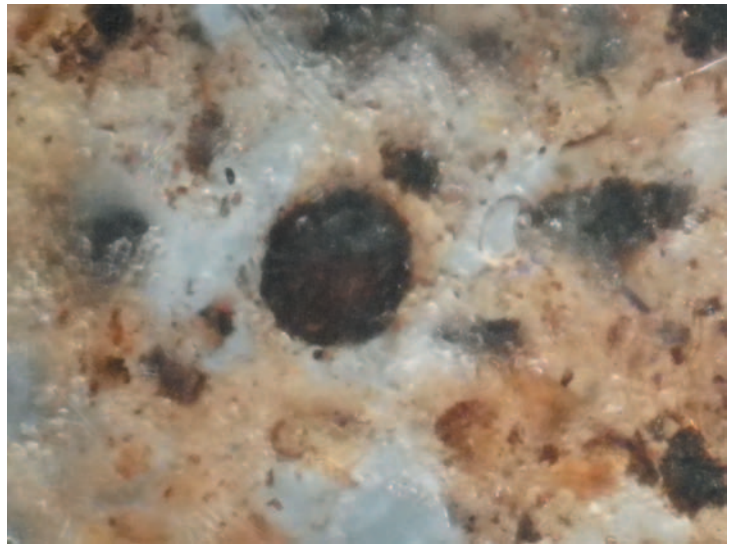
P. tohiveana

Exclusively a detritivore, all dietary items identified as small particles of detritus. No individual items identifiable.

Detritus



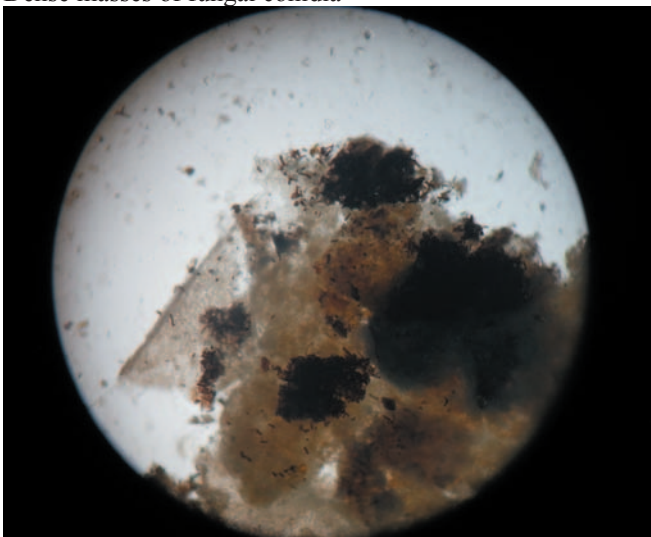
Detritus



P. olympia

This species was a detritivore and fungal grazer: in all samples small debris particles were recorded, along with fungal conidia, apparently of mildews. Similar conidia are found in the other species but only in *P. olympia* were they found in dense masses indicating deliberate consumption.

Dense masses of fungal conidia



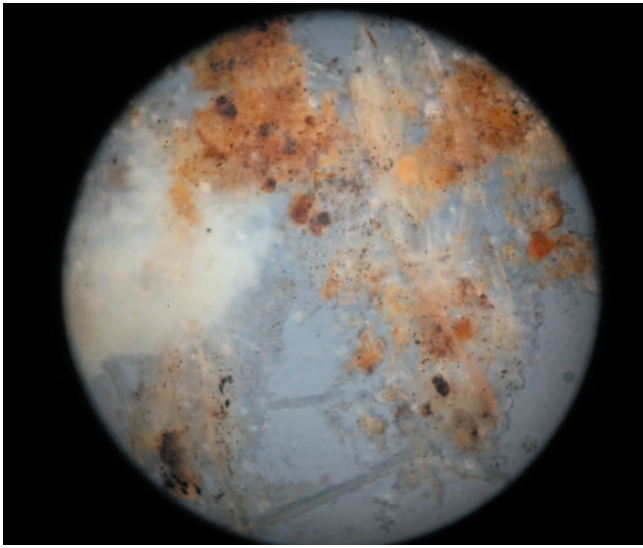
Fungal conidia



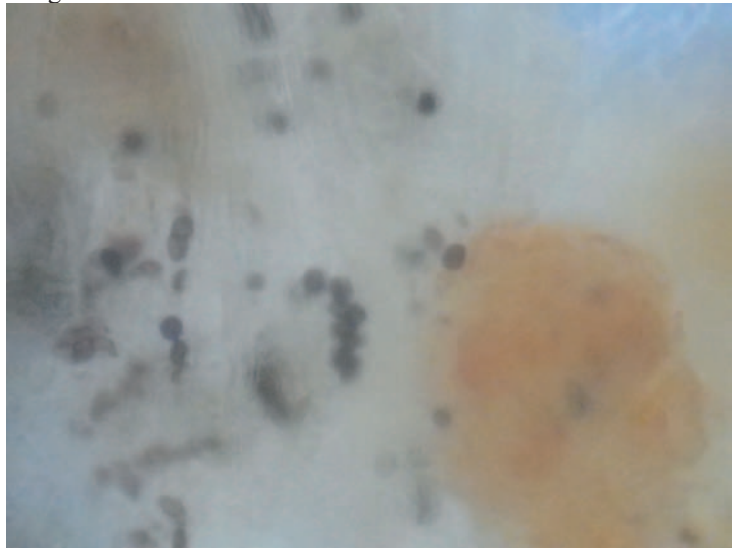
P. mooreana

As with *P. tohiviana* detritus and fungi were recorded in all samples.

Plant fibres and detritus



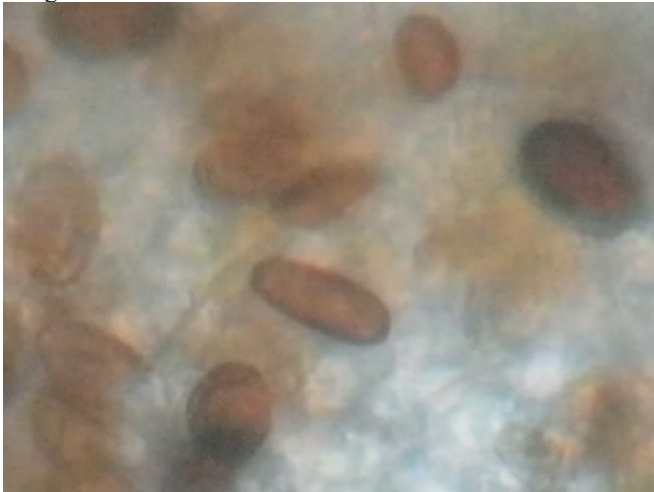
Fungal conidia



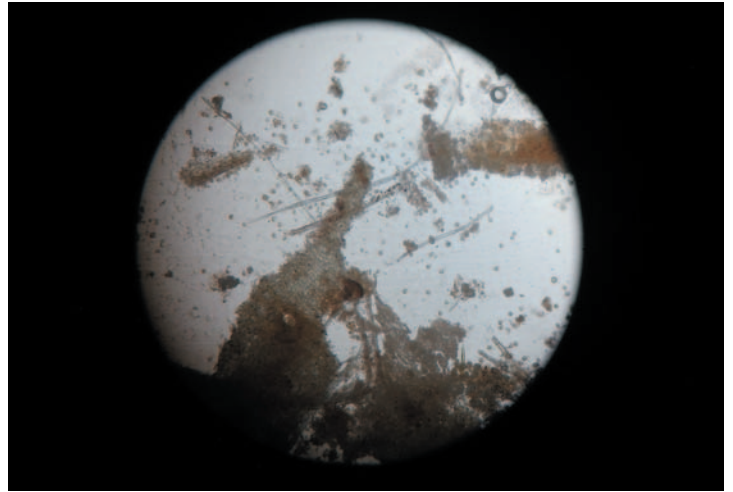
P. mirabilis

A wide variety of items were found in samples of this species. It can be identified as an omnivore; most samples contained fungal conidia, and either plant tissue or debris. Plant tissue comprised fibres and pieces of epithelium.

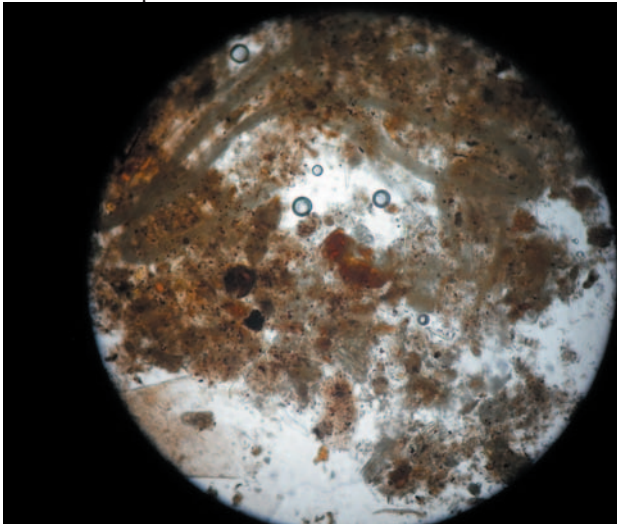
Fungal conidia



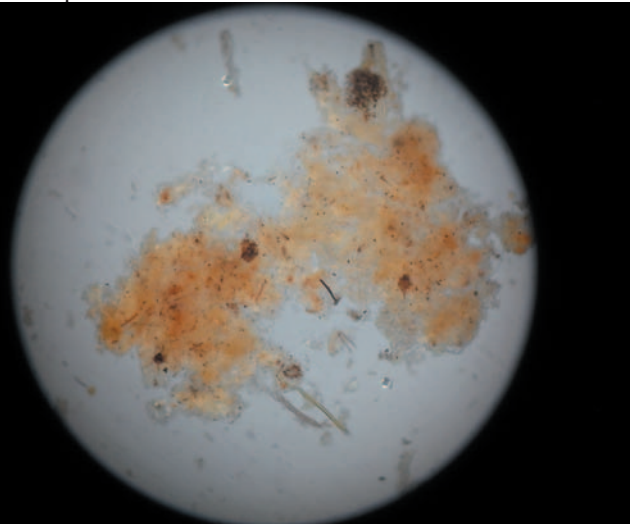
Plant fibres



Detritus and plant fibres



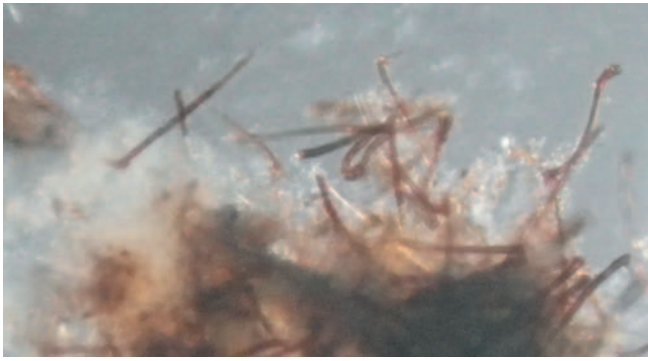
Detritus and plant hair



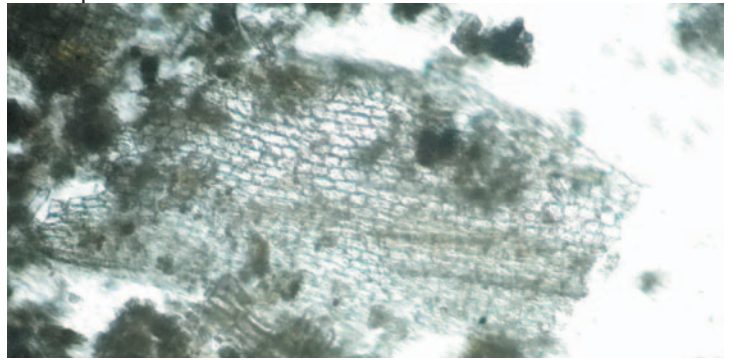
P. suturalis

This is a generalist herbivore and detritivore. All samples contained plant matter and many with debris. Plant material was mostly fibres, with many epithelial sheets or hairs. A small proportion contained fungal conidia.

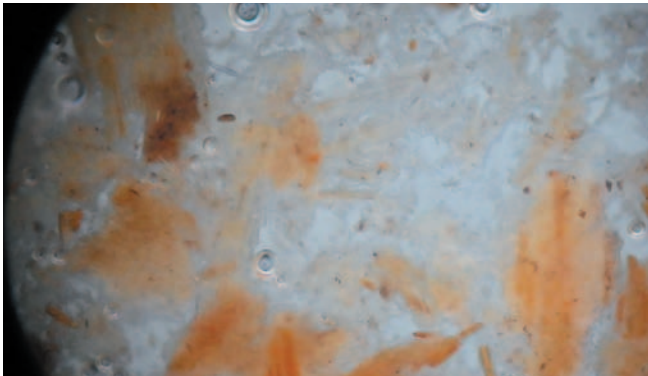
Plant hairs



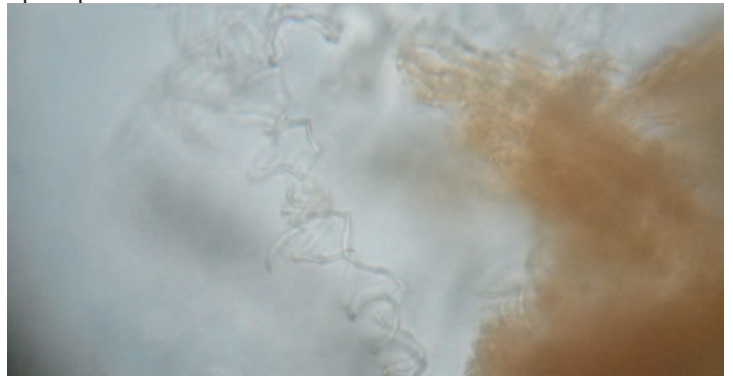
Plant epithelium



Plant fibres



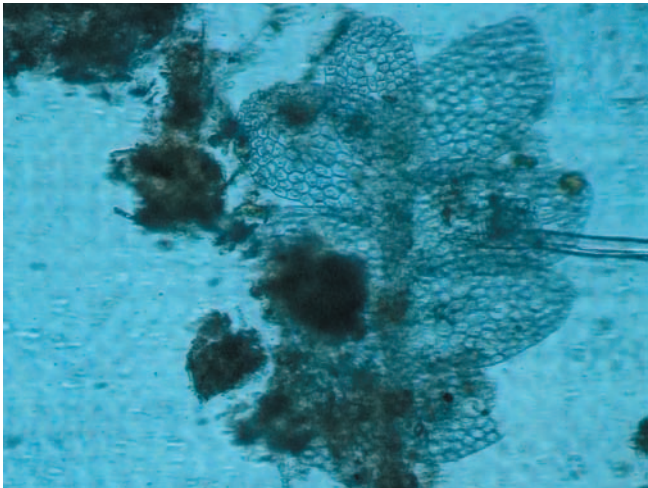
Spiral plant fibre



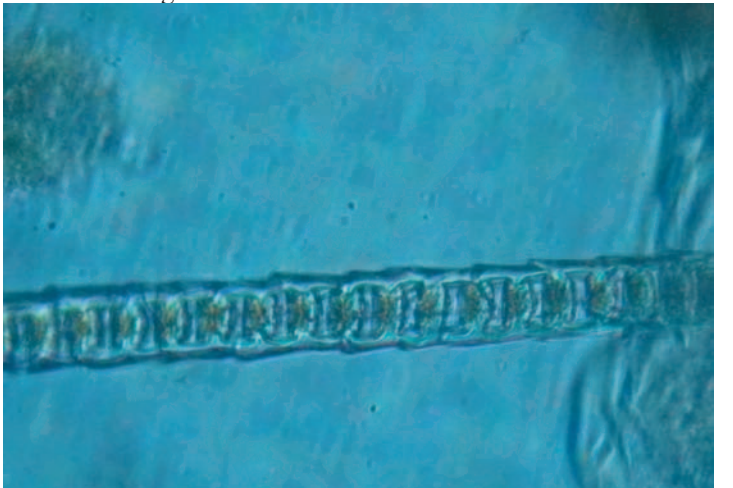
P. aurantia

This species was primarily a plant grazer, with samples containing epithelial sheets, epithelial hairs, algal fibres and a complete foliose liverwort. No detritus particles were identified but one sample contained some fungal conidia.

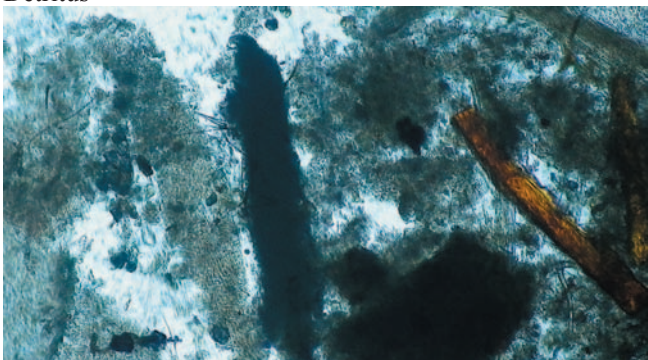
Liverwort



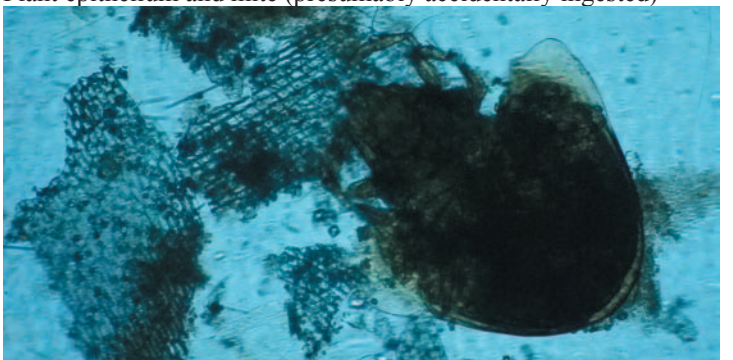
Filamentous algae



Detritus



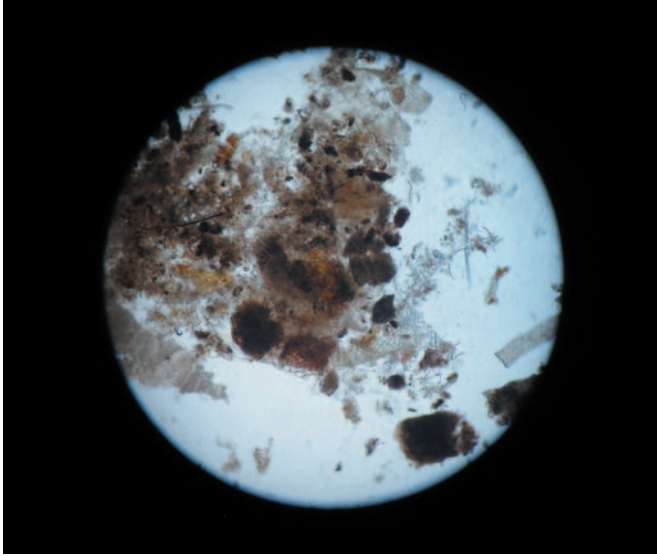
Plant epithelium and mite (presumably accidentally ingested)



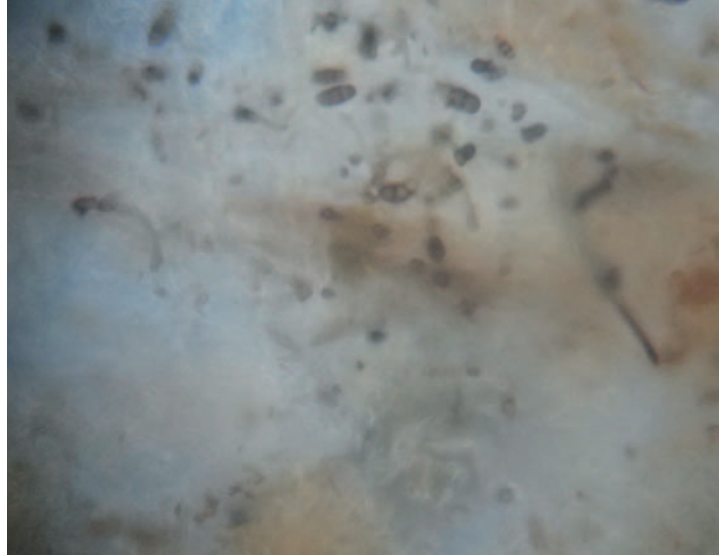
P. taeniata

This species is a detritivore and plant grazer. Most samples contained plant material, including petal cells, plant fibres, epithelial sheets, hairs. Just over half of all samples contained detritus. Fungal conidia occurred in 22% of samples.

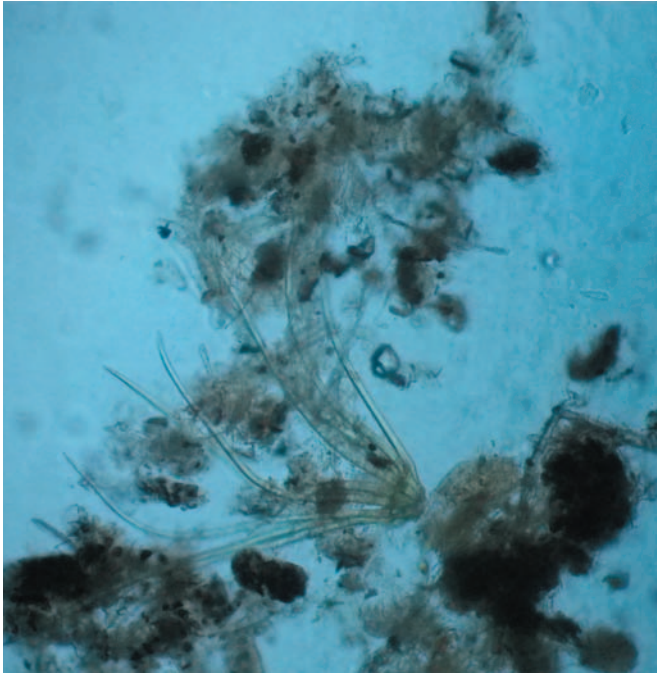
Debris



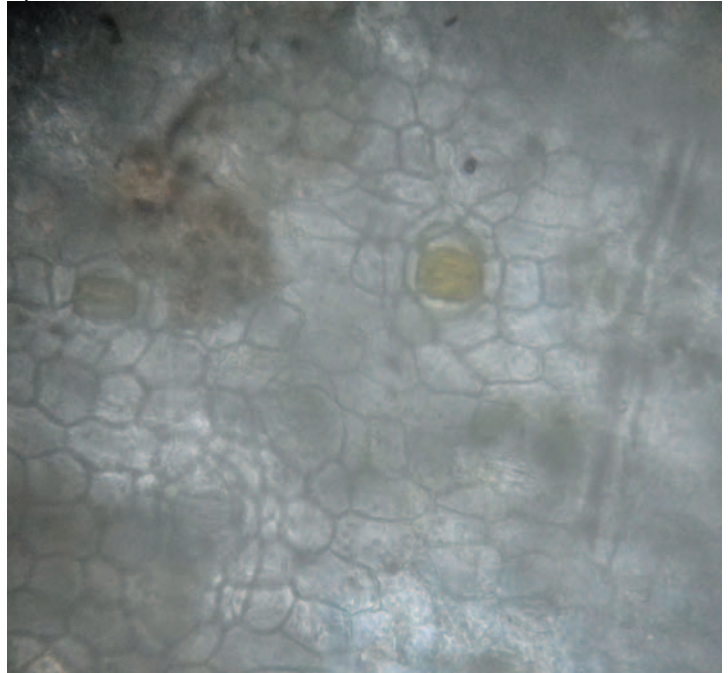
Fungal conidia



Plant hairs



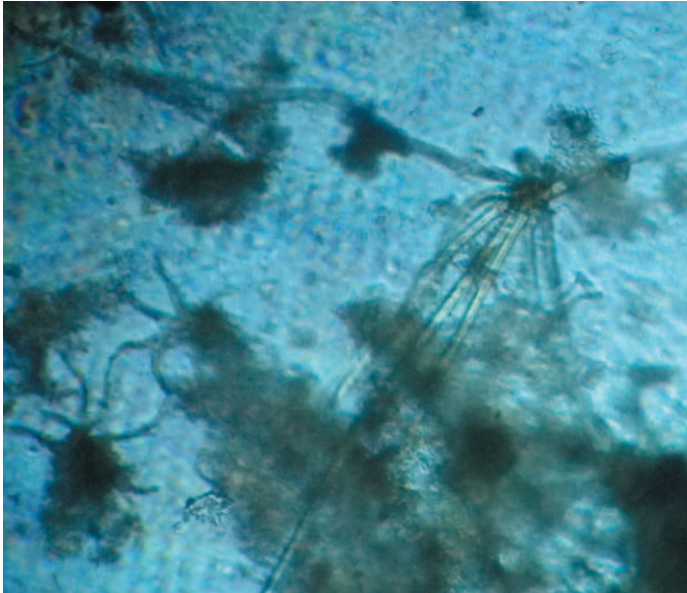
Epidermal cells



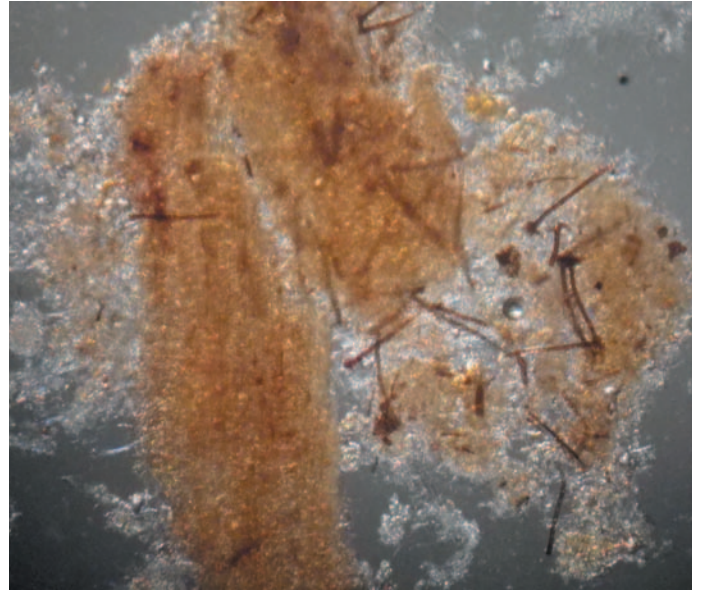
P. exigua

This was the most exceptional species, being an omnivore and a predator. Fungi were consumed in the form of conidia and pieces of fungal crust. Plant material included petal cells, plant fibres, epithelia sheets, and hairs. Most plant samples were epithelial hairs (55%). 25% contained detritus. 38% of specimens contained largely intact shells of other snails. This was only recorded in one site, Paparoa where 43% of *P. exigua* had shells in them. Most contained two shells, with numbers ranging from 1-4. These prey items were identified as belonging to two species: of *Diastole conula* (67% of snails containing shells had fed on juveniles of this species) and of *Georissa striata*. Whilst *G. striata* is found on the ground and on vegetation, *D. conula* is arboreal. Thus it seems that *P. exigua* preyed on small arboreal snails in contrast to the only other carnivorous partulid, *Eua zebrina*, which is terrestrial.

Plant hairs



Plant hairs



Fungal conidium



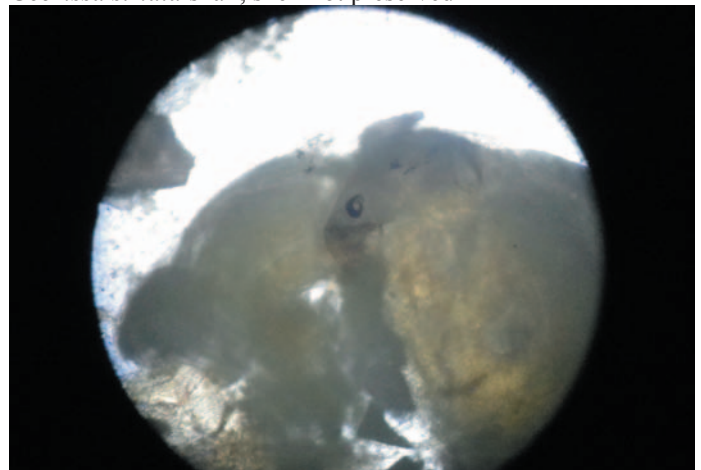
Fungal conidium and snail eggs



Diastole conula



Georissa striata snail, shell not preserved



Further research

Research is continuing on the Moorean *Partula* diet, with the intention of identifying the plant material to species. In addition this study will be expanded to cover the other Society Island *Partula*.

Relevance to captive diets

All Moorean *Partula* are extinct in the wild with the exception of *P. taeniata* which has a small number of surviving relict populations. The *Partula* conservation programme has successfully maintained populations of *P. taeniata*, *P. suturalis*, *P. mirabilis*, *P. mooreana* and *P. tohiviana*. *P. exigua*, *P. olympia* and *P. aurantia* never adapted to captivity and are completely extinct. The specialised diets of *P. exigua* and *P. olympia* may have made their adjustment to captive conditions difficult. The reasons for the loss of the short-lived *P. aurantia* populations are not known.

With the exception of *P. tohiviana* the surviving Moorean *Partula* have wide dietary tolerances and are likely to be well adapted to captive diets with high proportions of plant tissue. *P. tohiviana* is a detritivore and has successfully adjusted to the captive diet.

Acknowledgements

I am grateful to the Natural History Museum, London for giving me access to the specimens for dissection and to Jon Ablett and Fred Naggs for facilitating my use of the material. I am particularly grateful to Jim Murray and the late Bryan Clarke for preserving such outstanding samples.