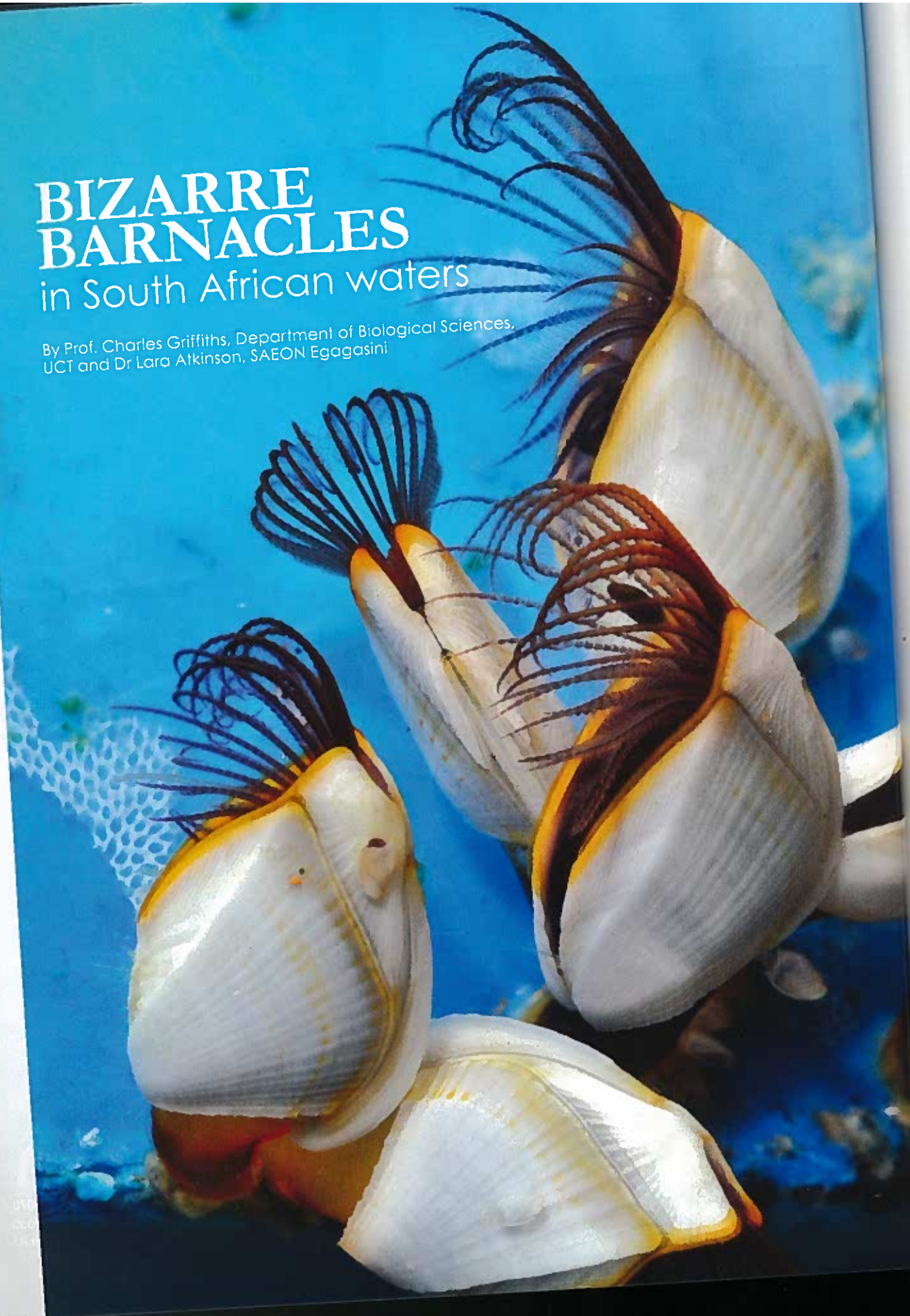


BIZARRE BARNACLES

in South African waters

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Barnacles are a highly modified group of crustaceans that bear little resemblance to their more typical walking or swimming cousins, such as shrimps, lobsters and crabs. Typical barnacles have instead taken up a sedentary existence and have adapted their body form to this lifestyle. They have become encased in a series of protective shell-plates and have modified their limbs into long, hairy appendages that can be combed through the water to collect floating food particles.

ACORN AND STALKED BARNACLES

There are two main groups within the "typical" barnacles and most divers or regular visitors to the seashore will be familiar with both of these. They are the "acorn" barnacles found encrusting rocky shores or ships' hulls and the "stalked" or "goose" barnacles, most commonly encountered attached to floating objects such as driftwood, plastic bottles or buoys.

Specialised habitats

Both these groups are, however, more diverse than this and include species that are restricted to specialised habitats. Among the acorn barnacles, for example, several large species are only found attached to, or burrowing into, the skin of whales or turtles; this is a convenient habitat, since the barnacle only has to extend its feathery legs and the host does the work of dragging these through the water! Many stalked barnacles also have relationships with other species; most simply live on the backs of crustaceans that they use as mobile homes. One particularly bizarre species has, however, become fully parasitic on deep-sea sharks, living on the head of the shark and sending down "roots" into the shark's brain, from which it extracts its food! This barnacle has completely lost its own feeding function and its body is now simply an enlarged reproductive organ. Given their position, these barnacles very likely also control the behaviour of the host sharks, but as few specimens have been recorded and these are all from deep waters, scientists have not yet been able to test this hypothesis.



OPPOSITE PAGE

Typical stalked barnacles

THIS IMAGE

Typical acorn barnacles

BELOW

Whale barnacles occur exclusively on or in the skin of whales (seen here with whale lice).



ABOVE TOP
These attractive stalked barnacles occur exclusively on the backs of deep-sea crabs.

ABOVE BOTTOM
A parasitic stalked barnacle species which sends roots into sharks' brains.

OPPOSITE PAGE
One of the newly discovered rhizocephalans (white mass attached to the abdomen of the crab).

BURROWING BARNACLES

Beyond the acorn and stalked barnacles there are also two other highly modified groups of barnacles that, although widespread, are seldom noticed. The first of these is the burrowing barnacles, small barnacles that have lost their shells and instead dig burrows into the shells of large molluscs, such as abalone or turban shells, from which they extend their feeding appendages.

PARASITIC BARNACLES

The last and most bizarre group has lost all appendages and most of the internal organs and become parasitic on other, larger crustaceans. These are the rhizocephalan (literally "root-headed") barnacles, which would be difficult to recognise as barnacles at all, except that their larvae have remained exactly like those of their more typical ancestors.

The bodies of rhizocephalans consist of just two structures: a branching, root-like "interna" that extends into the tissues of the host and sucks up nutrients from it, and a sac-like gonad or "externa", visibly attached to the outside of the host.

Lifecycle

Their lifecycle is equally unusual. Female larvae produced from the externa swim through the water in search of a new host – usually a crab or prawn – which must be of the same species as that parasitized by the parent. When it finds a host, the female larva attaches to it, bores through the exoskeleton and injects its cell contents into the host's tissues, where it grows into a branching, root-like interna by drawing nourishment from the host's body fluids.

When the female parasite reaches maturity, it develops a sac-like externa. This externa secretes hormones to attract male barnacle larvae, which must fertilise the female's eggs. The fertilised externa then produces both larger male and smaller female larvae and the cycle begins again.

"Enslaved" hosts

Infected hosts are usually castrated by the parasite and treat the parasite's externa as if it were their own, grooming and cleaning it. Sometimes the parasite also prevents the host from moulting, otherwise the externa is shed with the moult and regenerated afterwards from the interna. Infected hosts thus essentially become "enslaved" by the parasite; the food they eat is sucked up by the parasite's interna and diverted to the production of parasite larvae!

ONGOING RESEARCH

Rhizocephalans are very poorly studied in South Africa. To date, only three species have been described, all known only from their original taxonomic descriptions, which date back to the 1950s. However, collaborations between the South African Environmental Observation Network (SAEON), the University of Cape Town (UCT) and the Department of Agriculture, Forestry and Fisheries (DAFF) have resulted in the discovery of additional rhizocephalan species, as well as several new hermit species. These are all parasites of a single host, the deep-water cloaked hermit crab, *Parapagurus bouvieri*.

BURROWING BARNACLES DIG BURROWS INTO THE SHELLS OF LARGE MOLLUSCS.

NEW SCIENTIFIC DISCOVERIES

Examination of some 1 500 cloaked hermit crabs has so far resulted in the discovery of three different rhizocephalans. All of these are rare, which, combined with the challenges of obtaining large numbers of deep-sea hosts, is no doubt why they were not previously reported.

The most common species, which has a kidney-shaped externa, was recorded about eight times, giving an infection rate of less than 1%. The other two species each produce multiple externa, but of different shapes, one resembling a hand of bananas (as depicted on the right) and the other a group of skittles. Both of these have so far been recorded on just one individual host.

All these species are almost certainly new to science, as most rhizocephalans are host-specific, and none have previously been described from this particular host. Specimens have been sent to a taxonomic specialist in Norway, where they are currently being examined before they can be described and named.

These fascinating creatures represent just a few of many new taxa that are emerging from invertebrate samples now regularly being collected during the DAFF demersal research surveys. This emphasises how poorly-known the invertebrate fauna of deeper waters off South Africa are.



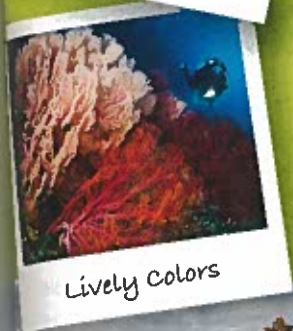
SEND YOUR IMAGES OR SPECIMENS TO THE AUTHORS

Rhizocephalans are also widespread among other shallow water crustacean hosts and any readers who may have noticed these strange creatures are encouraged to send images or specimens to the authors, who are keen to build up more information about this fascinating group and which South African hosts they infect. **SM**

ADDITIONAL READING

- Biccard, A. & Griffiths, C.L. 2016. Additions to the barnacle (Crustacea: Cirripedia) fauna of South Africa. *African Zoology*, 51:99-116.
- Tomlinson, J.T. 1969. The burrowing barnacles (Cirripedia: Order Acrothoracica). *United States National Museum Bulletin*, 296:1-162.
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