the Strandloper

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Strandloper 301 April 2022

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Shell Collectors SA

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IN SEARCH OF MPUMALANGA'S GULELLINAE

Text and photography by Ken Brown

Finding often involves expanding historically-dated distribution knowledge

In 1939 the amateur conchologist Mattthew Connolly produced an extraordinary monograph on Southern African land and freshwater mollusca. There were sporadic and patchy studies in the area for the next six decades, often focussed on a few select families like the Achatinidae, but little comprehensive study was undertaken, and when this did happen, it was often based on very selective and partial investigations, such as comparative genital anatomy to theoretically distinguish species.

Then in 2004 Dai Herbert and Dick Kilburn produced the wonderful and ground-breaking *Field Guide to the land Snails and Slugs of Eastern South Africa*. Apart from Dolf Van Bruggen, Chris Appleton and W. Sirgel, new materials were sporadically written about by Dai Herbert and Mary Cole, largely in remote scientific publications which were largely inaccessible to those outside of the scientific community.

Herbert and Kilburn's fresh approach, with photo images of every species presented in the book, breathed life into and generated renewed interest in our rich terrestrial molluscan fauna in a clear and user-friendly format.

Figure 1. Physical map of *Mpumalanga*

Figure 2. *Juventigulella peakei continentalis*

Figure 3. *Gulella infans*

The only drawback was that their book focussed only on KwaZulu-Natal and Transkei species, and left a major gap for the rest of the country and region.

I have spent several years researching and photographing material on the Gulellinae - a name coined by Dr Ben Rowson to describe a subfamily within the the family Streptaxiidae and under the umbrella of the superfamily Streptaxoidea. The Gulellinae consist of a number of genera, and these include the Malawian *Austromaronia*, the predominantly East African *Dadgulella* with a single South African species, and the *Gulella* which is predominantly South African. Within the *Gulella* are nestled a number of subgenera, including *Hutonella*, *Maurennea*, *Molarella*, *Paucidentina*, *Plicigulella*, *Tortigulella*, *Uniplicaria*, *Wilmattina* and *Zulugulella*. In 2021, I produced the first volume on the Streptaxoidea, which, whilst comprehensive, was cumbersome for collectors, and recently published a pocket guide to Southern African Gulellae, split by province. It is an easy-to-use and quick guide to identification. In the interests of promoting knowledge on the subfamily, a complimentary copy of the pocket guide is available free to every paid-up member of the Society on request to me.

A number of provinces are extraordinary hotspots of endemism and species concentration, and one of these certainly is Mpumalanga. This endemism is concentrated largely along the extension of the Drakensberg escarpment, although much of the lowveld is still unexplored. In the past few years, and particularly during the covid epidemic, I have been fortunate enough to explore a number of areas of Mpumalanga looking for Gulellae.

The most striking aspect for me is to have come across species which have never before been found in that part of the world and to have taken the decision to extend the range of a species rather than indulge in the urge to create new species. This has meant extending the distribution data of species to new places far-removed from where they have been previously recorded. In some instances the morphology of the shell alone has been so characteristic that it cannot be any other species. I have, for example, found the coastal *Juventigulella peakei continentalis* (Figure 2) at Waterval Boven, and recently *Gulella praelonga* (Figure 4) near Komatipoort, when it has only ever previously been recorded from central Mozambique.

In some instances narrow-range species have been easier to extend in range, such as *Gulella barnardi* (Figure 5) from its type species location of Mbombela, to Verlorenkloof near Mashishing, the mountain grasslands around Barberton and deep into the Kruger National Park at Nuantesi and Biyamithi.

Yet without a doubt it has been the escarpment of Mpumalanga which has yielded the greatest species richness. In November last year Anton Groenewald and I spent time exploring a few of these areas in search of Gulellae. At Verlorenkloof we extended the range of *Gulella viae* (Figure 6) and *Gulella perspicua* (Figure 7) as well as finding a number of shells which cannot be presently identified.

The same was certainly true for the extraordinarily beautiful afromontane forests of Mariepskop, and apart from finding wonderful species such as *Gulella (Plicigulella) davisae*, *Gulella hadroglossa*, and *Gulella incurvidens*, we also extended the range of *Gulella (Zulugulella) queketti* (all Figure 8). Even relatively widespread species such as *Gulella infans* (Figure 3) were to be found in many areas that had not previously been found, including Barberton, Verlorenkloof and Mariepskop.

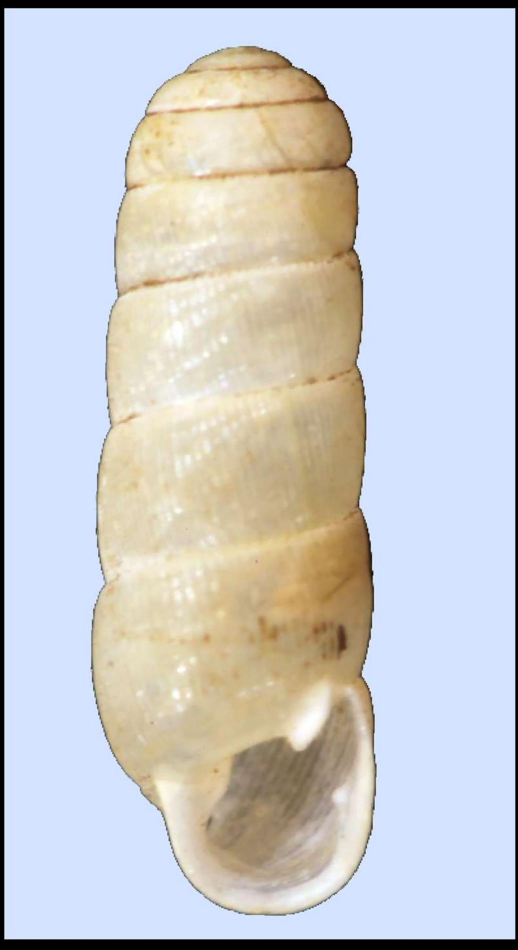


Figure 4. *Gulella praelonga*

Figure 5. *Gulella barnardi*

Figure 6. *Gulella viae*

Figure 7. *Gulella perspicua*

Figure 8. Mariepskop Gulellae: 8.1 *G. davisae*, 8.2. *G. hadroglossa*, 8.3. *G. incurvidens* and 8.4. *G. queketti*

There are also those species which I have identified and placed only fairly tenuously. This is particularly so for those shells I have found in the hot lowveld of Mpumalanga. It has been clear to me that whilst Game Reserves do protect many species, molluscan fauna takes a beating as it is preyed upon by many animals, including monkeys, baboons, mongooses, civets, rodents and many bird species, whilst artificially high population densities of wildlife also impact severely on larger landshells.

Yet Gulellae are largely spared in no small part due to their size, as opposed to Achatinidae which are decimated in reserves.

I have found what appears to be *Gulella bushmanensis* (Figure 9) as well as *Gulella gouldi discriminanda* (Figure 10) in game reserves of the lowveld, as well as *Gulella distincta*, *Gulella perissodonta*, *Gulella infans* and *Gulella barnardi*.

My investigations have at best been partial, yet what is very clear is that far too little work has been done on updating distribution patterns for many years for many species of land molluscs. This is probably due to the huge lack of intellectual investment by many of us.

Often the task of furthering science rests on the shoulders of the serious amateur. If we are not to be relegated to irrelevance, we need to seize the opportunity to make real value in what we do.

I believe that one of the greatest amateurs in South African conchology, Matthew Connolly, would smile. He chose to make a difference, and it was enormous.

Figure 9 *Gulella bushmanensis*

Figure 10. *Gulella gouldi discriminanda*

The Challenge: A photographic Competition for all



We have decided to launch a new competition. Covid marred our ability to host shell displays and we have decided to host a shell photo competition.

The rules are simple: present a shell or shells in some way that shows flair and originality, and of course showcases your creativity and ability to capture your passion. We have opened the competition to everyone - not just members - in order to foster and promote a keener interest in conchology and our Society. Only original work may be submitted, and up to 10 submissions per person are allowed. Provide a brief description of each photo.

Send your submission, name and details by email as attachments, preferably jpeg, to:

Andre Meredith: andrepm32@gmail.com or
Anton Groenewald: anton.groenewald@netcare.co.za

The submission deadline is 31 May 2022 and will be adjudicated on by the Executive Committee.

The winner will receive a cash prize of R200 and non-members will also receive a copy of the latest Strandloper.

The 10 best entries will be published in the next Strandloper.



Our 2021 Annual General Meeting

Finally the grip of Covid was sufficiently released for the Society to hold its Annual General Meeting late last year, after a long delay.

We were still restricted by a number of lockdown protocols, but a relatively small group was able to meet.

After feedback by various office bearers, the Minutes of the last AGM, as well as budget presentation, were adopted. Copies of those Minutes, as well as those of this AGM , are available from the Secretary, although they have been distributed to all members.

Alwyn Marais gave the key note address, and the subject which genereated the most interest, was his synopsis of the present state of DNA testing insofar as it relates to the ability to derive scientifically acceptable sampling from actual shells. Alwyn will be submitting an article in a forthcoming Strandloper on his investigations into this fascinating area.

The election of a new Executive took place and the following persons were unanimously elected for the next two-year period:

President: Andre Meredith
Secretary: Anton Groenewald
Treasurer: Maurice Evans
Scientific Officer: Alwyn Marais
Editor: Ken Brown
Committee member: Gillian Petzer
Patron: Johan Marais

Andre, Maurice and Ken have indicated that this will be the final two-year period of their availability to serve on the Executive.

The formal proceedings ended, and an informative and enjoyable shell auction took place under the guidance of Roy Aiken, with material for auction from the Du Preez collection, as well as from Roy and John Hobbs.

A club shelling get away

The Pretoria Group has decided to have a get away to the south coast of KwaZulu-Natal. Alwyn Marais is making the arrangements and it is anticipated that the outing will take place in late June or July.

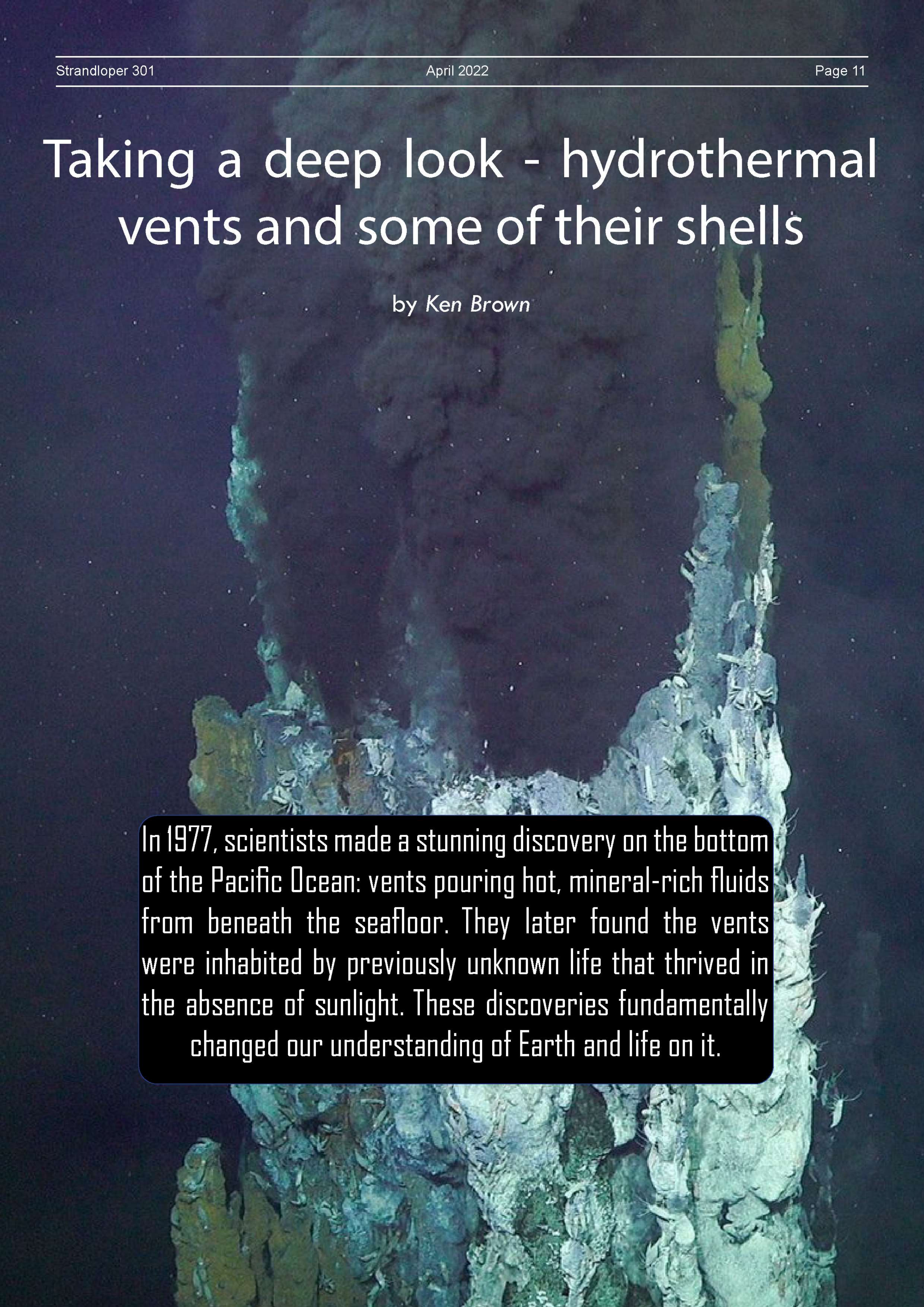
Whilst the shelling trip is driven by the Pretoria Group, any Society member and their partners are welcome to attend and can contact Alwyn at alwyn@deark.co.za.

The time away will focus not just on marine shells but also land and freshwater shelling too, as well as identification and informal teaching sessions. A number of snorkelling trips will also take place.

This is a great opportunity to get to know one another better, and to learn more and collect in a friendly and informative environment, and will no doubt prove to be huge fun. Book your place now.

Taking a deep look - hydrothermal vents and some of their shells

by *Ken Brown*



In 1977, scientists made a stunning discovery on the bottom of the Pacific Ocean: vents pouring hot, mineral-rich fluids from beneath the seafloor. They later found the vents were inhabited by previously unknown life that thrived in the absence of sunlight. These discoveries fundamentally changed our understanding of Earth and life on it.

Taking a deep look - hydrothermal vents and some of their shells

Just like hot springs and geysers on land, hydrothermal vents form in volcanically active areas — often at mid-ocean ridges, where the Earth's tectonic plates are spreading apart and where magma wells up to the surface or close beneath the seafloor.

Ocean water percolates into the crust through cracks and porous rocks and is heated by the underlying magma. The heat helps drive chemical reactions that remove oxygen, magnesium, sulphates and other chemicals from the water. In the process, the fluids also become hotter and more acidic, causing them to leach metals such as iron, zinc, copper, lead, and cobalt from the surrounding rocks.

Hydrothermal fluid temperatures can reach 400°C or more, but they do not boil under the extreme pressure of the deep ocean. As they pour out of a vent, the fluids encounter icecold, oxygenated seawater, causing another, more rapid series of chemical reactions to occur. Sulphur and other materials precipitate, to form metal-rich towers and deposits of minerals on the seafloor. The fluids also contain chemicals that feed microbes at the base of a unique food web that survives in the darkness of the abyss. Instead of relying on photosynthesis to convert carbon dioxide into organic carbon, the bacteria use chemicals such as hydrogen sulphide to provide the energy source to drive their metabolic processes and ultimately support a wide range of organisms such as tubeworms, shrimps, shells and bivalves.

Hydrothermal vents, in transporting chemicals from deep in the earth, help regulate global ocean chemistry. In the process, they accumulate vast amounts of potentially valuable minerals on the seafloor, and this is resulting in their

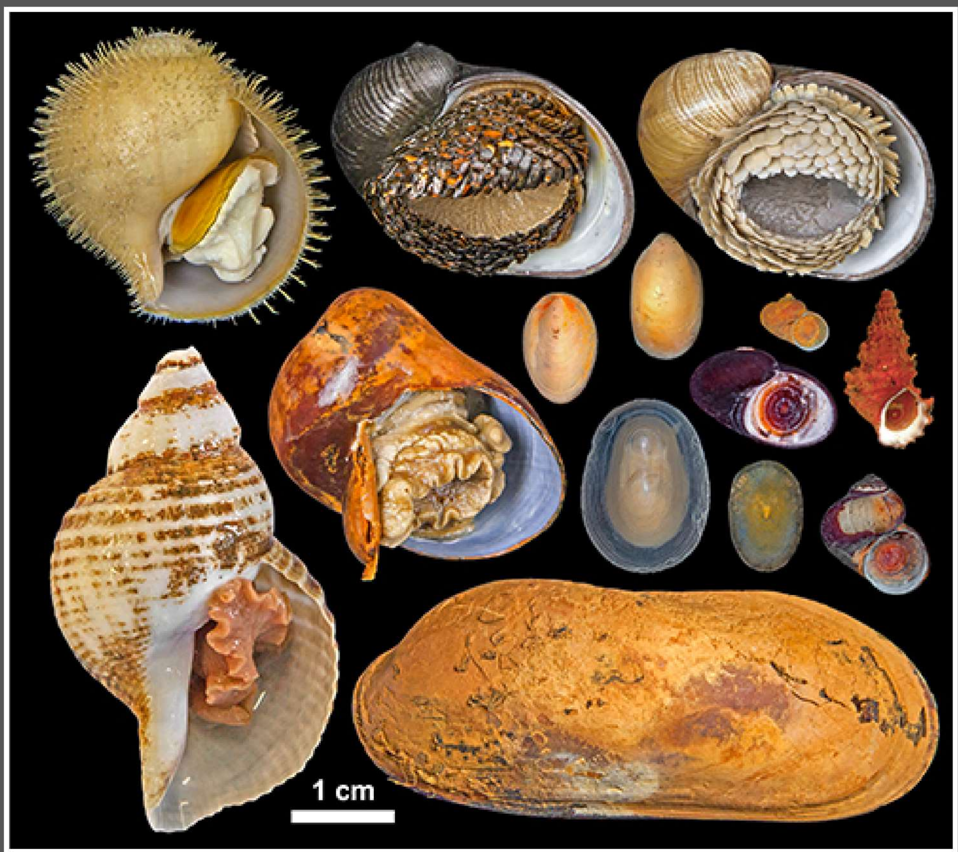
The geothermal scaly-foot snail *Chrysomallon squamiferum*

exploitation, and placing many of their unique and specially-adapted life forms at risk. Vents support complex ecosystems of exotic organisms that have developed unique biochemical adaptations to high temperatures and environmental conditions we would consider toxic. Learning about these organisms has taught us about the evolution of life on Earth and the possibility of life elsewhere in the solar system and the universe.

The unique adaptations by many of the species that have adapted these deep water, pitch dark, toxic cauldrons is astounding. Perhaps one of the most exotic is the so-called "scaly-foot shell", first discovered in 2001. This vent-endemic gastropod is known only from deep-sea hydrothermal vents in the Indian Ocean north of Rodrigues. It lives at a depth of 2900 metres. The mollusk's shell consists of three layers: a calcified inner layer, an organic middle layer and an outer layer fortified with iron sulphides. The snails also have enormous hearts, in part to accommodate the oxygen needs of symbiotic bacteria that live in their bodies and provide their nutrition. *Chrysomallon squamiferum*, which is also known as the sea pangolin for its tough plates, has a foot which is armoured at the sides with iron-mineralised sclerites.

Bathymodiolus heckerae, which exhibits giantism

Similar in many ways are cold water seeps also found at mid-ocean rifts, which likewise exhibit amazingly diverse life. This includes molluscan giantism, where bivalves can easily reach up to half a metre in length.



Some of the marine shells that inhabit hydrothermal deep-sea vents

Swathes of *Bathymodiolus manusensis* beside a vent

Certain species of bivalves have adapted spectacularly well to the waters surrounding geothermal vents, particularly the genera *Bathymodiolus* and *Benthomodiolus*.

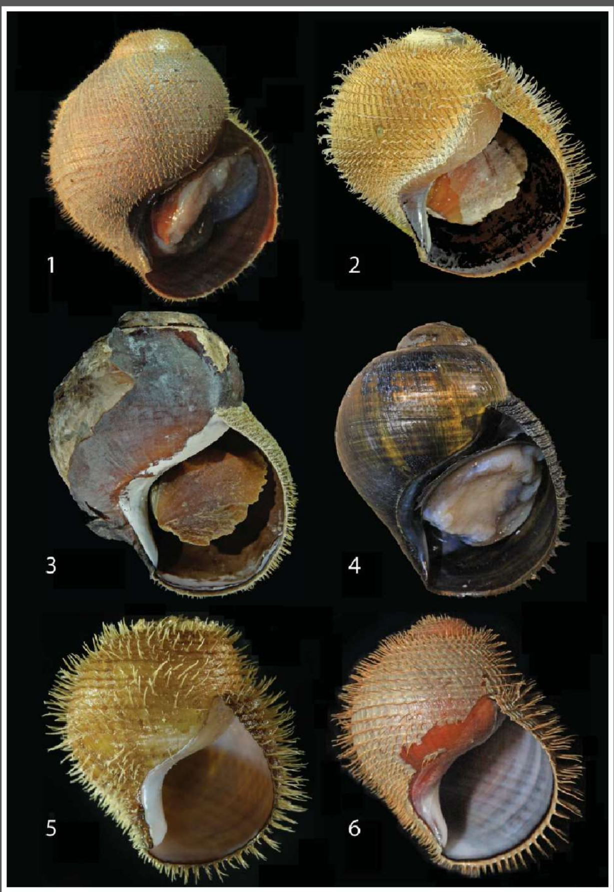
However limpets and many other species have also adapted to the toxic brew which allows them to thrive in the depths of a permanently dark marine world.

Limpets cover the rocks surfaces at East Diamante vent

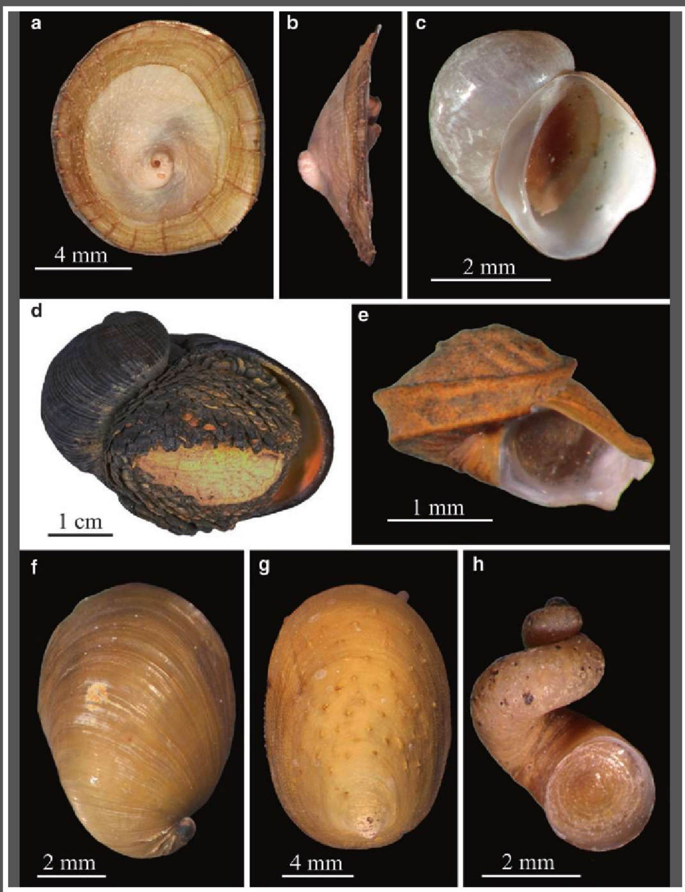
A lot of scientific research is being undertaken on marine shells being found at geothermal vents, with a plethora of recent discoveries, some of which are shown in the images below of newly described species.

In many respects there is enormous pressure to identify these species, as lurking in the background is the threat of unrestricted deep-sea mining, as the vents represent concentrated deposits of mineral wealth.

Four new deep-sea provannid snails in the superfamily of deep-water sea snails Abyssochrysoidea, have also been recently discovered (2019) by Chen, Watanabe and Sasaki (DOI: 10.1098/rsos.190393) from hydrothermal vents off the coast of Japan, and their images of these shells are shown on the opposite page.

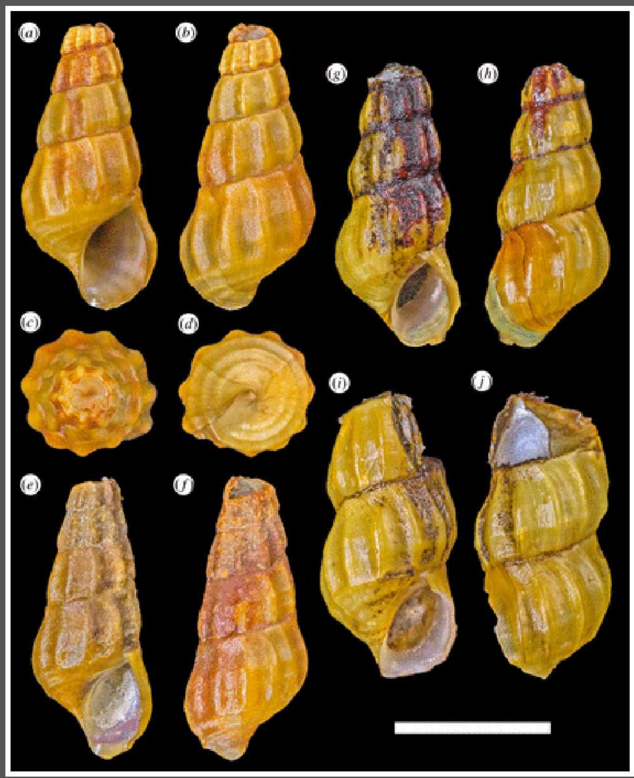


Images of recent deepwater vent *Alviniconcha* species holotypes (1) *A. hessleri* (2) *A. kojimai* (3) *A. boucheti* (4) *A. marisindica* (5) *A. strummeri* (6) *A. adamantis*



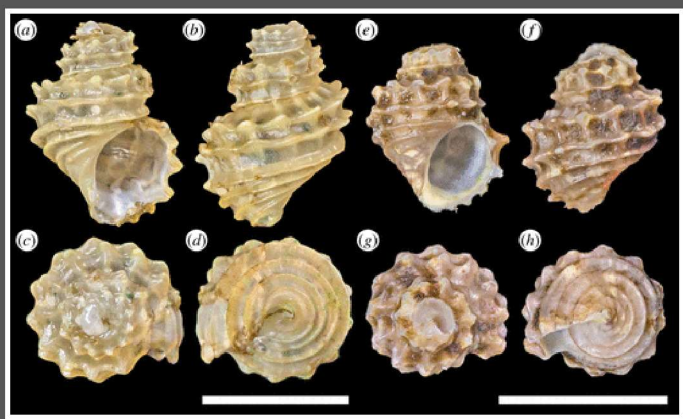
Recent deep water marine species: (a–b) *Neomphalus fretterae* (c) *Cyathermia naticoides* (d) ***Chrysomallon squamiferum*** (e) *Melanodrymia aurantiaca* (f) *Peltospira operculata* (g) *Nodopelta heminoda* (h) *Pachydermia laevis*

Images of *Desbruyeresia armata*

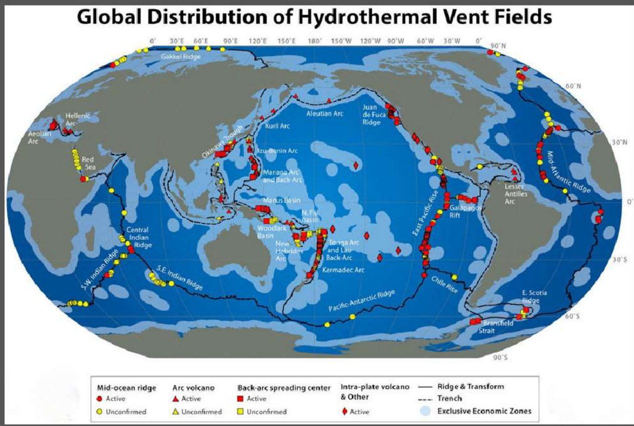


Images of *Desbruyeresia costata*

Images of *Provanna fenestrata*

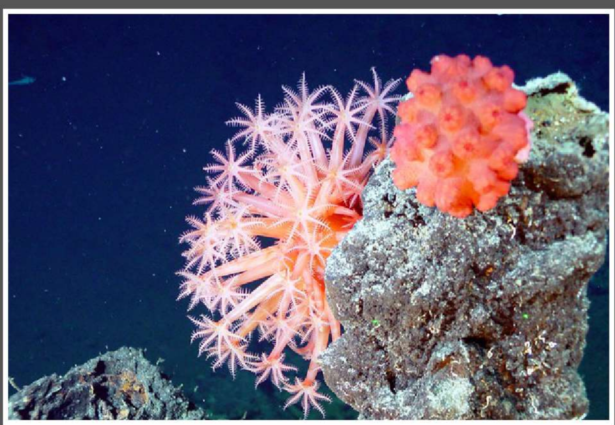


Images of *Provanna stephanos*

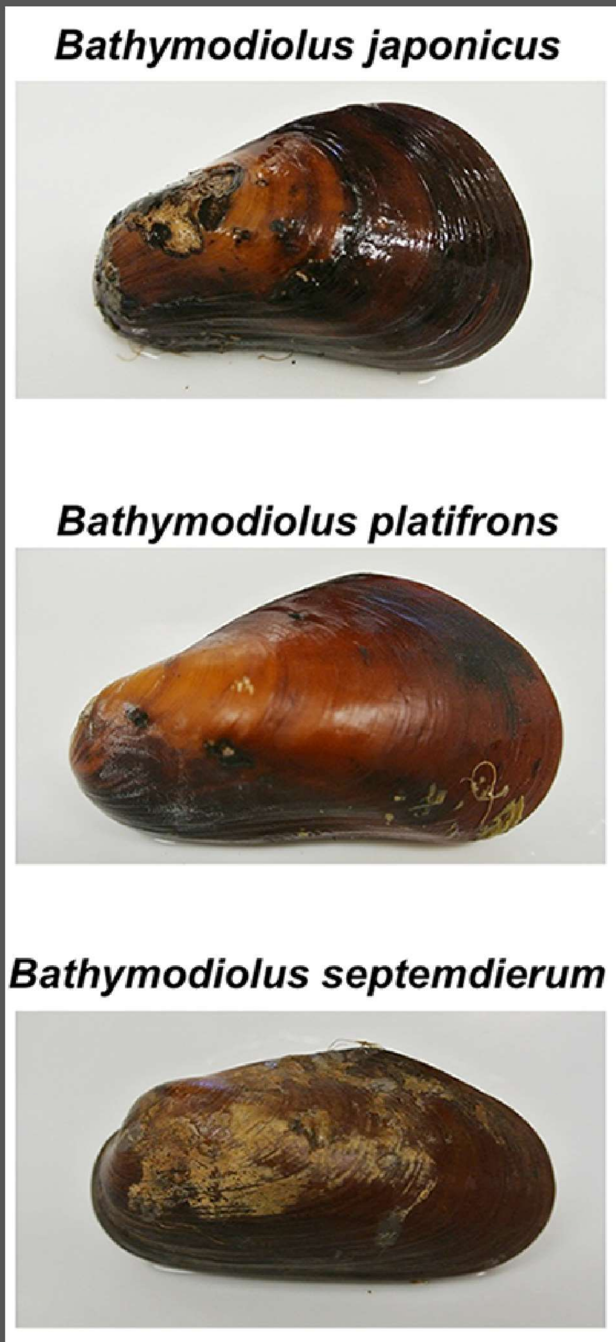


The deep-ocean environment certainly is the final frontier, and special niches such as hydrothermal vents open us to amazing new worlds, which despite their incredible ability to adapt, are immensely fragile and in need of our protection.

The deep ocean vent limpet found in the Southern Ocean: *Lepetodrilus concentricus*



It is clear that geothermal vents support an enormous array of marine life. This includes many species of rare corals, including octocorals or soft corals, such as the species above, *Octocorallia Alcyonacea*), which, as with other cnidarians, has stinging cells or nematocysts.



Images of deep water bivalves found at Japanese geothermal vents

Almost two-thirds of species at deep-sea hydrothermal vents are at risk of extinction

New research from Queen's University Belfast, has led to 184 deep-sea species being added to the global Red List of Threatened Species. With almost two-thirds of the species assessed listed as threatened, it highlights the urgent need to protect them from extinction.

The International Union for Conservation of *Nature's Red List of Threatened Species,* is the world's foremost conservation authority, with universally recognised extinction risk categories such as *Endangered* and *Critically Endangered* used to raise awareness of species' conservation needs to industry, policy makers, and the general public. More than 140,000 species have been Red Listed, but less than 15% are from marine environments and barely any are from the deep sea.

The deep sea is the largest environment on earth, with thousands of unique species living in extreme habitats.

The remoteness of these sea-floor habitats means they are often under-studied, making it difficult to understand and clearly set out their conservation requirements.

Hydrothermal vents are just one of these unique deep-sea ecosystems. Vent habitats host a similar density of life as tropical rainforests and coral reefs. There are approximately 600 of these hotspots known worldwide and most are one-third of a football field in size. Vent communities are also distinctly different from the surrounding seafloor, making these highly insular habitats.

There is growing industrial interest in the deep sea, including deep-sea mining for commercially important metals, meaning it is now vital to protect these unique, insular ecosystems and their specialist endemic species.

The assessment is that the scaly-foot snail is *endangered*, for example, and has been since 2019.

The researchers applied the *IUCN Red List* criteria to assess the extinction risk of all mollusc species known exclusively from hydrothermal vents. The research found that of the 184 species assessed, 62% are listed as *threatened*, 39 are *critically endangered*, 32 are *endangered*, and 43 are *vulnerable*.

The paper '*A Global Red List for Hydrothermal Vent Molluscs*' was published in Frontiers in Marine Science, which was supported by the Marine Institute. The research involved an international team from the USA, Canada, Japan and the UK.

It showed that Indian Ocean vent molluscs are under immense pressure, with 100% of species in *threatened* categories and 60% of those *critically endangered*.

Deep-sea mining is focussed on metals like copper, lead and zinc which are integral components of the towering hydrothermal vent structures. The International Sea-bed Authority, the UN body responsible for managing the seafloor beyond national jurisdictions, has already granted 31 exploratory deep sea mining contracts, seven of them at hydrothermal vents.

It is still unclear exactly how huge mining machines will impact the deep seafloor. But there is no reason to expect it will be any more eco-friendly than mining on land. At the very least, mining will destroy these areas and release toxic sediment plumes, so scientists agree it is not good news for deep-sea creatures. It highlights the risk that mining poses to all vent species. In fact, seabed management and mining regulation consistently has had the greatest impact on species extinction risk and there is a huge need for regulations to be put in place to protect these and many other species.

Using the IUCN Red List has enabled us to assess which species are most at risk and to inform policies to protect these from threats like mining, as well as enable conservationists to use this approach for assessing the extinction risk of other data-limited species, both marine and on land.

Time may not be on our side.