



From the Editor's Desk

Welcome to Volume 89 of *Forum Phycologicum* — the official newsletter of the Phycological Society of Southern Africa.

Our newsletters are intended as a platform for you to share any and all phycology-related content with the larger Southern African phycology community. This volume includes a fascinating peek in to rocky shore ecology, and a popular piece on whales and their fashion preferences! We also have a link to the Kelp Value Chain report, hot off the press for your perusal.

On the back end, the Steering Committee has been hard at work finalising B-BEE status for the PSSA — a new institutional requirement needed for the processing of payments to the Society. Thank you to everyone that responded to the questionnaire that was sent out. Soon, the planning for the PSSA 2024 Congress will be underway, and I think I can speak for the whole Committee when I say that we are so excited to convene in beautiful Mozambique next year!

Last off, a heartfelt thanks to everyone that contributed to this volume of *Forum Phycologicum*. Do keep the submissions coming, and wishing you all a restful and peaceful festive season!

Akshata Mehta
 Newsletter Editor of the Phycological Society of Southern Africa

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Between the Tides and a Hard Place: Surviving Between Tidemarks on Rocky Shores

by

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Few would welcome being “*caught between a rock and a hard place*”, ... being faced with equally undesirable alternatives. This statement is probably equally true for organisms living on the rocky intertidal zone where surviving in an environment that is neither truly marine nor truly terrestrial can be extremely stressful. The area between tidemarks on rocky shores experiences an array of intense physical and biological stresses associated with the combined extremes of living both on land and in the sea: salt spray; immersion in salt water; exposure to intense summer solar radiation, and potentially freezing winter temperatures; strong winds and wave action; drenching by heavy rainfall; unstable substrates; sand inundation; bulldozing by boulders and other organisms; and intense competition, predation and herbivory. How do they cope?

Plants and seaweeds generally find it more difficult surviving in this environment because they are exposed to a greater diversity of both physical and biological stressors. They must either tolerate these stressors or succumb to them, and indeed they have found astonishing ways of coping. For terrestrial plants living on the shore (maritime plants) the main problem is how to survive a salty environment. A characteristic feature of many of these plants is succulence as they must store lots of fresh water (seawater is too salty for them to use directly) whenever it becomes available. Additionally, maritime plants are often subjected to desiccating salt-laden wind, blasting by sea sand or sometimes even buried in it, and often also subjected to intense solar radiation. Moreover, they grow in organically poor soils that have little water-holding capacity.

Maritime plants use a variety of mechanisms to cope in this saline environment. Some can selectively control salt absorption at the root level. Others secrete excess salt via salt glands on their leaf surfaces. Some, like glassworts (*Salicornia* and *Sarcocornia* spp.) and the soutbossie *Bassia diffusa*, concentrate salt in their tissues, diluting the salt by storing it in their succulent parts, thereby compartmentalizing the salt in tissues where the high salt concentrations will not affect normal metabolism.

This environment is also a prime habitat for the establishment of lichens, which can survive extremes of heat, cold and drought. Lichens can dry out completely, shutting down their metabolic processes when conditions become too severe. It is also believed that their complex chemistry allows them to control light exposure, repel herbivores, kill attacking microbes and even discourage competition from other plants.



Dense mats of glassworts (*Sarcocornia littorea*, middle) and soutbossie (*Bassia diffusa*, foreground and left back), which concentrate salt in their succulent tissues.



Lichens are often prominent features above the high-water mark where they survive extremes of heat, cold and drought.

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Although marine, seaweeds also have a hard time surviving in this environment for they must often cope with the challenges of prolonged exposure to air (e.g., desiccation and temperature extremes) during low tide, and a host of biological factors. All the vital functions of life (e.g., respiration, photosynthesis, growth, and reproduction) must be adapted to two completely different environments. The red seaweed *Porphyra* (purple laver, cellophane seaweed), an abundant intertidal seaweed on rocky shores, can lose almost all its fluids, drying out to a crisp, paper-thin film, but which readily recovers after being re-hydrated by the incoming high tide or by sea-spray. Other seaweeds, less tolerant of desiccation stress, survive lower down the shore, or in tide pools. In tide pools, however, they must cope with salinity stress as these tidepools become extremely saline under hot, dry conditions, and tend toward fresh water under rainy conditions. Green seaweeds such as *Ulva* (sea lettuce) are uniquely adapted to such environments because they have an extremely high salinity tolerance, regulating the amounts of their dissolved internal salts, and thus keeping their internal osmotic pressures somewhat higher than the surrounding medium.

Besides the physical factors associated with aerial exposure, of all the biological factors, seaweeds are highly susceptible to grazing pressure. This is so because they can't simply get up and move. Seaweeds have found several ways of coping with grazing pressure. Most encrusting seaweeds contain either grazer-deterrent compounds or are physically defended (e.g., having calcified thalli). The brown seaweed *Ralfsia verrucosa* (kaki crust) uses secondary metabolites in a dual fashion; both as a feeding deterrent to most grazers, but also as a feeding stimulant for the gardening limpet, *Scutellastra longicosta* (long-spined limpet). In this limpet-seaweed association, the limpet has a steady supply of food, which it maintains and protects against other grazers. The red coralline seaweed *Chamberlainium cochlear* (cochlear coralline) also defends itself against most grazers. The seaweed infuses its cells with calcium carbonate (lime) making it hard as rock. Very few herbivores can graze coralline seaweeds. The seaweed is, however, often also found in association with another gardening limpet, *Scutellastra cochlear* (cochlear limpet), from which its name is derived, and which in its juvenile stage, feeds almost exclusively on the coralline, and inadvertently acts to maintain and protect the coralline from other grazers due to its highly territorial behaviour.

Most undefended seaweeds, however, must cope with some level of grazing pressure. Seaweeds that can grow quickly, soon reach a size-refuge from grazing. The large kelps, that essentially outgrow their grazers, survive in the intertidal and shallow subtidal zones by anchoring themselves to rocks with a large, root-like holdfast. But, even fast-growing seaweeds often succumb to grazers, either directly, by being consumed, or indirectly, by being bulldozed (where limpets use their shells to scrape seaweeds off from the rock surface to create clear grazing space). However, even such seaweeds have an ecological escape mechanism, but which mostly benefits their offspring. Molluscs (e.g., abalone, limpets, turban, winkles) are by far the most abundant and influential intertidal herbivores. Despite their abundance and prolific grazing of the intertidal, along with other invertebrates (e.g., barnacles, mussels) their shells offer important secondary substrates to a host of seaweed offspring (spores) that will eventually make these surfaces their home. Here, on these (shell) secondary surfaces, a diverse array of seaweeds escapes the intense grazing and bulldozing pressure from intertidal molluscs.



The seaweed *Porphyra* can dry out to a crisp, paper-thin film, but readily recover when wetted.



Coralline alga (grey-pink crusts) deposit lime in their cell walls, making it impossible for most molluscs to graze them. Those that can (e.g., the pear-shaped limpet *Scutellastra cochlear*), inadvertently often also protect these seaweeds because of their territorial behaviour.



Anemones often retract and shrink in size, collecting sand grains and bits of fragmented shells, which provides camouflage and prevents dehydration.

Although animals generally find it easier to survive in this harsh environment by virtue of their variable abilities to move, this ability to avoid intertidal stressors differs from organism to organism, with some marine invertebrates being little less sedentary than seaweeds. Sea anemones, for example, hardly move and avoid the pounding waves by retracting and shrinking in size, and wedging themselves into rock crevices. They have stinging tentacles to capture prey, but also use these to defend themselves against predators. Most species have sticky bodies, and the anemone collects and glues sand grains and bits of fragmented shells to its body, which provides camouflage and prevents it from drying out during low tide.

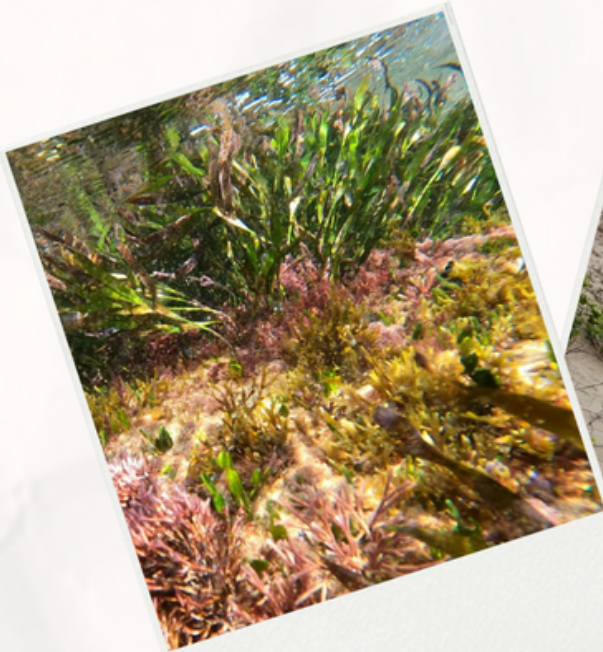
For mobile animals, the intertidal zone is a battlefield of interactions that they too must endure. Many small molluscs (small-sized species and juveniles of other species) generally avoid predators by surviving higher up the shore. Here, however, they must contend with wave action at high tide and with desiccation stress at low tide. The Southern periwinkle (*Afrolittorina knysnaensis*) is extremely desiccation tolerant, but additionally aggregates in crevices and shallow water-filled depressions, or hangs by a mucus tread to avoid contact with the hot rocks during the summer low tides, all in attempts to reduce water loss. As many molluscs age and generally grow larger, they migrate lower down the shore to avoid competition; by this time they have generally reached a size-refuge from predation, and are also better at coping with the intense wave action on the low shore.

The intertidal zone is home to a multitude of organisms that have adapted to surviving the changes between high and low tides. The reasons that these organisms survive in this harsh environment can probably be attributed to a combination of factors. Such factors notably include a greater tolerance of extreme conditions, and reduced competition from organisms (both marine and terrestrial) that simply cannot tolerate it between tidemarks on rocky shores.

Acknowledgments:

This article was first published in The Pringle Post in June 2023: <https://pringlebayratepayers.co.za/june-2023-post/>
All photos were provided by Gavin W Maneveldt.

SAVE THE DATE!



**34TH CONGRESS
OF THE
PHYCOLOGICAL
SOCIETY OF
SOUTHERN AFRICA**

WHEN: EARLY JULY 2024

**WHERE: MACANETA, MOZAMBIQUE
(55 KM NORTH OF MAPUTO)**

FORMAL PRE-ANNOUNCEMENT TO FOLLOW

Why Do Whales Wear Kelp Hats?

by

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Picture yourself out at sea, gazing at the boundless expanse of ocean when suddenly, an enormous creature emerges from the depths, adorned with an unexpected accessory – a hat made of seaweed! Scientists have recently uncovered a few reasons as to why whales have been observed wearing kelp hats.

This enchanting phenomenon has captivated the attention of marine enthusiasts and scientists alike. Whales, the giants of the deep, have been observed engaging in interesting behavior: adorning themselves with seaweed as hats or using it as an exfoliant. In this article, we will delve into this captivating behavior, shedding light on the reasons behind it, and uncovering the mysteries of these underwater fashionistas.

Whale Couture: The Purpose Behind Whales Donning Kelp Hats

The first question that springs to mind when you hear about whales wearing seaweed hats is, "Why do they do it?". It turns out there's more to it than just an unusual fashion statement. Experts have delved deeper into this phenomenon to discern the practical reasons driving it:

- 1. Kelp Play:** Healthy and happy whales don't mind pausing on feeding to indulge in some good old fun. Kelp play may have long-term benefits such as improving coordination and movement skills. Balancing the kelp on their flat upper head may also be ticklish as the seaweed brushes against fine hairs along the top of their heads.
- 2. Soothing Scratches:** We all appreciate the gratification of scratching an itch. Whales, incapable of using their fins for this purpose, might turn to seaweed for a good scratch. The coarse texture of kelp can provide the perfect exfoliation and alleviate any discomfort caused by baby barnacles and whale lice.
- 3. Seaweed Scrub:** Many of us enjoy going to a spa and indulging in a seaweed wrap, why not the same for whales? Some seaweed species are known to combat bacterial growth, which whale skin suffers quite a bit from. Whales generally have to shed their skin to prevent virus and bacteria overgrowth on their skin.



Image credit: Courtesy of Tyler Reynolds

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Keelping Behavior: More Prevalent Than Previously Believed

Until recently, the phenomenon of whales donning seaweed hats was shrouded in mystery and appeared to be a rare event, only occurring in a few places. However, thanks to advances in marine research, we now know that this behavior is a global phenomenon, and more common than previously thought. Researchers have documented over 100 instances of whales engaging in keelping behavior. Humpback, gray, southern and northern right whales have all been spotted adorning themselves with kelp. The observations range from a single strand of seaweed adorning a whale's head to more elaborate displays with entire seaweed wrapped around their bodies.

The Playful Side of Whales: A Peek into Their Intelligence

The act of donning seaweed hats or using it as an exfoliant not only highlights whales' adaptability but also offers insights into their intelligence. Whales are renowned for their intricate social structures and advanced cognitive abilities, and keelping behavior adds another layer to their enigmatic personalities.

1. Seaweed as a Tool: Whales employing seaweed as a tool to scratch an itch showcases an aspect of tool use that was not widely recognized before. Dolphins and turtles have also been observed using their environment to help scratch itches. This behaviour underscores their ability to improvise and adapt to their environment.

2. Social Learning: The newly discovered prevalence of keelping behavior among whales suggests a certain degree of social learning. It's possible that whales are passing down this knowledge from one generation to the next, implying a cultural aspect to their behavior.

3. Playfulness: Whales are celebrated for their playful nature, often seen breaching, tail-slapping, and spy-hopping. Keelping behavior adds to their playful repertoire, demonstrating that they can have fun while also accomplishing practical tasks.

Conservation Implications: Safeguarding Whales and Their Kelp Accessories

Comprehending the behavior of whales, including their penchant for seaweed, can have significant implications for their conservation:

1. Environmental Impact: The presence of abundant seaweed is crucial for whales to continue their keelping behavior. As climate change and pollution threaten marine ecosystems, preserving kelp forests becomes imperative not only for whales but for the entire oceanic ecosystem.

2. Tourism and Education: Whales have long been a draw for eco-tourism. Highlighting their unique behavior, such as wearing seaweed hats, can establish a deeper connection between people and these magnificent creatures, fostering a sense of responsibility towards their protection.

3. Research Opportunities: The study of keelping behavior offers researchers valuable insights into whale behavior, intelligence, and social structures. This knowledge can assist in developing more effective conservation strategies.

In conclusion, this newfound keelping behavior shows us that we still have much to learn about these giants of the sea. As we delve deeper into their world, let us also remember the importance of preserving their habitats and ensuring these gentle giants have access to their seaweed boutiques for generations.

Watch: [Humpback Whale "Keelping" Santa Barbara Channel Islands](#)



Acknowledgments: This article was originally published in *Animals Around the Globe* in November 2023: [\(https://www.animalsaroundtheglobe.com/why-whales-wear-kelp-hats/\)](https://www.animalsaroundtheglobe.com/why-whales-wear-kelp-hats/).

SOUTH AFRICAN KELP FARMING PROJECT: PHASE 2

The South African Kelp Farming Project (KFP) was commissioned in recognition of the opportunity to develop a financially and environmentally sustainable kelp farming industry in South Africa. The Bivalve Shellfish Farmers' Association of South Africa (BSASA) is the implementing organisation for the Project, which is funded by the United Kingdom (UK) via the UK Foreign Commonwealth and Development Office (FCDO) and supported by the South African Department of Forestry, Fisheries and the Environment (DFFE). The Pre-feasibility study (Phase 1) was conducted during 2021-2022, and the Feasibility study (Phase 2) is currently being conducted over a 30 month period and will focus on the following activities:

- Refining kelp hatchery/nursery technologies
- Testing and refining kelp grow-out technologies in Saldanha Bay
- Conducting food safety analyses to inform future food safety standards and certification
- Monitoring environmental parameters and assessing environmental benefits/risks as decision support for the DFFE's Environmental Management Programme (EMPr)
- Conduct stakeholder engagements to disseminate information and gain insights into the Kelp Value Chain and associated employment opportunities
- Investigate the financial feasibility of kelp farming in South Africa

It is in the context of the objectives of Phase 2 of the KFP, that BSASA appointed Advance Africa Management Services (Advance Africa) to conduct the 'Kelp Value Chain Analysis, Market Assessment and Roadmap for the development of kelp farming in South Africa'. We would like to thank all the stakeholders that contributed to shaping the content of this document which we are pleased to share

Please scan the QR code to get a copy of the document.



For any questions regarding the document, please contact the Project Manager:

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We would also like to thank our funders for the financial support that this project is receiving.

Looking for some inspiration to explore our kelp forests this summer? It's been just over a year since *Kelp: South Africa's Golden Forests* was filmed. Since then, the film has been very well received, and has been selected for a number of film festivals across the world including the prestigious Goethe Institut's annual Science Film Festival. If you haven't checked out the film yet, be sure to watch it [here](#) and take a dive into these beautiful underwater forests!

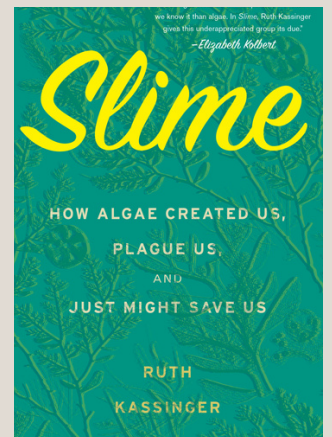


BOOK OF THE QUARTER EDITORS RECOMMENDATION

An old one but good one! In *Slime*, we delve into the world of algae and encounter the innovators striving for a sustainable future. From seaweed farmers in South Korea to scientists using algae to address waterway dead zones, and entrepreneurs pushing for the development of algae-based fuel and plastics, Ruth Kassinger weaves a narrative filled with vibrant science and history. This journey takes listeners around the globe, behind the scenes, and into the kitchen, revealing the surprising stories of algae's diverse applications.

Whether you previously viewed algae as mere aquarium residue or enjoy seaweed with your oatmeal, *Slime* captivates with its tales of the good, the challenging, and the emerging possibilities in the world of algae.

Summary credit: [Goodreads](#)



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CALL FOR SUBMISSIONS!

We welcome submissions for the next volume of Forum Phycologicum, Newsletter of the Phycological Society of Southern Africa.

Submissions can include:

- relevant news
- industry developments
- popular articles
- opinion pieces
- titles of recent publications
- reports
- photo essays
- poems, short stories, anecdotes...

...amongst others.

Please reach out to amehta@uwc.ac.za with your submission ideas.

Students: Note that the best student newsletter submission of the year will win a prize at the next PSSA Congress. Submissions will be judged on clarity of ideas, creativity, and overall quality of content. Student submissions should be a minimum of one-page.

