

Slugs in Space

The exogorth, that unexpected resident of an asteroid near Hoth in *Star Wars: The Empire Strikes Back* (1980) more often referred to as a space slug, taught the *Millennium Falcon* landing party and audiences alike to check for teeth before entering a cave. With insight from scientists who study life in extreme environments, *Star Wars Insider* explores how such creatures might survive the harshness of outer space.

WORDS: MELISSA T. MILLER

Of all the creatures in the *Star Wars* galaxy, only a few are shown living outside an atmosphere.

Many worlds played host to an array of wildlife despite often being limited to one climate, and even the icy cold of Hoth, the searing heat of Tatooine, and the aquatic depths of Naboo's planet core were home to many species. Here on Earth, scientists study areas of the planet that are inhospitable to humans in order to better understand the extreme limits of life. Such research gives us clues as to how exogorths, mynocks, and purrgils might have adapted to survive in open space.

Greg Rouse, Ph.D., is a Professor of Marine Biology and Curator of the Benthic Invertebrate Collection at Scripps Institution of Oceanography (SIO) at the University of California, San Diego. His studies of methane seeps and hydrothermal vents on the ocean floor reveal vast diversity thriving in such hostile environments.

"How animals survive these challenges gives us insight into how flexible life can be in colonizing other habitats," says Rouse.

Angela Zoumplis, a Ph.D. graduate student at SIO, studies extremophiles—life forms adapted to extreme environments. Her focus is on the McMurdo Dry Valleys of Antarctica, one of the coldest, windiest, and driest places on the

planet. "There are places on Earth that have very similar characteristics to some planetary bodies in space. The conditions—extremes in temperature, pressure, radiation, low or no oxygen, or just weird chemistries—result in some cool adaptations," she says.

However, Han, Leia, and Chewbacca were not adapted to survive on an asteroid without technological assistance, so when they investigated the supposed cave they had landed in, they used portable breathing devices and limited their time outside the ship. Long-term exposure to these conditions may have required additional personal protective equipment to protect them from extreme temperatures or radiation.

The study of extremophiles requires scientists working in hostile environments to withstand the conditions without the benefit of specific adaptations, relying instead on technology to survive.

"To study an extremophile you have to be a little extremophilic yourself," admits Zoumplis.

A Slug's Life

The asteroid-dwelling exogorths and mynocks encountered in *The Empire Strikes Back* were silicon-based, rather than the carbon-based lifeforms that thrived inside atmospheres from planet Naboo to the forest moon of Endor. "Silicon-based creatures would most likely arise in environments with low or no oxygen," says Zoumplis. "There

are some organisms that are capable of incorporating silicon into their structures and it is a crucial part of their growth and division."

It is via division, or fission, that exogorths reproduced. Instead of relying on the chance meeting of mates, they were able to split into fully independent fragments.

"Both life forms would have to have some kind of dispersal mechanism to get around," says Rouse. "Exogorths might have sent off fragments of themselves into space to find other suitable asteroid habitats and mynocks may have dispersed via the exogorths."

So as not to compete with each other for resources, one fragment likely remained in place while the other drifted off to another

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▶ asteroid. In turn, the mynocks that lived inside exogorths may have been alerted to the split and time their reproduction, also by fission, seizing the opportunity to travel along with the new exogorth.

In 2018, Rouse and a team of scientists named and described a marine worm that they had discovered during the course of their research—and owing to a similarity in body shape, named it after everyone's favorite *Star Wars* crime lord; Jabba the Hutt. Osedax jabba is just one of a species of worms whose existence requires the presence of bacteria that feed off the chemical

01 An exogorth strikes back.

02 Bombs rock the space slug's lair.

03 A boneworm species has been named after Jabba the Hutt.

breakdown of rocks and bones. The worms then eat the bacteria.

"There are worms that grow into the bones of dead vertebrates (whales, fish, et al.) on the seafloor, dissolving the bone via acid they secrete from their skin and sending roots down into the bone," explains Rouse. "They need bacteria to help them break down the collagen."

In a similar manner, exogorths would likely root themselves into the asteroid and may have hosted an entire ecosystem of bacteria. They were also probably opportunistic feeders able to convert pretty much anything into energy—passing spacecraft, solar radiation,



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and possibly even a takeout from Oga's Cantina.

It's probable that after finding a suitable home exogorths would only move under extreme circumstances, as the effort required to unroot themselves would have been substantial. It's also likely they restricted their growth to the size of their chosen cave, as becoming too large would risk breaking the rock or being forced to move. Given a large enough living space, an exogorth may not have reproduced, spending energy on its own growth instead.

While a quick demise in the guts of a space slug wouldn't be very cinematic, it's not just for dramatic effect that the exogorth responded slowly after food literally flew into its mouth. It transpires that there's actually a biological explanation for the slow reveal.

"We know of extremophiles that can go into cryptobiosis,

slowing their metabolism to almost undetectable levels," says Zoumplis. "In this dormant state, organisms are protected from unfavorable conditions such as desiccation, high or low temperatures, radiation, and the like. When conditions return to favorable, they resume a normal metabolic state."

When energy sources are rare, the needs of a huge creature such as the exogorth would be unsustainable without such an adaptation. The dormant stage was perhaps reversed by the mere presence of Han Solo's ship, not to mention the charges dropped by TIE bombers and the direct blaster fire to the exogorth's esophagus. Depending on what kind of sensors a ship used to detect life forms, it could be that an exogorth in its dormant stage would essentially be invisible to scans—an advantage when it comes to ambushing ships.

It's likely that the parasitic mynocks entered a semi-dormant stage along with their host, but may have rebounded faster, giving themselves time to feed off the ship's electricity before the exogorth had an opportunity to swallow it. "There have been several cases of bacteria powering themselves off of direct electricity in low oxygen environments," confirms Zoumplis.

The mynocks used a sucker to attach to ships for feeding and hitching rides to colonize new ports. The ability of these creatures to thrive both inside an exogorth and without a host has parallels in nature. "There are many kinds of parasitic animals that can also live freely for part of their life cycle," says Rouse. "My favorite are myzostome worms that live in the esophagus of crinoid echinoderms [relations of starfish]. The food

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gathered by the crinoid slides right over the worm, which siphons off as much as it can eat."

Han the Naturalist

When Han Solo decided to land his beloved ship in a cave on an asteroid, his focus was on escaping the pursuing Imperial forces and repairing the *Falcon's* hyperdrive. Lulled into a false sense of security by the apparent safety of his chosen hiding spot, Han was soon distracted by additional pursuits; namely winning the affections of Princess Leia. Though clearly curious about the repeated lurching of the ship, the fact that the motion lands Leia in his arms prevented the amorous captain from questioning it further. This flirtation, leading to their first on-screen kiss, could be the reason that they only barely escaped!

04 Chewbacca fights off a hungry mynock.

05 Stalagmites, stalagmites, or giant teeth? This is no cave!

As a good captain, Han knew about mynocks and their ability to disable the *Millennium Falcon* if left unchecked. Although it's Leia who gets the famous line, "I have a bad feeling about this," it is Han who figured out that the shifting cave was an immediate threat.

"I appreciated that Han Solo correctly identified the space creatures," says Zoumplis. "Taxonomic insights are super useful and quite a skill."

Han may not even have known exogorths existed—perhaps he had just heard stories—but he understood the need to flee, even if that meant flying back into the midst of the Imperial fleet. Indeed, these isolated and long-living species would likely not be well known or understood. Scientific research, in whatever manner it exists in *Star Wars*, may have been limited in the same way as on



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▶ Earth. Harsh environments and the potential to be attacked or eaten by a research subject deters scientific pursuits no matter what galaxy you're in. Add to that a galactic civil war that pulls funding and skilled scientists away from research to bolster defense and it's no surprise that exogorths existed as little more than a myth.

Even without specific knowledge, Han's brusque manner with a woman he would otherwise be trying to impress highlighted that he knew this to be a life or death situation. He was back at the helm as quickly as possible and the *Millennium Falcon* and its crew escaped just in time. The exogorth and mynock missed out on this opportunity and would have had to return to their dormant state and hope that another unwitting form of prey eventually came along.



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Purrgils in Space

The purrgils depicted in *Star Wars: Rebels* also adapted to survive in open space, though they required specific nutrients that the exogorths and mynocks were not limited by. The whale-type creatures breathed the gas Clouzon-36, and it served as a possible food source as well. On Earth, deep sea methane seeps foster bacteria that convert the gas to energy, and similar microbes would likely have been present in clouds of Clouzon-36.

"The breakdown of methane results in hydrogen sulfide, which drives a huge bacterial community, and this is used by animals; either directly as food or by farming them in their bodies," explains Rouse.

06 Mature purrgils can grow to a vast size.

07 Osedax worms growing on the vertebrae of a dead whale.

08 Ezra Bridger made a Force connection with a group of purrgils.

While the front half of purrgils are reminiscent of whales, they become more squid-like at the rear. However, the fact that they have teeth might suggest the hunting and eating of small prey equivalent to the diet of fish for toothed whales. This implies a food source that lives in open space too, or even in hyperspace.

The whales that inhabit Earth's oceans have enormous lungs to store enough air to last during long dives, assisted by the ability to slow their heart rate to conserve oxygen. They also possess a large layer of blubber, which sometimes accounts for half of their body weight. This provides warmth and allows them to go without feeding for long periods of time when necessary.

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Photo: © 2006 MBARI



Both purrgils and whales inspire a sense of wonder in those lucky enough to experience a connection with them.



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Similar adaptations would have allowed purrgils to sustain their enormous size and to travel at hyperspeed, even though their food and energy supplies were few and far between.

Another parallel with their Earthly counterparts was the behavior of traveling in social groups. A process which requires communication—usually visual or auditory—purrgil noises similar to whale songs and echolocation clicks would require adaptations to be heard in space. And the light show they put on is similar to that exhibited by squid, which use special color-changing cells along their body and tentacles as a means of camouflage and communication.

That purrgils were social also suggests they used teamwork to hunt food and find gas reserves. However, the skill required to do this implies that, like whales, adults taught their offspring these behaviors during the first years of life. It is likely then that they gave birth to live young as whales do and that the mother provided milk (of unknown color) using energy from her store of blubber. However, it's also possible that purrgil reproduction was more similar to



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that of squid, in which case they would lay eggs and anchor them to asteroids, with the young dispersing into space once hatched.

That purrgils were little more than legends parallels the lack of understanding humans once had about whales, relegating them to mythical or even divine status for thousands of years. Today there are still huge knowledge gaps about whale populations and behaviors due to the difficulty of studying such wide-roaming and inaccessible creatures. Even now, as new species are still being

09 Purrgils feed on exotic gases such as Clouzon-36.

10 Purrgil tentacles glow before they enter hyperspace.

discovered and described, some are only known from seafarers' accounts or specimens that wash up on shore.

Human Impact

In *Rebels*, Hera Syndulla's initial instinct was to fire upon the purrgils to save the *Ghost* and its crew. While unintentional, the creatures were capable of destruction simply owing to their sheer size and speed. On Earth that threat is reversed, with ship strikes more likely to harm whales than vice versa. What leads these creatures into the paths of vessels is unknown, but scientists are currently studying whether

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► ship sonar affects marine mammals with similar natural capabilities, disrupting their migration patterns and leading to mass strandings.

Sadly, the human part played in greatly depleted whale numbers today is undeniable. Historically hunted for oil, meat, and blubber, many populations were decimated by humans prior to the introduction of the international treaty to ban hunting for all but subsistence purposes. Positively, this agreement has led to a rebound in many species, although some remain critically endangered and others are now sadly extinct.

Both purrgils and whales inspire a sense of wonder in those lucky enough to experience a connection with them, whether through Force

sensitivity like Ezra Bridger or via whale-watching expeditions, now a huge worldwide industry. The joy of seeing their spouts and flukes never fades, and responsible ecotourism has the ability to tilt the scales toward protecting threatened species and habitats while also benefiting coastal communities.

While exogorths were adapted for a harsh life, with little to fear aside from a Star Destroyer blasting its way through an asteroid field, the sad reality is that Earth-bound extremophiles suffer from a more looming threat. It is important to acknowledge the incredible potential that humans have to impact the delicate balance of biodiversity, both positively and negatively. Pollution particularly

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is an immediate concern, and Rouse reveals that he has seen trash on the seafloor even at great ocean depths, not to mention the fact that it is often found in the stomachs of beached whales. Melting, flooding, and other effects of a warming planet are also a huge danger. “Polar regions in general are impacted heavily by climate change,” explains Zoumplis. “To counteract these changes, there are things we can do on a daily basis—use energy efficiently, waste less, and reduce our carbon emissions. However, the most important thing we can do is to encourage governments to enact science-backed policies that lead to a healthier climate.”

It would seem the continued study of extremophiles is important preparation for the day when the discovery of life in other galaxies is more than just science fiction. 🐙

11 Mynocks attached themselves to the *Millennium Falcon* to feed.

12 A mynock adapted to the planetary atmosphere of Stygeon Prime.

13 Whale-watchers on Earth might experience a similar sense of wonder watching purrgils in a galaxy far, far away....