

TECH-2-TECH

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This section offers readers the opportunity to submit informal contributions about any aspects of Animal Technology. Comments, observations, descriptions of new or refined techniques, new products or equipment, old products or equipment adapted to new use, any subject that may be useful to technicians in other institutions. Submissions can be presented as technical notes and do not need to be structured and can be as short or as long as is necessary. Accompanying illustrations and/or photos should be high resolution.

NB. Descriptions of new products or equipment submitted by manufacturers are welcome but should be a factual account of the product. However, the Editorial Board gives no warranty as to the accuracy or fitness for purpose of the product.

Symbiosis in the animal kingdom

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Abstract

This article will explore the interesting world of symbiosis and probe the many examples you could come across in the wild. Several different types of symbiosis exist including mutualistic, commensalism and parasitic. We will explore all 3 types pertaining to animals and explain the differences between them all and how they all benefit or perhaps not from these evolutionary deals.

Symbiosis in South America

One of the most misunderstood examples of symbiosis I see on a regular basis is between a tarantula and a frog. *Xenesthis immanis* and *Chiasmocleis ventrimaculata* are the only example of this relationship between these two types of animals. Tarantulas are fast, defensive and venomous and depending on the species have urticating hairs allowing them to put up a good fight and/or escape and hide. This provides the perfect protection for the

small frog with much less of a defence from predators. So what does the frog provide? Well unfortunately for tarantulas these defences prove to be pointless against ants, the small size, speed and teamwork all allow them to easily attack nests and often pick apart live tarantulas. The frog will consider these ants a meal, eating any intruders that may pose a threat to their protector and the nest.

Staying in the trees you will discover one of the more unique relationships between sloths and moths. Due to the sedentary nature of a sloth, they often will have algae and lichens growing in the fur which turns out to be very nutritious for the sloth. It has been discovered that the moths with the most growth in the fur are hosted by a species of moth that sometimes are completely reliant on the sloth for reproduction. The moth will lay its eggs in the fresh sloth dung and once hatched will return to the sloth for mating. This entire process increases nitrogen within the sloth's fur promoting algae growth which benefits the sloth's diet.

Over to Africa

Even the heaviest land mammal can rely on symbiosis to enhance survival. Elephants are not particularly considered prey animals due to the size and strength of these creatures. However the young are a little more vulnerable to the predators of Africa. In some cases elephants have formed mutualistic relationships with Olive Baboons where in the dry season, elephants are forced to dig for watering holes which a lot of smaller animals would struggle to do. The baboons will hover in the area and keep an eye out for predators, perhaps looking to hunt the elephants' calves and warn them of this. In return the elephants allow the baboons to drink from the newly dug watering hole.

Baboons are not the only animals teaming up with some of the largest animals around. Plover birds are known for forming mutualistic relationships with Nile Crocodiles. When the crocodiles have eaten a meal they may get pieces of flesh stuck in between the teeth and due to the lack of the ability to floss there isn't much they can do themselves. The crocodile will open its mouth inviting the Egyptian Plover in where they will pick the food out from its teeth enjoying the free meal whilst relieving the crocodile of the uncomfortable feeling and potential risks that come with rotting meat in the mouth.

Some birds also form commensalistic relationships (Figure 1) with some of these predators the baboons warn the elephants about.

Vultures are scavenger birds that will follow and remain in the region of predators like lions and hyenas. Once the predator has finished a meal leaving the carcass behind, they no longer want or cannot remove any more flesh from, the vultures will come down and pick the morsels remaining on the bones and the other bits the predators left leaving just the bones.

Heading over to the Tanganyika lakes you will find many species of cichlids and catfish of which there is an example of brood parasitism. Many species of cichlids exhibit an incubation method called mouthbrooding which is where the male or female will keep the eggs in its mouth, tumbling them, until they hatch and often the fry will stay in the mouth until they are able to survive on their own. Like the cuckoo bird the synodontis catfish will find a way to lay its eggs amongst the cichlid eggs so they all get mouth brooded together, the catfish eggs then hatch first and eat all the cichlid eggs.

Under the sea

One of the most well-known examples of mutualism are from clownfish and anemones (Figure 2).

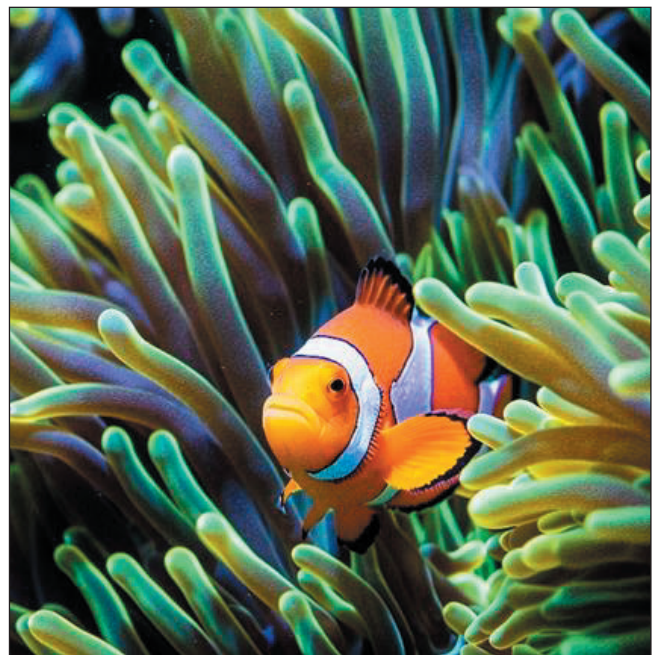


Figure 2. Clownfish and anemones.



Figure 1. Commensalistic relationship.

Anemones are made up of many tentacles that can sting their prey which allows them to pull them in and eat them using their tentacles. Fortunately for clownfish they are immune to this defence mechanism providing the ideal form of protection for them. In return for hosting the clownfish and allowing them to rest and mate free from predators the clownfish returns the favour by keeping the anemones free from parasites and other pests that may harm the anemone and do not appear to be affected by the stinging. The faeces from the clownfish also provide many nutrients for the anemone providing them with a food source even when no prey is present to catch and feed, this would also help the anemone preserve resources.

Another common example of mutualism in the ocean is from the pistol shrimp and goby. Invertebrates are often lower on the food chain and unfortunately for the shrimp it also has poor vision.

The shrimp digs burrows providing shelter and enough space to house themselves and a goby (Figure 3) where they can hide away from predators of their own, mainly groupers, who will keep guard and alert the shrimp of any incoming predators to allow them to both retreat to the burrow. The shrimp is also able to eat in peace knowing it has a bodyguard to alert them to any dangers, they sometimes will feed purely on the fish's faeces to minimise the amount of time spent outside the burrow.

Not everything below the surface of the water can hunt for themselves with much success. These creatures such as many species of invertebrates and some fish rely on the leftovers of other predators or just fish that have died from other factors. They will eat the sunken meal without having to hunt or cause harm from this relationship whilst the hunter with leftovers does not benefit or have loss from this happening. Younger fish of smaller species will sometimes form commensalistic relationships with jellyfish which form protection from other predators not small enough to manoeuvre the stinging tentacles. The jellyfish does not benefit from this relationship and likely as not, is even aware of this happening.

A parasitic relationship you may find if you start checking the tongues of fish are with the Cymothoidae crustaceans. This animal will attach itself to its host, sever its tongue and take its place. The crustacean will then feed on the food the fish catches and eats slowly depriving it of nutrition. This can cause the fish to become thin and weak and eventually die whilst the crustacean gets a free ride to a full meal and protection. Interestingly it is only females that do this and males must fend for themselves and find a mate. Being a hermaphroditic species they all start off as males and if no females are present they become female but females can also secrete pheromones to prevent males from being able to become females in the nearby area creating a parasitic



Figure 3. Shrimp and goby.

relationship within its own species. Fortunately for these fish they also often form mutualistic relationships with some species of cleaner shrimp that eat the juvenile crustaceans that first attach onto the skin of the fish helping to prevent further damage for the fish whilst getting a tasty meal for themselves.

What about us?

People are no exception to the rule when it comes to symbiotic relationships. Throughout history we have shown many cases of symbiosis including dogs, horses and donkeys. In exchange for providing a constant source of food and warmth for the animals they provide with protection, transportation and companionship.

Examples of this go as far back as 30,000 years when we first started to domesticate dogs. One modern day example that does not involve domestication are the Honeyguides in Africa. These birds have learned to show people where to find bees nests which the people harvest for food and in exchange the birds get to eat the leftover honey and wax, larvae and any insects it may attract without the risks of dealing with the bees

themselves. This is an example of mutualism where both animals benefit from the exchange. Commensalism and parasitism are something people experience on a regular basis. Much wildlife comes to rely on human settlements to survive, major examples are birds and squirrels in highly populated areas such as London. They will scavenge and feed from dropped wood waste left by us, this provides a food source for them whilst causing no harm to us. The waterfowl in many rivers and lakes like Windsor also lately rely on people coming to feed them to no benefit of our own.

A major example for parasitism is malarial parasites which affect over 200 million people every year. The parasite requires the human host to survive and complete its cycle whilst leaving the host a number of symptoms including but not limited to; fever, headaches, diarrhoea, vomiting, abdominal, muscle and joint pain and in over 600,000 cases a year, death.

References

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