

# STUNNING CEPHALOPODS



+ MANY LANDLUBBERS WILL NOW UNCONSCIOUSLY RECOGNISE CEPHALOPODS DUE TO A CAMEO IN *PIRATES OF THE CARIBBEAN* AS THE GIANT SQUID OR KRAKEN, OR AS 'CALAMARI WITH A SIDE OF FRIES'. A FEW MAY ALSO KNOW OF THEIR ASTOUNDING ABILITY TO CHANGE COLOUR AND TEXTURE, OR OF THEIR EYESIGHT WHICH ALMOST RIVALS OUR OWN. THOUGH MOST PEOPLE KNOW LITTLE ABOUT THE BIOLOGY AND BEHAVIOUR OF CEPHALOPODS, THEY'RE OFTEN HIGH ON THE MUST-SEE LIST OF BOTH NEW AND EXPERIENCED DIVERS.

**THE GROUP** Cephalopoda literally meaning 'head-foot', includes octopuses, squid and cuttlefish in addition to the rarely-seen nautilus. They're closely related to snails, slugs and clams within the broader Molluscan group. It's almost inconceivable that slugs and snails roaming urban gardens are the closest relatives of such dynamic and enigmatic creatures as squid and octopuses!

**ORIGINS** Cephalopods had their heyday during the Devonian period, some 400 million years ago, long before the dinosaurs roamed the land and the first fish had only just begun to swim the prehistoric seas. The now extinct ammonites were similar in appearance to today's nautilus with a protective external shell, though some species could reach over two metres in diameter. As fish became increasingly abundant and diverse, shell-less forms of cephalopods evolved that eventually gave rise to the 700 or so species of octopuses, squid and cuttlefish that now inhabit our oceans.

Today's cephalopods are exclusively marine and range from the poles to the tropics. Their basic

body plan has allowed them to adapt to many different habitats from shallow intertidal zones, where blue-ring octopus are resident, to the abyssal depths where vampire squid and dumbo octopus roam the darkness. The generic body plan consists of a ring of eight to 10 tentacles surrounding a beaked mouth, somewhat like a parrot's. Octopus have eight tentacles while squid and cuttlefish share in common an additional pair known as 'feeding tentacles' that are used to capture prey (see image of feeding flamboyant cuttlefish). They range in size from a couple of centimetres to the 18-20 metre long giant squid. Sperm whales dive to depths of over 2000 metres in search of these enormous squid. Whales return to the surface with disk-shaped scars from the beaked tentacles that indicate some of these cephalopods may be much larger than any currently known to science.

**UNDERSEA CHAMELEONS** One of the most well known characteristics of cuttlefish and octopuses is their ability to change the texture and colour of their skin with mood, or to fool predators and prey. Each time I come across a reef octopus or



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“ MIMIC AND WUNDERPUS OCTOPUS ARE ABLE TO MIMIC THE FORM AND BEHAVIOURS OF CERTAIN REEF ORGANISMS SUCH AS LIONFISH, SEASNAKES AND STINGRAY BY USING THEIR TENTACLES AND BODY TO IMITATE THE SHAPE OF THESE MORE DANGEROUS SPECIES ”



cuttlefish I sit and watch in awe as they show off this ability in an array of vibrant colours. Sometimes cuttlefish will respond favourably to a little sign language with fingers mimicking their own tentacle movements. They have such precise control over their colouration that they are able to flash colours on and off or even send contrasting bands of black and white rippling down their body. Chromatophores are the organs within the animals' body that control the colour of the skin – they are spots of pigment which densely cover the surface and can be expanded or contracted allowing for different densities of colour to be displayed. Since they occur in five colours, chromatophores enable the animal to blend into virtually any background.



The skin's texture on the other hand is controlled by muscles that can either relax to make the skin smooth, or contract to push it up into turrets of varying size, further concealing the animal into the environment. Additionally some species, such as the hairy octopus, have evolved a filamentous covering to their skin that permanently obscures them amongst a similarly textured environment (see image). While changes in the animal's surface are ideal for concealing it, they also play a vital role in the interaction between individuals of the same species. Changes in colouration can be perceived by other individuals and may be used to attract a mate or make a claim to a territory. This is helped by their extremely keen eyesight, which is remarkably similar to our own (See inset).

Since camouflage alone can be insufficient to keep the animal from the jaws of a predator, cephalopods have developed a secondary defence – as a last resort ink is squirted into the surrounding water as both a deterrent and to confuse a predator whilst the cephalopod escapes. Jet propulsion is the means by which cephalopods are able to move swiftly and smoothly through the water for hunting, evading predators and escaping from



overzealous divers. Water is taken into the body cavity, over the gills and out through the exhalant siphon. The flamboyant cuttlefish barely relies on jet propulsion to move around its sandy habitat. Rather it moves over the ground using muscular projections of its skin under the body along with an especially stable pair of tentacles (see image). This allows it to sneak up on its prey of small fish and crustaceans using its feeding tentacles from a distance to catch these items (see image).

**RARE GEMS** The most elusive cephalopods on the reef are also those most sought after by divers and photographers. The rare blue-ring octopus uses its iridescent rings to warn predators its toxic bite (See image). Tetrodotoxin is produced by special bacteria residing within the salivary gland and is then injected into the predator as the octopus bites using its small beak. This powerful toxin is known to have killed several people who were drawn to its beautiful colouration.

During an early morning dive on the shallow seagrass bed at Wakatobi resort, southeast Sulawesi, Indonesia, I witnessed an unusual attack on a blue-ring octopus (see image). I'd been in the water every morning at 6am to catch a glimpse of the diminutive octopus. Suddenly one morning, out of the corner of my eye, I saw an adult blue-ring with its full colouration displayed. Seconds later a large flounder ate the octopus, tentacles first, with only the sac-like body protruding from the mouth. The flounder then momentarily spat out the octopus before swallowing it whole. I watched the flounder digest its meal for 10 minutes, to see if it was suddenly overcome by the toxin, but apparently either the octopus didn't bite or the flounder is immune.

Another pair of rarely encountered octopuses, the aptly named mimic (see image) and wunderpus octopus (see image), use another method for deterring predators. They're able to mimic the form and behaviours of certain reef organisms

**THE CEPHALOPOD EYE:** Using similar principles to that of a camera, any advanced eye must be able to both adjust focus and admit different amounts of light. Nature has had two approaches to this, with the vertebrate and cephalopod eyes at the pinnacle. Given that the two groups evolved from totally different lineages they have evolved a remarkably similar way of providing the brain with visual information. The cephalopod eye is actually slightly superior in design compared to the vertebrate eye as the latter has a blind spot in the retina. The blind spot is caused by the optic nerve as it crosses the retina; the vertebrate brain is able to compensate by rendering it invisible.

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## marine life°

such as lionfish, seasnakes and stingray by using their tentacles and body to imitate the shape of these more dangerous species. These hazardous reef organisms are all common enough and with striking enough colouration that their unpalatability is well known by most reef predators. This allows the octopuses to hunt during the day when most other cephalopods must hide from diurnally active predators.

Since surprisingly little is known of the ecology and natural history for even fairly well known species of cephalopod, there's much to be learnt from the experiences of divers who are able to spend many more hours in the water with these enigmatic creatures than the majority of scientists. With the dive community's never ending quest for new and unique dive destinations there's sure to be many new discoveries of both cephalopod behaviour and extraordinary species.

**RICHARD SMITH BIO:** As a child, British-born Richard, was enthralled by the ocean and its inhabitants. This passion led on to his completing a degree in marine studies. In search of warmer seas he moved to Australia where he completed a masters degree in marine ecology and evolution. He now studies for a PhD on the social behaviour and ecology of the pygmy seahorse, *Hippocampus denise*. Richard has been diving for over 10 years and has travelled the world photographing and studying the ocean realm.

### Pirate ship found after 300 years

A US underwater archeology team announced that it had probably discovered the shattered remnants of a ship once captained by the notorious buccaneer William Kidd off a tiny Dominican Republic island. The barnacled cannons and anchors found stacked beneath just 3m of crystalline coastal water off Catalina Island were first spotted by a local man. They are believed to be the wreckage of the *Quedagh Merchant*, a ship abandoned by the Scottish privateer in 1699. The Dominican Government has licensed the US Indiana University to study the wreckage and convert the sea floor where the cannons and anchors are marooned into an underwater preserve, where it will be accessible to divers and snorkellers. "We believe this is a living museum," Professor Charles Beeker said. "The treasure in this case is the wreck itself." The find could reveal key information about piracy in the Caribbean and about the elusive Captain Kidd. "I look forward to a meticulous study of the ship, its age, its armament, its construction," Mr Foster, California's state underwater archeologist said. "Because there is extensive written documentation, this is an opportunity we rarely have to test historic information against the archeological record." Historian Richard Zacks, who wrote a book about the seafaring privateer, *The Pirate Hunter: The True Story of Captain Kidd*, said the Scotsman had captured the 500-tonne Moorish ship in the Indian Ocean but left it in the Caribbean in 1699 as he travelled to New York to try and clear his name of criminal charges. Kidd failed to convince authorities of his innocence and was hanged in 1701 in London.

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