

CORAL REEFS

*Nature's
Richest Realm*

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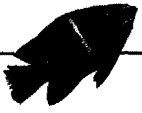
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Inhabitants

Swarming, hovering, creeping, crawling, lurking and hiding amid the attached animals of the reef gardens is an amazing assemblage of free-living inhabitants. Beautiful, grotesque, other-worldly, some are surreal versions of familiar inhabitants of our own gardens, others seem to have materialised from some distant realm of the imagination. Insects and spiders are represented by shrimps and crabs, slugs by colourful nudibranchs and snails by innumerable, beautiful shelled molluscs. Ordinary looking worms burrow in the substrate but others have assumed very un-wormlike, even attractive, guises. Innumerable inhabitants though, have no familiar counterpart unless it be the equivalent of gnomes, fairies, trolls and other such creatures from the depths of our own subconscious.

Beyond the impressionistic experience of the senses and the imagination lies a powerful reality. These creatures are more than just strange and beautiful. They are examples of most major forms of animal life which have evolved in over 700 million years of animal life on Earth. By about 500 million years ago there had developed at least 35 different basic body architectures for animal life. Nine eventually became extinct. The remainder over the succeeding aeons developed innumerable variations on the same basic plans. Today biologists recognise 26 major groups encompassing all animal life. These groups, based on body design, are called phyla. Less than half of them have representatives on land. All are found on coral reefs.

The reef inhabitants span the spectrum of animate being. Sponges occupy a simple vegetative stage of existence with little

we can recognise as behaviour. Corals and their relatives exhibit a few simple reflexes like retracting their polyps when touched. Brightly coloured flatworms possess mobility and a rudimentary eye and brain to direct it. Through the more advanced invertebrates, culminating in crustaceans and most molluscs, there is a general pattern of increasingly sophisticated mobility, sensory systems, and a brain to co-ordinate movement and process sensory input. Up to this point we find behaviour is largely fixed and instinctive with minimal ability to learn.

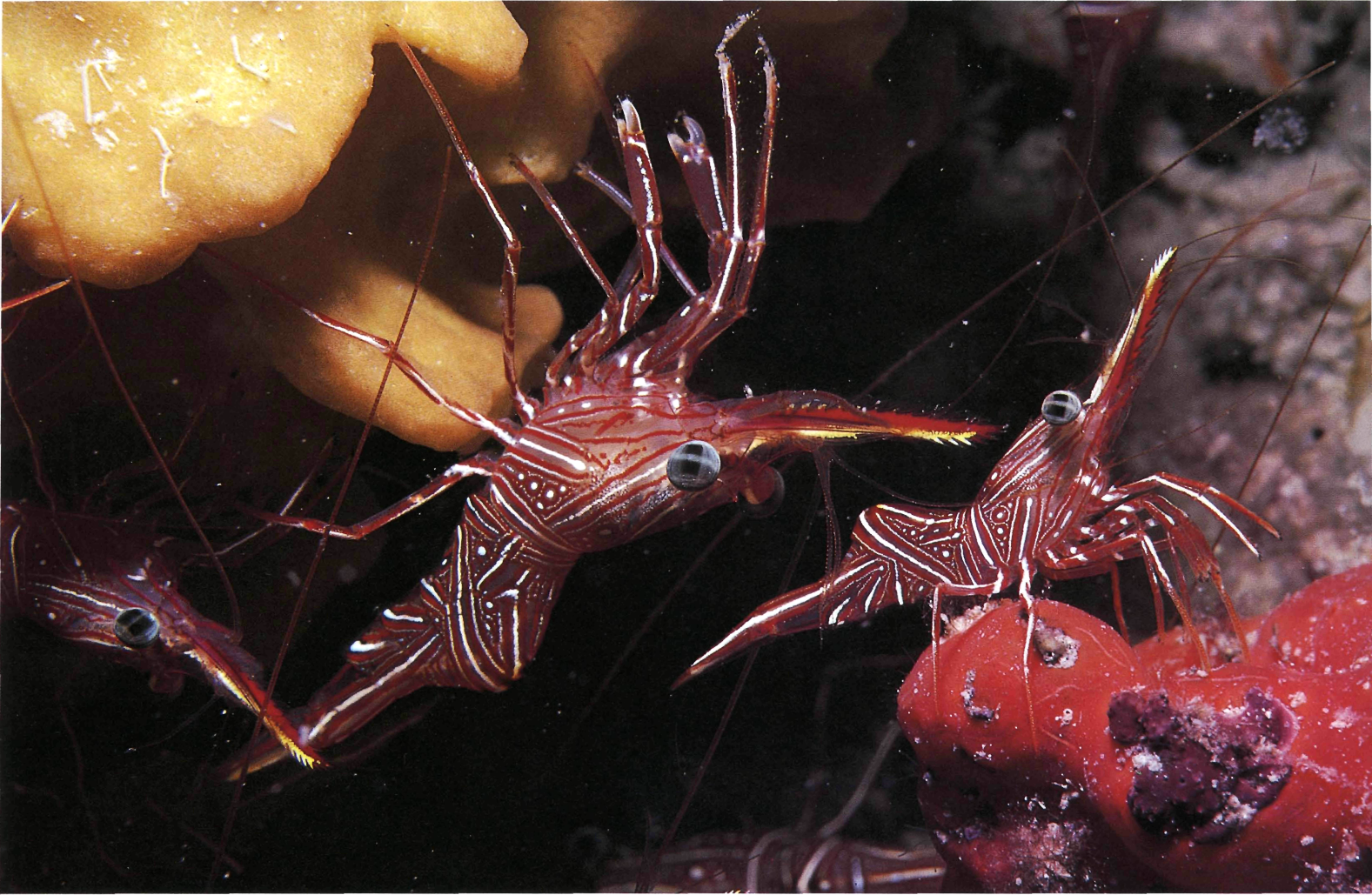
At the next level of evolution, that of fishes and the highest invertebrates, squids and octopi, we find this trend in evolution has reached a threshold whereby stored information from individual experience, i.e. learning, has become an important aspect of behaviour. With it comes the individual differences we call personality. Finally, there are the cetaceans, the whales and dolphins with brains larger and more complex than our own. Their intelligence is obvious. Its concerns and capacities are beyond our present understanding.

Beautiful or grotesque, familiar yet strange, ephemeral but timeless, simple and mysterious, the reef inhabitants embody the essential wonder of life itself. Delicate unlikely assemblages of matter persisting over unimaginable spans of time. Tiny bits of the cosmos interacting with the whole from the molecules around their bodies to the influence of sun and moon to the random genetic changes induced by radiation coming from the infinite reaches of space and time.

Inhabitants



A NOCTURNAL REEF PROWLER, THE HINGEBEAK SHRIMP.



ANOTHER HINGEBEAK SHRIMP. THIS SPECIES LIVES IN GROUPS.



MANTIS SHRIMPS ARE THE REEF EQUIVALENT OF THE PREYING MANTIS. A FINGERNAIL, SIZE SHRIMP USUALLY ASSOCIATED WITH ANEMONES.



THE BUMBLEBEE SHRIMP, ANOTHER TINY COLOURFUL CRUSTACEAN.



THE UNIQUE AND SPECTACULAR HARLEQUIN SHRIMP.



IMPERIAL SHRIMP ON SYNAPTID HOLOTHURIAN.



THE SQUAT LOBSTER, A DISTANT RELATIVE OF HERMIT CRABS.



ELEGANT SQUAT LOBSTER ON FEATHER STARFISH HOST.

77. Hingebeak shrimp, *Rhynchocinetes vriai*, 4 cm • Lizard Island, Great Barrier Reef • 15 metres • Kodachrome

Unlike the previous species, this shrimp is active during the day and occurs in large groups, often running into the hundreds. These groups can form a dense carpet up to one metre across.

78 Top. Mantis shrimp, *Odontodactylus scyllarus*, 20 cm • Rabaul, Papua New Guinea • 8 metres

Mantis shrimps resemble a preying mantis in having large spiked raptorial claws and conspicuous compound eyes. They are active predators of other small reef creatures. Large specimens can pierce two centimetres of wood with their powerful claws.

78 Bottom. White saddled shrimp, *Thor amboinensis*, 1.5 cm • Phuket, Thailand • 6 metres

This small shrimp occurs right around the world on coral reefs. It is usually found in association with a variety of coelenterate hosts, mostly anemones. Like other anemone commensals, it exhibits a colour pattern of sharply defined white blotches.

79. Bumblebee shrimps, *Gnathophyllum americanum*, 1 cm • Bali, Indonesia • 4 metres • Kodachrome

Another tiny shrimp which has somehow found its way right around the world in the tropics. It usually occurs in pairs.

80. Harlequin shrimp, *Hymonocera elegans*, 5 cm • Mombasa, Kenya • 3 metres

This exotic shrimp usually lives in pairs and uses its specialised claws to cut open starfish on which it feeds. Its prey includes the coral-eating crown-of-thorns starfish.

81. Imperial shrimp, *Periclemenes imperator*, 2.5 cm; Holothurian, possibly *Euapta godeffroyi* • Lizard Island, Great Barrier Reef • 12 metres

The genus *Periclemenes* encompasses a number of species of small colourful shrimps that live as commensals with other reef creatures. This species usually lives in pairs with sea cucumbers or the Spanish dancer nudibranch.

82. Squat lobster, possibly *Galathea* sp., 1 cm • Bali, Indonesia • 20 metres • Fujichrome

The reef holds many secrets. This squat lobster, never before seen by the photographer, was recently found off Bali.

83. Skeleton shrimps, *Caprella* sp., 1 cm • Lizard Island, Great Barrier Reef

These unusual creatures are not true shrimps, but members of another group of crustacea, the amphipods. They are slender, small in size, and move in a distinctive manner, bringing the posterior of the body forward and arching the back, then moving the front part of the body forward in order to get a grip.

84. Zebra worm, *Baseodiscus mexicanus* • Sea of Cortez, Mexico • 12 metres

The zebra worm is an inhabitant of the Sea of Cortez commonly found at night when it emerges from its rocky daytime hiding place. When contracted, it can reduce to one-quarter of its expanded size of 80 centimetres.

85. Pipefish and sponge: Brown banded pipefish, *Corythoichthys amplexus*, 8 cm; sponge, poeciloscarid • Honiara, Solomon Islands • 4 metres

Pipefishes and their close relatives, seahorses, are encountered on, or very close to, the reef's surface. They are poor swimmers that rely both on their special armour of segmented bony rings and cryptic habits to discourage potential predators. Photographed at night.

86. Talpa cowrie, *Cypraea talpa*, 10 cm • Scooterboot Reef, Great Barrier Reef • 6 metres

The numerous species of cowries are among the most beautiful and popular of reef shells. The lustrous porcelain-like surface is maintained by the fleshy mantle which can be extended to completely envelop the shell. They are active nocturnal grazers.

87. Brindled cowrie, *Cypraea valentia*, 7 cm • Rabaul, Papua New Guinea • 35 metres

Until recently the brindled cowrie was among the rarest of shells to collectors and good specimens were in demand for as much as \$2000. Few reef animals, however, are truly rare but many have habits and habitats that make them rarely encountered. Such was the case with this cowrie which has now been collected in some numbers, using new techniques at various localities. Photographed at night.

88. Ass's ear, *Haliotis asinina*, 10 cm • Lizard Island, Great Barrier Reef • 6 metres

Abalones are usually associated with temperate rocky areas but a few small species are found on tropical coral reefs.

89. Bubble shell, *Haminoea cymbalum*, 1 cm • Escape Reef, Great Barrier Reef • 1 metre

its habit of holding its claws in close alignment with the body. Its legs are unusually short and adapted to grasping the thin needle spines of the urchin.

157 Top. Urchin with shrimps: Shrimp, *Periclimenes colemani*, 2 cm; Urchin, *Asthenosoma intermedium* • Low Isles, Great Barrier Reef • 12 metres

Another commensal *Periclimenes*. In this species the female is markedly larger than her mate. They are known only from the dangerous sea urchin *Asthenosoma intermedium*. The venom is not associated with the spines but is actually injected by small stalked flower-like appendages called pedicellariae. Although the toxin is powerful enough to be dangerous to humans, these tiny shrimp appear to enjoy a form of diplomatic immunity.

157 Bottom. Crab on urchin: Zebra crab, *Zebriada adamsi*, 1.5 cm; sea urchin, unidentified • Wentworth Reef, Great Barrier Reef • 15 metres

This species of eumedonid crab is a commensal on several species of urchins. Clearly visible on the hind legs are unusual grasping pincers adapted to holding the spines of the host.

158. Squat lobster on crinoid: Elegant squat lobster, *Allogalathera elegans*, 2 cm; Feather starfish, *Comanthus bennetti* • Christmas Island, Indian Ocean • 10 metres

Found only in association with crinoids, the elegant squat lobster is in a group known as the galatheaids or half crabs. Like most commensals, this species has a colour pattern that blends with that of its host.

159 Top. Red shrimp on feather starfish: Pontoniine shrimp, *Paraportia nudirostris*, 2 cm; Feather starfish, *Himerometra robustipinna* • Wheeler Reef, Great Barrier Reef • 8 metres

Feather starfish have been prominent members of the coral reef community for hundreds of millions of years and have accumulated a number of specialised commensals including several species of shrimp.

159 Bottom. Yellow-spotted shrimp on feather starfish: Shrimp, *Synalpheus* sp., 3 cm; Feather starfish, *Comanthus parvicirrus* • Milln Reef, Great Barrier Reef • 12 metres

Most alpheid or snapping shrimps live independently in burrows that they construct. But a few, such as this species, have opted for life on or in other creatures.

160. Shrimp and coral cod: Shrimp, *Lysmata amboinensis*, 7 cm;

Coral cod, *Cephalopholis miniatus* • Bali, Indonesia • 20 metres • Fujichrome

Certain types of shrimps offer the same service as the better known cleaner fishes. The shrimps establish cleaning stations in sheltered parts of the reef, often in caves or crevices. These locations are visited by fishes that require parasite removal. Shrimps that perform cleaning services possess conspicuous white antennae which they wave to attract host fishes.

161. Shrimp and moray eel: Shrimp, *Lysmata amboinensis*, 7 cm; Vicious eel, *Gymnothorax breedeni* • Christmas Island, Indian Ocean • 30 metres

The aggressive reputation of moray eels is largely undeserved. Most are harmless and even the larger species hesitate to attack divers unless provoked. However, as its common name suggests, the vicious eel has a nasty disposition and will actively pursue and bite divers who enter their territory. This behaviour is not consistent though and may be associated with courtship activity.

162 & 163. Anemonefish and host: Pink anemonefish, *Amphiprion perideraion*, 8 cm; anemone, *Heteractis magnifica* • Murray Island, Solomon Islands • 12 metres

The 28 species of anemonefishes are among the most colourful inhabitants of the reef. Some live with several types of anemones, but the pink anemonefish is host specific to *H. magnifica*, one of the largest host species. Its colour is variable, often blue, red, purple or brown. Anemonefishes usually occur in groups. The largest individual is a female, the next her mate, and the smaller individuals are juveniles whose development is retarded until something happens to one of the adults.

164. Clown anemonefish, *Amphiprion percula*, 5 cm • Hastings Reef, Great Barrier Reef • 5 metres

Anemonefishes enjoy immunity from the tentacles of their host because of a special chemical in their external mucus, which prevents the stinging nematocysts from discharging. The immunity is acquired by newly settled juveniles after a brief acclimatisation period. This anemonefish species is perhaps the most colourful and best known.

165. Spinecheek anemonefish, *Premnas biaculeatus*, 8 cm • Madang, Papua New Guinea • 10 metres • Fujichrome

Both anemones and fishes benefit from their commensal relationship. The protection of the fishes is obvious, but the advantage gained by the anemone is less apparent. The anemonefishes ward off tentacle-nipping fishes, remove debris from the ten-