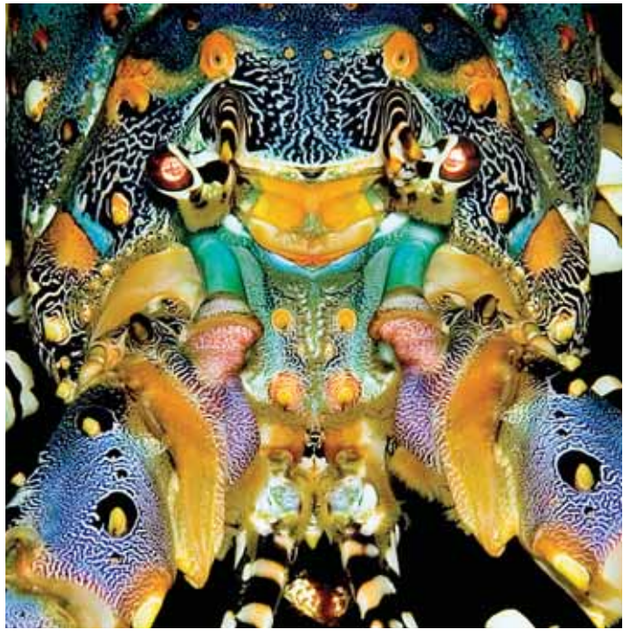
# REEF CREATURE
## Identification
# TROPICAL PACIFIC



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**NEW WORLD PUBLICATIONS, INC.**
Jacksonville, Florida USA

Printed by
**D2Print Pte Ltd**
Singapore

# Authors' Note

*"The world is so full of a number of things,*
*I'm sure we should all be as happy as kings."*
– Robert Louis Stevenson

In 1854 Alfred Russel Wallace stared down through the crystal water of Ambon Harbor, in what is today the far reaches of eastern Indonesia. Enchanted by the teeming life below he later wrote: "It was a sight to gaze at for hours, and no description can do justice to its surpassing beauty and interest."

There stood the co-discoverer of natural selection, the father of biogeography and a man lauded as the greatest field biologist of all times pining to explore just 20 feet away, but realizing that the inviting universe shimmering beneath the surface was as inaccessible as the far side of the moon. It is all too often lost on us that we are the first generation in history able to swim with the fishes – to freely explore the last great undocumented natural history on Earth. Today, a dive certification and bit of wanderlust is all that is necessary to plunge down the rabbit hole into the wonderland of Mr. Wallace's fascination.

Paul and I first began photographing Pacific marine life three decades ago. Our efforts became part of the 2003 publication of *Reef Fish Identification – Tropical Pacific*, co-authored with ichthyologist Gerry Allen and Australian underwater photographer Roger Steene, in association with John Jackson of Odyssey Publications. It wasn't until two years after the fish book went to press that we mustered the gumption to tackle Pacific invertebrates – a fauna whose species count roughly outnumbers the fishes by a factor of ten. Adding to the project's scope, the far reaching Pacific range we chose to catalogue, from Thailand to Tahiti, encompasses the oceanic wilderness known as the "Coral Triangle", a region conservation biologists have recently dubbed the epicenter of marine biodiversity. The Triangle's perimeter slants from its northern apex in the Philippines south-southwest to Bali in Indonesia where it angles sharply eastward extending past southern Papua New Guinea to the Solomon Islands before coursing back northwest to its peak.

Scientists are still attempting to understand exactly why the region's waters are so biologically rich. A widely held theory suggests that during the last major ice age sheets of ice spread north and south from the poles causing sea levels and water temperatures to drop dramatically, subsequently the world's tropical marine animals perished *en masse*. The only pockets of warm equatorial waters remaining were centered in the East Indian Sea. As the theory goes, tropical reef creatures around the globe are descendants of the those lone survivors that slowly radiated out in all directions as seas began to warm. In consequence, marine life in the Triangle has been around longer allowing more time for species to evolve.



After beginning work on this book, we switched our focus from the fishes to crabs and shrimp, nudibranchs and flatworms, sea stars and squid. It was a voyage into a world without backbones, where without the constraints of vertebrae, natural selection has gone wonderfully wild engendering an explosion of animals fitting every description from ladybuglike amphipods to multi-hued clams as big as bathtubs. Much of this diversity is driven by the fear of being eaten. Many small creatures have adapted the colors and textures of complex invertebrate hosts where they exclusively live, blending in like ghosts. Others have taken an opposite approach to survival acquiring striking colors to advertise their toxic nature, or secreting armored shells which allow them to roam unmolested. Another tactic, favored by crustaceans, requires hiding by day and feeding at night after predators have bedded down. Even nocturnal animals often hedge their bets, adapting camouflage to cloak their nighttime agendas. A group of crabs, known as decorators, attach living pieces of animal colonies and plants to Velcrolike body hooks to further disguise their presence.

These strategies not only hide the impersonators from predators, but also from the inquisitive eyes of underwater naturalists. Finding these little phantoms is one of the most challenging games in the sea – an addictive sport called critter hunting. The heady hunt expands horizons enticing you underwater after dark, and often takes you away from the reef into less visually appealing terrain. But, what a hoot it is when you sort out the cryptic profile of a creature designed by eons of evolution not to be found! And best yet, there are still thousands of marine creatures, the mind can't even imagine, still waiting to be discovered.

In a very real sense, the study of marine life is just beginning. Before scuba, the only practical method biologists had for studying animals from the sea was examining color-faded specimens pickled in formalin. The oceans are so rich that even pioneering collecting techniques, such as dredging, quickly produced a backlog of animals to be examined and named. All too often, preserved specimens sat neglected for years awaiting the scrutiny of marine taxonomists, a rare breed of scientists who have always been in short supply. Their work, sorting out a new species from all other known animals, is an exacting and tedious task. Classification of each new animal requires detailed examination of multiple specimens, dissection, and then rigorous comparison with similar organisms before a detailed description can be published in a peer-reviewed journal. After the painstaking process, the study animal is given a unique two-part scientific name, traditionally rooted in Latin or Greek. Because of a historical lack of resources, receiving a fancy new name and a place in the hypothetical hierarchy of evolution is typically all the attention a species will ever receive.

Unfortunately, just as technology is making the study of marine animals more practical, and new life forms from the sea are being discovered on an almost daily basis, interest in the natural sciences is on the wane. Adding to the dilemma, molecular biology has become all the rage. As funding for "old fashion science" dries up, fewer and fewer museums and universities are willing to maintain expensive specimen collections, or train a new generation of marine taxonomists for a dwindling job market.

On the bright side, marine conservation groups around the world are beginning to make significant strides formulating management practices long neglected. But it is difficult to manage something you don't understand. And how do you understand the nature of an animal, much less the complex ecosystem it inhabits, if you are unfamiliar with population dynamics. Those who care about the ocean's future should support marine conservation programs and their teams of biologists, taxonomists, environmentalists and volunteers who seek to catalogue the sea.

Digital photography is an impressive new tool for documenting marine wildlife. Even though an unknown animal can't be given species status from a photograph alone, an image does establish that a new species exists and indicates where it might be found. Photography is also beneficial for recording and monitoring biodiversity as well as confirming range extensions, information essential for evaluating management practices.

Although this field guide is a significant stride forward in the visual identification of Pacific marine invertebrates, it is only the latest step, a thin scratch into the veneer of what needs to be known. A quick glance through the pages offers insight into how many magnificent animals still lack scientific classification, but progress continues, and happily a lot of critter hunting awaits.

# Contents

**STIMPSON'S SNAPPING SHRIMP** *Synalpheus stimpsoni*

**SIZE:** to 3.5 cm (1 1/2 in.) Snapping Shrimp – Alpheidae

**ID:** Often marked with a series of yellow spots and lines; colors usually match the color of host crinoid *Comaster* spp.; usually in mated pairs; females larger than males. Identification tentative, could represent a complex of species. Indo-Pacific to Australia, also Japan.





**STRIPED SNAPPING SHRIMP**

*Synalpheus striatus*

Snapping Shrimp – Alpheidae

**SIZE:** to 3 cm (1 1/4 in.)

**ID:** Dark longitudinal stripes over a cream to tan body and claws. Never display yellow/gold spots. Inhabit crinoids, usually in mated pairs. Identification tentative. Some consider *S. striatus to be* synonymous with *S. stimpsoni* [previous]. West Pacific.

**CARINATE SNAPPING SHRIMP** *Synalpheus carinatus*

**SIZE:** to 3.5 cm (1 1/2 in.) Snapping Shrimp – Alpheidae

**ID:** Translucent white but can be red, often with line on center of carapace and abdomen; ridge on rostrum. Inhabit crinoids, usually in mated pairs; females larger than males. Identification tentative. West Pacific to Micronesia and Australia.

**RED BANDED LOBSTER**
*Justitia longimanus*
Spiny Lobsters – Palinuridae
**SIZE:** to 15 cm (6 in.)
**ID:** Shades of red to pale orange with red rectangular and triangular markings on lower carapace; bright red on segments of claws and short pincers. Inhabit deeper reefs below 30m; often in shallow recesses and under ledges. Circumtropical.

**BULLSEYE REEF LOBSTER** *Enoplometopus holthuisi*
**SIZE:** to 12 cm (4 3/4 in.) Reef Lobsters – Enoplometopidae
**ID:** Bright red with **conspicuous white circle on front side of carapace,** sometimes with a central white spot, and about 2-5 wavy bands behind. Inhabit deep recesses in reefs and caves below 12 m. Indo-Pacific.

**DEBELIUS REEF LOBSTER** *Enoplometopus debelius*
**SIZE:** to 10 cm (4 in.) Reef Lobsters – Enoplometopidae
**ID:** White to light lavender carapace and abdomen covered with red to violet spots; palm of claws violet. Inhabit recesses in reefs and caves. West Pacific to Australia and New Caledonia, also Japan and Hawaii.

**VOIGTMANN'S REEF LOBSTER**
*Enoplometopus voigtmanni*
Reef Lobsters – Enoplometopidae
**SIZE:** to 10 cm (4 in.)
**ID:** Bright red with **narrow incomplete white circle on side** and numerous wavy white lines on carapace. Inhabit deep recesses in reefs and caves. East Indo-West Pacific from Indonesia to Papua New Guinea, also Japan and Hawaii.

**RED REEF LOBSTER** *Enoplometopus occidentalis*
**SIZE:** to 10 cm (4 in.) Reef Lobsters – Enoplometopidae
**ID:** Bright red with only a few white spots on carapace and about eight white spots on each segment of abdomen; **white bristles extend from the body and claws.** Inhabit recesses in reefs and caves; wary. Indo-Pacific, also Japan and Hawaii.

**PURPLE REEF LOBSTER**
*Enoplometopus daumi*
Reef Lobsters – Enoplometopidae
**SIZE:** to 11 cm (4 1/4 in.)
**ID:** Shades of red often with purple tints on claws and upper carapace; **wavy red lines and spots on the carapace and small white ocellated spots on abdomen.** Inhabit recesses in reefs and caves. East Indo-West Pacific.

**PEACOCK MANTIS**
*Odontodactylus scyllarus*
Mantis Shrimp – Odontodactylidae
**SIZE:** to 18 cm (7 in.)
**ID:** Smasher; olive tan to dark green body (males dark green) orangish yellow to green antennal scales bordered with red; **blue eye stalks, dark blotches on front side of carapace**. Indo-West Pacific from Indonesia to Guam and E. Australia. There are two basic groups of mantis: **Smashers -** have blunt raptorial appendages for breaking shells for food. Often hunt away from burrow. **Spearers -** have long back-folding raptorial appendages for grasping prey. Many spearers hunt from entrance of their burrows.

**KEEL TAIL MANTIS** *Odontodactylus cultrifer*
**SIZE:** to 13 cm (5 in.) Mantis Shrimp – Odontodactylidae
**ID:** Smasher; dull green to brownish; antennal scales yellow with purple tips; uropods blue with red tips; **central keel on telson tall and reddish**. Indo-West Pacific from Indonesia and Philippines to Australia and New Caledonia.

**SHORT BEAK MANTIS** *Odontodactylus brevirostris*
**SIZE:** to 7 cm (2 3/4 in.) Mantis Shrimp – Odontodactylidae
**ID:** Smasher; mottled brown; red and **white banded raptorial appendages**; pink uropods (outside tail appendages). Daytime active. West and Central Pacific, also Hawaii.

**PINK-EARED MANTIS** *Odontodactylus latirostris*
**SIZE:** to 8 cm (3 1/4 in.) Mantis Shrimp – Odontodactylidae
**ID:** Smasher; female antennal scales pink to purplish, males red; body mottled greenish brown with reddish highlights; pink and red uropods (outside tail appendages). Indo-West Pacific from Indonesia to N.E. Australia and New Caledonia.

**SAFFRON NOUMEA**
*Noumea crocea*
Dorid Nudibranchs – Chromodorididae
**SIZE:** to 2.5 cm (1 in.)
**ID:** Yellow with thin white submarginal band; yellow rhinophores and gill. West Pacific to Marshall Islands, also Hawaii.

**ROMER'S NOUMEA** *Noumea romeri*
**SIZE:** to 2 cm (3/4 in.) Dorid Nudibranchs – Chromodoridiidae
**ID:** Pinkish tan with reticulated pattern similar to a sponge; thin white marginal band and orange rhinophores and gill. West Pacific to New Caledonia, also Japan.

**RED MARGIN NOUMEA** *Noumea flava*
**SIZE:** to l.5 cm (5/8 in.) Dorid Nudibranchs – Chromodoridiidae
**ID:** Brilliant yellow edged with a red band; yellow rhinophores and gill. Indo-West Pacific to Marshall Islands, also Hawaii.

**WHITE RING NOUMEA** *Noumea alboannulata*
**SIZE:** to 2.5 cm (1 in.) Dorid Nudibranchs – Chromodoridiidae
**ID:** Pink to orange; **short white line between rhinophores splits becoming two stripes that run to either side of gill**; white marginal band with purple highlights. West Pacific from E. Australia to Coral Sea and Solomon Islands.





**LABOUTE'S NOUMEA** *Noumea laboutei*
**SIZE:** to 1.5 cm (5/8 in.) Dorid Nudibranchs – Chromodoridiidae
**ID:** Bright yellow to green commonly with a reticulated pattern matching a sponge; red rhinophores and edging on gill branches. West Pacific to New Caledonia.

**UNDESCRIBED**
*Noumea* sp.
Dorid Nudibranchs – Chromodoridiidae
**SIZE:** to 2 cm (3/4 in.)
**ID:** Translucent white with orangish marginal band and narrow white submarginal band; orange rhinophores and gill. Known from Indonesia.

**NORBA NOUMEA** *Noumea norba*
**SIZE:** to 2.5 cm (1 in.) Dorid Nudibranchs – Chromodoridiidae
**ID:** Reddish orange to pink with purplish highlights and white stripe running from between rhinophores to around gill; white marginal band. Indo-West Pacific to Solomon Islands and Marshall Islands, also Japan.

**PLAIN NOUMEA** *Noumea simplex*
**SIZE:** to 1.5 cm (5/8 in.) Dorid Nudibranchs – Chromodoridiidae
**ID:** Smooth white to pink body with orange rhinophores and orange highlight on gill branches; occasionally broken marginal band. Indo-Pacific.

**MIMIC OCTOPUS** *Thaumoctopus mimicus*

**SIZE:** arms to 30 cm (12 in.) Octopuses – Octopodidae

**ID:** Long arms with a two-tone pattern of white banding on dark brown background; poorly defined whitish pattern on length of elongate mantle with a white U-shaped marking on posterior; a continuous thin white line highlights suckers along bottom of arms; short eye stalk with a brown and white pointed horn on top; skin smooth except for occasional fleshy tabs on mantle; can lighten somewhat or become quite dark when distressed. Day active on sandy inshore areas from shallows to 37 m, especially in and around mouths of dry river beds. **BL-** Frequently encountered with only head protruding from sand. Tend to be shy. When closely approached often disappear beneath surface, glide away on a spread skirt, or jet off trailing arms. Occasionally flee toward surface. At times allow close observations for extended periods. Famous for their ability to mimic the shapes and behaviors of other animals that share their environment. West Pacific from Indonesia, and Philippines to New Guinea and New Caledonia.

**Comparison with Wunderpus:** The similar-appearing Wunderpus [next], which shares the same habitat and geographical range, is often confused with the Mimic, however there are subtle visual distinctions between the two species. Wunderpus are reddish brown rather than dark brown and their webbed skirts are wider and more frequently displayed. The most consistently visible identification clue is the white outline bordering the bottom of each of the Mimic's arms, a feature absent on the Wunderpus. The edges of the white mantle pattern of the Wunderpus are also more sharply defined, and instead of displaying a U-shaped pattern on the posterior mantle, the Wunderpus displays a white circular patch.

**WUNDERPUS** *Wunderpus photogenicus*

**SIZE:** arms to 20 cm (8 in.) Octopuses – Octopodidae

**ID:** Long-arms with two-tone pattern of whitish bands on reddish brown background. Irregular, but sharply defined white pattern on elongate, amphora-shaped mantle with white patch on rear. Commonly display dramatic webbed skirts. Elongate eyestalks capped with a single long, solid brown, round-tipped horn. Although reported to be more active at dawn and dusk, the animals are regularly sighted throughout the day on inshore sand and rubble shallows to 20 m. Seldom seen with their heads protruding from the sand. Tend to be shy and typically disappear into small sand burrows made by other animals when approached. Occasionally, allow close observation and will display dramatic postures. Known from Indonesia, the Philippines, New Guinea, Solomon Islands, and Vanuatu.

**Comparison with Mimic:** Refer to Mimic text [previous] to help differentiate between these two similar-appearing octopuses that share the same habit and geographical range.

A small male Flamboyant Cuttlefish passing a sperm packet to a female.

**Flamboyant Cuttlefish, *Metasepia pfefferi,*** are quite different from other cuttlefishes. To begin with they are relatively small, easily fitting inside a cupped hand and instead of swimming they prowl sandy sea floors walking on modified arms and mantle flaps. But their most striking characteristic is the ability to display vibrant colors when disturbed. The aposematic coloration warns potential predators of their toxic flesh. This inherent protection renders the little cuttlefish unafraid, making them easy to approach and observe in the wild.

Flamboyants spend much of their day hunting for small bottom-dwelling crustaceans and fishes, which are captured with a pair of tentacles shot forward at lighting speed. Their reproductive behavior, which occurs frequently, is also easily observed. Just as when hunting, courtship and mating are not hindered by close observation as long as the cuttlefish are not touched or their paths blocked. Mating is face-to-face with the smaller male inserting a sperm packet into the females arms, which is then placed inside a pouch under her mantle. Shortly afterwards, the female will place fertilized eggs within protective recesses, in the reef, under rocks, or occasionally inside discarded cans or coconut shell halves.

Laying eggs inside a can.

Extending feeding tentacles.





Each tough, translucent casing, about the size of a marble, holds a single ovum. When ready to hatch the once white embryo will, over a matter of minutes, acquire its vivid red, yellow, orange and white aposematic coloration. Because the eggs are laid over multiple days, only a few embryos emerge at a time. In most instances, after breaking free from their casings, the tiny quarter-inch offspring drift away with the currents. However, on one grand occasion, a hatchling immediately settled on the sand and began to hunt. Within less than a minute after emerging, it shot out its feeding tentacles and captured a shrimp.

Fresh and hatched eggs inside a coconut shell half..

Embryo acquire color when ready to hatch.

Through an egg casing.

Breaking free.

Recently hatched Flamboyant Cuttlefish.