

Snakes of Papua New Guinea

David Williams

Introduction

Papua New Guinea is home to a wide diversity of snake species which have adapted to live in almost all habitats; from coastal mangroves through to highland forests. Virtually all of them are openly feared, and many snakes are killed through fear, despite the fact that of more than 112 different varieties, fewer than half a dozen have killed humans, and the majority of human deaths have been due to just one snake in particular.

The snakes of PNG fall into six taxonomic Families:

NON-VENOMOUS Blind snakes or worm snakes (Family *Typhlopidae*) **11 species**

- Small burrowing snakes with rudimentary eyes (hence the name ‘*blind snake*’).
- Characteristic small smooth scales with a down turned spine on the tip of the tail that is used as an anchor (and contains **NO** poisonous sting).
- Shovel-shaped head for use when burrowing.
- Typically nocturnal, but may come to the surface during rain.

NON-VENOMOUS File snakes (Family *Acrochordidae*) **2 species**

- Aquatic snakes in both brackish water and estuaries.
- Named for their very rough, loose fitting skin; also called ‘*wart snakes*’ or ‘*elephant trunk snakes*’.
- Very agile in the water but have difficulty moving on land.

NON-VENOMOUS Pythons and boas (Family *Boidae*) **11 species**

- The three small (< 1 metre) boa species are viviparous – they produce live young.
- Two harmless species resemble highly venomous death adders in body size, shape and habits, and are often needlessly killed.
- Pythons range in size from 1 to 6 metres in length and reproduce by laying eggs.
- Nearly all Papuan pythons are nocturnal, and have heat-sensing pits which they use for tracking prey in total darkness.
- Large pythons are extremely strong and can easily suffocate an adult human being, although it is very unlikely that they could swallow one. There are anecdotal claims of children having been eaten by large pythons.
- PNG’s only legally protected snake is Boelen’s python (*Morelia boeleni*); a large black and white snake that occurs in cool Highland forests.

NON-VENOMOUS or MILDLY VENOMOUS Colubrid snakes (Family Colubridae) 35 species

- Representatives of the world's largest group of snakes; there are more than 2,000 species worldwide.
- There are five subfamilies in PNG and the members of two of these are mildly venomous, but most are unlikely to be a danger to man.
- One species, the brown tree snake (*Boiga irregularis*) has caused moderate envenomation in children on the island of Guam, and therefore may be potentially dangerous.
- The 35 species include a number of tree-climbing species; several aquatic species that occur in both freshwater as well as in brackish water, muddy estuaries and swamps; and a number of small ground-dwelling snakes.
- Most of these species grow to no more than 1-1.5 metres in length; the majority reproduce by laying eggs, although the aquatic species bear live young.

VENOMOUS Front-fanged snakes (Family Elapidae) 30 species

- The Family which includes the species that are known to kill humans; snakes in 6 of the 14 genera can cause fatalities.
- There are 13 genera of land-dwelling snakes and a single genus containing two species of marine-dwelling snakes which can return to land.
- Most of the snakes in this Family should be considered potentially dangerous (with the possible exception of the very small ground-dwelling forest snakes); however very little is known about the venoms of most species.
- All species, with the exception of death adders (*Acanthophis* spp.), are oviparous (reproducing by laying eggs).
- All species produce venom in specialized salivary glands; venom is injected through the grooves in fangs situated at the front of the maxillary bone in the upper jaw.
- Species may be either diurnal (active by day) or nocturnal (active by night), and some species are active during both the day and the night.

VENOMOUS True sea snakes (Family Hydrophiinae) 23 species

- True sea snakes are not able to survive for long periods on land, and all have broad, paddle-shaped tails that have evolved specifically for life in the ocean.
- Some estuarine species have been found long distances from the open ocean in coastal rivers, and sea snake bites have occurred in rivers in Papua New Guinea.
- Sea snakes have a number of highly specialized adaptations to life in the sea, including valves on the nostrils that prevent water entering the lungs; the ability to absorb oxygen from sea water through the skin; salt excreting glands that protect them from dehydration; and an enlarged lung that can store air for deep diving.
- Some species in the open sea can dive to depths of more than 100 metres.
- Many are highly venomous and some are extremely dangerous to man, especially the very large fish or crustacean eating species.
- All reproduce by bearing live young.

General biology and ecology of snakes

All snakes share a number of common biological characteristics that make them unique among all other members of the animal kingdom. No other animal is as uniquely handicapped. Despite their lack of limbs; technical deafness; and imprecise long-range vision, snakes have managed to successfully colonize virtually every corner of the planet with the exception of the two poles. Snakes reside in the depths of the oceans; the thickest of rainforests, driest of deserts, and even in sub-arctic tundras where temperatures plummet to many degrees below freezing. Even though most of us are fearful of snakes, few will not admit to admiring their incredibly successful occupation of our planet.

Snakes occupy important ecological roles, and in many parts of the world (particularly Australia and New Guinea) without carnivorous mammals, they are among the highest order predators and fulfil a very important role in the delicate balance of complex ecosystems. The removal of snakes from the environment might be a blessing for human safety, however in ecological terms their loss can be catastrophic; many species play crucial roles in the control of agricultural pests such as rats and mice, and there are examples from around the world of huge increases in rodent-related crop losses in the absence of natural predators like snakes.

Biogeographical Radiation

The earliest fossil snakes appeared approximately 50-60 million years ago and were boid (python-like) snakes of moderate size. In the Australasian region the first front-fanged elapid snakes appear between 23-34 million years ago. Venomous snakes appear to have evolved from a common ancestor and to have radiated across the Australian landmass. During this time the island of New Guinea was connected to Australia by now-submerged land bridges in the Arafura Sea and Torres Strait, and this allowed considerable sharing of biodiversity. While some snake species such as the green tree python (*Morelia viridis*) and the amethystine python (*Morelia amethystina*) appear to have migrated south from New Guinea into north Queensland, the venomous species have done the opposite; migrating northwards in separate radiations into New Guinea where they became isolated and diversified into new species.

Our most highly venomous snakes are believed to have reached New Guinea around 6-8 million years ago. At this time two species complexes crossed to New Guinea from northern Australia; the smooth-scaled death adders (*Acanthophis laevis*) (6.4-7.5 Mybp) and the mulga snakes (*Pseudechis cf. australis*) (6.2-7.4 Mybp). The *A. laevis* group diversified right throughout New Guinea and as far west as the Indonesian island of Seram, while *P. cf. australis* seems content to have remained living in the open forests and savannah's of the Oriomo plateau and Wasur lowlands on the west of the Fly river.

The Papuan black snake (*Pseudechis papuanus*), whose closest relative can be found in central-western Queensland, probably arrived here across the trans-Torresian land bridge around 2.9-3.6 million years ago. The rough-scaled death adders (*Acanthophis rugosus*) are only recent colonialists having arrived from Australia sometime in the last 0.6-1.0 million years. Remarkably genetic studies suggest that the most highly venomous of all New Guinea's snakes, the Papuan taipan (*Oxyuranus scutellatus canni*) only made its way north during the very late Pleistocene before the loss of the most recent land bridge approximately 8,000 to 10,000 years ago. This snake is such as recent arrival that in genetic terms its status as a different subspecies to the Australian taipan (*Oxyuranus scutellatus scutellatus*) is tenuous.

Physiology

All snakes share a common physiological structure:

- An elongated backbone that can comprise more than 400 individual vertebrae and rib pairs which can articulate horizontally, vertically and diagonally to give extreme flexibility and fluidity of motion.
- Dry waterproof skin composed of keratinous material similar to that of human fingernails; the texture of the skin varies – in some species it is smooth, while in others it can be slightly to extremely rough to the touch.
- Flexible skulls with loosely joined bones that can separate from each other to enable the snake to swallow prey items many times larger in diameter; the lower jaw bones are joined in the middle by elastic ligaments to enable wide separation.
- Ectothermic metabolism which relies on external heating rather than self-generation of body heat (i.e. as in mammals and birds). The key advantage of this is that snakes have a metabolic rate that is only 10-15% of that of a ‘warm-blooded’ animal, and can therefore survive much longer without eating.
- Completely absent external ear openings; despite this they are not deaf – snakes ‘hear’ by detecting sound vibrations through their bodies and these vibrations are picked up by internal ear structures.
- A bifurcated (‘forked’) tongue which is the primary scent organ; the tongue is flicked out to collect scent particles in the air which are then transferred to a special groove in the roof of the mouth (Jacobson’s Organ) that contains chemoreceptors similar to those present in the noses of other animals.
- Binocular vision of variable acuity and absent eyelids. Snakes track movement rather than identifying shapes, and some can detect movement at considerable distances.
- With the exception of crocodiles all reptiles have a three-chambered heart. In snakes the position of the heart largely depends on the behaviour of the species; tree climbing pythons and colubrids have hearts positioned closer to the head, while diving sea snakes have a heart that is more centrally located.
- A single functional lung that is elongated and may extend up to two-thirds of the body length. The second lung is much smaller and is little more than an air sac.

Reproduction

Different species of snakes employ different reproductive strategies, however reproduction is sexual in nature despite the fact that female snakes of some species can ‘retain’ sperm in their bodies and produce successive clutches/broods of young without a second mating.

In Papua New Guinea nearly all species mate in late winter and spring (between June and October) although some may mate all year round in favourable conditions. The males of some species such as Papuan taipans (*Oxyuranus scutellatus canni*) engage in ritual fighting prior to mating. This typically involves two or more combatants entwining around each other like corkscrews and attempting to push each others head to the ground. Biting rarely occurs until one snake attempts to flee, and then he may be bitten by the pursuing victor. Most snakes are immune to their own venom, so such bites do not result in death.

A successful mate may mate with a female for many hours over many days. After mating is complete it is very rare for the two snakes to remain together, as snakes are typically solitary creatures.

In egg-laying (oviparous) species (such as all pythons and most venomous land species) the fertilized embryos develop in the female over a period of 6-10 weeks. At the end of this time the female will find a secluded location such as a deserted animal burrow, or the space under a large rock or log to use as a laying chamber. Pythons typically coil around their eggs to protect them from predators and to ensure an even incubation temperature. Female pythons do not feed while incubating eggs, however many use muscle contractions to generate slight increases in body heat to warm the eggs, and this added reproductive cost means that they may lose a considerable amount of body weight during this time.

Most other egg-laying snakes deposit their eggs and then leave them to incubate at ambient temperature. Many ground-dwelling snakes lay their eggs in rotting vegetation in order to take advantage of higher temperatures due to decomposition. These snakes are then able to resume feeding immediately, and many may subsequently produce additional clutches of eggs in the same year.

The death adders (*Acanthophis* spp.) are unique among PNG's venomous snakes in that they, like the marine sea snakes of the Family *Hydrophiinae*, produce live young (viviparous). The embryos develop inside the body of the female over a lengthy period (from 4 to 6 months in some species) before being born alive inside a thin membrane from which the young snakes rapidly break free and disperse. Once the baby snakes hatch, or are born, their parents have no interest in them, and adult snakes do not protect or guard their young – in fact many species will eat their own babies if the small snakes do not move away quickly.

Life Expectancy

There is very little information available about how long a snake can live in the wild. Snakes which are born and raised in captivity may live for more than 15-20 years; however this is not an accurate estimate of wild life expectancy because captive snakes do not have the same risks of predation or death through disease.

What is known is that most juvenile snakes do not reach reproductive maturity until they are between 2 and 3 years of age. Reproduction is the driving force in all organisms and for a species to be successful it must reproduce at least once and have at least two juveniles survive long enough to reproduce themselves. The higher the risk to juveniles, the more young a snake is likely to produce in a single clutch or brood.

Captive pythons have been known to live for more than 25 years, and some captive venomous snakes have also lived for between 15-20 years, although most live only for 8-10 years. With this in mind it is likely that the average life expectancy of most wild snakes would be from 5 to 8 years depending on the species.

Aggressive Behaviour

It is very important to realise that snakes are not aggressive animals, although most will attempt to defend themselves if threatened or approached.

All snakes are secretive. Their absence of limbs despite enabling them to adapt to many different environments does leave them with vulnerabilities, and most snakes spend the majority of their time being as elusive and secretive as possible in order to avoid potential predators. If a snake is given an opportunity to escape from a predator it will always take this option rather than attacking. At the same time however, different species may be more easily threatened than others; a death adder (*Acanthophis* spp.) has to be touched before it will bite, but a Papuan taipan (*Oxyuranus scutellatus canni*) may only need to be approached closely

(within 5-6 metres) before feeling sufficiently threatened to bite what it perceives to be a potential threat. Understanding this sort of behaviour by different species can be important when teaching people how to avoid snakebite, and it is often useful to use the analogy of the frightened dog that barks loudly when you are distant, but which may bite if you walk to close to it. Many snakes are exactly the same – at a distance they may hiss and puff themselves with air to make themselves look more dangerous, but if you come too close, they become afraid and defend themselves in the only way possible – by biting.

There is no truth in the common misconception that venomous snakes will attack people during the ‘breeding season’; the only reality is that male snakes are more likely to be encountered when they are actively looking for females.

If a person sees a snake and either stands completely still or slowly backs away there is a 99.9% chance that the snake will use the opportunity to escape as quickly as possible. The only exception to this rule of thumb are the death adders (*Acanthophis* spp.) which are ambush hunters and rely on sitting perfectly still to all their prey to come towards them. A death adder will sit completely still even if a person walks right up to it, and if the person is unfortunate enough to touch the snake or stand on it, then the death adder will bite.

Feeding

Most snakes have particular dietary preferences, although some are more specific about what they eat than others. The small ‘blind snakes’ feed solely in ant and termite eggs, and consequently spend much of their lives underground in ant and termite nests satisfying this peculiar appetite. Some species of sea snakes feed solely on fish eggs, while others live upon crabs and other crustaceans, and still others prefer eels or fish.

Many colubrid snakes live on small fast moving lizards, and have slender streamlined bodies and great agility to enable them to catch such prey. Some semi-aquatic colubrids live only on frogs and toads, and in particular the Keelbacks (*Tropidonophis* spp.) are such successful amphibian-eaters that they are able to consume poisonous cane toads (*Bufo marinus*) without succumbing to the potent cardiotoxins the toad has in its parotid gland secretions.

Small aboreal pythons such as the green tree python (*Morelia viridis*) have extremely long front teeth that they use to snatch birds and small bats out of the air as they fly close by. Ground dwelling giants such as the Papuan python (*Apodora papuana*) are opportunistic feeders and will eat almost anything they can overpower including lizards, other snakes, ground birds and mammals like bandicoots and wallabies. Large Papuan pythons have been known to eat wallabies up to 23kg in weight – the size of a small child!

Small venomous snakes like death adders (*Acanthophis* spp.), brown-headed snakes (*Furina tristis*), and whipsnakes (*Demansia* spp.) feed primarily on small lizards and occasionally small rodents. The New Guinea forest snakes (*Toxicocalamus* spp.) have been reported feeding on earthworms and other small invertebrates that live among the leaf litter on the forest floor. Larger venomous snakes tend to be opportunistic, and this is certainly the case with species like the New Guinea small-eyed snake (*Micropechis ikaheka*) which feeds on lizards, frogs, small rodents and even other snakes. Papuan blacksnakes (*Pseudechis papuanus*) are believed to be largely frog-eaters (although they may also eat lizards and rodents) and this is one of the reasons their numbers appear to have declined rapidly with the spread of the introduced cane toad (*Bufo marinus*) which is extremely poisonous if eaten. Papuan taipans (*Oxyuranus scutellatus canni*), on the other hand, are highly specialized mammal feeders, and this is the major reason for their extreme toxicity towards humans; the venom of these snakes has specifically evolved to target mammalian nervous systems.

Differences between non-venomous and venomous snakes

The accepted means of distinguishing one species of snake from another has for many years been based upon counting the numbers and arrangements of scales on their bodies (FIGURES 1 & 2). This works very well for zoologists and museum technicians, but unfortunately is fraught with obvious dangers for everyone else. As a consequence it is very difficult for untrained people to identify one snake from another, and this has special significance when dealing with cases of snakebite.

In southern PNG the vast majority of snakebite victims who see a snake identify the offending animal as a 'Pap black'; literally taken to mean a Papuan blacksnake (*Pseudechis papuanus*). Accepting such an identification at close quarters can, however, have disastrous consequences, given that:

- there are several species of snakes (assuming a snake is actually involved at all) that may have been responsible for the snakebite; and while,
- some of them are completely non-venomous species, at least two species of black-coloured snake are extremely venomous; and
- administration of the either the incorrect antivenom, or an antivenom when one is not required can result in serious medical complications or the death of the patient.

Studies of snakebite in Papua New Guinea have demonstrated that the reality is that less than 5% of serious snakebites admitted to PMGH are caused by Papuan blacksnakes (*Pseudechis papuanus*), and that an overwhelming majority (83.2%) of 'Pap black' bites are actually caused by the much more dangerous Papuan taipan (*Oxyuranus scutellatus canni*).

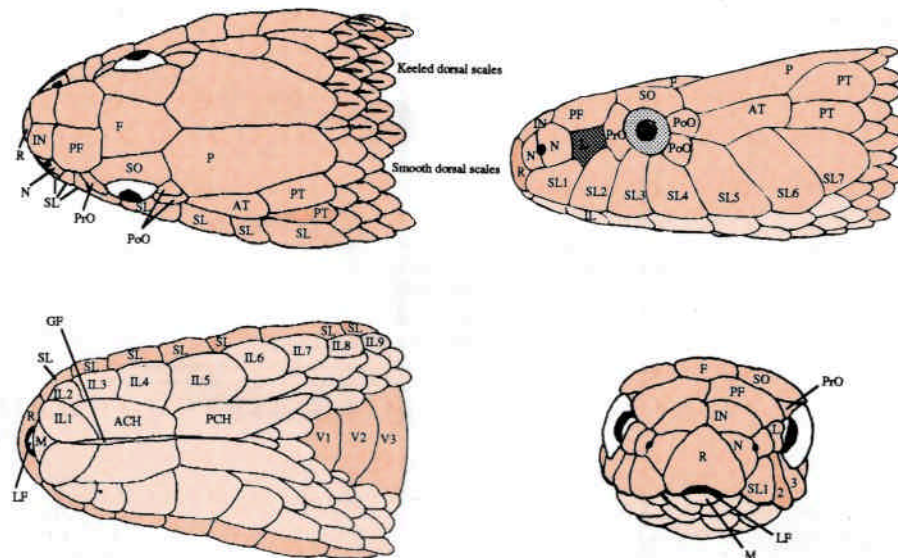


FIGURE 1: IDENTIFICATION FEATURES OF SNAKES: HEAD SCALATION

Typical arrangement of head scales that are used in the identification of different species of snakes. **KEY:** (ACH) anterior chin shield; (AT) anterior temporals; (F) frontal; (GF) gular fold; (IL) infralabials; (IN) internasal; (LF) lingual fossa; (M) mental; (N) nasal; (P) parietal; (PCH) posterior chin shield; (PF) prefrontal; (PoO) postoculars; (PrO) preoculars; (PT) posterior temporals; (R) rostral; (SL) supralabials; (SO) supraocular; (V) ventrals.

SOURCE: *A Guide to the Snakes of Papua New Guinea* by M T O'Shea (Independent Publishing) (1996)

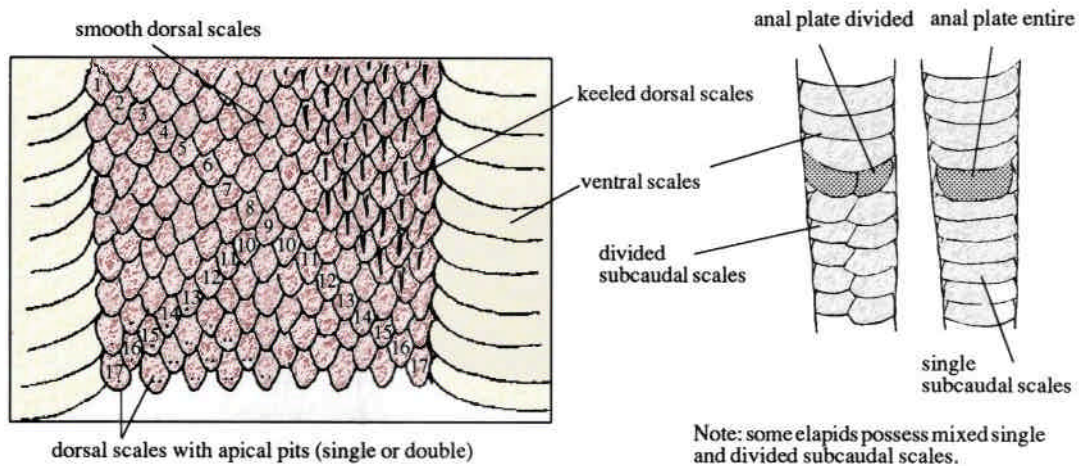


FIGURE 2: IDENTIFICATION FEATURES OF SNAKES: BODY SCALATION

A key means of differentiating species rapidly is to count the numbers of scale rows across the dorsal (back) surface at the middle of the body. Scales are counted diagonally. Additional counts of the total numbers of ventral (belly) scales and subcaudal (beneath tail) scales provide further information for identification purposes, as does the structure of the larger anal scale covering the cloaca (it may be either singular or split into two halves). **WARNING: Inexperienced people should never attempt to count the scales of a live snake.**

SOURCE: *A Guide to the Snakes of Papua New Guinea* by MT O'Shea (Independent Publishing) (1996)

On the other side of the island, many people who are bitten by a 'short, sharp-tailed snake' or a 'death adder' present to health centres in an extremely anxious state, with tachycardia, shortness of breath and anxiety (to the point of causing nausea or vomiting). Despite the seemingly clear-cut identification the reality is that the real culprit is not a highly venomous death adder (*Acanthophis* spp.), but a completely non-venomous ground boa (*Candoia aspera*) with a bad temper!

So how then can a casual observer tell the difference between a non-venomous and venomous snake, or for that matter between two different varieties of any snake?

There is no simple answer.

There are however some approximate rules of thumb that may help to distinguish some species:

- (1) A description of either a black or brown-coloured snake 'with a red stripe on the back' refers invariably to the highly venomous Papuan taipan (*Oxyuranus scutellatus canni*).
- (2) All snakes can climb, and even small snakes like death adders (*Acanthophis* spp.) can climb very well. **HOWEVER**, as a general rule, the majority of snakes encountered more than 2 metres above the ground are non-venomous.
- (3) A description of a 'white snake with pink stripes' typically refers to the highly venomous New Guinea small-eyed snake (*Micropechis ikaheka*); 'white snake' is the common name for this snake in the Madang and Karkar Island districts.
- (4) Aquatic snakes with laterally flattened 'paddle-shaped' tails are venomous sea snakes.
- (5) If a suspected snakebite is involved and you are in doubt – follow the management plan, perform appropriate diagnostic tests and observe the patient closely over a period of at least 24 hours.

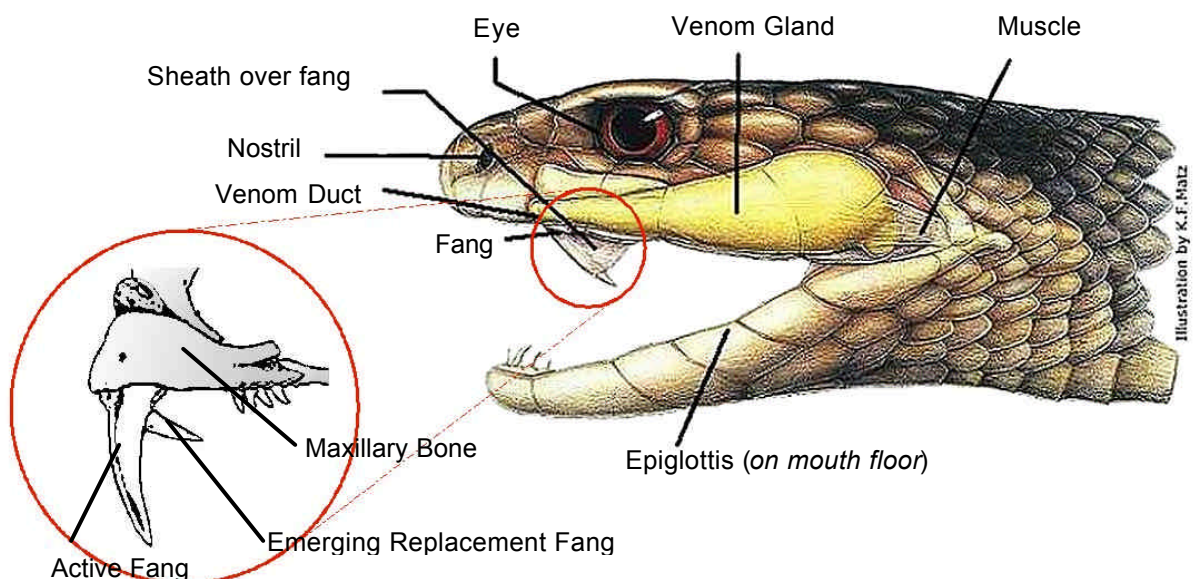
Venom delivery system

All venomous snakes produce their toxins in modified salivary glands comprised of densely packed epithelial cells which secrete the proteins, carbohydrates and other compounds that constitute “venom”. Each snake has two separate glands located on either side of the head just below, and to the rear of, the eyes. The glands are encased in powerful muscles which are used to compress the venom glands and expel venom along narrow ducts which connect to the tops of thickly grooved fangs at the front of the upper jaws.

Papua New Guinea’s front-fanged land snakes and sea snakes differ from some other venomous snakes in the degree of evolutionary development present in the highly modified teeth that are used to inject venom into their prey. The fangs of more primitive venomous colubrid snakes such as the brown tree snake (*Boiga irregularis*) are located at the rear of maxillary bones (hence: ‘rear-fanged’) in the upper jaw, are relatively short, and are only slightly grooved. This system is relatively inefficient and these snakes need to be able to grasp prey firmly and ‘chew’ in venom in order to inject venom. In the most highly evolved venomous snakes, such as the African vipers (i.e.: *Bitis* spp., *Echis* spp.) and North American rattlesnakes (*Crotalus* spp.), the fangs are extremely large (up to 4.5 centimetres!), are completely hollow and fused (like hypodermic needles) and are located at the front of a highly mobile maxilla; both the fangs and the maxillary bones rotate forward to project the fangs outward and down when these snakes bite. The elapid and hydrophiid snakes that occur in PNG and Australia are intermediate between these two groups in terms of evolutionary fang development (FIGURE 3).

FIGURE 3: VENOM DELIVERY SYSTEM OF ELAPID SNAKES

Elapid snakes are proteroglyphous, meaning that the fangs are grooved rather than completely hollow, and are located at the front of the maxillary bone. The fangs of venomous snakes are replaced periodically throughout their lives, and replacement fangs are always under development. The fangs of most elapid snakes in Papua New Guinea are extremely short; between 1 and 4 millimetres. The notable exceptions are the Papuan taipan (*Oxyuranus scutellatus canni*) which can have fangs more than 1 centimetre long; and the death adders (*Acanthophis* spp.) – large specimens can have fangs up to 6-7 millimetres long.



Venomous Papua New Guinean snakes

There are 37 species of semi-aquatic and land-dwelling venomous snakes in Papua New Guinea that are currently known to science. The majority of these are not considered to be dangerous to humans, but this is based more on a lack of information than on specific scientific evidence.

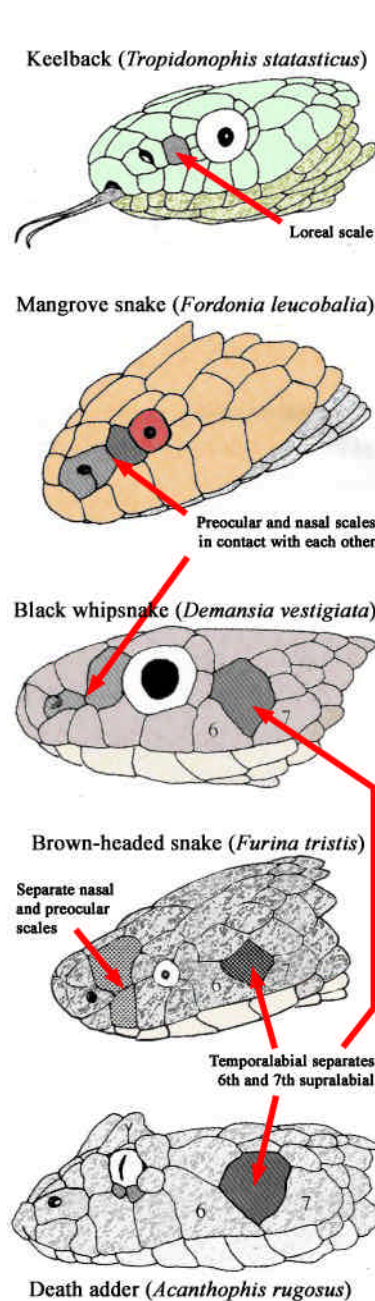


FIGURE 4: HEAD SCALES

Non-venomous snakes typically have a loreal scale between the nasal and preocular scales; a feature absent in venomous species. Elapid snakes have a large temporalalial scale that wedges between supralabial scales on the upper lip.

The bites of rear-fanged semi-aquatic species such as the white-bellied mangrove snake (*Fordonia leucobalia*) are not known to be dangerous, and while there have been cases of envenomation (mainly among children) by the aboreal brown tree snake (*Boiga irregularis*) on the island of Guam, these were unusual cases, and the majority of bites by this species produce no effects.

Nothing is currently known about the venoms of most of the 30 species of elapid snakes present in Papua New Guinea. Among nine species of New Guinean forest snakes (*Toxicocalamus* spp.) there are several species that grow large enough to be considered potentially dangerous. The widely distributed Loria forest snake (*Toxicocalamus loriae*) and Preuss's forest snake (*Toxicocalamus preussi*) both reach maximum lengths of between 70-80 centimetres and should be considered to be of potential medical importance.

Other small elapid snakes that could be dangerous include the black-striped snake (*Rhinoplocephalus nigrostriatus*) from the Oriomo plateau in Western province; the brown-headed snake (*Furina tristis*) that occurs right across southern PNG; and the Solomon's coral snake (*Salomonelaps par*) from Buka, Bougainville, Fauro and Shortland Islands.

The Papuan whipsnake (*Demansia vestigiata*) attains a maximum length of approximately 1.5 metres and is often mistakenly called a 'Pap black'. This slender, very fast snake has a characteristic long whip-like tail and large eyes that are sometimes surrounded by a yellowish ring of colour on the ocular scales. Bites by whipsnakes can cause severe local pain and swelling but there are no current reports of systemic illness other than allergic reactions in people who have histories of repeated snakebites.

The bites of seven species are known to be potentially fatal:

- Papuan taipan (*Oxyuranus scutellatus canni*)
- New Guinea death adders (*Acanthophis rugosus* and *Acanthophis laevis*)
- New Guinea small-eyed snake (*Micropechis ikaheka*)
- Papuan blacksnake (*Pseudechis papuanus*)
- Papuan mulga snake (*Pseudechis cf. australis*)
- New Guinea brown snake (*Pseudonaja cf. textilis*)

Photographs of some non-venomous PNG snakes



Blind snake (*Ramphotyphlops*) spp.



Arafuran file snake (*Acrochordus arafurae*)



Common keelback (*Tropidonophis mairii*)



Coconut treesnake (*Dendrelaphis calligastra*)



Slatey-grey snake (*Stegnotus cucullatus*)



Papuan carpet python (*Morelia variegata*)



Green tree python (*Morelia viridis*)



Boelen's python (*Morelia boeleni*)



Papuan olive python (*Apodora papuana*)



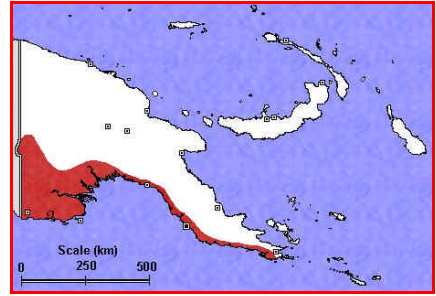
D'Albert's python (*Leiopython albertisi*)

Papuan taipan (*Oxyuranus scutellatus canni*)

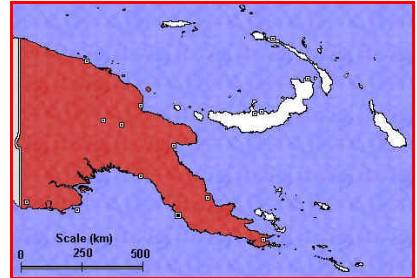
- DESCRIPTION:** A large snake that is typically dark-brown to black above with a broad orange-red dorso-vertebral stripe extending along most of the back. The ventral surface can be white to orange in colour. The tip of the nose and the sides of the lips are usually creamish.
- SCALATION:** Dorsal scales in 21-23 rows at mid-body; 220-250 ventrals; anal single; 45-80 paired subcaudals.
- BODY SIZE:** Average length is from 1.8-2.4 metres; maximum length is 3.36 metres.
- DISTRIBUTION:** Milne Bay, Central, NCD, Gulf and Western Provinces and as far west as the Wildoman River in West Papua.
- HABITAT:** Inhabits grasslands and savannah woodland to an altitude of around 400 metres. Adapts well to areas of human habitation and is a frequent inhabitant of village gardens and residential areas. Specimens have been collected in Port Moresby on Ela Beach Road.
- DIET:** Feeds on warm-blooded prey; primarily rodents and small mammals to the size of bandicoots, but also known to eat ground-dwelling birds. Does not appear to have been affected by the introduction of the cane toad (*Bufo marinus*), which is hypothesized as a cause of declines in frog-eating species. If other species continue to decline, the proportion of snakebites involving this species will only continue to rise.
- REPRODUCTION:** Oviparous producing 1-2 clutches of 16-22 eggs each year.
- ACTIVITY:** Active by day but may be nocturnal just after dark in very hot weather.
- BEHAVIOUR:** Unless approached closely this is a very shy, extremely nervous snake that endeavours to avoid human contact. Veteran snakeman Ken Slater (who described this species in 1956) said of the Papuan taipan that he knew of "*no other snake more formidable or adept in defence when at close quarters nor more capable of clearing the Papuan grasslands of man if it did adopt truly aggressive behaviour*".
- If provoked or frightened this very large snake is indeed capable of unparalleled ferocity and may inflict multiple bites in rapid succession using a '*snap and release*' strategy in which larger amounts of venom are injected with each subsequent bite. Taipans also tend to strike much higher than other venomous species; bites to the calves or even above the knee are not uncommon. This is the only snake in Papua New Guinea that will pursue an attack against a perceived threat.
- MEDICAL IMPORTANCE:** The most venomous snake in Papua New Guinea, with the highest venom yield and the longest fangs (*see* CHAPTER 3).
- There is considerable evidence that this species is responsible for the majority of serious snakebites admitted to health centres in Central Province and to PMGH. In a study by Laloo et al (1995), it was shown, using a specific diagnostic test (EIA), that 82.3% of serious snakebites in Central Province were caused by this species.
- ANTIVENOM:** **CSL monovalent taipan antivenom or CSL polyvalent antivenom.**

Death adders (*Acanthophis rugosus*, *Acanthophis laevis*)

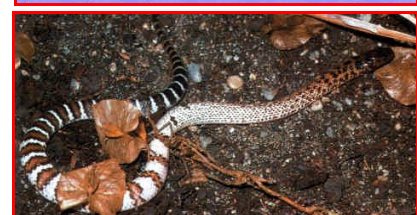
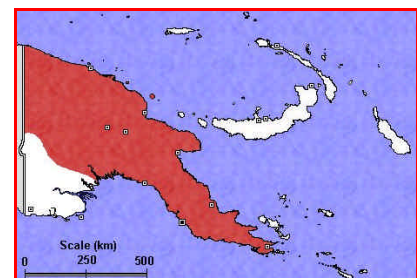
- DESCRIPTION:** Short, thickset snakes with large angular heads and raised supraocular scales that give the appearance of small horns. The tail is thin and ends in a soft 'spine-like' tip. Colour varies enormously and background body colour can vary from almost black to red, brown, yellow or light grey interspersed with alternate light and dark transverse bands which are most prominent when the snake is threatened. The labial scales are usually white with dark brown or black streaks. The belly is white, occasionally with darker spots.
- SCALATION:** Dorsal scales in 21-23 rows at mid-body; 110-135 ventrals; anal single; 36-60 subcaudals – anteriorly single, paired posteriorly. Dorsal scales of *Acanthophis laevis* are usually smooth, while those of *Acanthophis rugosus* are strongly keeled and look rough.
- BODY SIZE:** Average length is from 0.3-0.6 metre; maximum length is 1.1 metres.
- DISTRIBUTION:** Occurs in all of the mainland PNG Provinces and on closer islands such as Karkar, Yule, Daru and those in the mouth of the Fly River. Also found throughout West Papua and on Seram and the Aru islands.
- HABITAT:** Death adders occur in a wide range of habitats including lowland grasslands and savannahs, sago swamps, monsoonal forests, woodlands, rainforest, coffee, tea and cocoa plantations, village gardens, highland grasslands and other montane environments.
- These ground dwelling snakes do well in any area with an abundance of leaf litter, grass trash or other ground cover.
- DIET:** Predominantly small ground-dwelling lizards, frogs and occasionally small rodents or ground birds that are attracted to wriggling of the snake's grub-like tail. The tail does not contain a poisonous sting.
- REPRODUCTION:** One of the very few viviparous venomous snakes in PNG which produce live-born young in litters of 8-12.
- ACTIVITY:** Generally nocturnal these snakes usually sit under cover during the day; often close to pathways along which small animals (and people) often travel. If disturbed (by the burning of grass for example) they may move around during the day.
- BEHAVIOUR:** Death adders are unique in their reliance on a 'sit and wait' ambush feeding strategy which means that they will remain motionless on the ground even when approached very closely. These inoffensive snakes become a significant snakebite threat because of this behaviour. While most snakes will flee from an approaching human, death adders rely on remaining motionless to avoid detection, but if touched will strike reflexively.
- MEDICAL IMPORTANCE:** Although considered responsible for only about 10% of serious snakebites in Central Province, death adders are the major cause of snakebites in northern PNG where they are the most commonly encountered venomous snake. (see CHAPTER 3 for venom data).
- ANTIVENOM:** CSL monovalent death adder antivenom or CSL polyvalent antivenom.



PAPUAN TAIPAN (*Oxyuranus scutellatus canni*) showing characteristic orange-red dorso-vertebral stripe. The very dark body colour of some snakes (smaller photograph) often results in this species being mistaken for a Papuan blacksnake (*Pseudechis papuanus*)



DEATH ADDERS (*Acanthophis* spp.) Note large angular head with raised supraocular scales over eyes. Also note thin tail with soft spine-like tip that is used as a lure to attract prey – has no poisonous sting.



NEW GUINEA SMALL-EYED SNAKE (*Micropechis ikaheka*) A fossorial burrowing snake that is often found living in plantation trash and husk piles on Cocoa plantations in northern Papua New Guinea.

New Guinea small-eyed snake (*Micropechis ikaheka*)

- DESCRIPTION:** This is a thick-bodied snake with an extremely variable colour pattern based on a greyish head and pale yellow, creamish or salmon coloured body with dark-tipped scale edges that give rise to broad dark bands from midbody to the end of the tail. Juvenile snakes are much more prominently marked than adults (see inset photograph previous page). In Madang Province the snake is often known as the 'white snake' due to its pale body colour.
- SCALATION:** Midbody dorsal scale rows are in 15 rows; ventrals number 178-225; the anal is divided as are 36-55 subcaudals under the tail.
- BODY SIZE:** Average length is from 1.2-1.4 metres; maximum length is 2.1 metres.
- DISTRIBUTION:** Recorded from northern Western Province (Kiunga to Star Mountains); and all of the Highland and New Guinea Provinces. Isolated records in Gulf and Central Provinces. Widely distributed in West Papua and the Aru Islands.
- HABITAT:** Lives in wet environments from sea level to over 1,500 metres. Common in monsoonal forests, lowland swamps and rainforests where it lives in ground debris. There are abundant regional populations in and around Cocoa plantations (especially Karkar Island) where the snake lives in old coconut husk piles.
- DIET:** Believed to be an opportunistic feeder, preying on a wide variety of small ground dwelling animals including lizards, rodents, frogs and particularly other snakes, including its own species.
- REPRODUCTION:** Nothing is currently known although juvenile snakes have been collected in the wild.
- ACTIVITY:** Although generally considered to be a ground dwelling largely nocturnal species, there is a single report from West Papua of a serious snakebite having been caused by a large *Micropechis ikaheka* that was caught in a bird trap high in a tree.
- During the dry season this snake is a common inhabitant of coconut husk piles, but appears to disperse during the wet season and may be encountered at night moving on the ground.
- BEHAVIOUR:** A shy snake until disturbed. If handled this snake is very aggressive and will bite readily, often chewing down hard and refusing to let go of its victim. Small specimens are very agile and surprisingly fast.
- The small eyes and smooth body scales are specific adaptations for foraging among ground debris and loose topsoil.
- MEDICAL IMPORTANCE:** This highly venomous snake is believed to account for only a small proportion of snakebites in the mainland Madang and Sepik regions, however one study found that approximately 40% of snakebites on Karkar Island could be attributed to bites by *Micropechis ikaheka* (see CHAPTER 3 for venom data).
- ANTIVENOM:** **CSL polyvalent antivenom.**

Papuan blacksnake (*Pseudechis papuanus*)

- DESCRIPTION:** As the name implies these snakes are typically gunmetal black both on the dorsal and ventral surfaces. The tip of the nose and the throat may be cream to yellow in colour. Rare brown-coloured specimens have also been recorded. This is a large heavy-bodied snake; the head is indistinct from the neck, unlike the Papuan taipan (*Oxyuranus scutellatus canni*) in which the head is clearly distinct from the slender neck.
- SCALATION:** There are 19 rows of dorsal scales; 220-230 ventrals; a divided anal scale and from 48-65 subcaudals (single anteriorly, but divided posteriorly).
- BODY SIZE:** Average length is from 1.2-1.7 metres; maximum length is 2.45 metres.
- DISTRIBUTION:** Specimens have been recorded in Milne Bay, Central, Gulf and Western Province, as well as in neighbouring southern West Papua. The current status of the species in Milne Bay and Central Provinces is unknown; very few specimens have been reported over the last 25 years, and no live or dead specimens have been positively identified in Central Province since 1992. The species is believed to be common in coastal areas of Gulf Province, but there are no identified specimens. Three snakes were collected near Kunini and Weam in Western Province in 2001, and the species is known to be common around Merauke in West Papua.
- HABITAT:** Coastal swamps and marshland, monsoonal forests, bamboo thickets and occasionally savannah woodland. Specimens have been found in rubber tree groves in the Abau district, and in rainforest around Veifa'a.
- DIET:** Opportunistic, but prefers frogs. One hypothesis for the apparent decline in numbers in Central Province is that the spread of the poisonous introduced cane toad (*Bufo marinus*) has resulted in regional extinction.
- REPRODUCTION:** Oviparous, producing clutches of 12-18 eggs.
- ACTIVITY:** This is a diurnal snake that is more likely to be encountered in daylight when it comes out of hiding to bask or hunt for food. In West Papua specimens have been collected in the early morning basking close to the edge of sago palm lined river banks. Specimens have been reported basking near the edges of forest thickets near Kukipi in Gulf Province. Ken Slater noted in the 1960's that these snakes were more likely to be seen during the late dry season.
- BEHAVIOUR:** Ken Slater, who collected many Papuan blacksnakes during the 1950's and 1960's for antivenom production, believed that it was a shy snake which almost always attempted to escape when disturbed, but noted that if provoked it would bite with minimal provocation.
- MEDICAL IMPORTANCE:** Lalloo et al (1995) determined by EIA that 4.2% of serious snakebites admitted to PMGH over a thirty month period were caused by this snake. (*For venom data see CHAPTER 3*).
- ANTIVENOM:** **CSL blacksnake antivenom or CSL polyvalent antivenom.**

Papuan mulga snake (*Pseudechis cf. australis*)

- DESCRIPTION:** A small slender species that is typically light yellowish-tan to reddish-brown dorsally, with a creamish ventral surface. The head is short, broad and indistinct from the neck. When agitated the snake will flatten the body to make it appear larger to a potential enemy.
- SCALATION:** Dorsal scales in 17 rows at midbody; 185-225 ventrals; anal divided with 48-60 subcaudals that are normally all single with last few paired.
- BODY SIZE:** Average length is from 0.8-1.0 metre; maximum length is 1.3 metres.
- DISTRIBUTION:** Only recorded near Bensbach and Weam in Western Province but possibly occurs further east on the Oriomo plateau. Common around the Etna Bay and Merauke districts in West Papua.
- HABITAT:** Restricted to dry savannah and savannah woodlands where they hide among rocks, fallen timber and in animal burrows. Specimens have also been found near the periphery of wetlands where frogs are abundant.
- DIET:** An opportunistic species that feeds on lizards, frogs, small rodents and ground birds. Australian specimens are known to be cannibalistic.
- REPRODUCTION:** Oviparous; however nothing is currently known of clutch sizes or seasonal reproductive timing in Papuan specimens. In Australia specimens of *Pseudechis australis* reproduce in early spring through to mid-summer, with females depositing clutches of 6-18 eggs.
- ACTIVITY:** A diurnal snake that may become nocturnal in very warm weather. Mulga snakes are often observed hunting during early to mid-morning or in the late afternoon. In Australia very closely related forms are commonly nocturnal in the tropics. In north-west Queensland and the Northern Territory these snakes may be found hunting for food well into the early hours of the morning; it seems reasonable to anticipate the same behaviour among Papuan specimens.
- BEHAVIOUR:** The Papuan mulga snakes are much smaller and more slender than their Australian relatives, and it is possible that they actually represent a different species. Captive specimens are extremely nervous and flighty and have been noted to bite with little if any provocation.
- MEDICAL IMPORTANCE:** There are no current records of bites by this snake in PNG; however, the venom of mulga snakes is highly toxic (*see* CHAPTER 3).
- ANTIVENOM:** **CSL blacksnake antivenom or CSL polyvalent antivenom.**

New Guinea brown snake (*Pseudonaja cf. textilis*)

- DESCRIPTION:** A slender snake that may be tan to dark brown in colour dorsally with a cream to yellow belly that is speckled with greyish-brown spots. Juveniles have a black patch on the top of the head and a black bar across the nape of the neck; some also have up to 50 black cross bands that eventually fade with age.
- SCALATION:** Dorsal scales in 17 rows at midbody; 200-210 ventrals; anal divided; 45-75 paired subcaudals (although a few may be single anteriorly).
- BODY SIZE:** Average length is from 1.2-1.8 metres; maximum length is 2.15 metres.
- DISTRIBUTION:** Most common in Milne Bay and Oro Provinces. A handful of specimens have been recorded in Central Province. Common in West Papua near Merauke and also reported in Western Province near Weam.
- HABITAT:** Grasslands, savannah woodland and coastal heaths. Adapts well to areas of human settlement.
- DIET:** Very opportunistic, but primarily small lizards and rodents.
- REPRODUCTION:** Females lay eggs in clutches of up to 22 eggs in October-November.
- ACTIVITY:** Almost exclusively diurnal and unlikely to be seen at night. Brown snakes are very active foraging species that are often encountered moving around searching for food or shelter.
- BEHAVIOUR:** If approached this is a very aggressive snake that will defend itself with little encouragement. Brown snakes typically adopt a very characteristic defensive stance in which they lift the front third or more of the body high off the ground in a rigid 'S' shape and hiss violently while holding the mouth open. From this position the snake will make repeated lunges at an antagonist, and will strike several times. This defensive posture is often well remembered by people who experience it due to the similarity to the threat display of Asian cobras (*Naja* spp.)
- MEDICAL IMPORTANCE:** Lalloo et al (1995) reported that this species was responsible for 1.8% of the serious snakebites in their study within Central Province, and reported bites from Tapini, Goldie River, Kapari and 9-Mile. Although the venom is extremely toxic, both the yield and the fangs used to deliver it are small (*see* CHAPTER 3 for venom data).
- In Australia the brown snakes (*Pseudonaja* spp.) are the most common cause of serious snakebites, and particularly of fatal cases. The common brown snake (*Pseudonaja textilis*) is distributed throughout eastern Australia and is abundant even in the suburbs of cities like Melbourne, Sydney and Adelaide.
- ANTIVENOM:** **CSL brown snake antivenom or CSL polyvalent antivenom.**

Sea kraits (*Laticauda colubrina* and *Laticauda laticaudata*)

There are two species of banded sea krait that occur in Papua New Guinean waters; the yellow lipped sea krait (*Laticauda colubrina*) and the common sea krait (*Laticauda laticaudata*). Both of these snakes have alternating blue-grey and black bands around the body, and a laterally compressed tail for swimming. The average length is 1 metre with a maximum length of 1.5 metres. Unlike the true Hydrophiine sea snakes, the sea kraits have round bodies and are equally at home on land.

Both *L. colubrina* and *L. laticaudata* have been reported from Lion, Manubada and other inshore islands in Central Province, and from Samarai Island in Milne Bay Province. Both species are also recorded from the seas around Rabaul. *L. colubrina* has been recorded off Karkar Island and along the coast north of Madang. It occurs around Manus and Pigeon Islands, and has been recorded off Aitape.

Sea kraits typically emerge from the water at night and make their way ashore to rest and to reproduce. Female snakes lay eggs in clutches of 3-6 eggs.

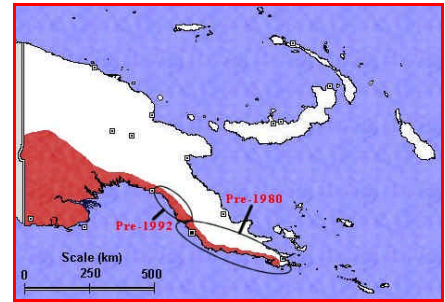
These two species are highly venomous, but generally considered to be of minor medical importance due to their docile nature and reluctance to bite even when handled.

True Sea Snakes (*Hydrophiine* species)

There are 20 species of true sea snake in the waters surrounding Papua New Guinea. The majority of these are inoffensive species and bites are uncommon. Several species are, however, commonly caught by fisherman and trawler operators, and these people are at risk of bites while separating the snakes from their catch. Two large species which are common in the waters off southern PNG; the olive sea snake (*Aipysurus laevis*) and the Stoke's sea snake (*Astrotia stokesii*) have been reported to cause serious envenomation, and have fangs that are moderately large. A third, smaller species, the spine-bellied sea snake (*Lapemis hardwicki*) is also capable of inflicting a serious bite.

Closer inshore, several species of sea snakes inhabit muddy coastal estuaries and sometimes travel long distances up coastal river systems. The beaked sea snakes (*Enhydrina schistosa*) and (*Enhydrina zweifeli*) have among the most toxic venoms of any snakes in the world, and one of these species is believed to have been responsible for at least one confirmed death in Ramu River. Other estuary-dwelling species from PNG including *Hydrophis elegans*, *Hydrophis ornatus* and *Lapemis hardwicki* have caused fatalities in South-East Asia and elsewhere.

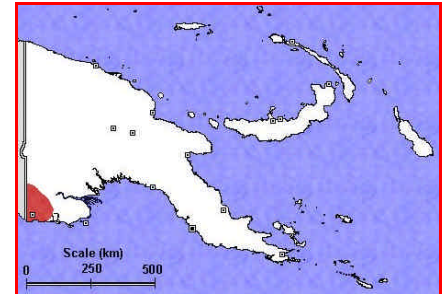
True sea snakes have tails and bodies that are laterally flattened, and most have great difficulty moving on dry land. Two exceptions are *Hydrelaps darwiniensis* and *Parahydrophis mertoni*, species that live on mudflats and have learned to move reasonably well out of the water. *H. darwiniensis* is recorded from the coast of Western Province. Most sea snakes average from 0.5-1.0 metre in length, however *Aipysurus laevis* can reach lengths of 2.3 metres; *Astrotia stokesii* grows to 1.8 metres and *Hydrophis elegans* can attain a maximum length of almost 2.5 metres. The inshore beaked sea snake *Enhydrina schistosa* grows to almost 1.5 metres in length.



PAPUAN BLACKSNAKE

(Pseudechis papuanus)

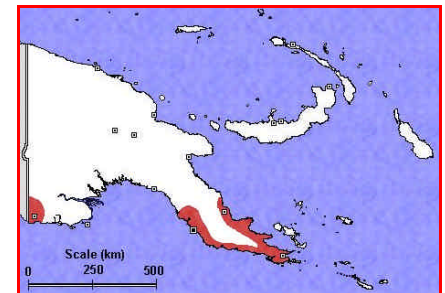
This species has been disappearing from the east of its range over the past 25 years. Snake shown has burn scarring.



PAPUAN MULGA SNAKE

(Pseudechis cf. australis)

Known from only a few specimens in the south-west of Western Province. The species may occur further east on the Oriomo plateau towards the mouth of the Fly River.



NEW GUINEA BROWN SNAKE

(Pseudonaja textilis)

Once considered to be an exotic import from Australia, it now seems likely that like other venomous species, the brown snake invaded PNG during the late Pleistocene via temporary land bridges.

Venomous Land Snake Distribution by Province

Western	Papuan taipan	Known only from south of Lake Murray & Balimo but possible further north
	Papuan blacksnake	
	Small-eyed snake	North of Lake Murray & Balimo
	Death adder	Widespread in whole Province
	Papuan mulga snake Brown snake	Weam and Bensbach districts
Gulf	Papuan taipan	East of Kerema; but possibly also lowland areas further west
	Papuan blacksnake	Probable in lowland regions
	Death adder	Widespread in whole Province
	Small-eyed snake	Kikori, Purari, Kerema, Omati
Central & NCD	Papuan taipan	Widespread in lowlands but not Yule Island
	Papuan blacksnake	Extremely rare but possibly in Mekeo, Yule Island and Abau
	Death adder	Widespread in whole Province
	Brown snake	Uncommon but widespread
	Small-eyed snake	Rare, but recorded from Dinawa, Koroko, Sogeri, Musgrave River
Milne Bay	Papuan taipan	Southern coast to the west of Samarai Island
	Papuan blacksnake	
	Death adder	Few records
	Brown snake	Cape Vogel, Dogura, Menapi and Baiawa
	Small-eyed snake	Loani and Kwagira River
Oro (Northern)	Death adder	Widespread in whole Province
	Small-eyed snake	
	Brown snake	Coastal: Embogo & Popondetta
Morobe	Death adder	Widespread in whole Province
	Small-eyed snake	Scattered records
Eastern Highlands	Death adder	Widespread in whole Province
	Small-eyed snake	Rare but reported from Aiyura
Simbu	Death adder	Common to altitudes of 1800 m
	Small-eyed snake	Tive plateau and Karimui
Southern Highlands	Death adder	Widespread in whole Province
	Small-eyed snake	Mt Sisa and Mt Bosavi

Venomous Land Snake Distribution by Province

Western Highlands	Death adder	Widespread in whole Province
Enga	Death adder	Widespread in whole Province
Sandaun	Death adder	Widespread in whole Province; a giant race occurs in the Sepik valley
	Small-eyed snake	Widespread in whole Province
East Sepik	Death adder	Widespread in whole Province
	Small-eyed snake	
Madang	Death adder	Widespread in whole Province
	Small-eyed snake	Widespread in whole Province and very common on Karkar Island
Manus		No highly venomous species
West New Britain		No highly venomous species
East New Britain		No highly venomous species
New Ireland		No highly venomous species
North Solomons		No highly venomous species

Important Footnotes to the Distribution Table

The table above is based upon available records of species and records of snakebites in which the species responsible has been reliably identified.

There are still many gaps in our knowledge of venomous snake distribution in Papua New Guinea. New distribution records may extend the ranges of some species, and it is also possible for venomous snakes to be translocated in shipments of freight and other goods.

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PHOTOGRAPHS: David Williams, Mark O'Shea, Richard Mastenbroek, Dr Wolfgang Wüster and the Queensland Museum.

ILLUSTRATIONS: Adapted from 'A Guide to the Snakes of Papua New Guinea' by Mark O'Shea and from 'Australian Snakes: A Natural History' by Richard Shine.