AD-754 069

HANDBOOK OF DANGEROUS ANIMALS FOR FIELD PERSONNEL

G. V. Pickwell, et al

Naval Undersea Center
San Diego, California

December 1972

DISTRIBUTED BY:

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National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)

Naval Undersea Center
San Diego, California 92132

2a. REPORT SECURITY CLASSIFICATION
Unclassified

2b GROUP

3 REPORT TITLE

Handbook of Dangerous Animals for Field Personnel

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)
Research and Development July 1970-January 1972

5 AUTHOR(S) (First name, middle initial, last name)

G. V. Pickwell, ed.
W. E. Evans, ed.

6 REPORT DATE
December 1972

7a TOTAL NO OF PAGES
142 ~~159~~

7b NO OF REFS

8a CONTRACT OR GRANT NO

b PROJECT NO

c.

d

Work was funded internally under NUC Independent Research and Independent Exploratory Development, ZR031-02-01.

9a ORIGINATOR'S REPORT NUMBER(S)

NUC TP 324

9b OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10 DISTRIBUTION STATEMENT

Distribution of this document is unlimited.

11 SUPPLEMENTARY NOTES

12 SPONSORING MILITARY ACTIVITY

Naval Material Command
Washington, D. C.

13 ABSTRACT

This handbook describes the appearance, habits and distribution of some of the more common sea snakes, land snakes and crocodiles of southeast Asia Color photographs and paintings of these animals are included as aids to recognition. A section on the American honeybee is included as a general guide to dealing with venomous insects, future, additional sections will cover southeast Asian insects, spiders and scorpions. A medical section describes tests of the potency of antivenins for the bites of the Malayan pit viper, common cobra and blue krait, and suggests a dose schedule for treatment

Revisions and additions to this handbook are expected in response to readers' comments and descriptions of encounters with dangerous animals; to this end, questionnaires and encounter description forms are included at the end of the handbook.

DD FORM 1 NOV 65 1473 (PAGE 1)
0102-014-6600

UNCLASSIFIED
Security Classification

UNCLASSIFIED
Security Classification

14 KEY WORDS	LINK A ROLE	LINK A WT	LINK B ROLE	LINK B WT	LINK C ROLE	LINK C WY
dangerous animals						
snakebite						
crocodiles						
sea snakes						
venoms						
antivenins						
reptiles						
bees						

ib

DD FORM 1 NOV 65 1473 (BACK)
(PAGE 2)

UNCLASSIFIED
Security Classification

HANDBOOK OF DANGEROUS ANIMALS FOR FIELD PERSONNEL

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AN ACTIVITY OF THE NAVAL MATERIAL COMMAND

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ADMINISTRATIVE INFORMATION

The information presented in this handbook was compiled between July 1970 and January 1972. Work was funded internally under NUC Independent Research and Independent Exploratory Development, ZR031-02-01. Production of the handbook was funded by Naval Science Assistance Program (NSAP), Project Number N-2-73.

ACKNOWLEDGEMENTS

We are indebted to many people for their aid in the preparation of this handbook.

For their aid and assistance in obtaining photographs of various species of snakes and crocodiles, we thank the following people: Bill Haast and Nancy Harrell, Miami Serpentarium; James Murphy, Dallas Zoo; Howard Hunt, Atlanta Zoo; Louis Pistoria, Columbus Zoo; Bill Hamlet and Jack Deprato, National Zoo; Wayne King and Pete Brazaitis, Bronx Zoo, and Andrew Koukoulis, Ross Allen Reptile Institute.

For general suggestions and information on antivenins, we thank MAJ James A. Vick and Marie Grenan of the Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.

We acknowledge the contribution of the field personnel, both civilian and military, for whom this handbook is intended. Their accounts of encounters with dangerous animals have suggested the safest ways to deal with them, their comments and criticisms in future will provide the final measure of the handbook's usefulness.

Released by
M.A. BEAL, Head
Marine Environment Division

Under authority of
G. B. ANDERSON, Head
Undersea Surveillance and
Ocean Sciences Department

SUMMARY

PROBLEM

Provide a handbook of the more common dangerous animals of Southeast Asia to help field personnel deal with these animals in the safest possible way.

RESULTS

A handbook has been prepared that describes the appearance, habits and distribution of some of the more common sea snakes, land snakes and crocodiles of Southeast Asia. Color photographs and paintings of these animals are included as aids to recognition. A section on the American honeybee is included as a general guide to dealing with venomous insects, future, additional sections will cover Southeast Asian insects, spiders and scorpions. A medical section describes tests of the potency of antivenins for the bites of the Malayan pit viper, common cobra and blue krait, and suggests a dose schedule for treatment.

Revisions and additions to this handbook are expected in response to readers' comments and descriptions of encounters with dangerous animals, to this end, questionnaires and encounter description forms are included at the end of the handbook.

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ABOUT THIS HANDBOOK

G. V. Pickwell
W.E. Evans

AIM OF THE HANDBOOK

This handbook describes the appearance, habits, and distribution of the more common dangerous animals of southeast Asia. Sea snakes, land snakes and crocodiles are described in sufficient detail to prepare field personnel to deal with them in the safest possible way. Our intent is to reduce fears based mostly on misinformation or ignorance on the part of those likely to encounter these animals. A little study or even casual reading of this material may help anyone not familiar with these animals to behave correctly and to make the right moves when he encounters any of them. This belief is based on extensive interviews we have had with field personnel, all of whom have supported the idea and verified the need for a handbook such as this.

There are several other excellent sources of general information on dangerous animals of the world and of southeast Asia. These have been written by scientific experts and may in some cases be difficult for a non-scientist to understand. We have attempted to make the information in this handbook available to a wide audience by employing a minimum of scientific terminology. Those seeking more detailed information than is available in this handbook are referred to the annotated biblography at its end. Each entry is given with descriptive notes on the topics covered and the level of technicality.

We include a section on bees which, while not at present covering southeast Asian species, is the first of several sections we hope to produce on venomous insects and their relatives, the spiders and scorpions. Later sections will cover species of other geographical regions.

We hope the medical section, which contains information contributed by Army collaborators on the potency of antivenins for Malayan pit viper, common cobra, and blue krait bite, will be of use to medical personnel, whether in remote field hospitals or in better equipped urban facilities. We plan to expand this section as new information relevant to the aims of the handbook, such as the availability of new antivenins for animal bites or stings, becomes available. We welcome any comments or suggestions from interested users regarding new subject matter to be included in the medical section.

LAYOUT AND USE OF THE HANDBOOK

We anticipate revisions in both the content and organization of this handbook; it has been produced in loose-leaf form so that each of the five sections may be updated from time to time, and new sections covering other animals can be added. Most revision and addition of new material will be based on user requests and recommendations. For example,

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different formats have been employed in different sections partly because the subject matter differs and partly because we want to learn which offers maximum convenience to you, the user. Do you like straight accounts of the different animals, general write-ups, more detail, or some other approach?

We welcome comments from users on any aspect of this handbook. To this end, we have prepared a questionnaire that will provide us with some of the information we need to better shape the handbook to the needs of field personnel. Space is provided for your comments or questions in addition to the questions we have asked. We will try to supply any additional information not already in the handbook. Requests for additional information should include the name or kind of animal, and kind of information you want, such as medical treatment, venom toxicity, general behavior, aggressiveness, distribution, abundance, or some or all of these.

Particularly important information can be supplied to us by your descriptions of encounters with potentially dangerous animals. A number of such accounts from UDT, Marine Corps, and civilian personnel have already been of real value to us. Forms are included at the end of the handbook for your descriptions. Please supply all the information requested on the form. Gummed mailing labels are provided. No postage is necessary.

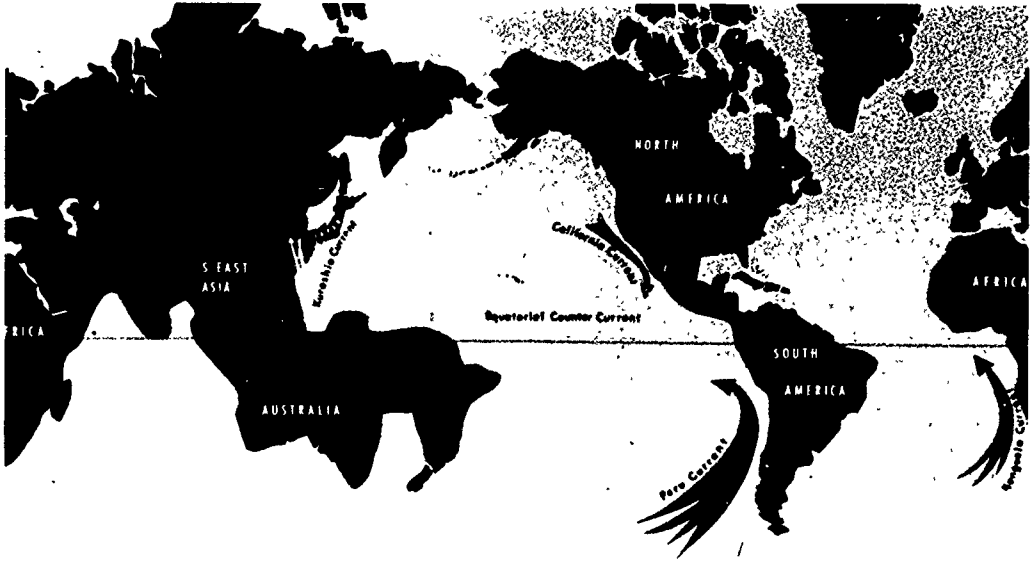
Questionnaires and descriptions of encounters should be mailed to

Dr. G.V. Pickwell
Dangerous Animal Research Program
Code 5045, Bldg. 149
Naval Undersea Center
San Diego, California 92132

Additional copies of the questionnaire or description form, or of the handbook, are available from the same address. Please include your name, unit or address, APO or FPO, etc. When requesting many copies for a unit include the responsible individual such as unit medical officer, CO, XO, etc.

SEA SNAKES OF VIET NAM AND SOUTHEAST ASIA

G.V. Pickwell



SEA SNAKES DISTRIBUTION. Red areas represent the range of the most widely distributed sea snake, the yellow-bellied sea snake, *Pelamis platurus*. All other species of sea snake occur inside the yellow-bellied sea snake's range. Within this range, the distribution of amphibious and non amphibious species is marked by vertical and horizontal lines, respectively. Cold ocean currents which limit the passage of the yellow-bellied sea snake are shown in blue. Warm currents which transport it are shown in yellow. Adapted from Smith 1935.

WHAT ARE SEA SNAKES?

Sea snakes are highly venomous, air-breathing reptiles that spend most or all of their lives in the sea. A few are amphibious and can crawl about on shore, but most are helpless out of water. All are potentially dangerous; their venom is from 10 to 20 times more potent than that of their cousins, the cobras and kraits, which live on land. Fixed, hollow fangs in the front of the upper jaw deliver the venom.

Adult sea snakes are, on the average, 4 to 6 feet long. Some are only 2 1/2 to 3 feet long, while a few reach 9 or 10 feet Most are less than 1 inch thick at the neck and are about 2 inches thick in the middle of their bodies. Some of the shorter species may be up to 4 inches thick. All have flat, paddle-like tails.

WHERE ARE YOU LIKELY TO FIND SEA SNAKES?

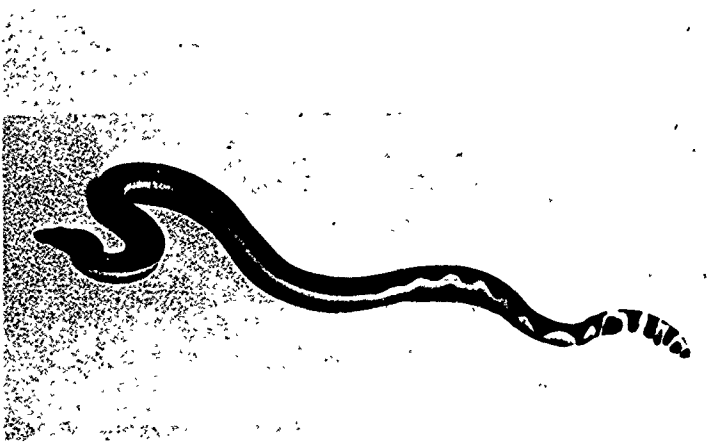
The world-wide distribution of sea snakes is shown on the map on the facing page. All are tropical and prefer warm seas. Almost all are restricted to the western Pacific. Only one, the yellow-bellied sea snake, *Pelamis platurus,* is found both in the western Pacific and in the eastern Pacific along the coasts of Southern Mexico, Central America, and South America north of the Peru Current. (See photograph on following page.) It is also found around the margin of the Indian Ocean south to the tip of Africa. No sea snakes have been found in the Atlantic or Mediterranean.

Over their entire range, most sea snakes are found near shore, usually near rock and reef areas where they dive for fishes on which they feed. They also gather near river mouths and estuaries, especially in the rainy season, where run-off from the rains brings organic material that attracts fishes.

The yellow-bellied sea snake is known to collect along slicks on the sea surface where fishes upon which it feeds may be more abundant.

HOW DANGEROUS ARE SEA SNAKES?

The greatest danger from sea snakes is to the native fishermen of southeast Asia, who wade barefoot in muddy, nearshore waters with their nets. They are most likely to be bitten when they step on or otherwise disturb an unseen sea snake. In South Viet Nam during the rainy season (usually from July to November), fishermen frequently catch



YELLOW-BELLIED SEA SNAKE, *Pelamis platurus*. This species shows two basic color patterns (top) a two-color pattern, and (bottom) a more common three-color pattern. Photographs by J. Sneed.

snakes as well as fishes in their nets, and are bitten when they sort their catch. Michael Barme, a French scientist and authority on the sea snakes of Viet Nam, states that sea snake bites are frequent among Vietnamese fishermen and are often fatal H.A. Reid, a British physician who has studied the frequency and severity of sea snake bites in the Malay Peninsula, found that almost all coastal villages had suffered deaths from sea snake bites. Reid thinks that this is probably true of most or all of the coastal villages of southeast Asia.

In some areas of the Malay Peninsula, the fishermen fear the yellow-bellied sea snake above all others. Whether this fear rests on superstition or experience is unknown.

Fishermen are not the only people menaced by sea snakes. In some areas such as Thailand, sea snakes enter rivers and canals and may travel considerable distances from the sea. In these areas they are a hazard to waders and to those living along the waterways

In some areas of the Philippines, as at Cebu City, concern over sea snakes has led resort hotels to place nets around their bathing beaches in an effort to keep out the snakes, and to put up signs warning bathers of the sea snake danger.

Although accounts vary, it is apparent that sea snakes can present a danger to divers. In a series of articles appearing in recent years Ben Cropp, a well-known Australian diver, has described repeated encounters he has had with aggressive sea snakes on the Great Barrier Reef. These episodes occurred at Swains Reef and apparently involved only one kind of sea snake, *Aipysurus laevis* (no generally accepted common name exists) In all cases, Cropp describes the snake as swimming aggressively toward the human diver and, if allowed, twining around flippers or spear gun No scientific explanation for this remarkable behavior is available, but Ron Taylor, another well-known Australian diver, feels the snakes are curious about any unfamiliar object in their area.

Recently, Kenneth MacLeish has described diving with Ben Cropp at Swain's Reef and being bitten several times by an annoyed sea snake. MacLeish was saved from poisoning and possibly death only by his wet suit, which prevented the snake's short fangs from reaching his skin.

Indian SCUBA divers working in the Gulf of Mannar have reported being approached repeatedly by sea snakes of an unidentified species. The snakes seemed to be attracted by the bubbles from the divers' regulators and followed the divers or their bubbles toward the surface when they swam upward. When the divers again swam down, the snakes continued toward the surface, apparently following the rising bubbles, and then frequently dove in a direction away from the divers. No diver was bitten although the snakes were encountered at close quarters

Not only bubbles, but lights shining in or over the ocean surface at night attract sea snakes. Night lights have been used by scientists for decades to gather sea snake specimens Divers conducting salvage operations or related missions requiring lights at night in southeast Asia might well expect to be joined by one or more sea snakes

Several encounters related to me by UDT men are similar to those of the Australians, Cropp and Taylor, on the Great Barrier Reef. In a number of cases sea snakes have been met with in the water and at no time did they retreat as though frightened. Generally, the snake's reaction ranged from seeming indifference to what might be termed mild avoidance, depending on the nearness of the man and his direction of travel.

But in at least five separate instances, divers in Vietnamese waters have described, with certainty and in detail, being approached or followed by sea snakes. Three of these episodes were surface encounters and two occurred beneath the sea surface, one at a depth of 30 to 60 feet. In one case at the surface the sea snake appeared to follow at an interval of a few yards for a total distance of more than 100 yards. In none of these situations did the sea snake come close enough to wrap itself around the diver or his equipment, and we can't say with certainty that this would have happened if the snake had found the chance. All the same, the similarity to the curious Australian sea snake is very evident.

There is a possibility that divers or swimmers in transit toward some destination are less likely to have difficulties with sea snakes than divers working continuously in a restricted area, such as in salvage and repair operations. The following excerpt from Naval Safety Center Diving/Salvage Safetynote 27 (15 July 1971) tends to bear this out. "A Vietnamese Navy SCUBA diver and his U. S. Navy counterpart were conducting a bottom inspection of a patrol boat when the Vietnamese diver was bitten by a sea snake. The Vietnamese diver ... lost his mouthpiece and sank to the bottom unconscious due to pain, shock and lack of air. The U. S. Navy diver made a successful rescue and the man was returned to full duty within a week. During his rescue efforts the U. S. Navy diver was also attacked by a sea snake, but his wet suit afforded complete protection. ..." The wet suit was not needed for warmth in this case, but did protect the U. S. Navy diver from the sea snake.

In waters where sea snakes and other dangerous marine life are known to abound, wearing a wet suit may afford a certain amount of protection. If the Vietnamese diver had been wearing a wet suit he would in all probability have escaped with only a scare. Had the U. S. Navy diver not been wearing a wet suit, death may have resulted for both men.

The pain suffered by the Vietnamese SCUBA diver was almost certainly not due directly to the sea snake venom, as it is well documented that sea snake–bite victims suffer no pain for an hour or so after receiving the bite. The diver's condition (medical shock) was very probably due directly to a fear of sea snakes shared (usually with good reason) with most native people who live in sea snake-infested areas

Our research group at NUC has attempted to check on the aggressiveness of the yellow-bellied sea snake toward SCUBA divers in Mexican waters. We found that individual sea snakes exhibited very little fear of man in the water and when approached on the surface swam away just fast enough to keep their distance. This they did no matter how fast the pursuing swimmer paddled. Under these circumstances the sea snakes did not dive, although they readily dive when disturbed by a passing ship.

The yellow-bellied sea snake has been known to attack divers As long ago as 1909 Louis Becke described an attack by this snake on a young native pearl diver in the Torres Straits (Cape York Peninsula, Australia). The diver apparently struck at the snake as it swam from below closely passing by his face. Very quickly the yellow-belly coiled about the diver's forearm and bit him on the finger. The victim experienced convulsions and paralysis and died 48 hours later in spite of amputation of the bitten finger.

When dip-netted from the water this sea snake often bites viciously at the net itself, or the hoop, or tongs used to pick it up. Often it hangs on with bulldog-like determination as do some cobras This seems to be a characteristic of many sea snakes. The yellow-belly, however, strikes with a lightning-swift *sideways* whip of its neck and is possibly the only sea snake that does not strike forward. The willingness to bite when disturbed and the sideways strike should be remembered by any who are likely to encounter this species of sea snake when swimming or diving.

We have also learned that the venom of the yellow-belly is about as potent as that of the three sea snakes responsible for the greatest number of human deaths, the beaked sea snake, the chittul, and Hardwick's sea snake.

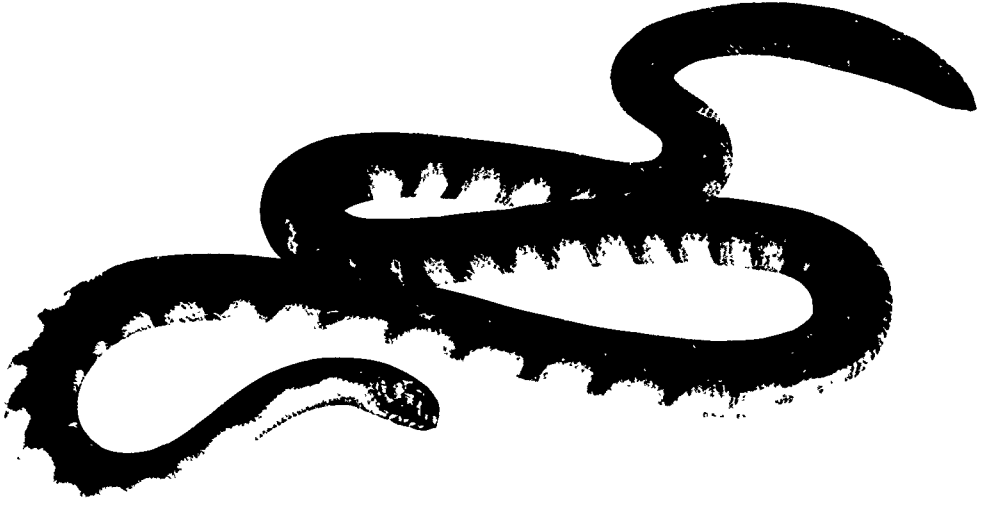
THE MAJOR KILLERS

All sea snakes are dangerous and must be treated with caution. However, a dozen or so of the more common and abundant forms are responsible for most human deaths from sea snake bite. Field personnel should learn to recognize and avoid these snakes. Learning to recognize these snakes is not easy because many of the 50 different species of sea snakes look very much alike. Many show a pattern of alternately light and dark bands of various colors (usually black or shades of brown, gray, or blue) around their bodies. The bands may go completely around the body or only part way. A few show no banding and tend to be a uniform gray-brown with the belly usually lighter. Fewer still show longitudinal stripes down the length of the body, these usually have a much darker back (the yellow-bellied sea snake, *Pelamis platurus*, is an example).

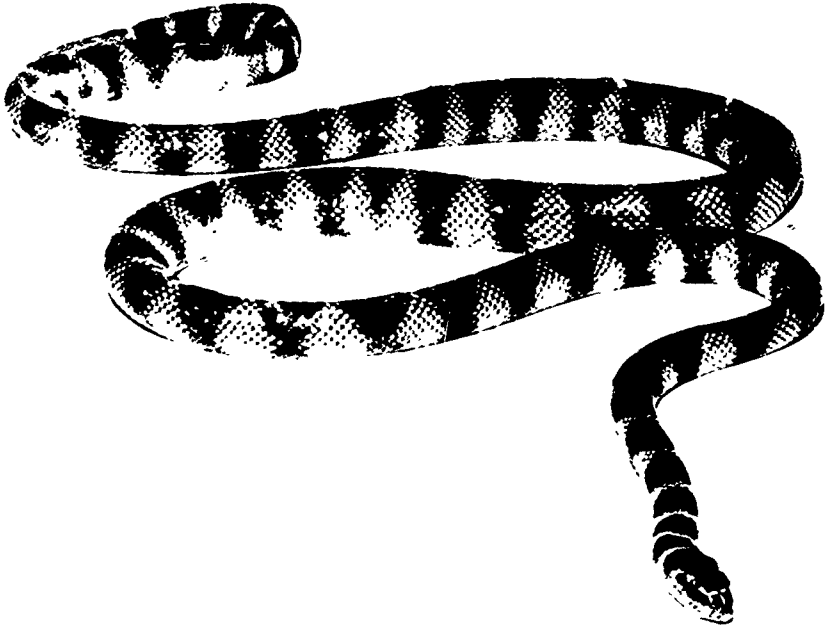
The illustrations on the following pages show some of the most common and potentially dangerous sea snakes found in the areas indicated on the accompanying map. A number of other sea snakes implicated in fatal poisonings are very similar in appearance to these. Still other sea snakes have never been shown to be responsible for a human death.*

Remember, *all sea snakes are venomous* and all, including the small-headed types, are able to open their jaws wide enough to inflict a good bite on a finger, hand or wrist, or on toes, foot or ankle. The old saying that sea snakes, or even just certain sea snakes, aren't dangerous because they can't gape their jaws wide enough is sheer bunk.

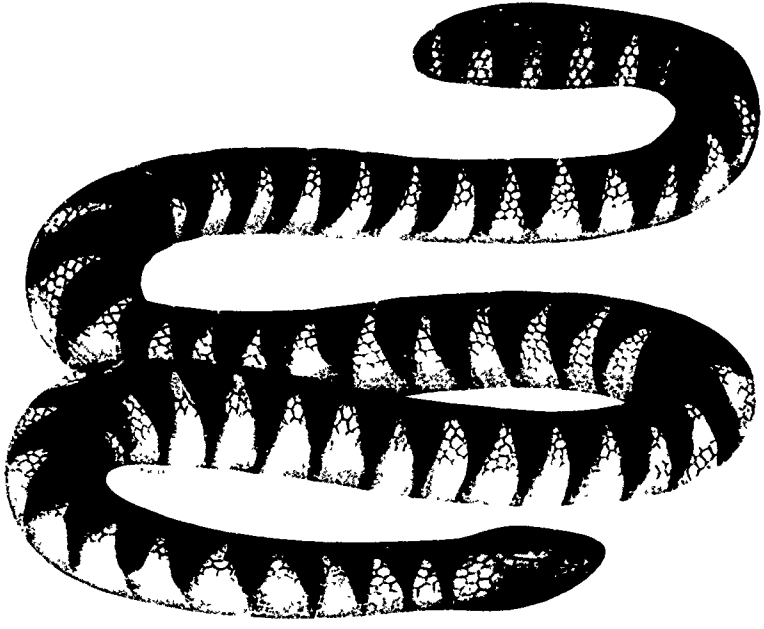
**None of the amphibious (Laticauda) species which can crawl about on shore have ever been shown to be responsible for a human death. They are less aggressive than most sea snakes, however, they are fully as venomous as the more aggressive species.*



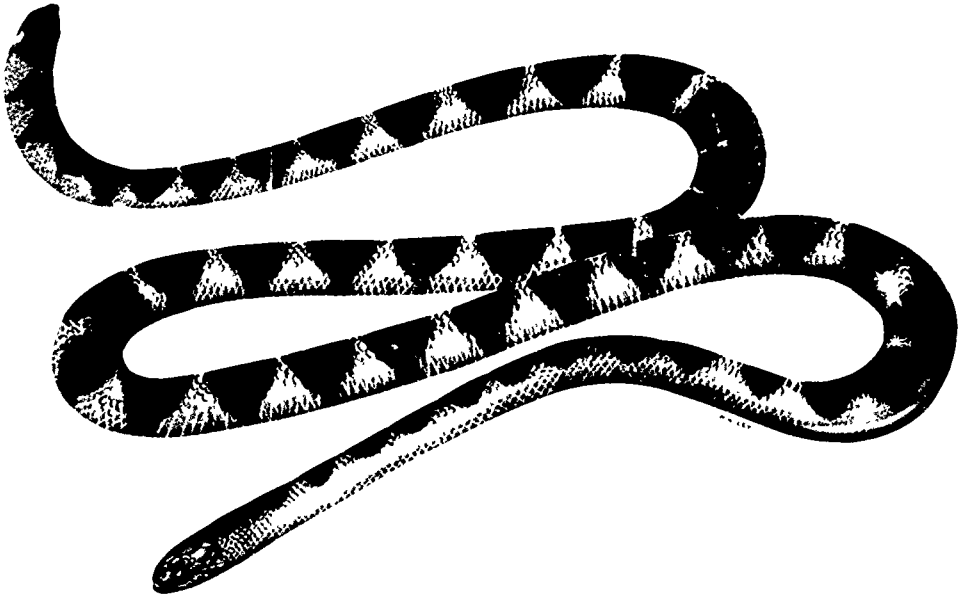
COMMON or BEAKED SEA SNAKE, *Enhydrina schistosa* This snake is responsible for more sea snake bites in peninsular Malaya than any other species



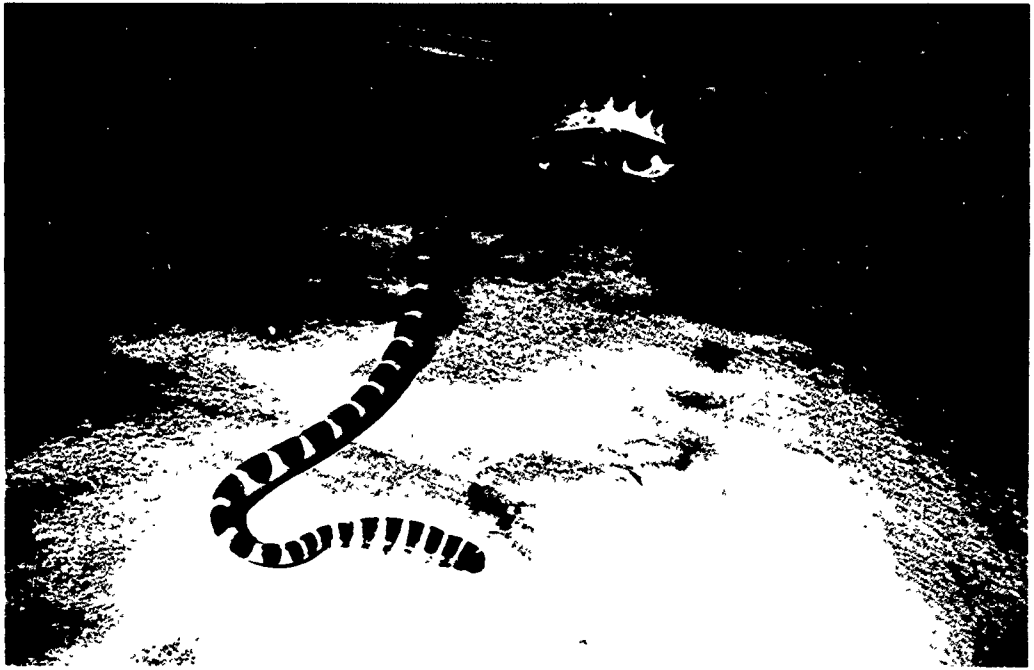
CHITTUL, *Hydrophis cyanocinctus.* This snake is one of three species most commonly associated with sea snake bite in southeast Asia. A young specimen is shown. U. S Navy photograph.



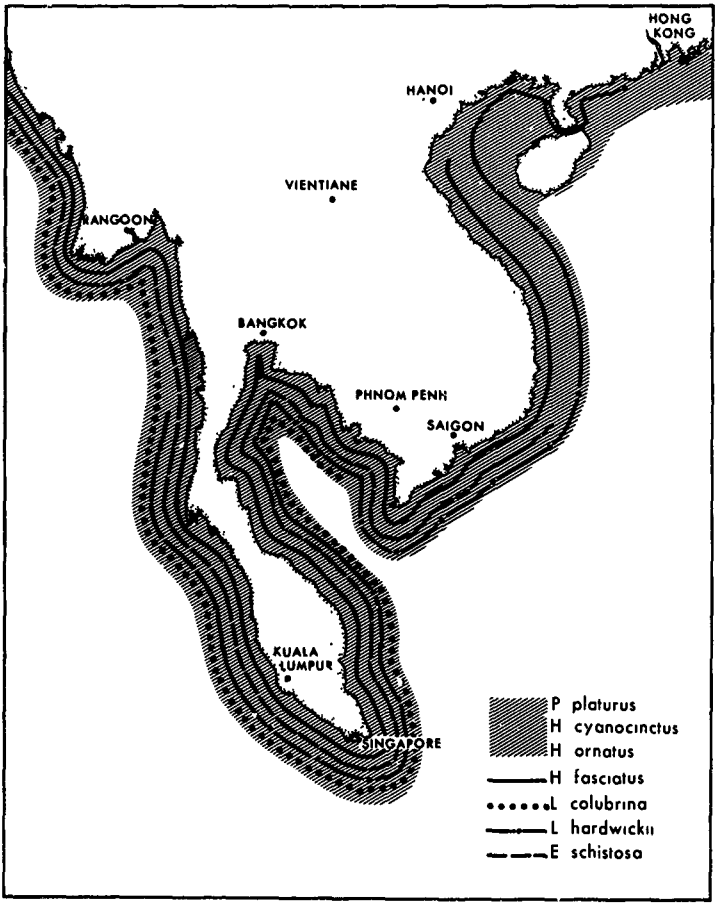
HARDWICK'S SEA SNAKE, *Lapemis hardwicki*. This species is responsible for the majority of deaths from sea snake bite among the fisherman of South Viet Nam



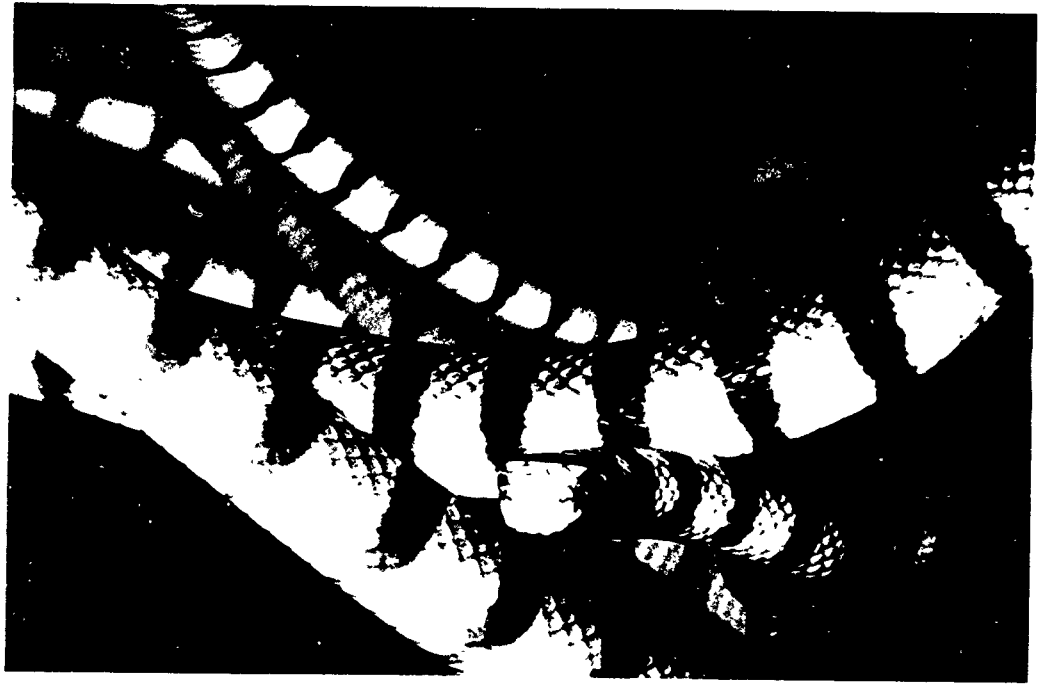
Hydrophis fasciatus. One of the commonest sea snakes of northern South Viet Nam and North Viet Nam.



Hydrophis ornatus. A widely distributed sea snake commonly encountered in certain areas. Note resemblance to *H. fasciatus*. Photograph by G. Pickwell.



SEA SNAKES – DISTRIBUTION. Distribution of the most common and potentially dangerous sea snakes in continental southeast Asia

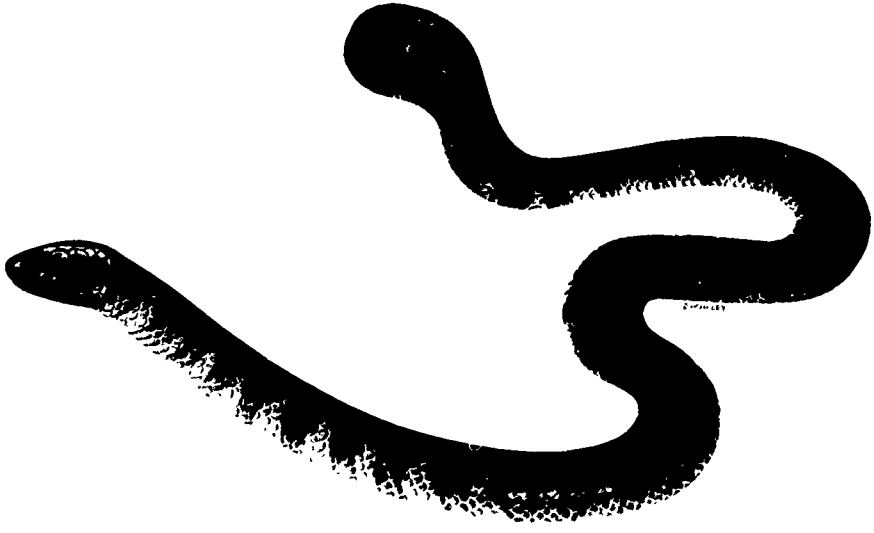


YELLOW-BELLIED SEA KRAIT *Pelamis platurus* The common name of this banded amphibious sea snake is not universally accepted. This snake has never been shown to be responsible for a human death. Photograph by J. Sneed.

SEA SNAKE OR EEL?

Not only do many sea snakes resemble each other, some look a great deal like eels. In the Philippines, the Ryukyu Islands, and elsewhere there are sea snakes and eels that look alike. Some eels resemble sea snakes so much that they are called "snake eels." I have had people describe sea snakes they had seen during dives in an area where sea snakes are known not to occur. Upon closer questioning, the animal could usually be identified as an eel. Being able to tell the difference can prove to be of real value to a swimmer or diver. Paintings of a representative sea snake and a common Okinawan sand eel are presented on the following two pages. Compare the two closely. The main differences between them are summarized below:

Sea Snake	Eel
Venomous; has short, fixed fangs at front end of upper jaw often not easily seen	Not venomous; has no fangs, but bite can cause infection
Flat, paddle-like tail (all sea snakes)	Pointed tail, not paddle-like
No fins	Fins (sometimes hard to see) top and bottom and in some kinds, a pectoral fin
Breathes air; no bulge for gills behind eyes in neck area	Breathes water; has gill pouch in neck area
Body enlarges gradually behind head; neck region more or less obvious	Body usually expands (becomes deeper) behind head; no neck
Scales may be evident (if snake is close enough)	Scales not visible to the naked eye
Not slippery, no covering of slime	Slippery and slimy due to usual fish coating of mucous
Often seen out hunting in daytime; may rest in crevices and holes in rock or reef, but must return to surface periodically to breathe	Usually found in holes in sand or rocks and reefs during daylight, often comes out to hunt at night, need not surface to breathe



SEA SNAKE OR EEL? Compare this banded, amphibious sea snake, *Laticauda semifasciata*, with the Okinawan sand eel on the facing page.

SEA SNAKE OR EEL? This Okinawan sand eel could easily be mistaken for a sea snake.

WHAT TO DO AND NOT TO DO WHEN ENCOUNTERING SEA SNAKES

1. Do not attempt to grab at a nearby sea snake. This could easily provoke a bite, and in any case some, probably all, of these animals have a superb talent for tying themselves into knots so that they are extremely difficult to hold and control.

2. Divers or swimmers at the surface can sometimes discourage individual sea snakes from coming too close by throwing things at them. A SCUBA diver told me that while on a salvage operation he frightened away a sea snake that surfaced near him by throwing a bolt at it. The snake dived and disappeared Ron Taylor (see bibliography) effectively dealt with annoying sea snakes on the Great Barrier Reef by using a pair of long-handled pruning shears. He simply snipped in two any curious sea snake that came dangerously close to him. This, of course, could lead to trouble if the snake succeeded in coiling around the shears. Even a dying sea snake can probably give a good bite.

3. When large numbers of sea snakes are encountered, whether rafted* or not, attempt to avoid them by going around or possibly even under them if they are collected on the surface. Any collection of more than a few sea snakes together in one small area may be an indication of breeding behavior. Remember, at these times sea snakes may be more aggressive.

4. Never voluntarily place yourself in a position where you might unavoidably kick, squeeze, restrain or otherwise disturb a sea snake. Even moderately docile sea snakes have been observed to bite when annoyed or threatened. When encountering one of these animals, particularly in a confined area, use your wits. If you can keep from irritating the snake it is much less likely to bite while you gently prod it away from you or away from the area in which you must work.

5. In areas where sea snakes are known or thought to be present and a potential danger, clothing (long pants) and boots provide excellent protection when wading in muddy shallow water. Wet suits give good protection while swimming or diving

In all cases, if you find yourself in a situation where you must deal with a sea snake, remember the odds are heavily in your favor, even if you should receive a bite. By knowing a little bit about these animals and not allowing yourself to become panicky, you can effectively deal with any sea snake you are likely to encounter.

MEDICAL TREATMENT FOR SEA SNAKE BITE

EMERGENCY PROCEDURES

1 Do *not* attempt to cut the wound and suck out the poison by any means whatever. The venom is absorbed too quickly for "cut and suck" procedures to be of any use;

*Some sea snakes gather at the surface in large, dense "rafts", presumably during their mating season In the May 23, 1967 edition of Pacific Stars and Stripes, a helicopter pilot out of Da Nang, South Viet Nam, described a raft of sea snakes 15 feet wide stretching as far as he could see in either direction.

you would only add to the patient's problems by introducing infection and causing excessive bleeding.

2. Immobilize the patient immediately after the bite. Do not allow him to walk or exert himself in any way. The bitten part in particular must be kept still.

3. Apply a tourniquet to the upper leg in foot, ankle, or leg bites, and to the upper arm in hand, wrist, or arm bites. Every few minutes, release the tourniquet for 30 seconds to 1 minute.

4. Carry the patient to the nearest aid station or hospital. Whenever possible, kill the snake and take it to the aid station or hospital. This is extremely important because it might be a harmless water snake.

5. If, within 1/2 to 1 hour after the bite, the patient develops symptoms of poisoning, antivenin therapy should be started. Before starting antivenin therapy, allergy tests should be run to determine sensitivity to horse serum by a subcutaneous injection of 0.2 ml of 1:10 dilution of the antivenin. If there is no general reaction to this dose, administration of antivenin by intravenous drip may be started. If reactions occur, antivenin may have to be administered more gradually along with epinephrine and corticosteroids, and possibly antihistamines.

SYMPTOMS OF POISONING AS A RESULT OF SEA SNAKE BITE

1. Generalized muscle aches and pains, and stiffness when attempting to move. These develop within 1/2 to 1 hour after the bite.

2. Mild to acute pain upon gentle movement of the limbs, neck, or main body muscles. This develops within 1 to 2 hours after the bite.

3. A deep, red-brown color of the patient's urine (called myoglobinuria). This appears within 3 to 6 hours after the bite.

NOTE: The importance of starting antivenin therapy at the earliest possible time following definite identification of poisoning symptoms cannot be over-emphasized. Medical personnel, corpsmen, and others who are likely to deal with sea snake-bite patients should acquaint themselves with the section on medical treatment for snake bite in the BUMED publication, *Poisonous Snakes of the World*, and the publications of H A. Reid, included at the end of this chapter. These publications give a more detailed discussion of the diagnosis and treatment of sea-snake bite and poisonous snake bite in general.

WHAT IS ANTIVENIN?

Antivenin is made by injecting a sublethal dose of venom into a horse and then withdrawing some of the serum after an appropriate interval of time. The serum from the immunized horse contains substances that will neutralize the toxic components of the snake

venom. If such an antivenin is administered within 6 to 8 hours after the bite, the patient is almost certain to recover fully, even if symptoms of severe poisoning were present As far as is known, permanent damage from sea snake bite is negligible.

WHY WAIT TO ADMINISTER ANTIVENIN?

Because of the effectiveness of sea-snake antivenin administered several hours after the bite, it is wise to wait 1/2 to 1 hour to see whether symptoms of poisoning actually develop before beginning treatment. *Not everyone bitten by a sea snake develops symptoms of poisoning* H. A. Reid, in conducting a census of 17 fishing villages on the northwest Malay Peninsula, found that only some 25 percent of those bitten by sea snakes develop any symptoms of poisoning, and of these only a small percentage become critically ill. Reid concluded that sea snakes are *unwilling to inject venom when biting in defense.* But for this, sea snakes would be a much greater danger. Even if you are bitten, then, your chances of recovery are very good.

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DANGEROUS LAND SNAKES OF SOUTHEAST ASIA

H. W. Campbell and S. P. Christman

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WHERE ARE YOU LIKELY TO FIND DANGEROUS LAND SNAKES?

Snakes can be found most everywhere, from vacant lots in the middle of town to some of the most barren areas on the face of the earth. The only thing that appears to prevent them from occupying an area is cold; snakes are either rare or completely absent in colder regions.

Each kind of snake has its own special needs and will be found only in certain areas, such as near rocks, in mangroves, in thick jungle or open forest, etc.

In this section, we will describe the major kinds of terrain inhabited by common venomous snakes in southeast Asia* and list the snakes likely to be found in each area. Then, we will describe each species of snake in some detail, including its appearance, typical behavior, and preferred locations within each area. Concluding each description is the snake's common name among the natives of its area.

Snakes are usually not aggressive toward man and will, if given half a chance, beat a hasty retreat. A nesting king cobra may defend her nest and those snakes which are camouflaged and depend on concealment to avoid their enemies may hold their ground and sit still when exposed, but this isn't an aggressive maneuver on their part. If you are in a situation where you can't afford to kill the animal, just take a step or so to the side and move around him. Just remember, snakes will strike you in self-defense; if you give them a 3- or 4-foot margin, they'll be no trouble.

If you *are* bitten by a snake remember that snake-bite seldom is fatal if medical aid is available. Kill the snake if possible and keep it for the medical people so that they can give you the proper treatment. Most important, keep as calm as possible, *do not run.* This advice is easy to give and hard to take, perhaps, but it is the *best* advice.

Photographs and descriptions of the general areas in which you can expect to find snakes are provided on the following pages.

*The high mountain forests of southeast Asia above 5,000 feet hold few dangerous snakes. For this reason, no photograph of this kind of terrain is included. It should be noted, however, that one snake, the mountain viper, *Trimeresurus monticola*, does occur at such an elevation.

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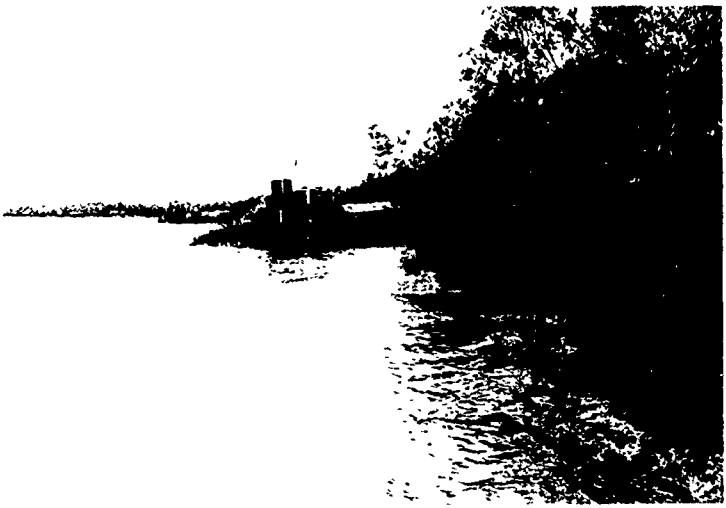
MANGROVE SHORELINE AND SWAMP

Mangrove areas are poor environments for most snakes, but a few seem to find them ideal. These are mostly species which live in bushes and trees and they are usually colored so that they blend in with the greens and browns of the vegetation. These snakes will not bite unless touched or brushed against. Caution should be used in pushing through the vegetation to avoid bites on the hands or face. The bites of snakes found in this kind of area are seldom fatal to man, despite wild stories to the contrary. They can, however, be painful. Snakes to be expected are these:

mangrove viper

Wagler's viper



MANGROVE SHORELINE. U.S. Navy photograph.

MANGROVE SWAMP U S Navy photograph

FRESH WATER SITUATIONS

Fresh water situations include marshes, river swamps, rice paddies, and the like. Several kinds of snakes are usually found in the vicinity of water, particularly in the dense vegetation that may grow along streams, along the edges of ponds, and in low, wet, swampy areas. The species most likely to be encountered in such areas are the following.

bamboo viper
Wagler's pit viper
Malayan pit viper
Russell's viper, or tic polonga
king cobra
common cobra
common krait
banded krait
reticulated python

FRESHWATER MARSH U S Navy photograph

RIVER SWAMP U.S. Navy photograph.

RICE PADDY. U.S. Navy photograph.

LOWLAND FORESTS

Most of the land snakes of southeast Asia are to be found in the forested areas of the lowlands. The following are most commonly encountered:

bamboo viper
habu
Malayan pit viper
tic polonga
king cobra
common cobra
common krait
banded krait
reticulated python

LOWLAND FOREST. U.S. Navy photograph

FORESTED HILL COUNTRY, TO 5,000 FEET

In the higher, hilly country and on the lower slopes of mountains the forests may contain the following species

mountain viper

tic polonga

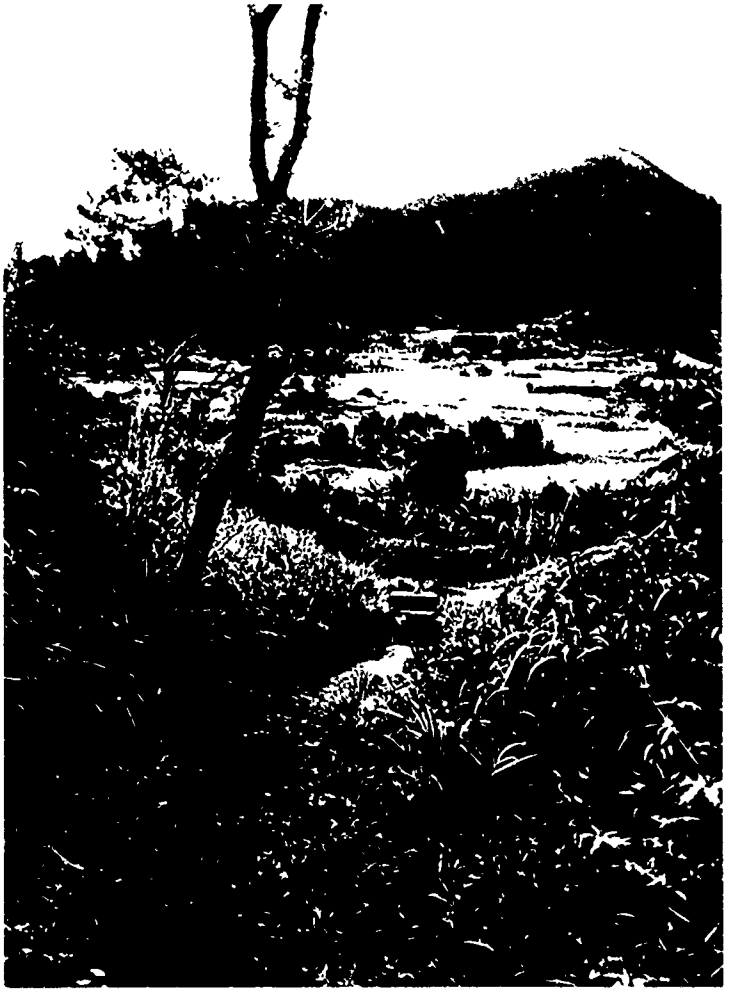
king cobra

common cobra

common krait

reticulated python

FORESTED HILL COUNTRY, U.S. Navy photograph



FORESTED HILL COUNTRY. U.S. Navy photograph

ROCKY HILLSIDES

In hilly country where rock outcrops are common you may expect the following species to be most common

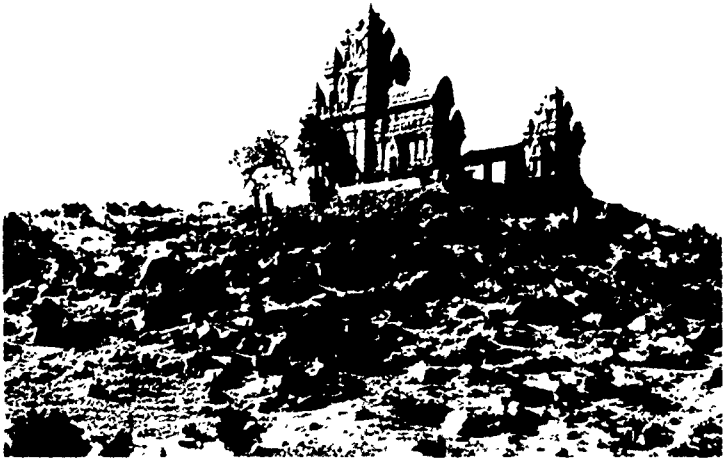
habu

tic polonga

king cobra

common cobra

reticulated python



ROCKY HILLSIDE U.S. Navy photograph

ROCKY HILLSIDE—U.S. Navy photograph

HUMAN HABITATION

Several species of dangerous snakes may be quite common around both occupied and abandoned villages, rubber plantations, and other human habitations. The most common types that should be looked for in these areas are the following:

bamboo viper

habu

tic polonga

common cobra

banded krait

HUMAN HABITATION. U.S. Navy photograph

HUANGHAIHON (US Army photograph)

DESCRIPTIONS OF SPECIES

Descriptions of each of the common dangerous snakes of southeast Asia follow:

RETICULATED PYTHON *Python reticulatus* (Schneider)

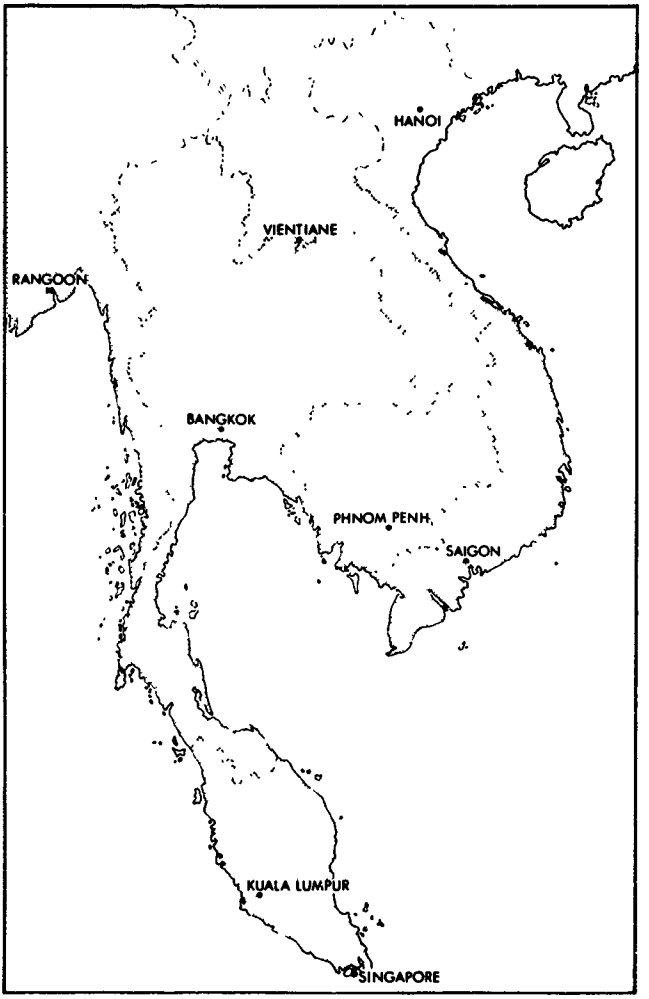
The reticulated python is a very large brown snake with a complex pattern of black-bordered light markings. It may reach 28 feet in length, making it the largest snake in southeast Asia. Any snake over 15 feet long is most probably this one. The color on top is some shade of brown or tan. The blotches are lighter brown or yellow and are distinctly outlined with black margins. The head is distinct and triangular-shaped.

At the base of the tail, on the underside, is a pair of small toe-nail like projections called spurs. Only pythons have these.

The python is *not* poisonous. A bite from a large python can still be quite painful and is likely to become infected if not cleaned properly. This snake is usually found near streams and often under bridges. Very large pythons must be treated with care, as there is at least one record of a python having eaten a small human being. Normally, pythons eat rats, and their quest for these often takes them into villages and around human habitation.

"Ular sawah" – Malay

RETICULATED PYTHON *Python reticulatus* (Schneider 1801) [illegible] Mike Pope



RETICULATED PYTHON – DISTRIBUTION

WAGLER'S PIT VIPER *Trimeresurus waglari* (Boie)

Wagler's pit viper is a black, chunky snake with green crossbars down the back. The ground color of the back is generally black. The sides are green. The crossbars are green on top, turning to yellow on the sides. The crossbars do not extend onto the belly, which is greenish white with a few scattered blotches of green or black. Often the end of the tail is black or even red.

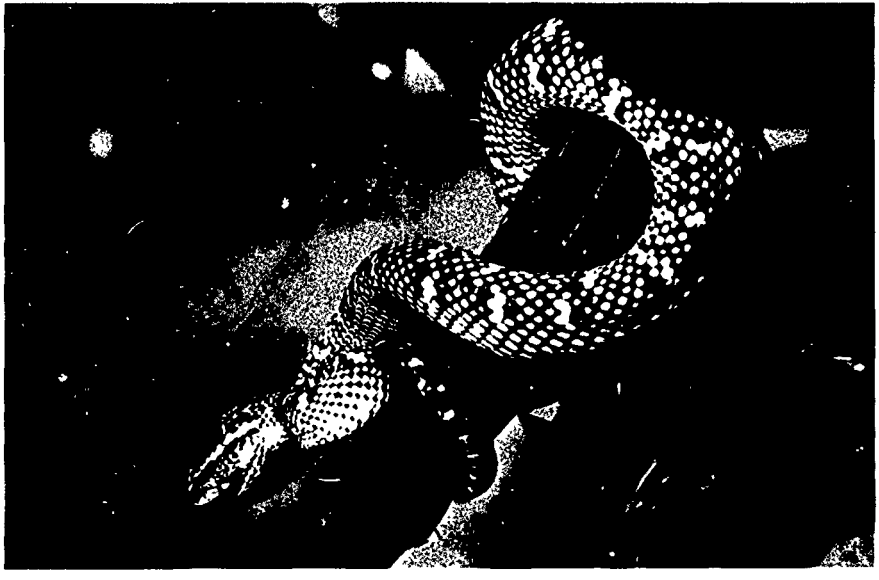
The pit on the side of the head, the small scales on top of the head, the chunky form, and the color should identify the Wagler's pit viper.

This snake lives in low bushes and small trees in lowland jungle and mangrove. It is a common snake but is sluggish and seldom bites. The bite is not reported as very dangerous but can be very painful and cause much swelling.

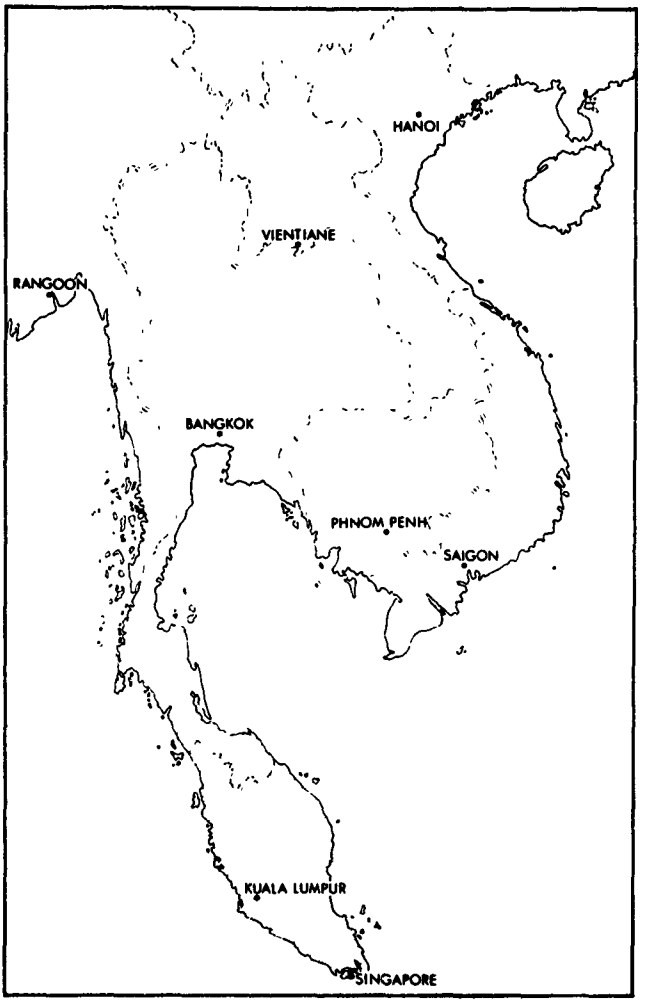
Antivenin is available from Taiwan Serum Vaccine Laboratory, Taipei.

"Ular puckus" – Malay

"Ular bakaw" – Malay



WAGLER'S PIT VIPER, *Trimeresurus wagleri* (Boie). Photograph by Mike Potts



WAGLER'S PIT VIPER – DISTRIBUTION

HABU *Trimeresurus* (4 species)

Habus are slender snakes with very distinct triangular-shaped heads. They are yellowish brown with a row of large, dark brown or chocolate blotches running down the middle of the back. The blotches are frequently run together. There is also a row of smaller brown blotches down each side. The undersides are lighter brown or yellowish with both lighter and darker mottling.

There is a pit between eye and nostril on each side of the head. The top of the head is covered with small bead-like scales, not large plates. There is a prominent dark band running from the eye to the corner of the mouth on each side.

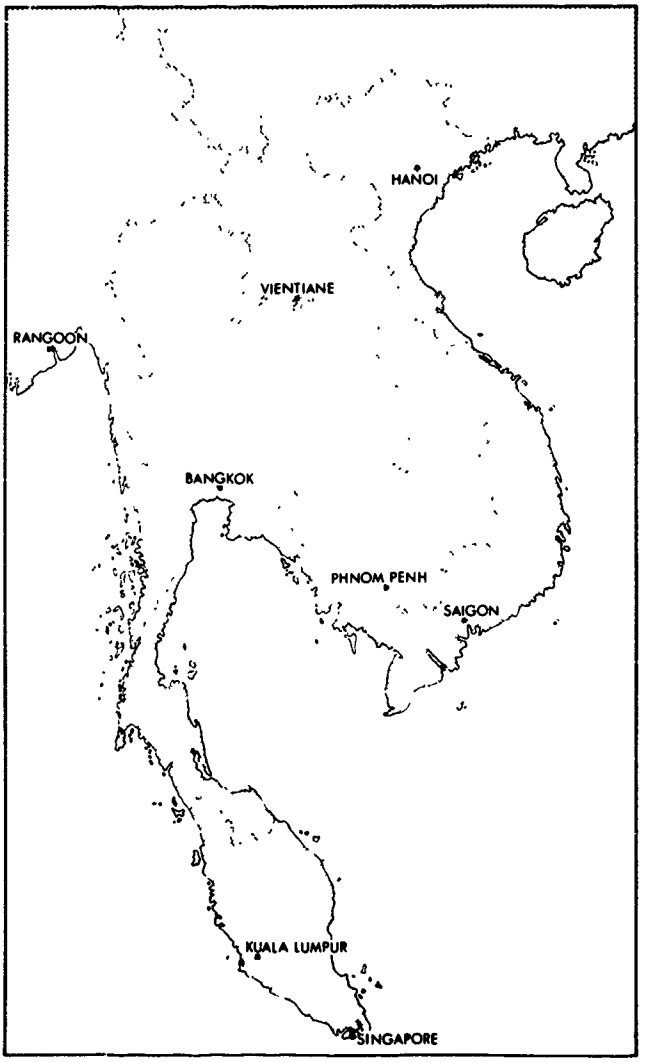
Habus are common throughout their range, especially in hilly or mountainous terrain. They are common in woody places, and even in cities, and are frequently found in houses. They are typically active at night. The habus are reluctant to bite unless picked up or actually stepped on. However, they are so abundant that bites from them are not rare. Fortunately, the bites are rarely if ever fatal.

Antivenin is available from Taiwan Serum Vaccine Laboratory, Taipei.

"Ular kapar" – Malay

Includes these species: *mucrosquamatus, kanburiensis, puniceus,* and *cornutus.*

HABU *Trimeresurus mucrosquamatus*. Photograph by Andrew Koukoulis



HABU – DISTRIBUTION

MANGROVE VIPER *Trimeresurus purpureomaculatus* (Gray and Hardwicke)

The mangrove viper is a slender purplish brown snake. Its head is distinct and triangular. Its body is dark purplish on top, sometimes with darker brown blotches and a light line along each side. The bottom is gray to brown. This snake grows up to 3 feet long.

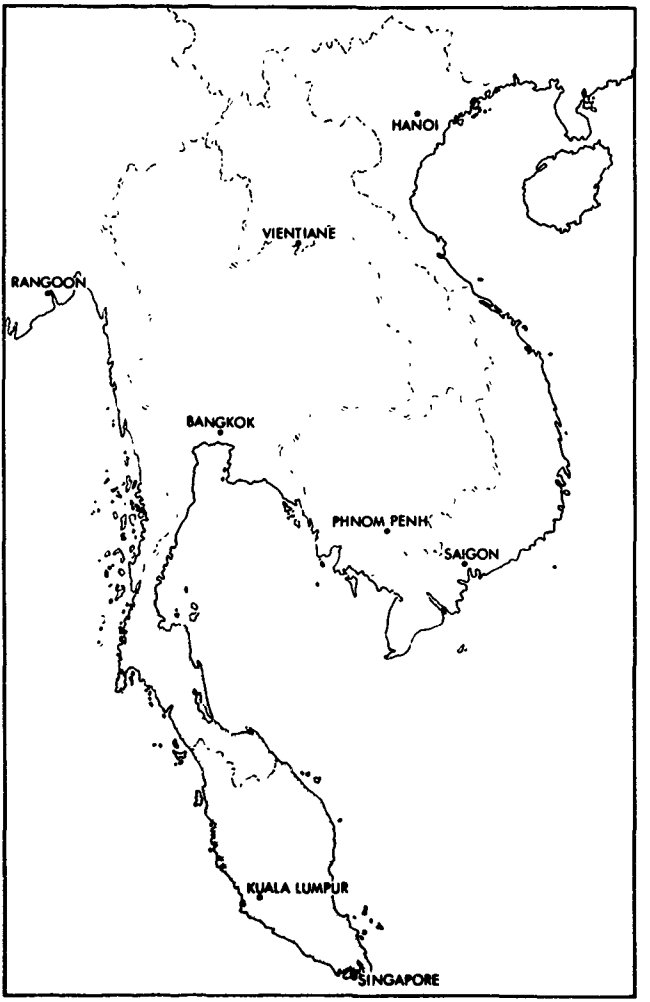
The mangrove viper is not likely to be confused with any other snake because of the restricted habitat (see below).

This is a common snake on the mangrove shorelines of islands. Also found in similar situations on the mainland, though less commonly. Almost always found climbing in the mangrove bushes, but sometimes seen on the ground and under rocks. The bite, while painful, is seldom lethal for an adult.

Antivenin available from Serum Vaccine Laboratory, Shih Ling, Taipei.

"Ular bakaw" – Malay

MANGROVE VIPER *Trimeresurus purpureomaculatus* (Gray and Hardwicke). Photograph by Mike Potts.



MANGROVE VIPER – DISTRIBUTION

BAMBOO VIPER *Trimeresurus* (6 species)

These are mostly green snakes with triangular, distinct heads. The [illegible] is all green; however, some may have a reddish tail. The belly may be anything from [illegible] ellow to bright yellow to green.

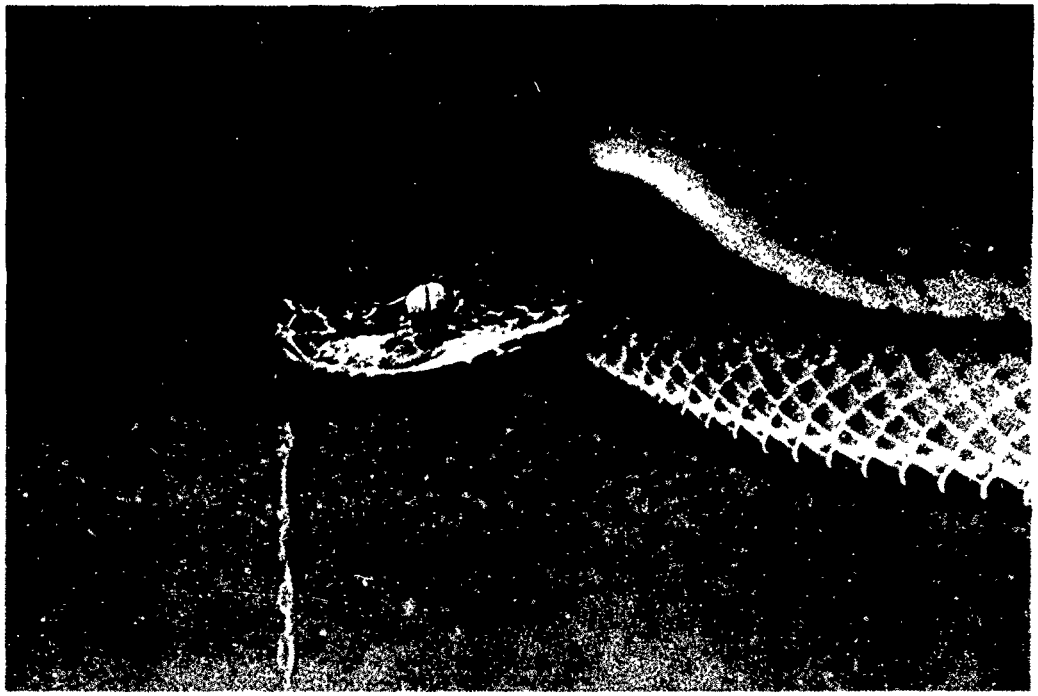
There are seven species included here. Some may reach a maximum length of 4 feet. All have a very distinct triangular-shaped head, and a pit between the eye and the nostril on each side. Some of these snakes may have various white markings on top, but all are predominantly green. Similarly colored harmless snakes lack the pit on the side of the head, and the shape of the head is elongated rather than triangular.

These snakes usually live in bushes and trees, but may turn up virtually anywhere in mountains and lowlands. They are frequently found near villages. People are bitten by bamboo vipers frequently, but the bite rarely, if ever, kills an adult, despite wild tales to the contrary.

Antivenin is available from Taiwan Serum Vaccine Laboratory, Shi Ling, Taipei, Taiwan.

"Hang deng" and "Ngu khieo hang mai" – Thai

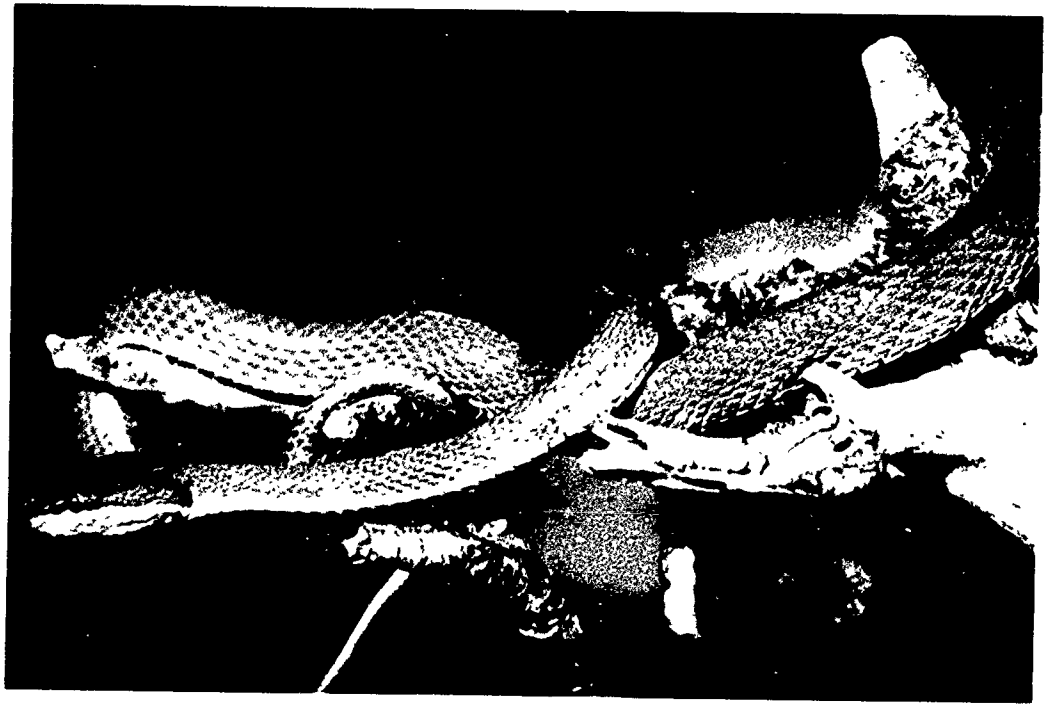
Includes these species: *sumatranus, albolabris, popeorum, stejnegeri, erythrurus, gramineus.*



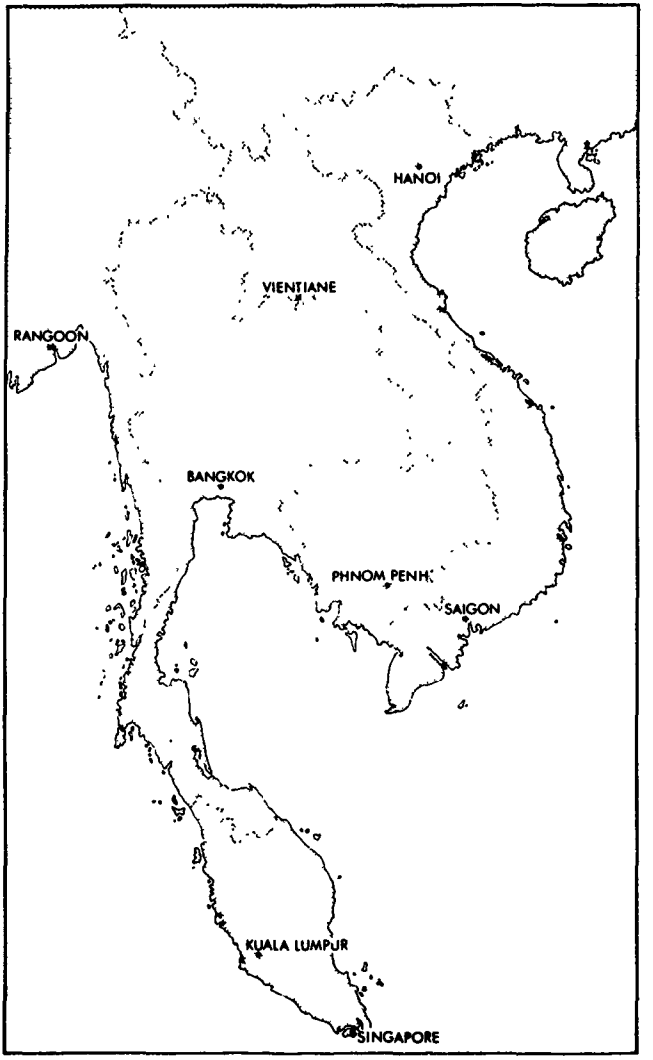
BAMBOO VIPER *Trimeresurus albolabris*. Photograph by Mike Potts

BAMBOO VIPER *Trimeresurus albolabris* (Photograph by Mike Rees)

BAMBOO VIPER *Trimeresurus popeorum* Photograph by Mike Potts



BAMBOO VIPER *Trimeresurus stenurus*. Photograph by Mike Parris



BAMBOO VIPER – DISTRIBUTION

MOUNTAIN VIPER *Trimeresurus monticola* Guenther

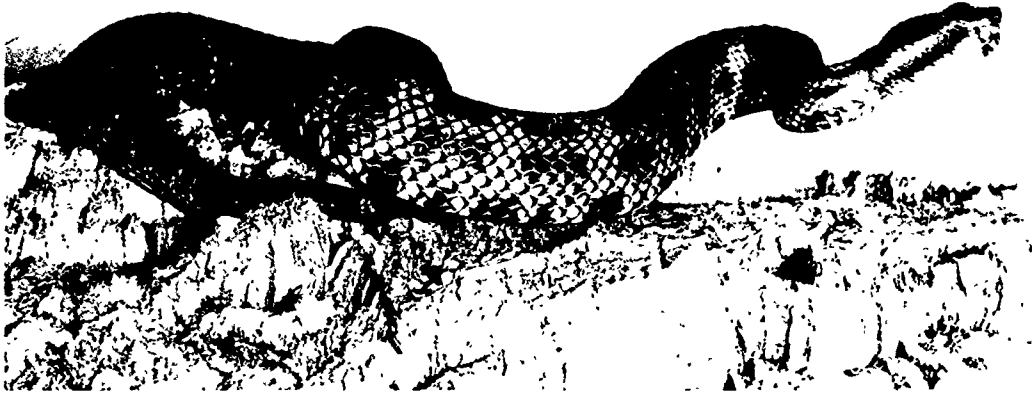
The mountain viper is a heavy-bodied gray or brown snake speckled with black and with large, squarish, black markings down the back. The top of the head is dark brown or black. The belly is whitish, powdered with brown. This snake grows up to 3-1/2 feet long.

Diagnostic characters are the pit on the side of the head, the small scales on top of the head, and the heavy-bodied shape.

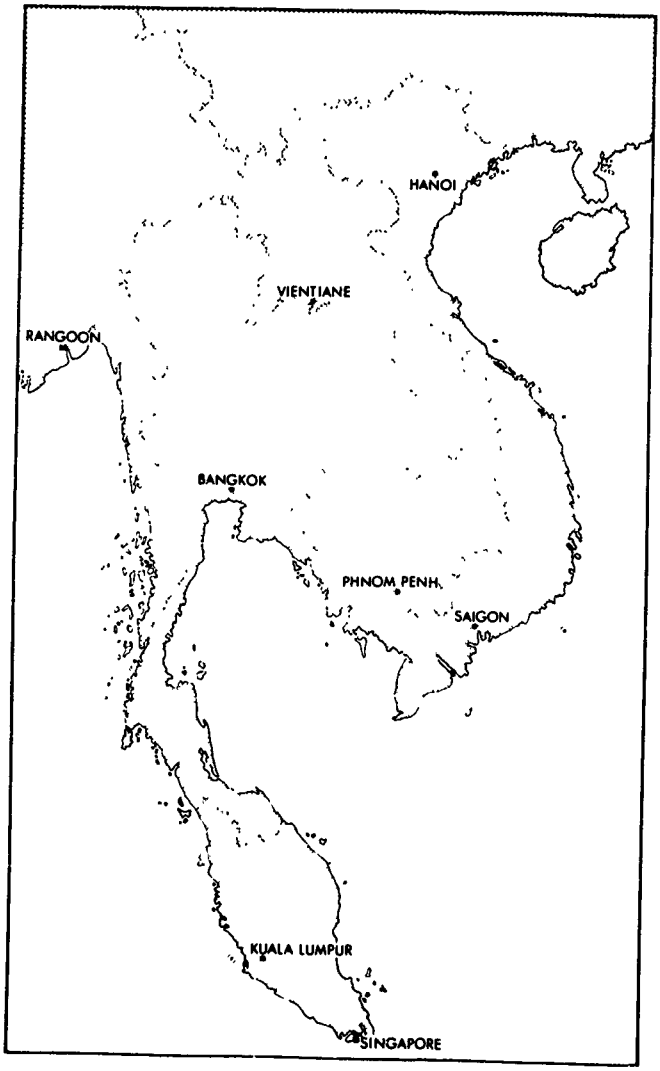
This is a mountain snake, usually found in forested hills up to 8,000 feet elevation. It is common in such situations but *does not appear to be especially dangerous* since very few fatalities have been reported.

Antivenin is available from Taiwan Serum Vaccine Laboratory, Taipei.

"Ular kapar" – Malay



MOUNTAIN VIPER, *Trimeresurus monticola* Guenther. New York Zoological Society Photograph.



MOUNTAIN VIPER – DISTRIBUTION

MALAYAN PIT VIPER *Agkistrodon rhodostoma** (Boie)

The Malayan pit viper is a very heavy-bodied snake with a complex pattern of dark triangles on a gray or light brown background. It grows up to 2-1/2 feet long A double series of dark brown triangles alternates down the back. This snake has a brown, black-edged bar extending from the eye to the corner of the mouth. The belly is white or yellowish. The tail of juveniles is yellow.

This snake has a pit between the eye and the nostril on each side of the head. Unlike other pit vipers in the area, this one has large plates on top of the head instead of ordinary small scales.

This is a nasty-tempered snake, prone to bite. The bite fortunately is rarely fatal. This snake is most abundant in wooded country, usually lowlands.

Antivenin is available from Queen Saovabha Institute, Bangkok, the Pasteur Institute, Bandoeng, Indonesia, and Commonwealth Serum Laboratory, Parkville, Victoria, Australia

"Ngu maaw sao" – Thai

"Ngu kaba" – Thai

"Ngu pak kapu" – Thai

"Ular kapak daun" – Malay

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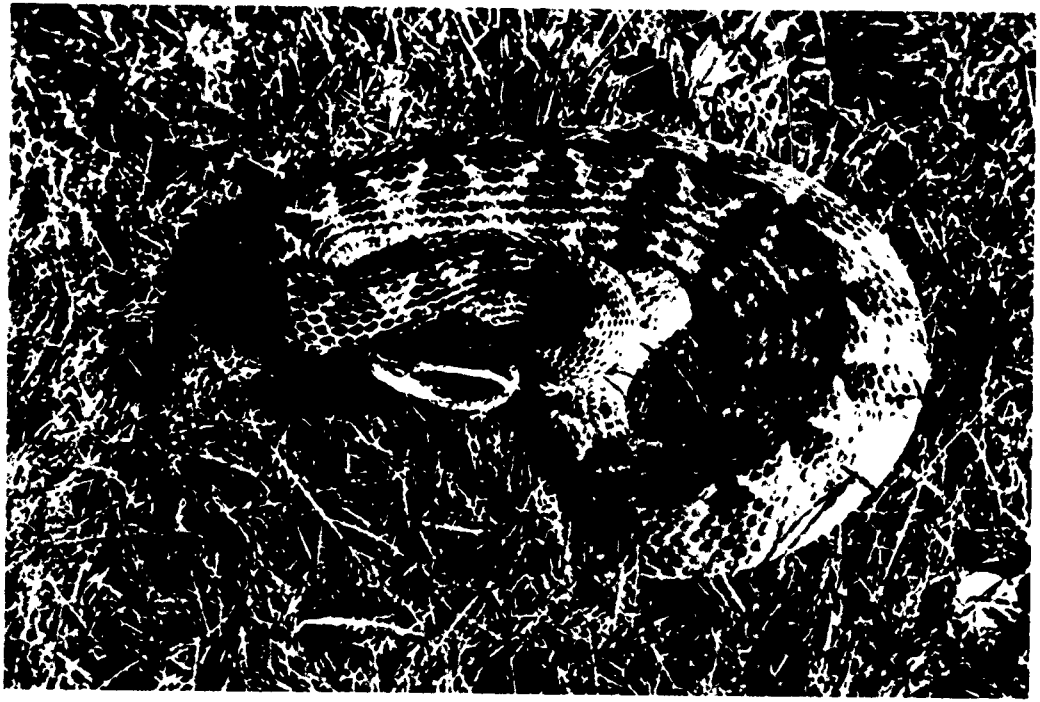
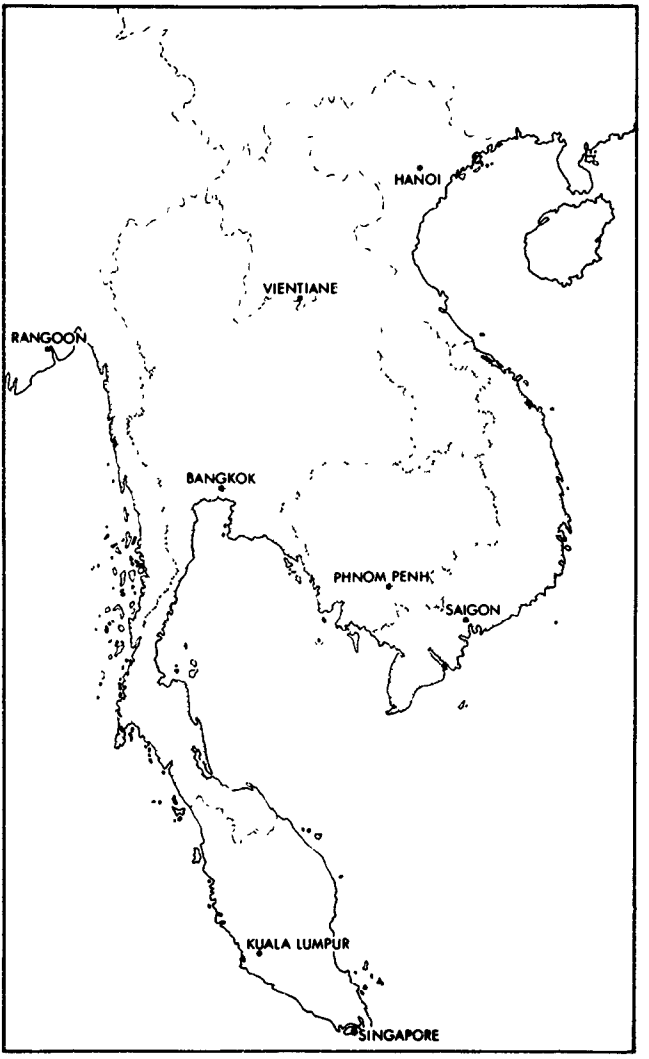
*Now generally known as Calloselasma rhodostoma.



MALAYAN PIT VIPER - *Ichistrodon rhodostoma* (Boie) - Photograph by Mike Peets



MALAYAN PIT VIPER – DISTRIBUTION

RUSSELL'S VIPER OR TIC POLONGA *Vipera russelli* Shaw

The tic polonga is a gray, brown, or yellowish snake with large black blotches. It is very heavy-bodied and reaches a length of 3-1/2 feet. The head is triangular, and distinct from the neck. Brown blotches on the back are highlighted with black margins. In some cases, the blotches are very dark brown, and the borders are obscured. Another color phase of this snake shows blotches of light brown, even lighter than the background color. The belly is always white or light gray with a black checkerboard effect.

The heavy body of this snake distinguishes it from harmless snakes which may be colored similarly The long fangs in the upper jaw confirm the identification.

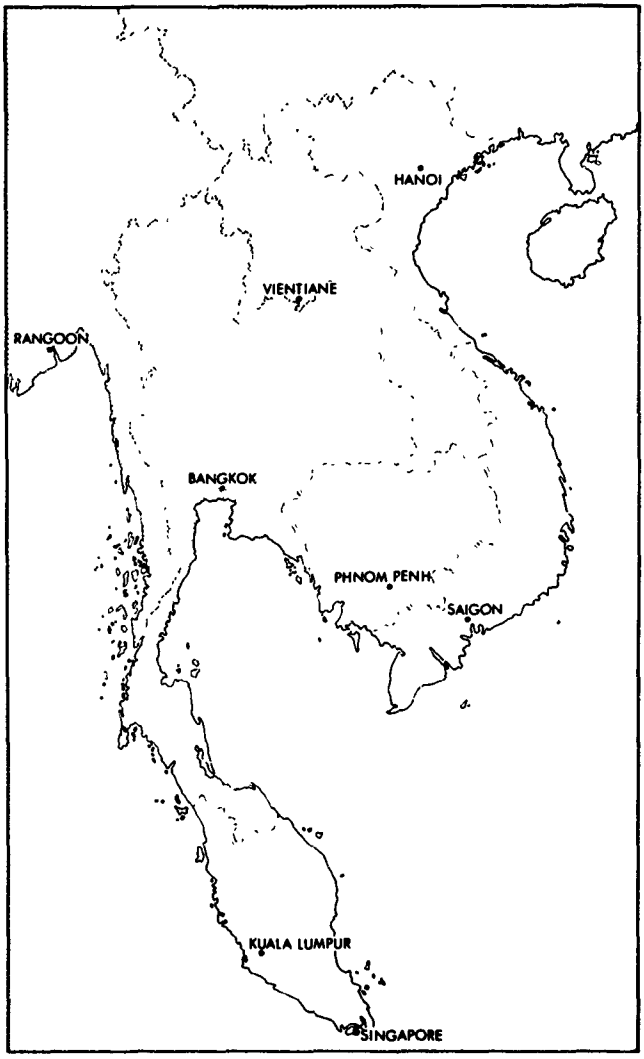
This snake is common and very dangerous. It may be aggressive and strike without apparent provocation. It sometimes rubs its sides together when excited to produce a low, rasping sound, much like a rattlesnake's warning. It occurs virtually anywhere in its range except in dense jungle.

Antivenin available from Queen Saovabha Institute, Bangkok.

"Mwe bwe" – Burmese

"Ngu maaw sao" – Thai

RUSSELL'S VIPER or HIGH POLONGA *Vipera russelli* Shaw. Photographed by Max Paterson



RUSSELL'S VIPER or TIC POLONGA - DISTRIBUTION

COMMON COBRA *Naja naja* (Linnaeus)

The common cobra is a large (up to 6 feet) brown or black snake with no markings, or with scattered white specks. There is usually a design on the neck which is spread as a "hood" when the snake is alarmed. The back and belly are olive drab, brown, or black. The chin is usually white, followed by a dark bar, with a white bar on the throat.

The alternating bars on the throat are good identification marks. Some of the rat snakes may resemble the cobra, but they do not have the design on the hood, or the throat bars.

This snake is common virtually anywhere except dense rain forests. It has earned the nickname, "spitting cobra," for its habit of spraying venom, which it does quite accurately up to 4 or 5 feet. (There are several races of cobras, not all seem to have this habit.) Venom in the victim's eyes can be painful and could cause damage if not flushed out quickly. The cobra's large size, abundance, and quick temper make it one of the most dangerous snakes in the area.

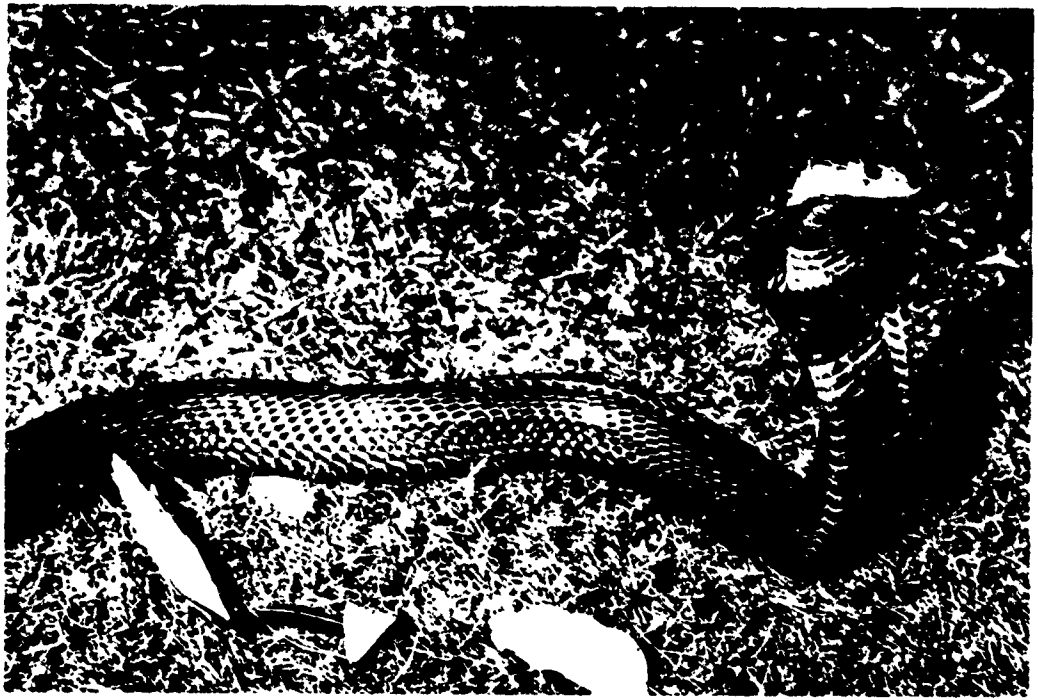
Antivenin is available from Queen Saovabha Institute, Bangkok, Haffkine Institute, Bombay, and Commonwealth Serum Laboratory, Parkville, Victoria, Australia.

"Ular tedong sendok" – Malay

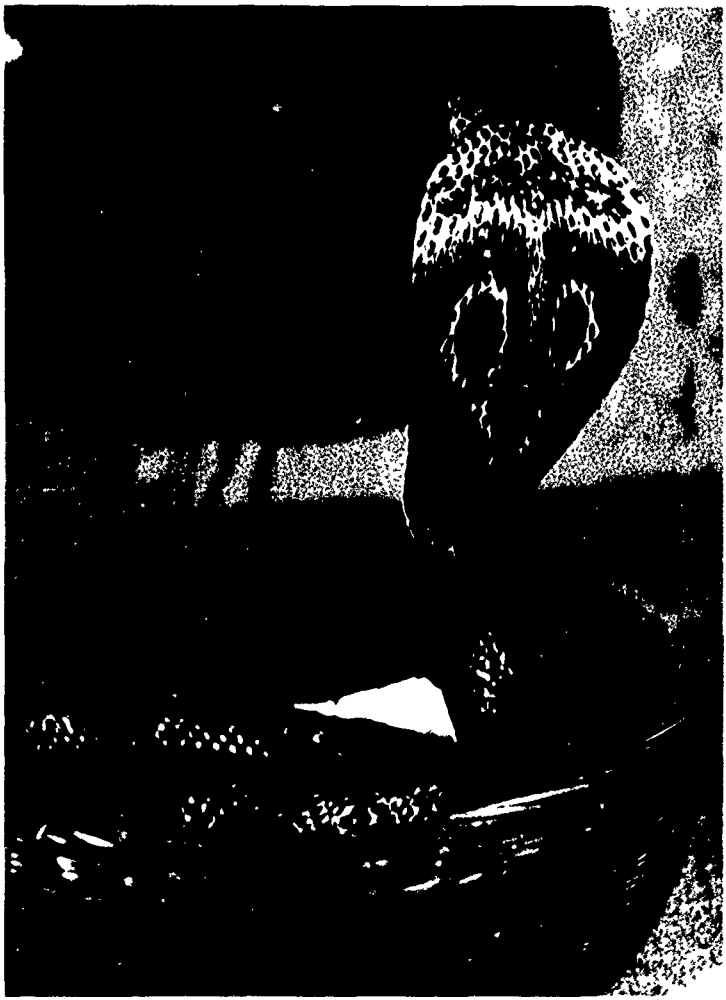
"Ular bedul" – Malay

"Ngu hau" – Thai

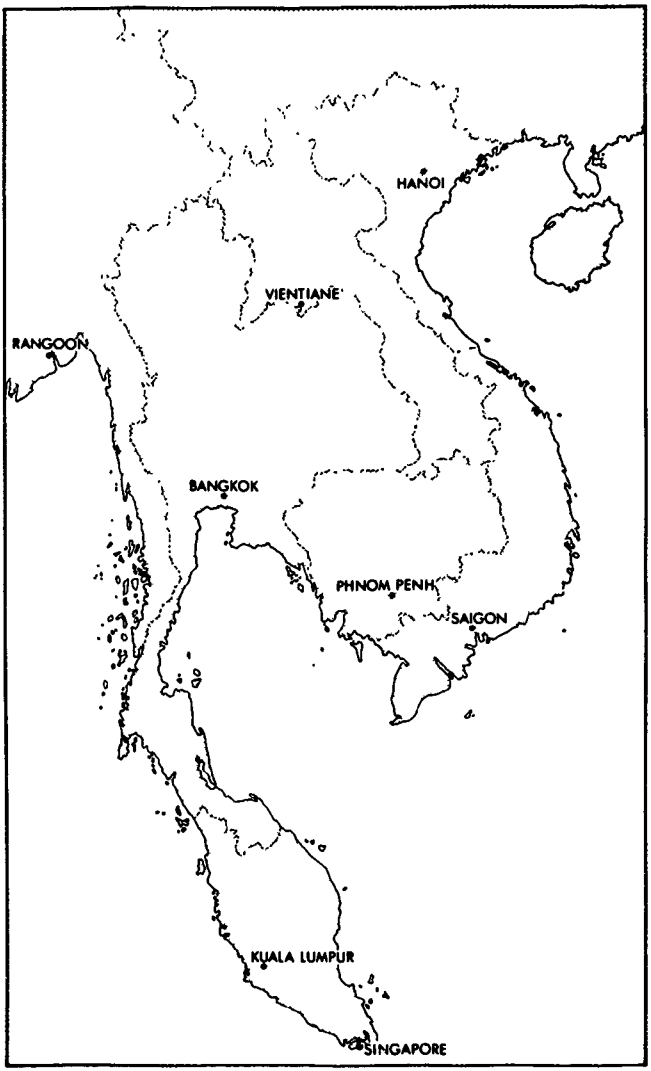
COMMON COBRA *Naja naja* (Linnaeus). Photograph by Mike Port



COMMON COBRA *Naja naja* (Linnaeus). Photograph by Mike Potts



COMMON COBRA [illegible] Photo by Mike Potts



COMMON COBRA – DISTRIBUTION

HAMADRYAD or KING COBRA *Ophiophagus hannah* (Cantor)

This is a very large brown or olive snake, slender in build, and very active. When alarmed, the king cobra will spread its hood like other cobras, though not so wide. The king cobra grows up to 15 feet long. Adults are light brown-olive with indistinct lighter crossbars across the back, especially prominent towards the rear. The throat is yellow or orange and the belly is lighter. The young are darker brown or black with prominent yellow chevrons down the back.

The king cobra is often confused with the harmless Asian rat snake, which is also a large, slender, brown snake. It is hard to tell the difference between these two unless you can see it spread its hood; only the cobras can spread the hood. On a dead snake, you can check for some single scales underneath the tail. On the harmless snakes, all the scales under the tail are divided; that is, there appear to be two rows of scales. The cobra has some of the scales in only one row.

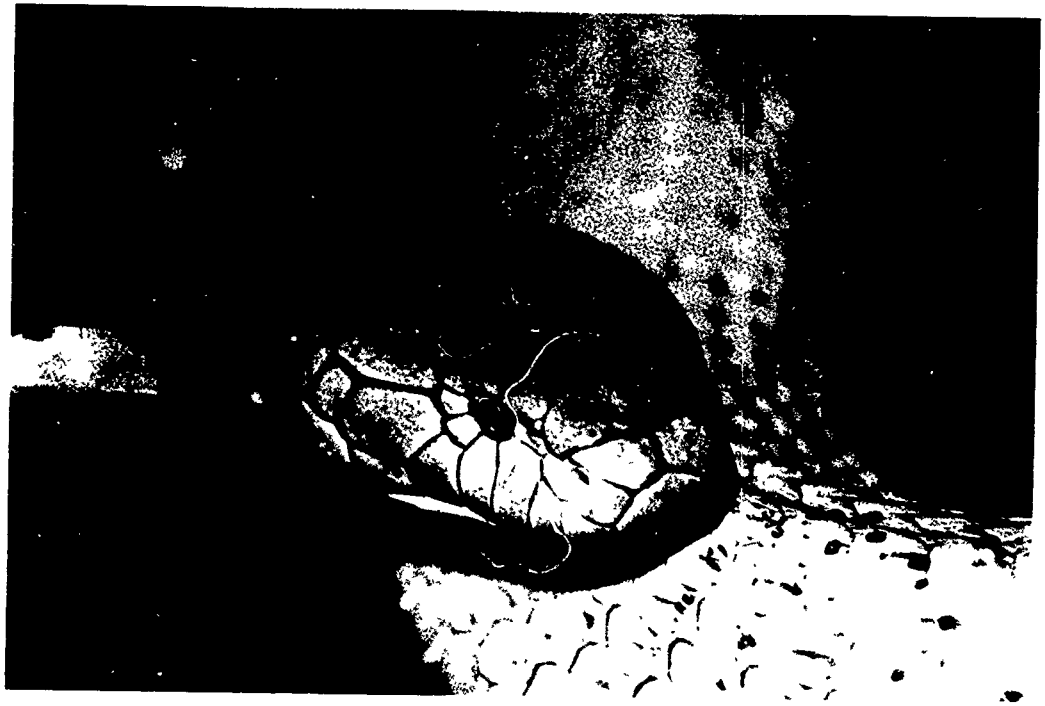
The hamadryad is active by day and is most common along streams in jungle situations. However, they may turn up virtually anywhere. This is the largest poisonous snake in the world, and because of its great size must be considered one of the most dangerous.

Antivenin is available from Queen Saovabha Institute, Bangkok.

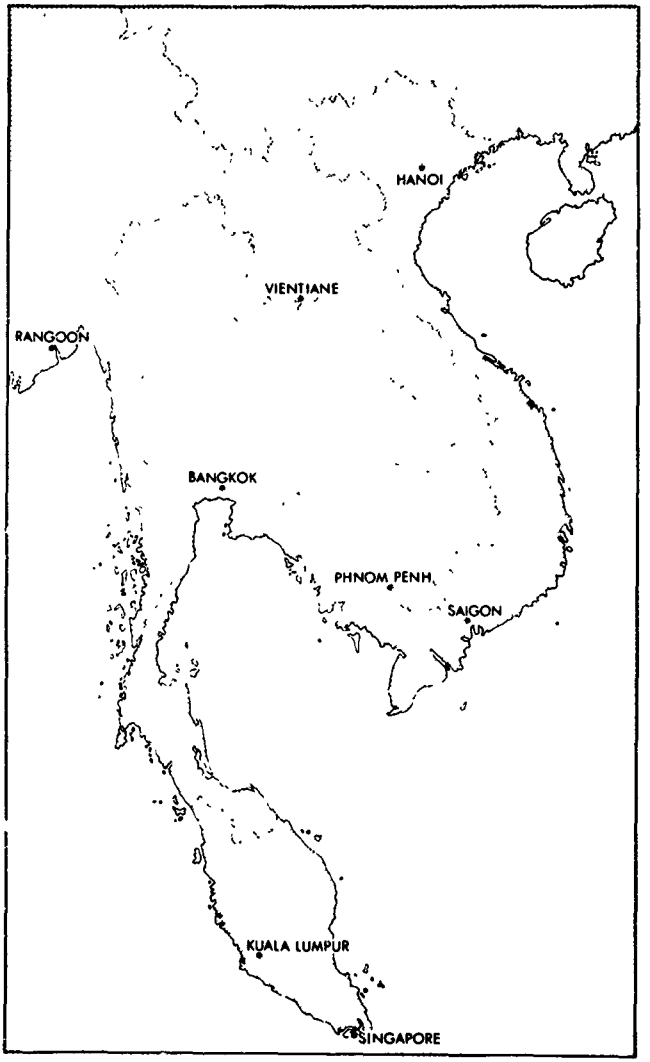
"Ular tedong selar," "ular kunyet terus," and "ular tedong abu" – Malay

"Chong ang" and "Ngu hao dong" – Thai

HAMADRYAD OR KING COBRA, *Ophiophagus hannah* (Cantor). Photograph by Mike Potts



HAMADRYAD OR KING COBRA, *Ophiophagus hannah* (Cantor). Photograph by Mike Potts



HAMADRYAD OR KING COBRA – DISTRIBUTION

COMMON KRAIT *Bungarus candidus* (Linnaeus)

The common krait is a medium-sized black snake with white crossbands. The bands do not encircle the body. The underside is pure white. The tail tapers to a point and has a single row of scales on the underside. This snake grows up to 3-1/2 feet long.

The young of the harmless wolf snake have a similar color pattern, but have two rows of scales under the tail.

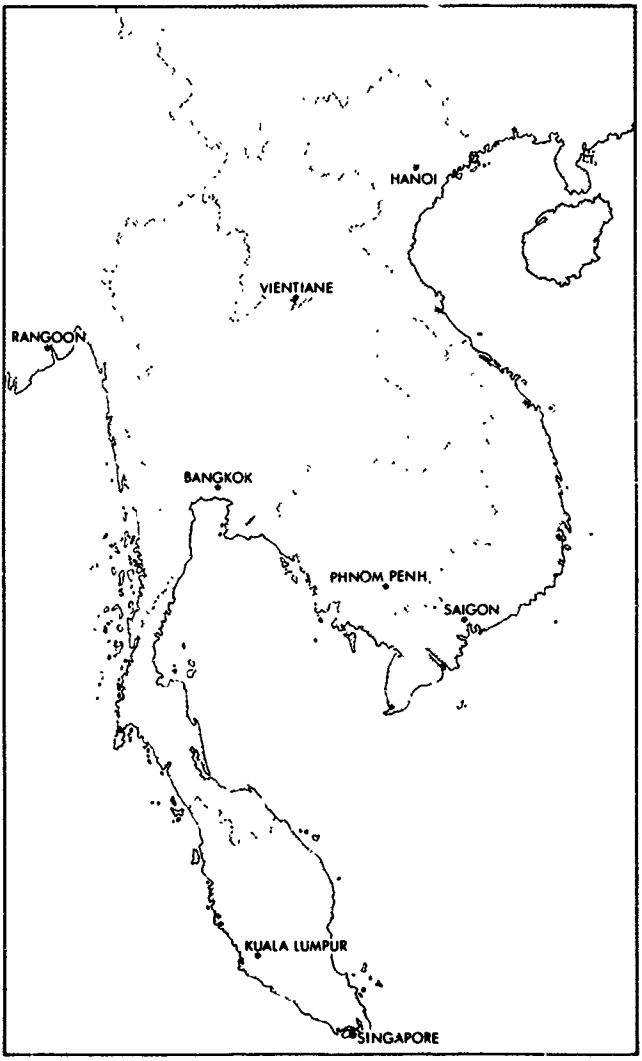
This snake is usually found near water, along jungle streams or near rice paddies. It is most frequently encountered at night. This is another potentially dangerous snake that seldom bites.

Antivenin is available from Queen Saovabha Institute, Bangkok.

"Ular katem tebu" – Malay

This description also applies to the many-banded krait, *Bungarus multicinctus.*

MANY-BANDED KRAIT *Bungarus multicinctus* (Lindwurm). Photograph by Mike Potts



MANY-BANDED KRAIT – DISTRIBUTION

BANDED KRAIT *Bungarus fasciatus* (Schneider)

This is a fairly large, boldly banded black and yellow snake. It grows up to 7 feet long. Alternating black and yellow bands of nearly equal width completely encircle the body.

This snake might be confused with the harmless mangrove water-snake, but in that species the yellow bands are much narrower than the black spaces. Also, the tail of the banded krait is blunt-ended and does not taper to a point as it does in most other snakes.

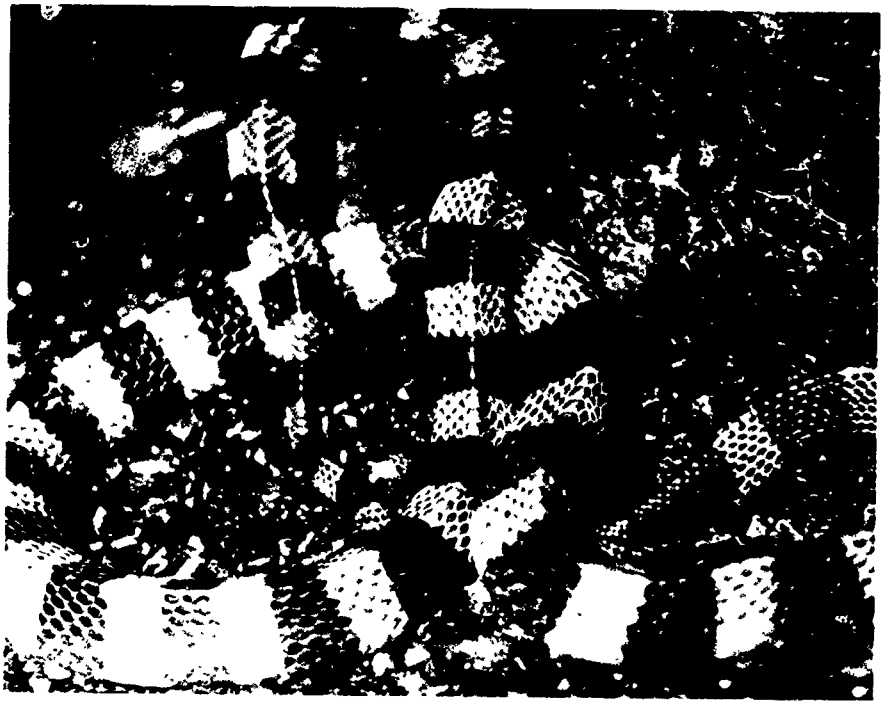
The banded krait is not aggressive. It seldom bites, but is potentially very dangerous. It is usually active only at night. It is often found in or near rice paddies, and near towns. It is seldom seen in the dry season. This snake does not occur in dense jungles.

Antivenin against the bite of the banded krait is produced at the Queen Saovabha Institute, Bangkok, Thailand

"Ngu sam hem" – Thai

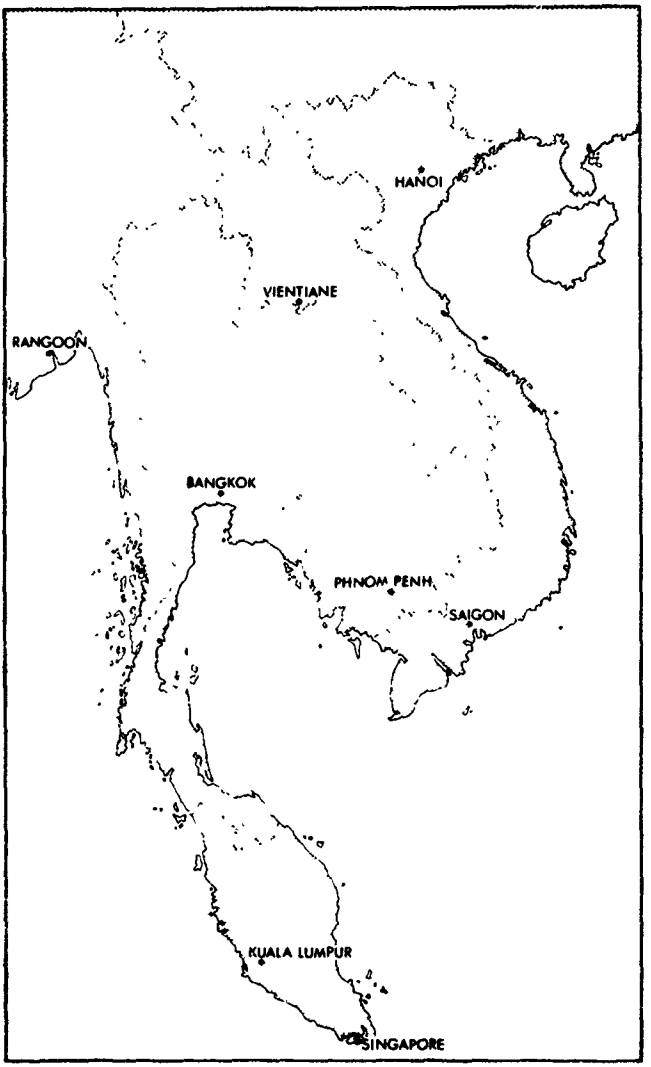
"Ular katem tebu" – Malay

"Ular welang" – Malay



BANDED KRAIT, *Bungarus fasciatus* (Schneider). Photograph by Mike Potts

BANDED KRAIT, *Bungarus fasciatus* (Schneider) New York Zoological Society Photograph.



BANDED KRAIT DISTRIBUTION

CROCODILES OF SOUTHEAST ASIA

W. H. Campbell, S. P. Christman, and W. E. Evans

INTRODUCTION

Crocodiles of one species or another may be expected throughout the permanent waters of this area, both salt and fresh. As a general rule the fresh water species are timid and will avoid contact with man, if at all possible. The saltwater crocodile (also found in brackish areas and in the larger rivers) is the species that is most likely to cause difficulties. Today the crocodiles have been greatly reduced in numbers and, except under unusual circumstances, should pose no serious threat to life and limb. Give them a wide berth and, if pressed, move into deep water and submerge if possible. This is suggested because crocodiles generally seize their prey near shore in shallow water where they lie in wait. They do not usually pursue prey beneath the surface. If you are seized, attempt to gouge the eyes with fingers or knife. Crocodiles will usually twist around rapidly once they have secured a grip in order to tear off a limb or a piece of flesh. To counter this, attempt to grab the head so that you roll with the animal and then gouge its eyes. This will usually cause the animal to release its grip and retreat. The skin is very tough and difficult to cut with a knife. The tail can deliver a vicious blow and should be avoided in any encounter.

Any crocodile over 7 feet long should be considered dangerous and avoided when at all possible. Most recorded attacks by crocodiles are by specimens 9 or 10 feet or longer.

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FALSE GAVIAL or FALSE GHARIAL *Tomistoma schlegelii* (S. Müller)

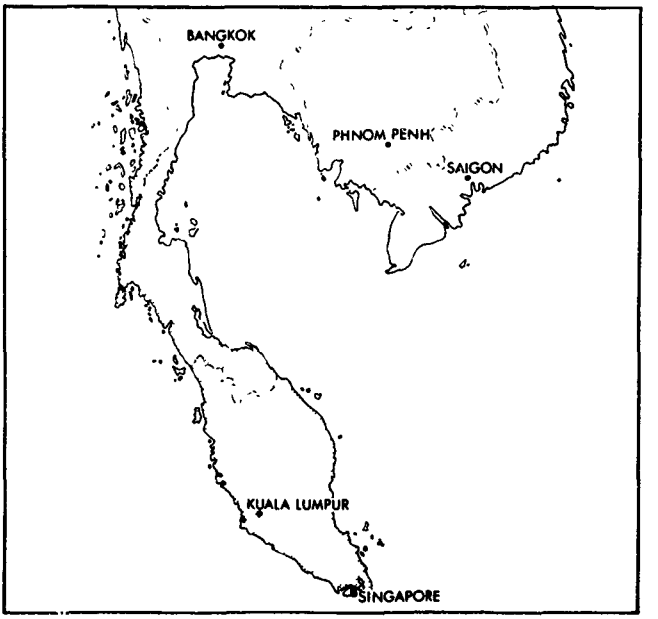
The False Gavial is a large, olive or greenish lizard-like reptile with large scales and a very slender snout with prominent teeth. It may reach a length of 15 feet, but such large specimens are seldom seen. Most individuals will be smaller than 10 feet.

This is a fresh-water crocodile found in swamps and rivers.

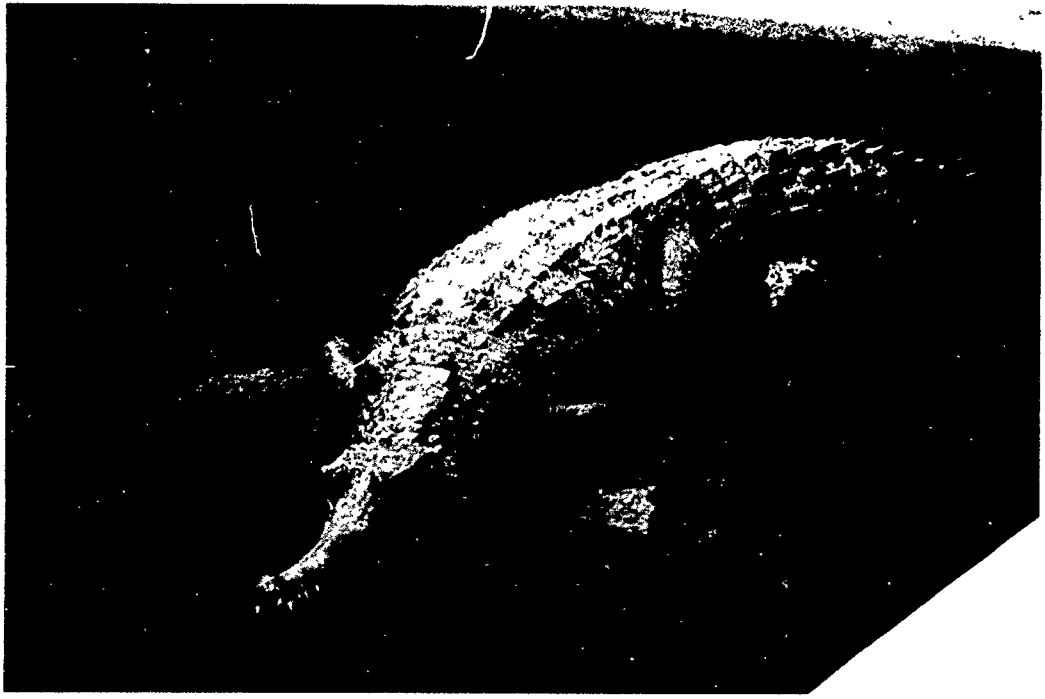
The long, slender snout of this crocodile is built for catching fish and this is not a dangerous species. There are no recorded attacks against humans by a Gharial. Females near their nests, however, should be considered potentially dangerous and avoided.

"Buaya jolong-jolong" – Malay

"Buaia sapit" – S. Borneo



FALSE GAVIAL or FALSE GHARIAL - DISTRIBUTION



FALSE GAVIAL or FALSE GHARIAL *Tomistoma schlegelii* (S. Muller). Photograph by Mike Potts

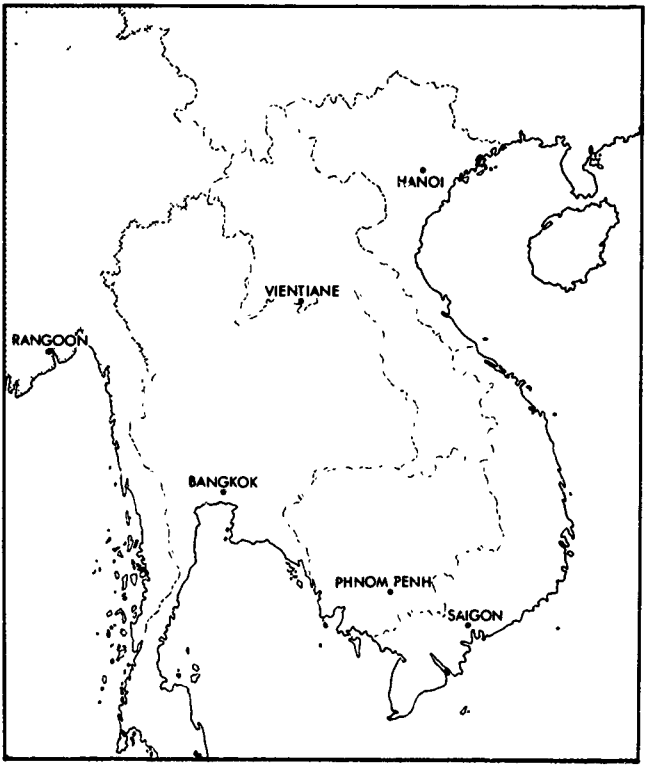
FALSE GAVIAL or FALSE GHARIAL, *Tomistoma schlegelii* (S. Muller). Photograph by Mike Potts.

MUGGER OR MARSH CROCODILE *Crocodylus palustris* Lesson

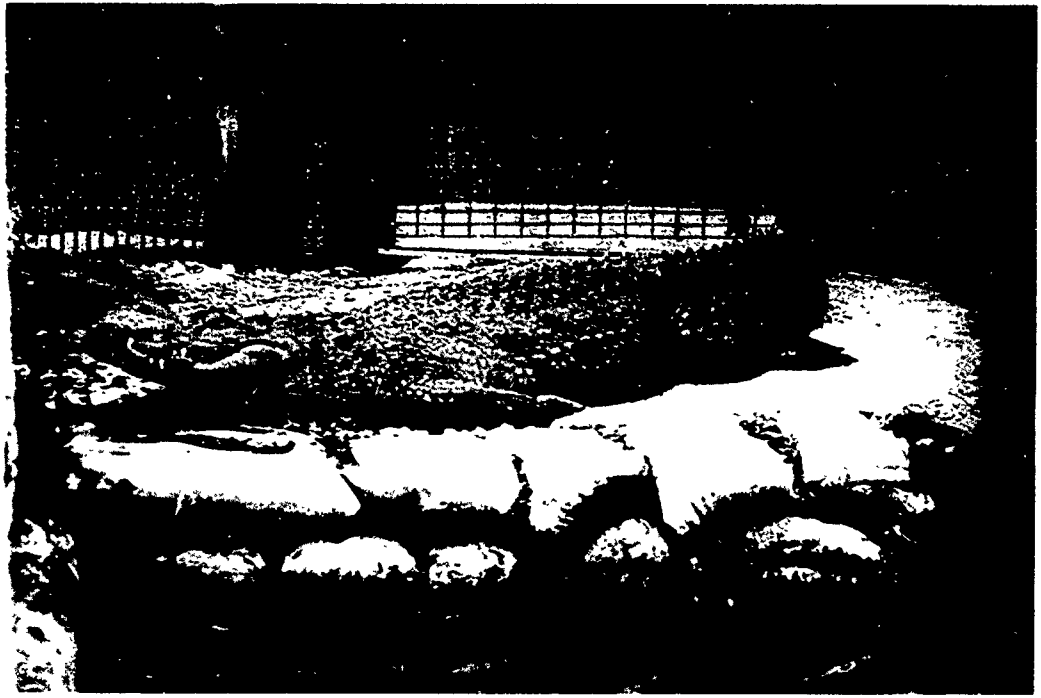
The mugger is a large, brownish, lizard-like reptile with large rough scales. It may reach a length of 12 feet, but most specimens are less than 10.

This crocodile is restricted to fresh-water swamps, rivers, ponds, and lakes. It may also be encountered in the forest during dry periods when water levels are low.

The mugger is a mild-tempered animal if not disturbed and will not generally attack man. In areas where human corpses are disposed of in the rivers, they may develop into man-eaters. Females guarding their nests on the edges of ponds and streams may also be aggressive.



MUGGER or MARSH CROCODILE – DISTRIBUTION



MUGGER or MARSH CROCODILE *Crocodylus palustris* Lesson. Photographs by Mike Potts

MUGGER OR MARSH CROCODILE *Crocodylus palustris* Lesson

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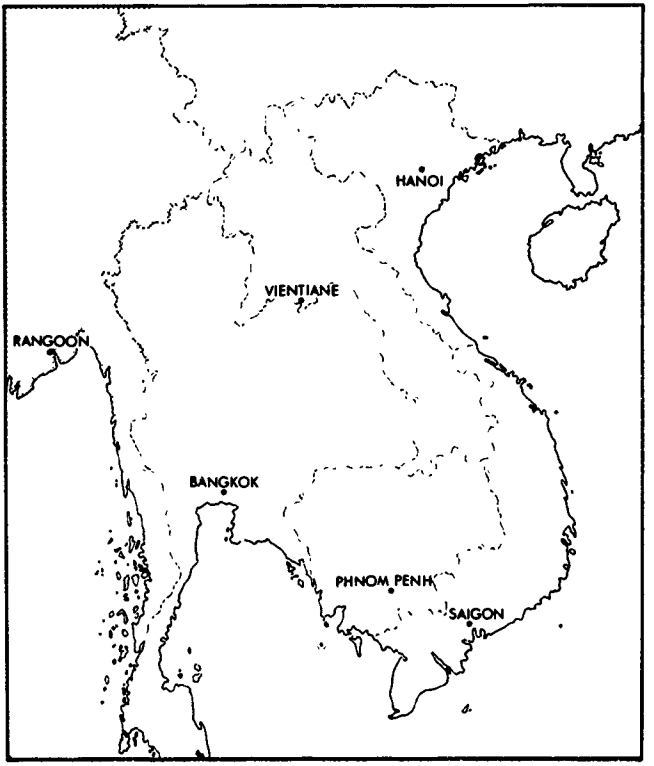


MUGGER or MARSH CROCODILE – DISTRIBUTION

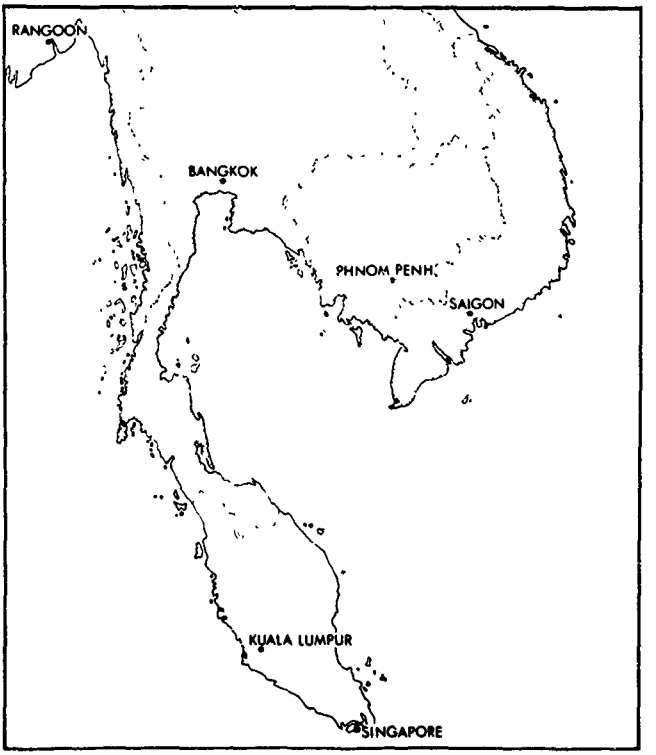
SIAMESE CROCODILE

Crocodylus siamensis Schneider

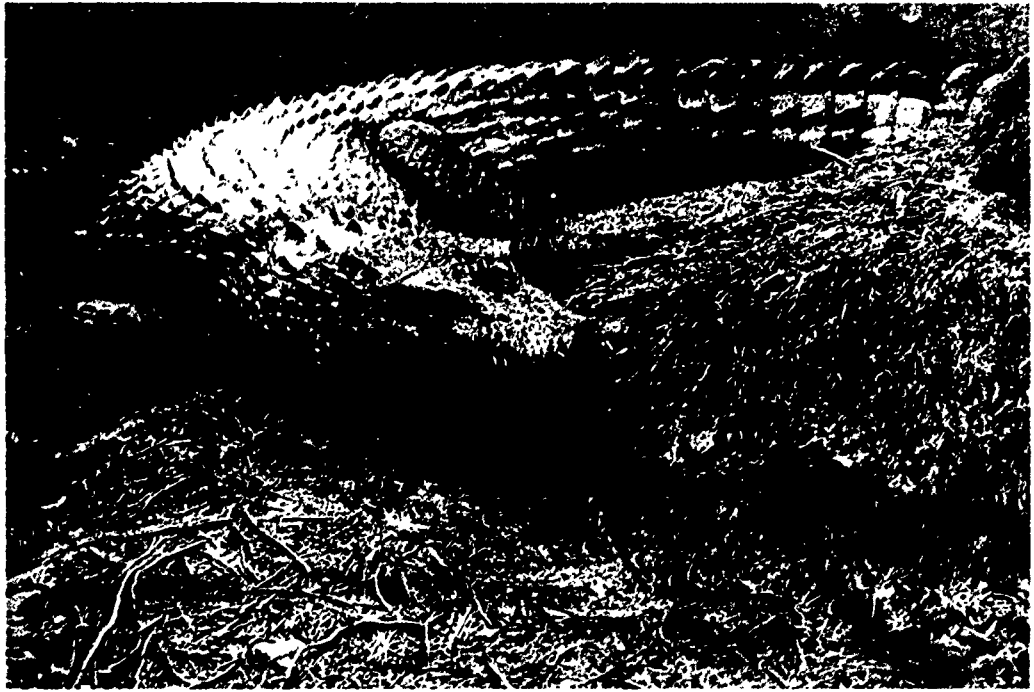
The Siamese crocodile is an olive, brown, or greenish lizard-like reptile with large, rough scales. It may reach a length of 12 feet, but most specimens are no larger than 8 feet in length.

This crocodile is found only in fresh-water areas, rivers, lakes, etc. It is not vicious and is not likely to attack a man. Females guarding their nests along river banks and similar places may be aggressive if the nest is approached. They will not leave the nest area, however, so retreat is the best defense.

"Buaya" – Malay



SIAMESE CROCODILE - DISTRIBUTION



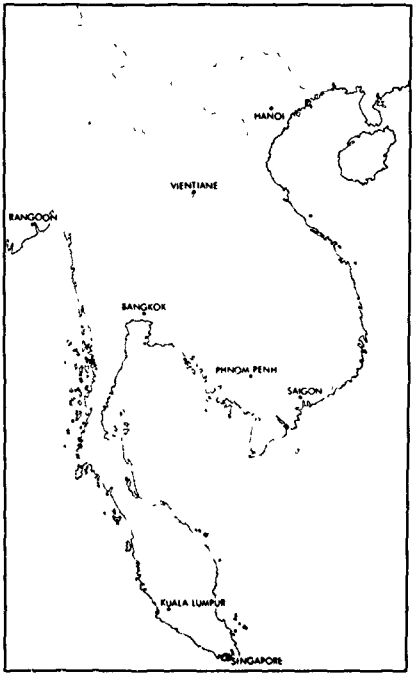
SIAMESE CROCODILE *Crocodylus siamensis* Schneider. Photograph by Mike Potts

SALTWATER OR ESTUARINE CROCODILE *Crocodylus porosus* Schneider

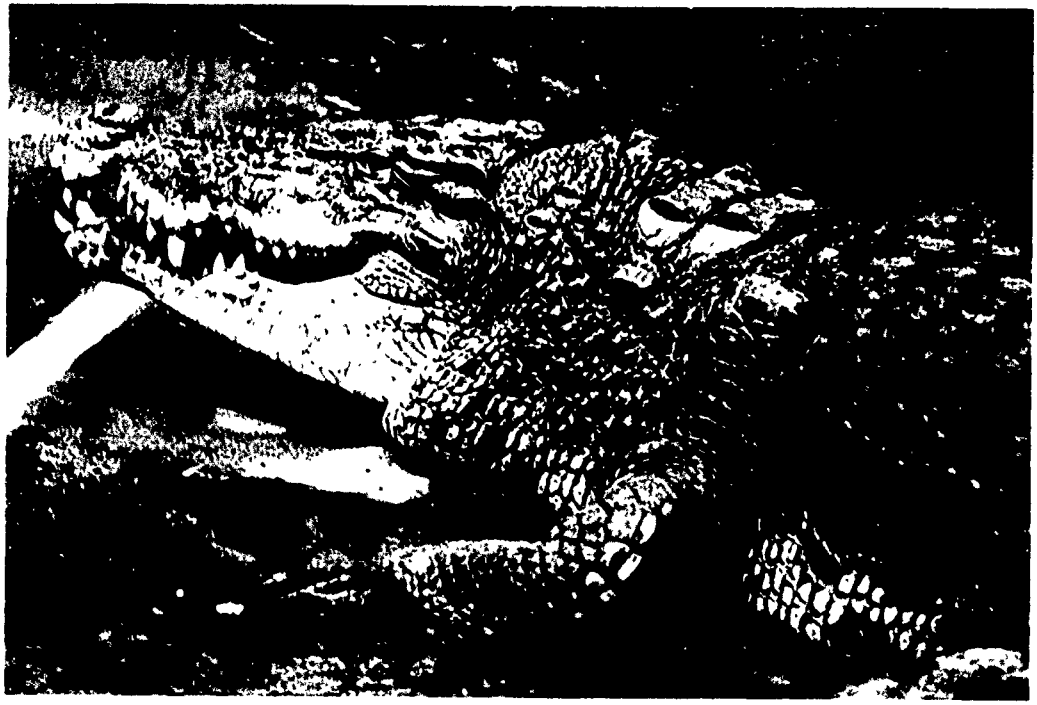
The saltwater crocodile is a large, dark olive lizard-like reptile, covered with rough scales. It is reliably known to reach a length of nearly 30 feet, although most specimens today are less than 15 feet.

This species is a well-known man-eater. It is nearly always found in salt or brackish water, seldom in fresh, and is most common near river mouths and along the coasts. It has been known to swim far out to sea, as much as 40 miles from land. Females near their nests along the coasts are especially likely to be vicious and aggressive.

"Buaya" – Malay



SALTWATER or ESTUARINE CROCKODILE – DISTRIBUTION



SALTWATER or ESTUARINE CROCODILE *Crocodylus porosus* Schneider. Photograph by Mike Potts

THE HONEYBEE

W. H. Shipman

INTRODUCTION

Most biting or stinging insects belong to one of two groups. The biting insects such as mosquitoes and biting flies belong to the order Diptera. The stinging insects such as honeybees, wasps, yellow jackets, hornets and ants belong to the order Hymenoptera. The Diptera are without venom as such, but inject enzymes or chemicals that tend to dissolve tissue or prevent coagulation of blood. As a result they cause irritation and swelling; nevertheless, severe reactions are rare. On the other hand, the Hymenoptera possess a stinger and inject a venom. In many cases these venoms are comparable in toxicity to some snake venoms although they are delivered in much smaller individual doses. If many hundreds of stings are received the amount of venom delivered by the insects is comparable to a snake bite and the possibility of death must then be considered.

Parrish recorded 215 deaths from venomous animals in the United States for the years 1950 to 1954. Of this number, 86 resulted from Hymenoptera stings, 71 from poisonous snake bites, 39 from black widow spider bites, and the remainder from scorpions and the like Of the 86 deaths from Hymenoptera stings, 52 were from honeybees, 21 from wasps, 7 from yellow jackets, 5 from hornets and 1 from an ant.

Because the honeybee is the most common species of the Hymenoptera and also the most studied, this section will describe the honeybee, its behavior and how to avoid being stung.

The honeybee population cannot be divided into male and female as is the case with most creatures. There is a male bee called a "drone." He is larger than the rest of the bees and makes a very loud buzzing when he flies, but is harmless since he has no stinger. If you define the female duties as being able to lay eggs or bear young and nurse them to maturity, then there is no one type of bee that performs these defined duties. There is a so-called queen bee that is about twice the size of the average bee. This bee lays eggs at the rate of about 1000 per day during maximum production. It is her responsibility to maintain the hive population in balance with the food supply. She appears to have free choice in whether she lays an unfertilized or a fertilized egg The unfertilized egg becomes a drone, while the fertilized egg becomes either a queen or a worker bee, depending on the diet of the larva. The worker bee is the one most commonly encountered. This bee also performs female duties, since she has glands that secrete "milk" to feed the young. The average commercial hive will have about 50,000 worker bees during the honey flow. Thus there are three types of honeybees. male or drone bees that are harmless, one queen bee per hive that is nothing more than an egg-laying machine, and the worker bees that constitute the hive population It is the worker bee that does all the stinging, and an understanding of its psychology is important if you want to avoid a painful experience.

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WHAT TO DO TO AVOID BEING STUNG

The things that cause a bee to sting are quick movements, loud noises and odors such as sweat and some hair oils. When an apparently hostile bee or bees are encountered, one should cover the eyes, nose and mouth. Looking between the fingers, bend low at the waist to decrease your size and back away using slow smooth movements and stepping behind each tree or bush you can until the bee or bees are gone. Running is justified only when an entire hive has been seriously disrupted.

THE DANGER OF BEE STING

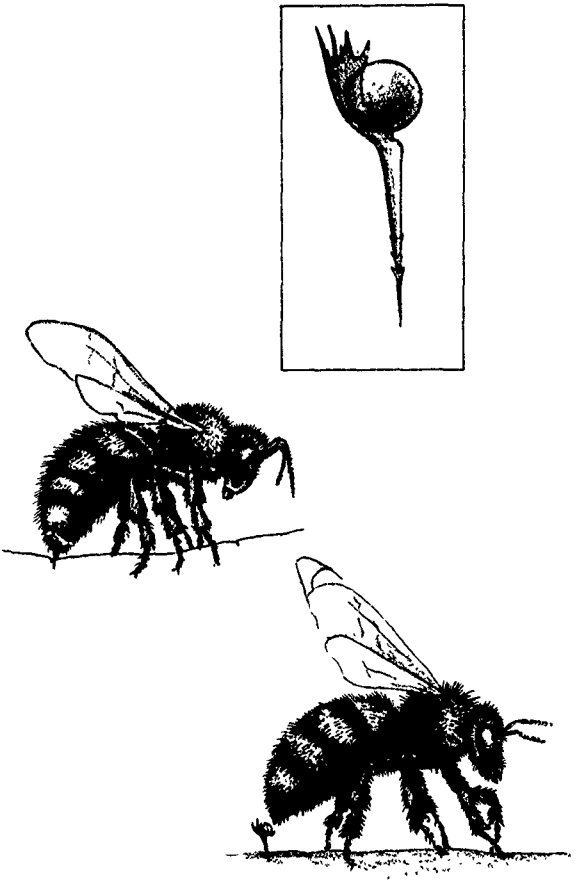
In general, the honeybee is gentle. Only about one bee in a thousand is willing to sting under normal circumstances. Under conditions of severe disturbance of the colony, the percentage willing to sting will rise to about one percent. In a normal hive with a population of about 50,000 this percentage of stinging bees would yield 500 stings. An individual so stung would have about a 50 percent chance of living.

Dr. Mykola Haydak of the University of Minnesota was stung 150 times on his arms. He describes the experience as follows· "In a few minutes after I was stung my heart started pounding vigorously and my scalp itched terribly. Next, the area around my lips became numb and there was a tingling sensation as though ants were running over them. I had the same feeling in my feet with the difference that the ants were running toward my knees. Then I became slightly dizzy. Meanwhile, the grass, the leaves and the sky turned white. I couldn't feel my pulse. Usually fainting is preceded by a sensation of darkness, but in my case the dizziness progressed until finally I saw only a white indefinite mass before my eyes. Then I fainted. The unconsciousness lasted about half a minute according to the testimony of persons who saw me collapse. I felt dizzy, had an urge for defecation after which I almost fainted. I lay on the ground for about 10 minutes. The leaves, the grass and the sky gradually assumed their normal colors. All symptoms lasted for about 15-20 minutes. The swelling on my arms completely disappeared in two days."

It must be understood that some individuals are extremely sensitive to bee venom, these people may die after a single sting. In severe reactions, there is a feeling of constriction in the throat and chest, respiratory difficulty with bluish coloration of the skin, massive local swelling, giant hives, loss of consciousness, involuntary bowel and bladder excretion, bloody and frothy saliva, and either a slow recovery or death. This extreme reaction will occur in only about one person out of a thousand, although it should be recognized that about two percent of the population have some degree of sensitivity to Hymenoptera venom

HOW THE BEE STINGS

The honeybee is unique. As can be seen in the illustration, the stinger and its associated venom sack are torn from the bee's abdomen during the act of stinging and the bee later dies. It is therefore important that the site of the sting be inspected as quickly as



HONEYBEE. The honeybee is the only member of the Hymenoptera that loses its stinger in the act of stinging. Consequently, the honeybee can sting only once.

possible. If a stinger is seen, do not grab it and pull it out. If this is done your act will complete the injection and you will receive the maximum amount of venom, hence the most pain. What you should do is flick the stinger out with a fingernail from the underside of the protruding sting sack. The quicker this is done, the less venom injected by the stinger, and, as a result, less pain. The sting shafts are black and attached to them are some bits of white tissue; the whole unit is about one quarter the size of a match head.

In contrast to the honeybee, the wasp, hornet, yellow jacket, and all other members of the order Hymenoptera do not lose their stinging apparatus when they sting. They can sting as often as they wish. Unlike bees, wasps and hornets are scavengers and are likely to transmit infection along with their venom. Local reactions, therefore, may be complicated by infection which may develop some hours or days after the sting.

REACTIONS TO BEE STING

When you are stung, there are two types of reaction that you can experience. The most common is the local reaction. In this situation the only result is pain and local swelling to some extent. The other reaction is one in which the whole body is involved and is called a systemic reaction. There are four degrees or classifications of systemic reactions:

Slight General Reaction. Generalized hive-like eruptions, itching, a tired feeling, and anxiety.

General Reaction. Any of the above plus any two or more of the following: generalized swelling, constricted feeling in the chest, wheezing, abdominal pain, nausea or vomiting, dizziness

Severe General Reaction. Any of the above plus two or more of the following: painful breathing, difficulty in swallowing, hoarseness or thickened speech, marked weakness, confusion, feeling of impending disaster.

Shock Reaction. Any of the above plus loss of consciousness, involuntary bowel and bladder excretion, drop in blood pressure.

TREATMENT OF BEE STING

When stung, immediately inspect the site and flick out the stinger if present. Then apply a 5 percent thephorin tartrate ointment and use gentle massage to facilitate absorption. This act will decrease the severity of any local reaction. Generally if one of the first three types of systemic reactions occur no treatment is necessary and keeping warm and resting is the only immediate action necessary. It would be advisable to go to the doctor and be desensitized in the near future. If a shock reaction is starting to develop then a 1.1000 adrenaline solution should be given every 5 to 10 minutes using an injection volume of 0.3 to 0.6 ml.

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MEDICAL SECTION

In conducting the research reported in the following two papers, the investigators adhered to the "Principles of Laboratory Animal Care" as established by the National Society for Medical Research.

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EVALUATION OF ANTIVENIN FOR MALAYAN PIT VIPER *(Agkistrodon rhodostoma)* VENOM

MAJ James A. Vick and Marie Grenan

Walter Reed Army Institute of Research
Walter Reed Army Medical Center
Washington, D. C. 20012

SUMMARY

Results of tests conducted using white mice and beagle dogs indicate that 1 ml of monovalent antivenin obtained from the American Field Service, Thai Red Cross, Bangkok, Thailand, will neutralize 1.6–1.8 mg *Agkistrodon rhodostoma* venom.

This antivenin appears to be an effective, potent preparation and could be considered adequate treatment for envenomation by the pit viper, *Agkistrodon rhodostoma*, in the dose schedule indicated.

No tests for sterility or pyrogenicity were carried out in these laboratories.

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INTRODUCTION

The purpose of this investigation was to determine the ability of a monovalent antivenin* (batch 15) prepared by the American Field Service, Bangkok, Thailand, to neutralize the effects of the venom of the pit viper, *Agkistrodon rhodostoma*

MATERIALS AND METHODS

Agkistrodon rhodostoma venom (lot CR1168) was obtained in a lyophilized state from the American Jungle Laboratories, Thurmont, Maryland. Prior to use, the venom was dissolved in physiologic saline. The lethal intravenous dose of venom was established by injecting graded doses into groups of approximately 10 mice. Each group was injected with doses ranging from 40 to 200 μg venom per mouse. All injections were into the tail vein. The mortality rate and survival times recorded from these injections were transformed to log-probit scale using the Miller-Tainter method of analysis to yield the LD-50 (the lethal dose that will kill 50 percent of the experimental animals) for *Agkistrodon rhodostoma* venom.

The relative potency of the antivenin was determined by injecting a lethal amount of venom into two groups of mice. One group was not treated and served as a control group. The second group was treated by injection of 0.1 ml antivenin into the tail immediately after injection of the venom. Comparison of the mortality rates and survival times of the treated groups with those of the untreated groups provided a measure of the antivenin's potency relative to that of the venom.

Survivors were those animals alive at 24 hours.

The mice used in these tests were ICR/FG females, 8-9 weeks old weighing 25-30 g, obtained from the Walter Reed Animal Colony.

The ability of the antivenin to neutralize *Agkistrodon rhodostoma* venom was further tested by injecting graded intravenous doses into seven anesthesized adult beagle dogs, followed as quickly as possible with intravenous doses of 10 ml of antivenin. The dogs weighed 10 ±2 kg.

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*A monovalent antivenin is effective against the venom of only a single species of snake.

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RESULTS

The results of these studies are summarized in tables 1-3. Table 1 shows the effects of graded intravenous doses* of *Agkistrodon rhodostoma* venom on mortality rate and survival time in mice. From these data, the LD-50 of the venom was determined to be 120 ±9.2 μg/mouse or 4.8 mg/kg (4.32–5.17 mg/kg). Dose response did not appear to vary with concentration of venom, however, in some instances, survival times showed a slight variation.

Table 2 shows the mortality rates and survival times of treated and untreated groups of mice injected with *Agkistrodon rhodostoma* venom. The mortality rates and survival times of the treated groups were transformed to log-probit scale using the Miller-Tainter method of analysis, and the LD-50 for the venom plus antivenin was determined to be 7.6 mg/kg. The potency of the antivenin relative to that of the venom may be expressed as the ratio of the LD-50 of the venom plus antivenin to the LD-50 of the venom alone, $\frac{7.6 \text{ mg/kg}}{4.8 \text{ mg/kg}}$**, or 159 percent. It can be interpreted that 1 ml of the Thai Red Cross pit viper antivenin will neutralize 1.6 mg of the *Agkistrodon rhodostoma* venom in mice or 6.4–7.2 mg/kg.

Table 3 presents the mortality rate for beagle dogs given graded doses of *Agkistron rhodostoma* venom plus antivenin. The data show that 10 ml of the antivenin appear capable of neutralizing not more than 1.6 mg venom. Thus, the results of the dog study confirm those derived from tests on mice 1 ml antivenin will neutralize not more than 1.6 -1.8 mg venom, or 6.4–7 2 mg/kg.

*When repeated tests were made at the same venom dose, averages of response were used in plotting the LD 50
**6 40 8 48

Table 1. Estimation of LD-50 for *Agkistrodon rhodostoma* Venom Injected Intravenously into Female Mice.

No. mice per group	Venom dosage			No. dead	Percent mortality	Survival time, min.
	μg/mouse	mg/kg[a]	ml			
10	40	1 6	.4	0	0	—
10	50	2 0	.5	1	10	15
10	60	2 4	.3	1	10	72
10	80	3.2	.4	3	30	10–51
10	100	4 0	.5	3	30	18–33
10	100	4.0	.2	4	40	38–174
9	120	4.8	.3	3	33	20[b]
9	120	4.8	.2	5	55	25–175
10	140	5 6	35	9	90	10–162[c]
5	140	5.6	.2	3	60	13–54[c]
9	160	6.4	.4	8	88	8–30
5	160	6.4	.2	4	80	15–45[c]
10	200	8.0	.5	10	100	4–70
5	200	8.0	.2	5	100	20–30[b]

a mg dry venom per kg mouse *b Two mice survived overnight.* *c. One mouse survived overnight*

Table 2 Determination of Potency of Thai Red Cross Antivenin Relative to *Agkistrodon rhodostoma* Venom.

No. mice per group	Venom dosage			Antivenin, ml	No. dead	Percent mortality	Survival time, min.
	μg/mouse	mg/kg[a]	ml				
6	–	–	–	.1	0	0	
9	120	4.8	.2	not treated	5	55	25–175
10	120	4.8	.2	.1	1	10	overnight
5	140	5.6	.2	not treated	3	60	13–54
10	140	5.6	.2	1	2	20	33–overnight
6	150	6.0	.25	not treated	4	67	18
9	150	6.0	.25	.1	2	22	58–135
5	160	6.4	.2	not treated	4	80	15–35[b]
10	160	6.4	.2	.1	1	10	overnight
10	180	7.2	.3	not treated	10	100	3–77[b]
10	180	7.2	3	.1	4	40	20–30
5	200	8.0	.2	not treated	5	100	20–30[c]
10	200	8.0	.2	.1	7	70	24–67

a. mg dry venom per kg mouse. b. One mouse survived overnight. c. Two mice survived overnight.

Table 3. Effect of *Agkistrodon rhodostoma* Venom Plus Thai Red Cross Antivenin on Survival of Dogs.[d]

Dog	Venom dosage, mg	No. dead	Percent mortality
1	8	0	0
2	12	0	0
3	16	0	0
4	16	0	0
5	20	1	100
6	24	1	100
7	32	1	100

a Each dog was treated with 10 ml antivenin.

EVALUATION OF ANTIVENIN FOR COMMON COBRA *(Naja naja)* AND BLUE KRAIT *(Bungarus caeruleus)* VENOMS

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SUMMARY

Results of tests conducted using white mice indicate that 1 ml of either lot 143E or 143F of polyvalent Haffkine antivenin will neutralize not more than 0.500 mg *Naja naja* or *Bungarus caeruleus* venom. Haffkine found that 1 ml of either lot of antivenin would neutralize 0.600 mg *Naja naja* venom or 0.450 mg *Bungarus caeruleus* venom. No explanation is offered for differences between Walter Reed and Haffkine results.

This antivenin appears to be an effective antidote for *Naja naja* or *Bungarus caeruleus* venom.

No tests for sterility or pyrogenicity were carried out in these laboratories.

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INTRODUCTION

The purpose of this investigation was to determine the ability of two lots (143-E, 143-F) of a polyvalent antivenin* prepared by the Haffkine Institute, Bombay, India, to neutralize the lethal effects of the venom of the common cobra, *Naja naja*, and the venom of the blue krait, *Bungarus caeruleus*.

MATERIALS AND METHODS

Two lots of *Naja naja* venom and one of *Bungarus caeruleus* venom were obtained in a lyophilized state from the Miami Serpentarium, Miami, Florida. Prior to use, the venoms were dissolved in buffered saline, pH 7.4-7.6. Freshly prepared solutions of venom were used for each day's testing The lethal intravenous dose of each venom was established by injecting graded doses into groups of approximately 10 mice. Each group was injected with a dosage ranging from 2.5 to 10.0 μg venom per mouse. All injections were into the tail vein. The mortality rate and survival times recorded from these injections were transformed to log-probit scale using the Miller-Tainter method of analysis and were used to estimate the LD-50 (the lethal dose that will kill 50 percent of the experimental animals) for each venom.

The two batches of antivenin were prepared each day following the instructions in the enclosed pamphlet. The relative potency of each batch was tested as follows An amount of venom ranging from 4 to 12 times the LD-50 was injected (in 0.2 ml saline) into two groups of mice. One group was not treated and served as a control group. The second group was treated by injection of 0.1 ml antivenin into the tail vein immediately after injection of the venom. (This procedure is in keeping with that outlined in the Haffkine brochure.) Comparison of the mortality rates and survival times of the treated groups with those of the untreated groups provided a measure of the antivenin's potency relative to the venom.

Survivors were those animals alive at 24 hours.

The mice used in these tests were ICR females, 8-9 weeks old, weighing 25-30 g, obtained from the Walter Reed Animal Colony.

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*A polyvalent antivenin is effective against the venom of two or more species of snake.

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RESULTS

The results of these studies are summarized in tables 1-6. Table 1 shows the effects of graded intravenous doses of *Naja naja* venom on mortality rate and survival times in mice. Two lots of *Naja naja* venom were used. From the data recorded, the LD-50 of lot NS 6T V was estimated to be 0 25 mg/kg, the LD-50 of lot USAMRL was estimated to be 0.35 mg/kg.

Table 2 shows the mortality rate and survival times of treated and untreated groups of mice injected with *Naja naja* venom, lot NS 6T V. Treated mice received lot 143E polyvalent antivenin. These data indicate that 1.0 ml of the reconstituted antivenin will effectively neutralize not more than 0.500 mg *Naja naja* venom.

Table 3 shows the percent mortality and survival times of treated and untreated groups of mice injected with *Naja naja* venom, lot USAMRL. Treated mice received lot 143F polyvalent antivenin. The data indicate that 1 ml of the reconstituted antivenin will effectively neutralize not more than 0.500 mg of *Naja naja* venom.

Table 4 shows the effect of graded intravenous doses of *Bungarus caeruleus* venom on mortality rate and survival times in mice. A single lot of *Bungarus caeruleus* venom was tested; its LD-50 was estimated to be 0.09 mg/kg.

Tables 5 and 6 both show the mortality rate and survival times of treated and untreated groups of mice injected with *Bungarus caeruleus* venom. Treated mice for which data are recorded in table 5 received lot 143E polyvalent antivenin, treated mice for which data is recorded in table 6 received lot 143F antivenin, Data recorded in each case indicate that 1 ml of either lot of the reconstituted antivenin will neutralize not more than 0.500 mg venom

DISCUSSION

Data from these studies indicate that 10 μg/mouse (.4 mg/kg) *Naja naja* venom will kill 90-100 percent of all mice given a single injection. Five μg/mouse (.2 mg/kg) *Bungarus caeruleus* venom kills 100 percent of all mice given a single injection. These data closely parallel those derived in previous studies at this and other laboratories.

Time-to-death following either venom decreases with an increase in the amount injected. These data are also consistent with previous publications.

Since the manufacturer chose to define the potency of his preparation as "each ml of the antiserum* will neutralize not less than a given amount of venom," we were forced to follow the same criteria. Recognizing fully that factors such as venom purity, collection methods, size and health of donor snakes and assay procedures can vary from place to place, we found that the Haffkine antivenin was effective against both the cobra (*Naja naja*) and the krait (*Bungarus caeruleus*) venoms.

*The terms antivenin and antiserum are, for the purposes of this paper, synonymous.

The potency of the Haffkine antivenin was found to be somewhat different than stated, however. The antivenin was found to be less potent than stated when used against *Naja naja* venom. Haffkine found 0.600 mg/ml vs. Walter Reed 0.500 mg/ml. When used against *Bungarus caeruleus* venom, however, the antivenin was more potent than stated. Haffkine gave 0.450 mg/ml vs. Walter Reed 0.500 mg/ml. We can offer no explanation for these differences at this time, yet in our opinion the Haffkine preparation can be considered a potent antivenin.

Table 1. Estimation of LD-50 for *Naja naja* Venom Injected Intravenously into Female Mice.

Lot venom	No. mice per group	Venom dosage			No. dead	Percent mortality	Survival time, min.
		μg/mouse	mg/kg[2]	ml			
NS6TV	10	2.5	.1	.2	0	0	-
	10	5.0	.2	.2	4	40	86 124
	10	7.5	.3	.2	10	100	31 122[b]
	10	7.5	.4	.2	10	100	29 63
USAMRL	10	2 5	.1	.2	0	0	
	10	5 0	.2	.2	0	0	
	10	7.5	.3	.2	4	40	overnight
	10	10.0	.4	.2	10	100	33–103

a. mg dry venom per kg mouse
b. One mouse survived overnight

Table 2. Determination of Potency of Lot 143E Polyvalent Antivenin Relative to *Naja naja* Venom.

No. mice per group	Venom[a] dosage			Antivenin, ml	No. dead	Percent mortality	Survival time, min.
	μg/mouse	mg/kg[b]	ml				
5	25	1	.2	not treated	5	100	10 15
10	25	1	.2	.1	1	10	20
5	50	2	.2	not treated	5	100	9 - 10
11	50	2	.2	.1	6	54	35 - 175
5	75	3	.2	not treated	5	100	7 - 10
10	75	3	.2	.1	10	100	4 136

a. Venom lot NS6TV (estimated LD-50, .25 mg/kg).
b. mg dry venom per kg mouse.

Table 3. Determination of Potency of Lot 143F Polyvalent Antivenin Relative to *Naja naja* Venom.

No. mice per group	Venom[a] dosage			Antivenin, ml	No. dead	Percent mortality	Survival time, min.
	μg/mouse	mg/kg[b]	ml				
5	25	1	.2	not treated	5	100	9–13
10	25	1	.2	.1	1	10	22
5	50	2	.2	not treated	5	100	5–8
10	50	2	.2	.1	4	40	13–65[c]
5	75	3	.2	not treated	5	100	2–7
10	75	3	.2	.1	7	70	16–49
5	100	4	.2	not treated	5	100	2–6
5	100	4	.2	.1	5	100	6

a. Venom lot USAMRI (estimated LD-50, .35 mg/kg)
b. mg dry venom per kg mouse
c. One mouse survived overnight.

Table 4. Estimation of LD-50 for *Bungarus caeruleus* Venom Injected Intravenously into Female Mice.

No. mice per group	Venom dosage			No. dead	Percent mortality	Survival time, min.
	μg/mouse	mg/kg[a]	ml			
10	1.25	.05	.2	0	0	–
10	2.5	.10	.2	6	60	323–333
10	5.0	.20	.2	10	100	48–298

a. mg dry venom per kg mouse

Table 5. Determination of Potency of Lot 143E Polyvalent Antivenin Relative to *Bungarus caeruleus* Venom.

No. mice per group	Venom[a] dosage			Antivenin, ml	No. dead	Percent mortality	Survival time, min.
	μg/mouse	mg/kg[b]	ml				
5	50	2	.2	not treated	5	100	14–40
10	50	2	.2	.1	3	30	55–110
5	75	3	.2	not treated	5	100	12–20
10	75	3	.2	.1	4	40	22
5	100	4	.2	not treated	5	100	6–13
10	100	4	.2	.1	10	100	175–190

a Lot 108AIS, the single lot of B. caeruleus venom tested (estimated LD-50, .09 mg/kg).
b. mg dry venom per kg mouse.

Table 6. Determination of the Potency of Lot 143F Polyvalent Antivenin Relative to *Bungarus caeruleus* Venom.

No mice per group	Venom[a] dosage			Antivenin, ml	No. dead	Percent mortality	Survival time, min.
	μg/mouse	mg/kg[b]	ml				
5	50	2	.2	not treated	5	100	18–53
10	50	2	.2	.1	0	0	–
5	75	3	.2	not treated	5	100	14–32
10	75	3	.2	.1	4	40	87[c]
5	100	4	.2	not treated	5	100	7–9
10	100	4	.2	.1	8	80	85–183[c]

a. Venom lot 108AIS (estimated LD-50, .09 mg/kg).
b. mg dry venom per kg mouse.
c. One mouse survived overnight.

ANNOTATED BIBLIOGRAPHY

Those seeking additional information on dangerous animals are referred to the publications below.

Bureau of Medicine and Surgery. Department of the Navy. 1968. *Poisonous Snakes of the World. A Manual for Use by U. S. Amphibious Forces.* NAVMED P-5099. 212 pp. U. S. Government Printing Office: Washington, D. C.

A thorough coverage of the majority of the world's venomous snakes. Has illustrations (some color), scientific keys for identification of the various species, discussion of medical treatment and sources of antivenin. Compiled by a committee headed by three of the country's leading venom experts and herpetologists.

Campden-Main, S. M. 1970. *A Field Guide to the Snakes of South Vietnam.* 114 pp. Division of Reptiles and Amphibians, U. S. National Museum, Smithsonian Institution, Washington, D. C

A very useful handbook describing both venomous and non-venomous snakes, but not including the sea snakes. Illustrated with good black and white line drawings. Of particular value to herpetologists. Free to individuals upon request to the Smithsonian Division of Reptiles.

Cogger, H. 1967. *Australian Reptiles in Color.* 112 pp. A. H. and A. W. Reed: Sydney, Australia.

A superbly illustrated little book with color photographs by the author. Informative accounts of the various species accompany the illustrations.

Dowling, H. G. 1966. Poisonous Snakes of Vietnam. *Animal Kingdom.* Vol. 69, No. 2. pp. 34-43.

A brief, non-technical article useful as a quickly read overview of the subject.

Halstead, B. W.
1964. *Poisonous and Venomous Marine Animals of the World.* Vol. I. Invertebrates.
1967. Vol. II. Vertebrates.
1970. Vol. III. Vertebrates
U. S. Government Printing Office· Washington, D. C.

A comprehensive treatise of the subject including all poisonous and venomous marine animal groups from microorganisms, sponges, and jellyfish, among others (Vol. I), through poisonous and venomous fishes (Vols. II and III), to venomous sea snakes and

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a miscellany of higher marine animals (Vol. III). Largely written for the scientist, but with good, rather non-technical general accounts of the animal groups as well as extensive medical, chemical, and pharmacological information. Profusely illustrated with excellent photographs and art work.

Keegan, H. L., R. E. Weaver, S. Toshioka, and T. Matsui. 1964. *Some Venomous and Noxious Animals of East and Southeast Asia.* 43 pp. 52 illustrations. 3rd edition. Department of Entomology, 406th Medical Laboratory, U. S. Army Medical Command, Japan.

A good, but unfortunately rather obscure and poorly circulated general account of dangerous and venomous animals likely to be encountered in the area covered. This useful book has gone through three editions and several printings. Coverage ranges from jellyfish, among numerous other animals, through spiders and scorpions to snakes. Good drawings and art work are included.

Kuntz, R. E.. 1962. Snakes of Taiwan. *Quarterly Journal of the Taiwan Museum.* Special Issue 79 pp.

Another excellent reference, but again not readily available to the non-scientist. Species write-ups are good and useful, but the outstanding feature of this work is the superb color photography of the living snakes.

Romer, J. D. 1965. *Illustrated Guide to the Venomous Snakes of Hong Kong.* 26 pp. In Chinese and English. S. Young, Government Printer, Government Press. Hong Kong.

This useful little booklet also possesses superior color photographs of the snakes. The works of Cogger, Kuntz, and Romer are especially recommended for their very high quality color photography which can be a decisive aid in correct identification of species by non-scientific personnel.

QUESTIONNAIRE

Please answer as many questions as you can. Sign the questionnaire only if you wish; however, it would help us greatly if you would do so, so that we can contact you regarding any points of special interest. We would like replies from both military and civilian personnel.

1. Do you feel that a handbook of dangerous animals like this one is of any use to you? _____ yes _____ no

2. If not, what sort of help in dealing with dangerous animals would you like to receive that the handbook does not give you? (Describe briefly.)

3. If you think this handbook is of value, please rate the ways it is, or might be, helpful.

	very helpful	some help	little help
a. Makes me more aware and more careful in the field	_____	_____	_____
b. Makes me less uptight about dangerous animals I might encounter	_____	_____	_____
c. Provides me with the kind of information I wanted about a particular kind of animal	_____	_____	_____

d. Other: _____

4. What format do you favor? (Circle your choice.)

   a. General account of animal group
   b. Individual write-up for each animal
   c. Some combination of a. and b.
   d. Other format (Describe briefly.)

5. How much information would you like in a handbook of this kind?

_____ more _____ less _____ about same

If less, what should be taken out?
If more, what sort of information would you like included?
(Describe briefly.)

6. Please note any specific suggestions you have regarding the illustrations of

   a. animals

   b. distribution maps

   c. habitats

7. Are there any other kinds of dangerous animals you would like to see included? What are they?

   a.

   b.

   c.

8. Please add here any additional comments or criticisms you would like to make. Use additional sheets if necessary.

ENCOUNTER DESCRIPTION FORM

DATE AND APPROXIMATE LOCAL TIME

Include general weather conditions.

LOCATION

Include description of immediate area, such as open plains, forest, swamp, etc.

IDENTIFICATION

Identify the animal as best you can. Include its local name if you know it. If you cannot identify the animal, describe it in as much detail as possible (color, shape, markings, size).

NUMBER OF ANIMALS

UNCLASSIFIED CIRCUMSTANCES OF ENCOUNTER

Include the number of persons involved and all other features of interest. If in doubt about the importance of some detail, include it in your write-up and let us decide. Use additional sheets if necessary