Bites and stings by venomous animals with special reference to snake bites in West Malaysia

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BITES AND STINGS of venomous animals of West Malaysia are common and a number of fatal cases due to snake-bites have been reported from time to time. Most of these bites are attributed to venomous snakes but other venomous animals, such as scorpions, centipedes, spiders, bees, wasps and marine vertebrates and invertebrates, have also contributed to the numbers of cases of toxicity in West Malaysia.

Fortunately, the venomous snakes constitute only 10% of the snake fauna, of which only half are considered dangerous to man. Even dangerously venomous snakes seldom inject a lethal dose of venom in a defensive bite. Stings and bites by most of the other venomous animals are unlikely to kill unless they are multiple or hypersensitivity exists. Unlike in some other Southeast Asian countries, where venomous animals are a constant hazard and fatality rates are alarmingly high (Swaroop and Grab, 1954), the numbers of fatal cases of toxicity due to snake-bites and bites and stings by other venomous animals in this country are much less formidable.

The very low mortality rates in West Malaysia may be attributed partly to availability of antivenin for treatment of most snake-bites and partly because the bites of most venomous snakes, like the vipers, are seldom fatal even in the absence of proper treatment.

The present paper deals with the distribution and observations of the habits of most of the venomous snakes of West Malaysia. Data on bites and stings from other venomous animals in the 11 states of West Malaysia for the period 1960–1968 are also presented, giving the number of cases and the mortality rates.

MATERIALS AND METHODS

Venomous and harmless snakes were collected throughout Malaysia in connection with bio-medical studies of the vertebrate hosts of zoonotic diseases. During the periods from 1948 to 1969, 3,457 specimens of land snakes, including each of the venomous species, were examined.

Stomach contents of most of these snakes were also examined and, whenever possible, the contents were identified.

Data on patients inflicted with snake-bites and stings from other venomous animals were obtained from the Ministry of Health, Kuala Lumpur, Malaysia.

RESULTS

Identifications of the venomous land snakes are already adequately described in "Snakes of Malaya"

by Tweedie (1957). The main differences useful in identifying venomous and harmless snakes are illustrated in the "Snake Chart" (Appendix 1).

COBRAS

Two species of cobras are found in West Malaysia. The King Cobra or Hamadryad **(Ophiophagus hannah)** is more active in the day than at night. The Common Cobra **(Naja naja)** is mainly nocturnal. Both these snakes are widely distributed throughout the country.

The King Cobra is common in the lowlands but rare in hilly places, and, on islands (Table 2). It is usually found in primary and secondary forests and in oil palm estates but uncommon in the open fields and rubber estates (Table 1). It feeds exclusively on reptiles, such as lizards and other snakes. Being cannibalistic in its behaviour, this snake has been found to have victims of its own species in its stomach contents (Table 3).

Tweedie (1941) gave an interesting account attesting to the unaggressiveness of this snake. His findings were later confirmed by us. The first time was in 1953 when we were inspecting rodent traps near a forest path at Sungei Buloh Forest Reserve, 14 miles northwest of Kuala Lumpur.

A trap was laid near a palm tree just by the edge of a large forest stream and while checking the trap, one member of the team happened to throw a stick into the palm tree. The stick must have hit the snakes and much to our surprise, we were suddenly confronted with two expanded hoods raised about three feet high in the middle of the palm tree.

Both snakes were hissing loudly, but made no attempt to attack. We immediately retreated and in trying to go across to the other side of the stream by the wooden bridge, two of us fell into the water. Under these circumstances, if the snakes were aggressive, as is assumed by many people, they would have attacked. Instead, they moved slowly away from the palm tree. When we went back to retrieve the trap (with a rat in it), we saw a brood of eggs in the nest. It was, therefore, quite obvious that the two snakes had been there for quite some time and despite the fact that we had been tramping in and out through the path, no attempt was made by them to attack us earlier, which indicates that the King Cobra is not aggressive unless, perhaps, unduly provoked. When we visited the area again the following day, we could see from the other side of the stream that the snakes had returned to their nest.

The second occasion was in 1956 in the Ampang Reservoir Forest, six miles east of Kuala Lumpur. This time we came across a King Cobra in the middle of a jungle path. The snake rose up to a height of about three to four feet, but made no attempt to attack as we retreated. It soon wriggled its way into the thicket and we were left to carry on with our work.

Fig. 1: King Cobra, *Ophiophagus hannah*. The expanded hood is most characteristic of cobras.

Tweedie (1941) stated that the venom of the King Cobra is less toxic than that of the Common Cobra, and any fatality from the bite may be due to the quantity of the venom injected. According to the Orang Asli (Aborigines) in Selangor, bites inflicted by King Cobras are rarely sustained by members of their tribes, but those few that were bitten usually died within 20–30 minutes.

The Common Cobra is found in all types of habitats (Table 1). In human inhabitated areas, cobras are found in basements of houses and under outbuildings. It is sometimes encountered inside bathrooms, sewage pipes and in dwelling rooms. In the

Fig. 2a: **A comparison of a normal palm with that of a palm bitten by the Common Cobra 36 hours after hospitalisation.**

Fig. 2b: **A close-up of the index finger bitten by the Common Cobra.**

open, it can be found in holes in the ground or at the bases of trees among exposed roots.

Like the King Cobra, the Common Cobra is also non-aggressive. It will only attack when provoked or accidentally stepped on. It feeds on small mammals. particularly rats and frogs (Table 3).

There are two forms of common cobras in the country. In the northern part of West Malaysia, a yellowish form is found. Unlike the Indian cobra, the Malaysian species "spit" the venom.

We have encountered many of this species during the course of our work in the field and found that if suddenly disturbed, the snake quickly erects itself, hisses loudly and awaits the opportunity to strike. If one keeps still, the danger is quickly over, and the snake drops its head and moves away.

It has been demonstrated in the laboratory that the snake can spit venom for a distance of about one to one-and-a-half feet. If the venom comes in contact with an open wound, its toxic effect is the same as that of the venom infected in a direct bite. If the spitted venom gets into the eyes, it may cause permanent injury, if not treated immediately.

Often the bite of a cobra is a mere snap of the jaws and the bitten part is immediately released. Rarely will the snake fasten itself tenaciously, necessitating a forcible opening of the jaws to effect release.

Frog hunters at night are commonly inflicted by the bite of this common cobra. On two occasions, two of our frog hunters were bitten on the hand by this snake while searching for frogs at night by the side of forest streams. The symptoms described by these two persons revealed that at the time of the bite there was no pain, but five to ten minutes later, a sharp pain and a prickly sensation developed starting from the site of the bite and gradully spreading through the arm. Swelling, numbness, and discolouration of the palm occurred almost 15 minutes after the bite. Fortunately in both cases, a tourniquet was used as a first aid measure and the persons were rushed to the hospital and received medical attention within one hour after the bite. Both were hospitalised for about a week. Eight months after treatment, scars formed by the bite were still visible.

It is a misconception to think that young cobras are less dangerous than adults. In 1955, two young cobras, about ten to 12 inches long, were brought to this institute. The trapper claimed that they were newly hatched from the eggs. An experiment was carried out to test the toxicity of the venom of these young cobras and compare it with that from a fully-grown adult, 5½ feet long. Two guinea pigs, weighing about 500 grams each, were placed in separate cages containing the young cobras and the adult cobra. It took about six to seven hours before the cobras started attacking the guinea pigs. The guinea pig that was bitten on the hind limb by the young cobra died within 20 minutes and the second one bitten on the body by the adult snake died within 45 minutes. Although the experiments were carried out once only, nevertheless, the potential danger of young and newly-hatched cobras should be noted.

KRAITS

There are three species of kraits inhabiting West Malaysia: the Red-headed Krait **(Bungarus flaviceps)**, the Banded Krait **(B. fasciatus)**, and the Common Krait **(B. candidus)**. The latter two were widely distributed throughout the country, but specimens of

Fig. 3: **Banded Krait, *Bungarus fasciatus*. The snake is in the process of killing its prey, a puff-faced fresh-water snake.**

B. flaviceps have so far been collected from Perak, Pahang and Selangor only. They are strictly nocturnal.

Of the three species of kraits, the Red-headed Krait is the least common. Few specimens have been collected, all of them from primary forests in the lowland (Tables 1 & 2). Tweedie (1941) reported that **Bungarus flaviceps,** is usually found in hilly country, and later in 1957, he mentioned that one specimen was collected from sea-level near the coast of Perak. In subsequent years, four more specimens were collected in the state of Selangor, and one in Pahang, and all these were obtained in the lowland primary forests, which indicates that the snake has a wide range of habitat. Although the distribution of this species extends throughout the Malayan archipelago, it appears to be uncommon in West Malaysia, where not many specimens of this species have been collected thus far.

Stomachs of these specimens contained other harmless snakes (Table 3), but one was found with a partially digested snake of the same species.

There is no information regarding the toxicity of its venom and very little is known of its habits and behaviour in comparison to **B. candidus** and **B. fasciatus.**

The commonest is the **Banded Krait.** This snake is found numerously in mangrove forests and swamps in the coastal region and also around human habitations. Thus, it is common to find them around outbuildings, verandahs, bathrooms and edges of doors in houses. It is less common in inland areas although it is found in lowland primary and secondary forests, scrub fields, ricefields, rubber estates and oil palm estates (Tables 1 & 2). It feeds on reptiles and on one occasion, a fish was found in the stomach of one of the specimens obtained from mangrove forests (Table 3).

The Banded Kraits are among the most inoffensive snakes we know. Captive specimens were timid even when they were teased. In excitement, they flatten the posterior part of the body and inflate and deflate themselves anteriorly like many other snakes. When provoked, they frequently protruded their tongue but seldom struck.

Laboratory experiments carried out on the toxicity of the venom revealed that white rats, which weighed 350 grams, were killed within 50 to 75 minutes compared with that of the cobra, which killed white rats in less than 45 minutes, the venom of the banded krait being less toxic.

The Common Krait is commonly found in inland areas and is frequently encountered around human habitations (Tables 1 & 2). It feeds on reptiles only. Although it killed small mammals in the laboratory, it refused to eat them (Table 3). Otherwise, its behaviour and habits are similar to that of the Banded Krait.

Laboratory tests carried out on similar lines as for the Banded Krait indicated that the venom from the Common Krait is more toxic. It was found that white rats bitten by the Common Krait died within 35 to 50 minutes.

CORAL SNAKES

Four species of coral snakes belonging to two genera, **Callophis** and **Maticora** are found in West Malaysia. All but one, **Callophis maculiceps,** are widely distributed throughout the country. **C. maculiceps** is found in the northern parts of West Malaysia. They are all nocturnal in habits.

The commonest of the coral snakes is the Banded Malaysian Coral Snake **(Maticora intestinalis).** It is found inhabiting all elevations in West Malaysia, and on surrounding islands (Table 2). It is found in primary and secondary forests and around human habitations (Table 1).

In human habitations, this snake is usually found in the garden under flower pots, stones and rubbish heaps. In fields and forests, it is found under dead logs on the forest floor and under wood or in heaps of rubbish. It feeds on reptiles, particularly smaller snakes and tiny lizards (Table 3).

Tweedie (1941) cited the case of Dr. E. Jacobson of Bandung, Java, who was handling a live specimen, accidentally bitten in the web of the fingers, with the implantation of only one fang. According to Tweedie,

Table 1. Distribution of Venomous Snakes in various habitats.

	Primary forest	Secondary forest	Mangrove forest	Scrub	Fields*	Ricefields	Rubber Estate	Oil palm estate	Human habitats*
ELAPIDAE									
Ophiophagus hannah	XX	XX	–	X	X	–	X	XX	–
Naja naja	XXX	XX	XX	XX	XX	XX	XX	XXX	XX
Bungarus candidus	X	X	X	X	X	XX	X	X	XXX
Bungarus fasciatus	X	X	XXX	X	X	X	X	X	XX
Bungarus flaviceps	X	–	–	–	–	–	–	–	
Callophis gracilis	XX	X	–	–	–	–	–	–	
Callophis maculiceps	X	–	–	–	–	–	–	–	
Maticora intestinalis	XXX	XX	X	X	X	X	X	X	XX
Maticora bivirgata	XX	X	–	–	–	–	–	–	–
VIPERIDAE									
Ancistrodon rhodostoma	X	X	–	–	–	XX	XXX	–	–
Trimeresurus wagleri	XXX	XX	X	–	–	–	–	–	–
Trimeresurus sumatranus	XXX	XX	X	–	–	–	–	–	–
Trimeresurus purpureomaculatus	–	X	XXX	–	–	–	–	–	–
Trimeresurus monticola	XX	–	–	–	–	–	–	–	–
Trimeresurus puniceus	XX	–	–	–	–	–	–	–	–
Trimeresurus popeorum	XX	–	–	–	–	–	–	–	–

XXX very common
XX common
X rare
– not observed
* Fields includes lallang fields **(Imperata cylindria)** and back yard gardens.
+ Human habitations are places like towns, villages, and farming villages.

Table 2. Distribution of Venomous Snakes at various elevations and islands.

Species	Lowland	Highland	Islands
ELAPIDAE			
Ophiophagus hannah	XX	X	X
Naja naja	XXX	XX	XXX
Bungarus candidus	XXX	X	X
Bungarus fasciatus	XXX	–	XXX
Bungarus flaviceps	XX	–	–
Callophis gracilis	XX	XX	–
Callophis maculiceps	X	XX	–
Maticora intestinalis	XXX	X	–
Maticora bivirgata	XX	XX	X
VIPERIDAE			
Ancistrodon rhodostoma	XXX	–	–
Trimeresurus wagleri	XXX	–	XX
Trimeresurus sumatranus	XXX	–	XX
Trimeresurus purpureomaculatus	–	–	XXX
Trimeresurus monticola	–	XX	–
Trimeresurus puniceus	XX	–	–
Trimeresurus popeorum	–	XX	–

XXX very common
XX common
X rare
– not observed

Table 3. Food of Venomous Snakes.

Species	Small mammals	Reptiles & amphibians	Birds	Fish
ELAPIDAE				
Ophiophagus hannah	–	+	–	–
Naja naja	+	+	–	–
Bungarus candidus	–	+	–	–
Bungarus fasciatus	–	+	–	+
Bungarus flaviceps	–	+	–	–
Callophis gracilis	–	+	–	–
Callophis maculiceps	–	–	–	–
Maticora intestinalis	–	+	–	–
Maticora bivirgata	–	+	–	–
VIPERIDAE				
Ancistrodon rhodostoma	+	+	+	–
Trimeresurus wagleri	+	–	+	–
Trimeresurus sumatranus	+	–	+	–
Trimeresurus purpureomaculatus	+	+	+	–
Trimeresurus monticola	+	–	–	–
Trimeresurus puniceus	+	+	+	–
Trimeresurus popeorum	+	–	–	–

+ positive
– negative

the symptoms recorded were typical of the venom of the poisonous colubrine snakes; however, the patient recovered after having suffered for more than 1½ days. Dr. Jacobson later said that he was convinced that if both of the snake's fangs had penetrated the skin and discharged their full measure of poison, the effect would have been very serious indeed.

In West Malaysia, there have been no reported cases of man bitten by this snake, but from the above incidence, the toxicity of the venom of this snake is not to be underestimated inspite of the fact that the snake is small.

The Blue Malaysian Coral Snake, **(Maticora bivirgata)**, is the largest of the coral snakes and grows to about five feet in length. It is found inhabiting all elevations and islands (Table 2), and is confined to primary and secondary forests (Table 1) where it is found in crevices of rocks, under fallen trees on the forest floor and also in between roots of large trees. It feeds on reptiles, mainly on other snakes, although in captivity, lizards were also eaten (Table 3).

Harrison (1957) reported a two-year-old girl bitten by a young specimen of this snake while she was playing on a concrete area outside her house near Malacca, West Malaysia. She was bitten between the base of the thumb and the first finger and died before reaching the hospital. From the above incident, it can be said that the bites of these two coral snakes are indeed dangerous.

The uncommon species are the Spotted Coral Snake, **Callophis gracilis** and the Small Spotted Coral Snake, **Callophis maculiceps.** The latter is rare. They are found in primary and secondary forests only (Table 1). **C. gracilis** is found at all elevations and **C. maculiceps** is found in the lowlands only. There are no records of these snakes from islands (Table 2). **C. gracilis** appears to feed exclusively on other small snakes (Table 3), but the feeding habits of **C. maculiceps** are not known, although it also is said to feed on other snakes (Tweedie, 1957).

C. gracilis is found under logs on the forest floor and in crevices between rocks. So far, only a few specimens of these snakes have been collected, and very little is known of their feeding behaviour and habits.

There are no records of man being bitten by these snakes.

PIT VIPERS

West Malaysia has seven species of pit vipers, belonging to two genera, **Ancistrodon** and **Trimeresurus.** The former genus comprises a single species only, while the latter contains six species. All these vipers are active during the day, as well as at night.

Of these vipers, the Malayan Pit Viper, **Ancistrodon rhodostoma,** is the most notable species, being the source of more snake bites than any of the Elapid and Viperid snakes throughout the country (Reid, 1963). The distribution of this snake is confined to Kedah in the northern part of West Malaysia and extending into Southern Thailand. It is a lowland snake (Table 2) and is common in primary and secondary forests, ricefields, and rubber estates (Table 1). It feeds on frogs, lizards and small mammals, and in captivity it also takes birds (Table 3).

This snake is found on the forest floor, taking shelter in between roots of trees, underneath logs and also among heaps of dried leaves. In rubber estates, it is found on the ground or at bases of rubber trees. In ricefields, it is found commonly in the straw during harvest when rats are abundant.

In 1969, when we visited Kedah in connection with filariasis control activities, we also took the opportunity to visit the hospitals at Sungei Patani and Alor Star. In Sungei Patani, we were taken by the State Health Officer, Dr. Mahathevan, to the hospital where we saw five cases bitten by **A. rhodostoma,** and one case inflicted by **T. purpureomaculatus.** Two of the patients were bitten on the palms and the rest on the legs. One case developed gangrene and the others were about to be discharged. On an average, 25 cases of snake bites were admitted into this hospital monthly.

At Alor Star Hospital, the average number admitted was between 30 and 35 cases a month and most of them were bitten by **A. rhodostoma,** although cases bitten by other Viperid and Elapid snakes were also occasionally admitted.

Most of the victims of **A. rhodostoma** were rubber tappers, farmers in padi fields, and people using the forest paths. In the case of **T. purpureomaculatus,** the majority of the vicitms were wood cutters in mangrove swamps.

Of the **Trimeresurus** species, the Speckled Pit Viper, **T. wagleri,** is the commonest. It is abundant in lowland primary and secondary forests, but rare in mangrove or swamp forests (Tables 1 & 2). It feeds on small mammals and birds (Table 3).

This is an arboreal snake. In the forest, it is usually found clinging to branches of trees and bamboos and also found clinging to shrubs on the forest floor as low as two to three feet high. Unlike **A. rhodostoma,** it is seldom found on the forest floor. It is viviparous

Fig. 4: Wagler's Pit Viper, *Trimeresurus wagleri*. The most obvious characteristic of this genus *Trimeresurus*, is the triangularly-shaped head.

Fig. 5: Malayan Pit Viper, *Ancistrodon rhodostoma*. The colour of this snake is well camouflaged with the habitat.

and gives birth to as many as 40 young at a time. This is the species that is kept at the Snake Temple at Penang giving rise to the name "Temple Snake".

The largest and longest of the pit vipers is the Sumatran Pit Viper, **T. sumatranus.** It is strictly a lowland form and is also found inhabiting the surrounding islands (Table 2). It feeds on small mammals and birds (Table 3). Like **T. wagleri,** this is also an arboreal snake and its behaviour in the forests is similar to that of **T. wagleri.** This snake is very aggressive and strikes vigorously if provoked. In Sabah, East Malaysia, this snake is the main source of viperid snake bites in plantations and in forests.

The Shore Pit Viper, **T. purpureomaculatus** is strictly a lowland snake (Table 2) and is confined to coastal regions in mangrove forests, rarely encountered in bamboo forests in inland areas (Table 1). It feeds on small animals, such as small rodents, birds, and lizards (Table 3). It is also an arboreal snake, found clinging to branches of trees ranging from two to ten feet high.

In the northern parts of West Malaysia, especially in Perlis, Kedah, and Perak, this snake is very numerous in the mangrove and swamp forests, where it is known to be one of the chief causes of snake bites (Reid, 1963).

Trimeresurus puniceus, a rare viper in this country, has been recorded five times only. Two of the five specimens were collected by Tweedie (1941 & 1957) from hilly places in Perak and Johore, the rest were obtained by us in lowland forests in the state of Selangor (Lim 1963 & 1967). All three Selangor specimens were obtained from forest canopy ranging from 20 to 70 feet high.

The tail of this snake is very prehensile, much more so than all the rest of the vipers, attesting to its arboreal adaptation. That it was not found previously in the lowlands may be because of lack of knowledge of the habits of this snake. It is quite probable that if the appropriate habitats are searched for this species in forested areas of other states in West Malaysia, considerable light may be thrown on the distribution of this species in other parts of the country. This species appears to be confined to lowland primary forest (Tables 1 & 2). It feeds on small mammals, birds and lizards (Table 3).

The Pope's Pit Viper, **T. popeoprum**, and the Mountain Pit Viper, **T. monticola,** are widely distributed, but strictly confined to hilly areas, in primary forests (Tables 1 & 2). They feed on small mammals (such as rodents), lizards and birds (Table 3).

Both these vipers, **T. popeoprum** and **T. monticola,** are ground dwellers. They are usually found on the forest floor by the sides or underneath logs. They are sluggish snakes. In captivity, these snakes do not thrive well.

SNAKE BITE RATES

Records of snake bites and bites and stings from other animals, for the period from 1958 to 1959, comprising cases admitted in the government hospitals throughout the 11 states of West Malaysia, were reported by Reid (1963). During the years 1960 through 1968, there were 15,919 admissions of cases of snake bite in the 11 states of West Malaysia (Table 4). Of these, 73.6% were from the four northern states of Perlis, Kedah, Penang and Perak; 7.6% were from the west-central parts in Selangor and Negri

Table 4. Admissions into Government Hospitals of Cases of Snake Bites in Relation to the Number of Deaths in West Malaysia (1960 – 1968).

States	1960		1961		1962		1963		1964		1965		1966		1967		1968		Total (1960–1968)		Percentage of Deaths to Admissions
Population	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	
Perlis 111,867	–	–	–	–	150	4	255	3	307	3	330	1	310	1	389	2	405	–	2,146	14	0.65%
Kedah 873,568	395	4	577	6	658	4	652	5	799	5	800	8	884	5	827	7	917	5	6,509	49	0.75%
Penang 714,423	69	–	71	1	94	2	176	1	144	1	144	2	168	2	117	1	141	1	1,124	11	0.98%
Perak 1,547,090	188	1	157	3	171	2	234	1	241	5	261	3	196	–	210	–	288	4	1,946	19	0.98%
Selangor 1,317,046	39	–	56	–	91	1	72	–	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	157	3	142	1	557	5	0.89%
Negri Sembilan 480,394	–	–	62	–	86	–	34	–	46	–	74	–	100	1	134	1	125	1	661	3	0.46%
Malacca 384,371	1	–	3	–	–	–	1	–	6	–	2	–	–	–	–	–	–	–	13	–	0.00%
Johore 1,216,754	89	–	100	4	132	–	112	1	100	1	125	1	81	–	116	1	98	2	953	10	1.05%
Pahang 399,275	38	–	50	–	62	2	79	–	75	2	86	–	90	1	69	–	85	1	634	6	0.95%
Trengganu 356,530	24	–	33	–	73	1	69	–	98	1	133	–	134	–	120	1	126	–	810	3	0.37%
Kelantan 636,812	–	–	–	–	–	–	57	–	100	–	59	1	102	–	95	–	153	1	566	2	0.35%
11 States 8,039,030	843	5	1,109	14	1,517	16	1,741	11	1,916	18	2,014	16	2,065	10	2,234	16	2,480	16	15,919	122	0.76%

A = Admissions
D = Deaths
N.A. = Not available

Table 5. Admissions into Government Hospitals of Cases Resulting from Bites & Stings of Venomous Animals & Insects in Relation to the Number of Deaths in West Malaysia (1960 – 1968).

States	1960		1961		1962		1963		1964		1965		1966		1967		1968		Total (1960–1968)		Percentage of Deaths to Admissions
Population	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	
Perlis																					
111,867	344	4	332	2	161	1	29	–	38	–	27	–	15	–	16	–	20	–	982	7	0.71%
Kedah																					
873,568	205	2	61	1	68	–	72	–	191	–	171	1	184	–	130	–	146	3	1,228	7	0.57%
Penang																					
714,423	77	–	63	–	102	1	87	–	74	1	55	–	149	2	66	1	38	–	711	5	0.70%
Perak																					
1,547,090	130	1	133	–	163	1	141	–	151	1	147	2	225	–	361	2	364	1	1,815	8	0.44%
Selangor																					
1,317,046	105	–	78	2	125	1	129	–	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	99	–	112	–	648	3	0.46%
Negri Sembilan																					
480,394	180	–	120	–	134	–	112	–	172	–	109	–	117	–	166	2	159	–	1,269	2	0.16%
Malacca																					
384,371	2	–	–	–	1	–	2	–	2	–	1	–	N.A.	N.A.	–	–	–	–	8	–	0.00%
Johore																					
1,216,754	94	1	107	–	128	1	167	1	219	–	232	2	240	1	275	–	168	–	1,630	6	0.37%
Pahang																					
399,275	83	–	60	–	72	–	16	1	73	–	81	–	84	2	73	–	76	–	618	3	0.48%
Trengganu																					
356,530	28	–	25	–	31	2	20	–	27	–	36	–	36	–	74	–	80	–	357	2	0.56%
Kelantan																					
636,812	60	2	73	1	53	–	71	–	12	–	34	1	34	–	49	–	46	–	378	4	1.06%
11 States																					
8,039,030	1,314	10	1,052	6	1,038	7	846	2	959	2	893	6	1,084	5	1,309	5	1,209	4	9,704	47	0.48%

A = Admissions
D = Deaths
N.A. = Not available

Sembilan; 6.1% from the two southern states of Malacca and Johore; 12.7% were from the three eastern states of Pahang, Trengganu and Kelantan.

The high prevalence in the four northwestern states were mostly due to bites inflicted by **A. rhodostoma**, particularly in the two northernmost states (Perlis and Kedah) where Reid (1963) reported that **A. rhodostoma** was responsible for 85% of snake bite cases occurring in these two states (from 1958 to 1959). In the other two northern states, Penang and Perak, sea snakes and other venomous snakes were the main source of snake bites, although occasionally cases of **A. rhodostoma** bites were admitted into hospitals in Penang from either Kedah, Prai or Bukit Mertajam (personal comm. Dr. T. Devaraj). Snake bite cases reported in the rest of the seven states in west-central, eastern and southern parts were from bites of other venomous land or sea snakes and harmless snakes.

In 1958–1959, there were 34 deaths (1.1% death rate) among 2,114 snake bite cases admitted into government hospitals throughout the country (Reid, 1963) as compared with 122 (0.7% death rate) among 15,919 cases from 1960–1968. Of the 34 deaths, 20 occurred in Perlis and Kedah out of 1,428 admissions (Reid, 1963). In 1960–1968, 63 of the 122 deaths occurred in these two states among 8,655 admissions. Although the majority of deaths occurred in Perlis and Kedah, the mortality rate was 0.65% in the former and 0.75% in the latter in the period 1960–1968 as compared with 0.73% and 1.67% respectively in 1958–1959 (Reid, 1963). Penang and Perak had 19.3% of the snake bites, with death rates of 0.98% in each state. The rest of the seven states had 26.4% of the total snake bite cases, with death rates ranging from zero to 1.05%.

were recorded from 1960 to 1968 (Table 5). Most of these bites and stings were inflicted by arthropods, such as wasps, bees, hornets, spiders, scorpions and centipedes, and the rest were by marine animals, such as jelly fish, poisonous shells, sea urchins and fish.

The northern states had the highest prevalence of cases, comprising 48.7% of the total admissions for the country as compared to 19.6% for the west-central states, 16.9% for the southern states and 14.8% for the eastern states. With the exception of Malacca and Kelantan, the average mortality rate was about 0.5%. In Malacca, there were no reported fatalities among only eight admissions during the 8-year period (excluding 1966, when no information was available). In Kelantan, the mortality rate appeared to be the highest, 1.06% of 378 admissions.

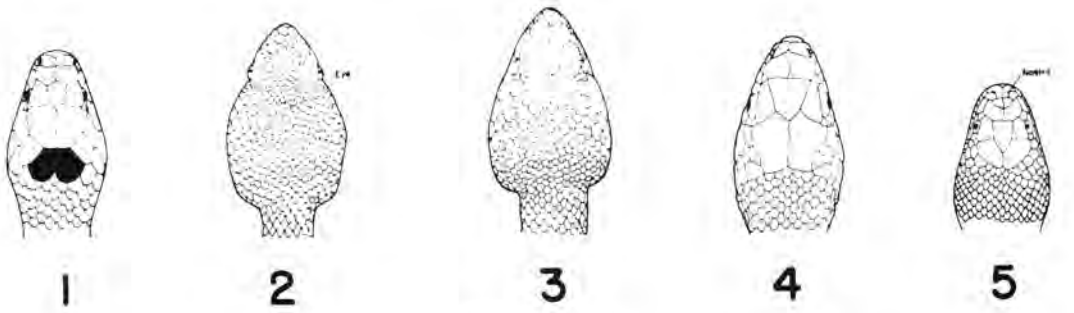
DISCUSSION

The elapid snakes, all but the Common Cobra, were found to feed on reptiles and amphibians. The Common Cobra feeds mainly on small rodents, such as field rats, and, to a lesser extent, on amphibians, e.g. frogs. The viperid snakes appear to be very adaptable in their food habits as they take not only warm-blooded vertebrates but also the cold-blooded vertebrates.

Cannibalism among the elapid snakes appears to be very common. This has been found in Kraits, Coral Snakes and King Cobras in previous investigations (Lim, 1956 & 1960). It is, therefore, reasonable to assume that their cannibalistic behaviour may help maintain a natural population balance of the elapid snakes. This may have a bearing on the ideas of Wynne-Edwards (1962) in regard to self-regulation of animal numbers.

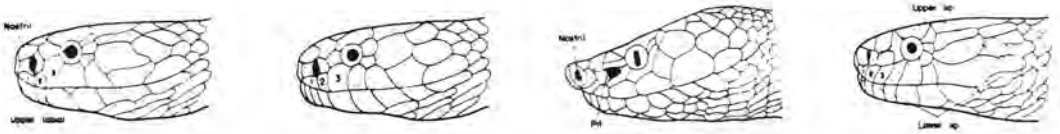
1. Tail flattened like the blade of an oar (Fig. 13) ..... Sea Snakes
   Tail not so ..... Land and fresh and tidal water Snakes 2
2. Head (Fig. 1) with the side of head (Fig. 6) with belly (Fig. 10) and with tail (Fig. 15) ..... *Ophiophagus hannah* (KING COBRA)
   Head (Fig. 2) with side of head (Fig. 8) with belly (Fig. 10) and with tail (Fig. 17) ..... *Trimeresurus* spp. (PIT VIPERS)
   Head (Fig. 3) with side of head (Fig. 8) with belly (Fig. 10) and with tail (Fig. 17) ..... *Ancistrodon rhodostoma* (MARBLED PIT VIPER)
   Head (Figs. 4 & 5) 3
3. Side of head (Fig. 6) with head (Fig. 4) with belly (Fig. 10) and with tail (Fig. 18) ..... *Naja naja* (COMMON COBRA)
   Side of head (Fig. 7) with head (Fig. 4) with belly (Fig. 10) and with tail (Figs. 14 & 15) ..... *Bungarus* spp. (KRAITS)
   Side of head (Fig. 7) with head (Fig. 4) with belly (Fig. 10) and with tail (Figs. 17 & 18) ..... *Maticora* spp. and *Callophis* spp. (CORAL SNAKES)
   Side of head (Fig. 9) and with head (Fig. 5) 4
4. Tail (Fig. 13) and with belly (Fig. 12) ..... Sea Snakes
   Tail (Figs. 16–18) and with belly (Figs. 11 & 12) ..... Fresh and tidal water snakes (HARMLESS)

DIFFERENCES BETWEEN VENOMOUS AND HARMLESS SNAKES OF MALAYSIA



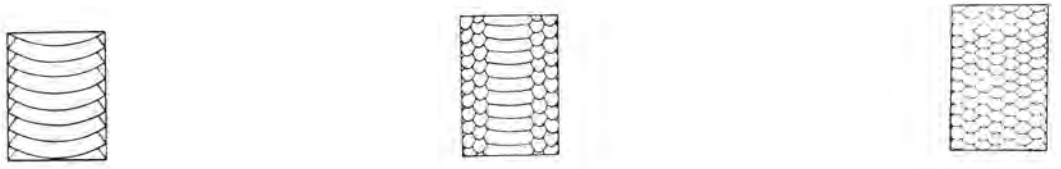
1 2 3 4 5

HEAD (TOP)



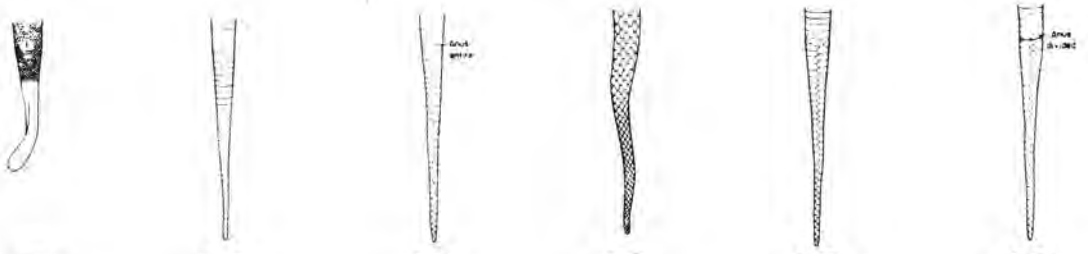
6 7 8 9

HEAD (SIDE)



10 11 12

BELLY



13 14 15 16 17 18

TAIL

According to Inche Hassan bin Haji Mohd. Nor (1965), the estimated population in the 11 states of West Malaysia was 8,039,030. The least populated state is Perlis, with a population of 111,867 and the highest is Perak, 1,547,090. Snake bite cases involved less than 0.2% of the total human population throughout West Malaysia. Even in the two northernmost states, Perlis and Kedah, where prevalence of snake bites was highest, the death rate was very small (Table 4).

BITES AND STINGS OF VENOMOUS ANIMALS OTHER THAN SNAKES

An overall mortality rate of 0.48% of a total of 9,704 admissions resulting from bites and stings of insects and venomous vertebrates other than snakes

Harrison (1956) stated that snakes may serve to keep numbers of wild rats down in nature. Lim (1961) reported that 63 or 98 species of land snakes, including the venomous species, fed mainly on rats, but that amphibians and reptiles were also taken by some of these snakes. The common cobra and all of the viperid snakes, although potentially dangerous to humans, therefore play some essential economic roles as predators on pests, such as rats.

Although snake bites are a serious medical problem in Malaysia, particularly in the northwestern part of West Malaysia, deaths from snake bites are surprisingly few. The present report supports the findings of Reid (1963) that the two northernmost states, Perlis and Kedah, have the highest incidence of snake bites and have more deaths than any other states. The mortality rate, however, is less than 1%.

In other states, the death rate is even lower. **A. rhodostoma** has been the main cause of snake bites in the northwestern states, whereas venomous snakes, such as cobras, kraits, coral snakes, vipers, sea-snakes and including harmless snakes, were involved in snake bite cases in the west-central, southern and eastern states of West Malaysia.

It is evident from the present report and from investigations carried out by other workers that the prevalence of snake bite cases in West Malaysia is influenced by the local distribution and abundance of the various species of venomous snakes, especially those that are commonly found near human habitations, particularly in the northwestern states of West Malaysia. With the exception of **A. rhodostoma** and **C. maculiceps** that are confined to the northern parts of West Malaysia extending south as far as Perak, the rest of the venomous snakes are widely distributed throughout the country.

During 1958–1959, admissions to general hospitals throughout the country due to bites and stings of venomous animals other than snakes were 2,070 cases, with 20 deaths (Reid, 1963). For the period 1960–1968, a total of 9,704 admissions, with 47 deaths (0.48% death rate), were recorded (Table 5).

Archer (1958) stated that hornets were commonly encountered in the Malaysian forests and these insects were very aggressive, especially in the vicinity of their nests. Deaths from bee or wasp stings were caused by multiple stings and by the amount of the venom injected. Reports of deaths of humans, water buffaloes, and even elephants due to the giant Asian bee, **Apis dorsata**, were also cited and Tweedie (1941) reported that bites and stings by scorpions, bees, wasps, spiders, centipedes, jelly fish, sea urchins and cones (shells) were common. Lately, a case of spider bite was reported by Lim and Davis (1970), but the patient recovered 12 hours after hospitalisation.

It is evident from these records that apart from snake envenomations, bites and stings by other venomous animals poses a potential danger to man, although the death rate reported for the periods 1960–1968 was less than 0.5%.

SUMMARY

During the period 1960–1968, 15,919 cases of snake bites and 9,704 cases of bites and stings by other venomous animals were admitted to hospitals throughout West Malaysia. Death rates resulting from the former averaged 0.76% and the latter 0.48%. The distribution of the venomous land snakes, their habits, and feeding behaviour are discussed.

ACKNOWLEDGEMENTS

This study was made possible through the co-operation of the staff of the Medical Ecology, Institute for Medical Research, Kuala Lumpur. We are grateful to Dr. M. Mahathevan, State Health Officer in Sungei Patani, Kedah; Dr. T. Devaraj, Director, Snake and Venom Research Institute, Penang; for their help in providing information on patients bitten by venomous animals in their respective areas, and also to the Ministry of Health, Kuala Lumpur, particularly to Mr. E.J. Martinez, for sending us the data on stings and bites by venomous animals for 1960–1968; to Mr. Lee Eng Kee for his assistance in the illustration of the snake chart.

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