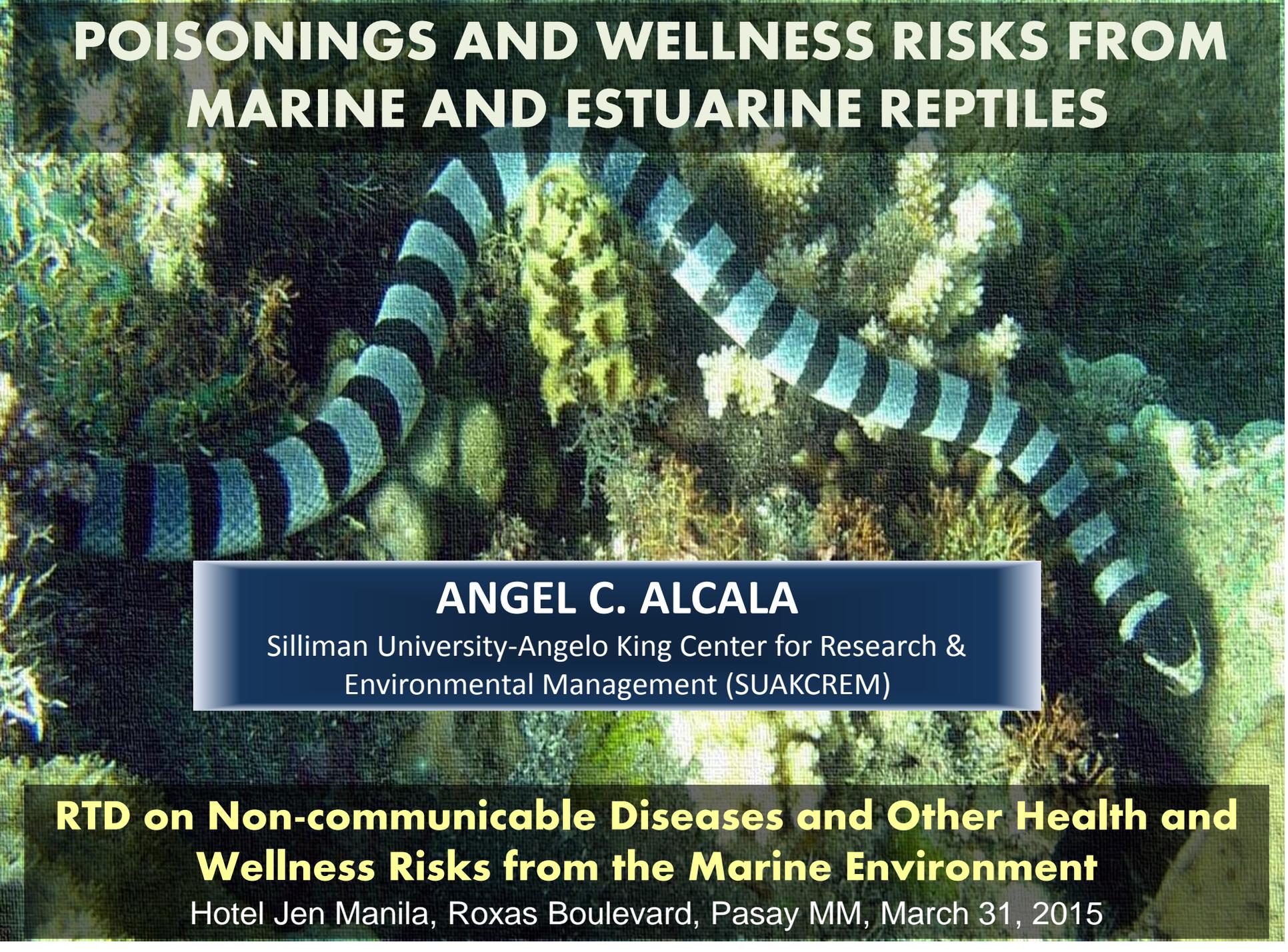


POISONINGS AND WELLNESS RISKS FROM MARINE AND ESTUARINE REPTILES

A large sea snake with prominent black and white bands is swimming in a coral reef. The snake's body is curved, and it is surrounded by various types of coral and marine life. The lighting is somewhat dim, typical of an underwater environment.

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Silliman University-Angelo King Center for Research &
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**RTD on Non-communicable Diseases and Other Health and
Wellness Risks from the Marine Environment**

Hotel Jen Manila, Roxas Boulevard, Pasay MM, March 31, 2015

BITES of SEA SNAKES and SEA KRAITS in the Philippines are wellness and health risks from the marine environment

- * Snakes are Widespread in the internal seas of the Philippines, Sulu & Sulawesi Seas, West Philippine Sea**
- * ca.15 species of Sea Snakes & Sea Kraits in the Phils:**
 - Sea Snakes = Viviparous (giving live births)**
 - Sea Kraits = Oviparous (lay eggs)**
- *Subfamily Hydrophiinae, family Elapidae**

All species pose considerable risk to man from potential envenomation thro' their bites

Aipysurus eydouxii and *Emydocephalus annulatus*

- ✓ feed on fish eggs
- ✓ greatly reduced fangs & toxicity
- ✓ have small gapes, hence not effective in causing serious envenomation



Aipysurus eydouxii

Photo: Chek Jawa www.wildsingapore.com



Emydocephalus annulatus

May not deliver enough venom to cause serious harm, but **CAUTION** still needed

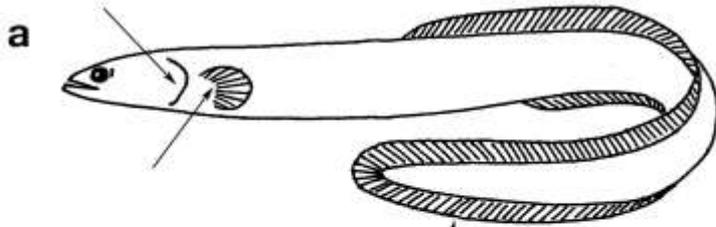
VENOMOUS SEA SNAKE SPECIES REPORTED FROM PHILIPPINE WATERS

Species	Areas Found
<i>Emydocephalus annulatus</i> Krefft	Probably found throughout the country. Recorded from coral reefs off Negros, northern Mindanao and Bohol.
<i>Hydrophis belcheri</i> Gray	Reported from sea in central Philippines (Visayan Sea).
<i>Hydrophis caerulescens</i> Shaw	Probably present in Philippine seas but no definite records.
<i>Hydrophis cyanocinctus</i> Daudin	Luzon marine waters and the Visayan Sea.
<i>Hydrophis fasciatus</i> Schneider	Recorded from the Visayan Sea and seas around Samar, Mindanao and Sulu.
<i>Hydrophis inornatus</i> Gray	Recorded from marine waters of eastern Luzon
<i>Hydrophis melanocephalus</i> Gray	Pacific Ocean to Australia
<i>Hydrophis ornatus</i> Gray	Visayan Sea, central Philippines.
<i>Hydrophis semperi</i> Garman	Found only in Lake Taal, endemic to the Philippines.
<i>Hydrophis spiralis</i> Shaw	Only one record in the Philippines; range not known.
<i>Lapemis hardwickii</i> Gray	Recorded from the Visayan Sea, also probably in large bodies of marine water south to New Guinea and Australia.

VENOMOUS SEA SNAKE SPECIES REPORTED FROM PHILIPPINE WATERS , cont'd

SPECIES	AREAS FOUND
<i>Laticauda colubrina</i> Schneider	Found in shallow waters along seacoasts throughout the country.
<i>Laticauda laticaudata</i> Linnaeus	Found in shallow waters around small islands throughout the country.
<i>Laticauda semifasciata</i> Reinwardt	Known to occur throughout the Philippines, including northern Cebu.
<i>Pelamis platurus</i> Linnaeus	In coastal waters throughout the country. It is a pelagic species and has the widest distribution among sea snakes.

DISTINGUISHING CHARACTERISTICS



SNAKE-LIKE FISH



SEA SNAKE

*Flattened, padde-shaped tail

*Valved nostrils

*Sublingual salt excreting gland

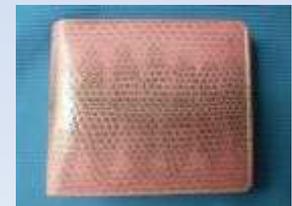


TERRESTRIAL SNAKE

OTHER CHARACTERISTICS

HABITS/HABITATS

- ❖ Can stay in the bottom at more than 100m up to 2 hrs w/o surfacing
- ❖ *Laticauda* uses the skin to take in oxygen
- ❖ Inhabit bottom environments of mouths of rivers coral reefs, estuaries, mangrove swamps; freshwater of Lake Taal (*Hydrophis semperi*)
- ❖ Most species feed on the surface ; Most spp. feed on elongated fish; *Aipysurus* and *Emydocephalus* feed on fish eggs
- ❖ Sea Snakes = Viviparous (giving live births)
Sea Kraits = Oviparous, laying eggs in rock crevices on small islands/rocky shores
- ❖ Skins and meat of economic importance



**SEA KRAIT *Laticauda colubrina* in Minalayo,
Snake Island, Ticao, Masbate**



VENOMOUS SNAKES



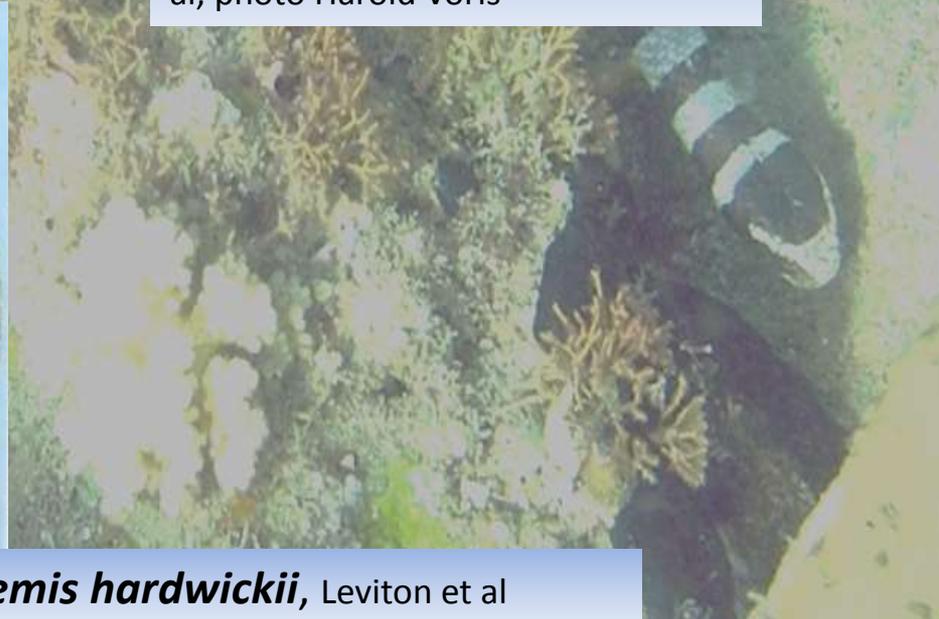
Hydrophis cyanocinctus_ Leviton et al, photo Harold Voris



Hydrophis semperi_ Leviton et al, photo Harold Voris



Lapemis hardwickii, Leviton et al





Yellow-bellied Sea snake *Pelamis platurus*, Leviton et al. Photos :John Tashjian (L) & William Flaxington (R)



Turtle-headed sea snake *Emydocephalus annulatus* (Photos: K. Stiefel (L), J Maypa (R))



Yellow-lipped Sea Krait *Laticauda colubrina*



VENOM APPARATUS

- ❖ 2 Front fangs, Venom glands and Associated muscles

Elapids = Fixed front fangs

=Venom-conducting teeth are grooved or closed canal to facilitate flow of venom from the venom gland to the tissues of the victim

Viperids= 2 Movable fangs w/c are replaceable



Front-fanged, Greene 1997
(Ex. Elapids, Viperids)



Rear-fanged, Greene,1997
(Ex. Colubrids or common snakes)

EFFECTS OF SEA SNAKE VENOMS

Toxins attack **Nervous System** and **Skeletal Muscles**

- = Clenched jaws, Dark urine, Respiratory failure
- = Symptoms of envenomation may appear a few minutes to several hours after bites from the more dangerous spp:
(*Enhydrina schistosa*, *Hydrophis cyanocinctus*,
Lapemis hardwickii, *Pelamis platyurus*)
 - ❖ Generalized aching or stiffness of muscles
 - ❖ Difficulty in speaking and swallowing
 - ❖ Muscular paralysis
 - ❖ Nausea & vomiting

EFFECTS OF SEA SNAKE VENOMS

- ❖ Weak or irregular pulse
- ❖ Muscular twitchings and spasms
- ❖ Jaw stiffness
- ❖ Ocular & facial paralysis
- ❖ Albuminuria (Albumin in urine)
- ❖ Hemoglobinuria, Myoglobinuria (Hemoglobin or myoglobin in urine)
- ❖ Respiratory Failure.....then death if not treated

EFFECTS OF SEA SNAKE VENOMS, Cont'd

(*Laticauda* venom less dangerous to humans altho' may be fatal to rats, mice, guinea pigs, rabbits)



Laticauda laticaudata, Leviton et al



Black-lipped Sea Krait *Laticauda laticaudata* in Pinyahon Islet, Sibutad, Zamboanga del Norte

FIRST AID PROCEDURES

- ✓ Apply compression bandage to affected site
- ✓ Immobilize victim and bring to hospital/clinic
- ✓ If breathing is difficult, victim should be placed in assisted breathing
- ✓ Administer anticholinesterase drug (Neostigmine or Edrophonium) to improve neuromuscular transmission or Give Atropine
- ✓ Offending sea snake species should be identified
- ✓ Administer antivenom if w/ signs of local envenomation, but make Epinephrine available in case of anaphylaxis or shock

FIRST AID PROCEDURES, Cont'd

- ✓ **Epinephrine** is used to determine allergic reactions
- ✓ **Use only antivenom manufactured in the country** against the offending species
- ✓ **Doctor should monitor patient** at least 1 hour
- ✓ If antivenom is expensive or unavailable, victims should **have prolonged artificial respiration** until paralysis from neurotoxin wears off
- ✓ **Bolster circulation** of victims with IV fluids

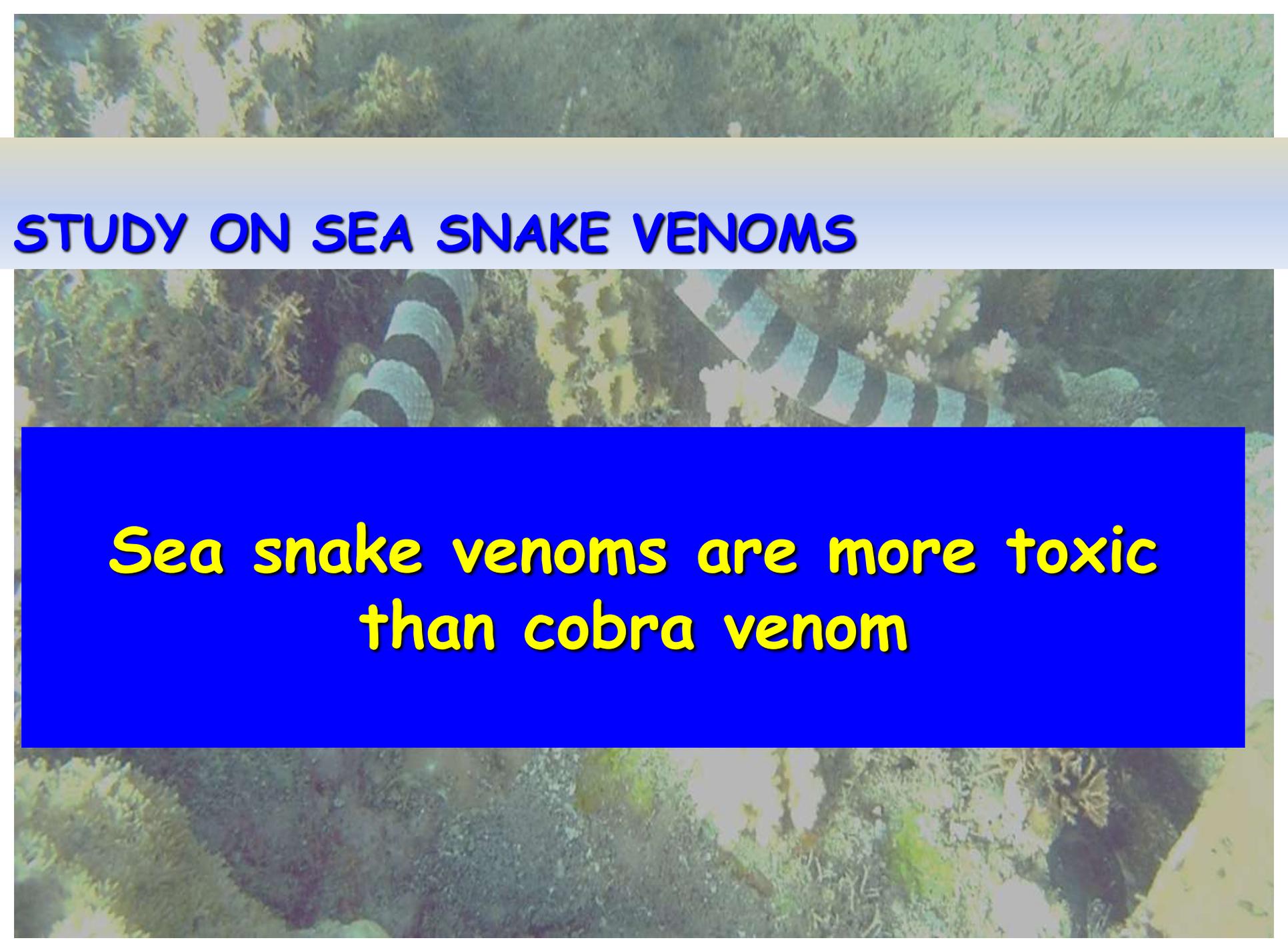
STUDY ON SEA SNAKE VENOMS

Mean Lethal Dose (MLD) of Venom (mg /kg body weight of experimental animal)

	Mice	Dog	Monkey	Chimpanzee
1. <i>Laticauda colubrina</i>	0.113			
(Cobra)	0.25			
2. <i>L. laticaudata</i>	0.06	0.05	0.08	0.10
3. <i>L. semifasciata</i>	0.08	0.01	0.01	0.10

STUDY ON SEA SNAKE VENOMS

- ❖ **Purifications on:** Lapemis hardwickii, Enhydrina schistosa, Laticauda laticaudata, L. colubrina and L. semifasciata
- ❖ **Amino acid sequence of sea snake neurotoxins found to be PROTEIN in nature, w/ high molecular weights:** Lapemis, Enhydrina, Laticauda and Hydrophis cyanosinctus

An underwater scene featuring a sea snake with prominent black and white vertical stripes swimming through clear, blue water. The background shows a sandy seabed with some green and brown marine plants or coral.

STUDY ON SEA SNAKE VENOMS

**Sea snake venoms are more toxic
than cobra venom**

PUBLIC HEALTH ASPECTS of sea snake poisoning

Difficult to evaluate due to:

- 1. Lack of accurate statistics and unreported cases**
- 2. Cultural beliefs & local superstitions**

ex. Bites will be fatal after 8 hrs. have elapsed

ex. Several common "cures" w/o scientific bases

ex. W/holding information on snake bites because

of fear of retaliation from the offending snake

STATISTICS

- *50 YEARS AGO, after advent of antivenoms- 500,000-1 million people (mostly in tropical countries) were snakebite victims*
- *40,000 at least were killed per year, ~25,000-35,000 in Asia, mostly FISHERMEN*
- *Rate of fatality in Philippines: ?*

RECORDED POISONING INSTANCES

	Victims	Region	Example	Sea Snake bites recorded	Results
INDONESIA	Fishermen	Coasts of SE Asia, Persian Gulf, Malay Archipelago	In 1944-45: 17 Villages in Malaysia (40,100 pax)	144	41 fatal
DEVELOPED COUNTRIES	<p style="text-align: center;">Less than 1 % fatality</p> <p>Probable Reason: Availability of Antivenom in hospitals & Proper treatment)</p>				



RECOMMENDATIONS

1. Continue to produce antivenom in the country and make them available in hospitals

2. Some Physicians should be trained in recognizing species of venomous snakes

3. Disseminate educational materials on venomous sea snakes and sea kraits including instructions on how to avoid snake bites and what to do in bite cases

4. Encourage Research on possible uses of snake venom other than for production of antivenom

RECOMMENDATIONS, cont'd

5. Learn techniques of handling venomous snakes

6. Have a Research Program on Philippine seasnakes to fill existing gaps, i.e. no. of species & and their geographic distributions and their ecology

FOR MORE INFORMATION ABOUT SEA SNAKES AND SEA KRAITS

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