

*rhodostoma*.

**Cat 1:** *Bungarus candidus*, *Calloselasma rhodostoma*, *Naja kaouthia* (south); *Bungarus multicinctus*, *Bungarus slowinskii*, *Deinagkistrodon acutus*, *Naja atra* (north); *Cryptelytrops albolabris* (throughout) **Cat 2:** *Bungarus flaviceps*, *Cryptelytrops macrops*, *Naja siamensis* (south); *Protobothrops mucrosquamatus* (north); *Bungarus fasciatus*, *Ophiophagus hannah*, *Viridovipera stejnegeri*

**Australo-Papua (Including Pacific Islands):** There are no medically important land snakes in American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Northern Mariana Islands, Pitcairn Island, Samoa, Tokelau, Tonga, Tuvalu, or Wallis and Futuna Islands. Fiji possesses a single terrestrial venomous snake species (*Ogmodon vitianus*) while the Solomon Islands possess three terrestrial venomous species (*Salomonelaps elapoides*, *Loveridgelaps salomonis* and *Parapistocalamus par*) with no, and few, snakebites respectively

**Australia:** Approximately 1,100-1,500 snakebite envenomings occur in Australia annually with an average incidence of 4.76/100,000/year (Currie, 2000). The number of deaths due to snakebite ranges from 2-5 (0.01-0.02/100,000/year). Brown snakes (*Pseudonaja textilis* etc.) cause most bites and deaths, followed by tiger snakes (*Notechis scutatus* etc.).

**Cat 1:** *Notechis scutatus*, *Pseudonaja affinis*, *Pseudonaja nuchalis*, *Pseudonaja textilis* **Cat 2:** *Acanthophis antarcticus*, *Acanthophis* spp., *Austrelaps* spp., *Hoplocephalus* spp., *Oxyuranus scutellatus*, *Oxyuranus microlepidotus*, *Oxyuranus temporalis*, *Pseudechis australis*, *Pseudechis* spp., *Tropidechis carinatus*

**Indonesia (West Papua & Makulu):** It is important to recognise that the fauna of West Papua Province is Australo-Papuan in origin and hence the venomous snake fauna are biogeographically distinct from that of the rest of Indonesia. The smooth-scaled death adder (*Acanthophis laevis*) is the most widespread venomous species in West Papua.

**Cat 1:** *Acanthophis laevis* **Cat 2:** *Acanthophis rugosus*, *Micropechis ikaheka*, *Oxyuranus scutellatus*, *Pseudechis papuanus*, *Pseudechis rosignoli*, *Pseudonaja textilis*

**Papua New Guinea:** The incidence of bites was 215/100,000/year with a mortality rate of 7.9/100,000/year in Central Province while in Kairuku subprovince there were 526 bites/100,000/year (Lalloo *et al*, 1995). It is estimated that there are 3200 bites with about 500- 1500 snakebite envenomings and 200 deaths in Papua New Guinea (Data: Australian Venom Research Unit; Williams, 2005). The most important species are taipans (*Oxyuranus scutellatus*), and smooth-scaled death adders (*Acanthophis laevis*.)

**Cat 1:** *Acanthophis laevis*, *Oxyuranus scutellatus* **Cat 2:** *Acanthophis rugosus*, *Micropechis ikaheka*, *Pseudonaja textilis*, *Pseudechis papuanus*, *Pseudechis rosignoli*

## EUROPE

**Central Europe Albania, Bulgaria, Romania, Serbia, Slovenia, Former Yugoslav Republic of Macedonia:** There are no published epidemiological data available.

**Cat 1:** *Vipera ammodytes* **Cat 2:** *Vipera berus*

**Bosnia and Herzegovina:** There are no published epidemiological data available. One hospital reported between 10-70 cases of envenoming per year (Bubalo *et al.*, 2004).

**Cat 1:** *Vipera ammodytes* **Cat 2:** *Vipera berus*

**Croatia:** In Southern Croatia, the mean annual incidence is 5.2/100,000/year, with the

majority of bites caused by *Vipera ammodytes* (Luksic et al., 2006).

**Cat 1:** *Vipera ammodytes* **Cat 2:** *Vipera berus*

**Czech Republic:** Valenta et al (2000) reports incidence as being "several tens per year".

**Cat 1:** None **Cat 2:** *Vipera berus*

**Greece:** The majority of snakebites in Greece are caused by *Vipera ammodytes* (Frangides et al, 2003). Other species of lesser medical importance include *Montivipera xanthina*, *Macrovipera schweizeri*, *V. berus* and *V. ursinii*.

**Cat 1:** *Vipera ammodytes* **Cat 2:** *Macrovipera schweizeri*, *Montivipera xanthina*, *Vipera berus*, *Vipera ursinii*

**Hungary:** A recent report suggests that only 31.5% of the 3-4 snakebites each year from 1970- 2006 were by native species (*V. berus*, *V. ursinii*) while 68.5% are by exotic species kept as pets (Malina et al, 2008).

**Cat 1:** None **Cat 2:** *Vipera berus*, *Vipera ursinii*

**Poland:** Twenty-five cases of *Vipera berus* envenoming were reported in the Silesia region of Poland between 1999 and 2003 (Kepa et al, 2004). Only four cases were graded as severe. **Cat 1:** None **Cat 2:** *Vipera berus*

**Slovakia:** From 1993-2002 there were 81 reports of snakebite to the National Toxicological Information Center; 73 of these were by *Vipera berus*, 7 were caused by exotic venomous snakes (Kresanek et al, 2004).

**Cat 1:** None **Cat 2:** *Vipera berus*

### **Eastern Europe**

**Belarus, Estonia, Latvia, Lithuania,**

**Moldova:** There are no published epidemiological data available.

**Cat 1:** None **Cat 2:** *Vipera berus*

**Russian Federation:** In 2005-2006 there were 109 cases including 4 fatalities in the 5 Urals territories of the Russian Federation; 142 bites with 9 fatalities from 8 territories of Siberia and the Russian Far East; and 287 bites including 22 fatalities in the 14 territories of European Russia (Data: Federal Agency on Health and Social Development Research and Applied Toxicology Center, Moscow). Dangerous species include *Vipera berus*, *Macrovipera lebetina*, and *Gloydius halys* (Urals); *Gloydius intermedius* and *G. brevicaudus* (Russian Far East); and *Vipera berus* (European Russia).

**Cat 1:** *Vipera berus* **Cat 2:** *Gloydius brevicaudus*, *Gloydius intermedius*, (far-east Russia); *Macrovipera lebetina* (Dagestan); *Gloydius halys*, *Vipera ursinii*

**Ukraine:** There are no published epidemiological data available.

**Cat 1:** None **Cat 2:** *Vipera berus*, *Vipera nikolskii*, *Vipera renardi*

**Western Europe: Austria:** There are no published epidemiological data available.

**Cat 1:** None **Cat 2:** *Vipera ammodytes*, *Vipera berus*

**Belgium:** There are no published epidemiological data available.

**Cat 1:** None **Cat 2:** *Vipera berus* **Denmark** There are no published epidemiological data available. **Cat 1:** None **Cat 2:** *Vipera berus*

**Finland:** There are no published epidemiological data

**Cat 1:** None **Cat 2:** *Vipera berus*

**France:** There are less than 1,500 snakebite envenomings (Chippaux and Goyffon, 1989) due to bites by *V. berus* and *V. aspis* each year, but only 300 cases of envenoming

admitted to hospital, about half of which are treated with antivenom and with a few deaths.

**Cat 1:** *Vipera aspis* **Cat 2:** *Vipera berus*

**Germany:** There are no published epidemiological data available.

**Cat 1:** None **Cat 2:** *Vipera berus* **Italy:** From 1980 to 1984, a total of 2,329 people reporting bites by venomous snakes were admitted to hospitals (average 466 per year), three died (Pozio 1988).

**Cat 1:** *Vipera aspis* **Cat 2:** *Vipera berus*, *Vipera ammodytes*

**Netherlands:** Snakebites (*Vipera berus*) are reported to be rare. About 15 snakebite envenomings are reported annually (Data: National Vergiftingen Informatie Centrum).

**Cat 1:** None **Cat 2:** *Vipera berus*

**Norway:** About 40 enquiries about *Vipera berus* bites each year are received by the Norwegian National Poisons Information Centre.

**Cat 1:** None **Cat 2:** *Vipera berus*

**Portugal:** There are no published epidemiological data available at present.

**Cat 1:** None **Cat 2:** *Vipera aspis*, *Vipera latastei*, *Vipera seoanei*

**Spain:** There may be as many as 600 cases of snakebite envenomings per year (Persson, 1995). Deaths are rare. *Vipera latasti*, *V. aspis* and *V. seoanei* are important.

**Cat 1:** None **Cat 2:** *Vipera aspis*, *Vipera latastei*, *Vipera seoanei*

**Sweden:** There were 44 deaths caused by *V. berus* in Sweden between 1911 and 1978 but in 1995, 231 patients were treated in hospitals and none died (Karlson-Stiber et al. 2006).

**Cat 1:** *Vipera berus* **Cat 2:** None

**Switzerland:** About 40 snakebite envenomings occur in Switzerland annually (Data: Swiss Toxicological Information Centre).

**Cat 1:** None **Cat 2:** *Vipera aspis*, *Vipera berus*

**United Kingdom:** There are more than 200 adder (*Vipera berus*) bites each year but there have been only 14 deaths during the last hundred years, the last in 1975 (Warrell 2005a).

**Cat 1:** *Vipera berus* **Cat 2:** None

## THE AMERICAS

### North America USA and Canada

Of the estimated 45,000 bites and 7,000-8,000 treated snakebites each year in USA (and a few in Canada), 70% are attributed to rattlesnakes, 20% to copperheads, 9% to cottonmouth water moccasins and 1% to coral snakes or exotic other species. From 2001-2005 an average of 4,800 native venomous snake exposures/year and 50 exotic venomous snake exposures/year were reported to poison centers (Seifert et al, 2007; Seifert, 2008a,b) The number of snakebite deaths reported range from 5 to 10 (Forrester and Stanley, 2004). The very few fatal cases each year are caused by rattlesnakes (*Crotalus adamanteus*, *C. atrox*, *C. horridus*, *C. oreganus*, *C. scutulatus*, and *C. viridis*).

Canada

**Cat 1:** None **Cat 2:** *Crotalus oreganus*, *Crotalus viridis*, *Sistrurus catenatus*

United States of America

**Cat 1:** *Agkistrodon contortrix*, *Agkistrodon piscivorus*, *Crotalus adamanteus*, *Crotalus atrox*, *Crotalus horridus*, *Crotalus oreganus*, *Crotalus scutulatus*, *Crotalus viridis* **Cat 2:** *Crotalus molossus*, *Crotalus ruber*, *Crotalus* spp., *Micrurus fulvius*, *Micrurus tener*, *Sistrurus miliaris*, *Sistrurus catenatus*

**Mexico:** In 2005, 48,371 cases of attacks by venomous animals (ICD 10<sup>th</sup> Rev T63 excluding T63.2 scorpions) were reported in Mexico (Data: Vigilancia Epidemiológica Semana 51). On average about 28,000 snakebite envenomings occur in Mexico each year (Frayre-Torres *et al.*, 2006).

**Cat 1:** *Agkistrodon bilineatus*, *Agkistrodon taylori*, *Crotalus atrox*, *Crotalus scutulatus*, *Crotalus simus*, *Crotalus totonacus*, *Bothrops asper* **Cat 2:** *Agkistrodon contortrix*, *Atropoides* spp., *Bothriechis* spp., *Cerrophidion* spp., *Crotalus basiliscus*, *Crotalus molossus*, *Crotalus oreganus*, *Crotalus ruber*, *Crotalus viridis*, *Crotalus* spp., *Ophryacus* spp., *Micruroides euryxanthus*, *Micrurus tener*, *Micrurus* spp., *Porthidium* spp., *Sistrurus miliaris*, *Sistrurus catenatus*

**Central America** The most medically important species are *Crotalus simus* and *Bothrops asper*. In Central American countries, the average annual rate of bites is 600 in Costa Rica, 600-1000 in Guatemala and Honduras, 500 in Nicaragua (Gutiérrez *et al.*, 2006) and 2,000-2,500 in Panama (Gutiérrez *et al.*, 2006; Ministerio de Salud, Panama). A few cases occur in El Salvador and Belize. Fatalities have decreased to almost zero in Costa Rica and in Mexico.

**Belize:** There are no published epidemiological data available.

**Cat 1:** *Bothrops asper* **Cat 2:** *Agkistrodon bilineatus*, *Atropoides mexicanus*, *Bothriechis schlegelii*, *Crotalus tzabcan*, *Micrurus* spp., *Porthidium nasutum*

**Costa-Rica:** The incidence of envenoming was estimated at 20/100,000/year in 1995, translating to approximately 680 cases/year (Rojas *et al.*, 1997). Recent estimates cite 500-600 envenomings (11-13/100,000/yr) and 0-5 deaths (0.1/100,000/year) in Costa-Rica (Sasa & Vázquez, 2003; Gutiérrez *et al.*, 2006).

**Cat 1:** *Bothrops asper*, *Crotalus simus* **Cat 2:** *Agkistrodon bilineatus*, *Atropoides* spp., *Bothriechis schlegelii*, *Bothriechis lateralis*, *Bothriechis* spp., *Cerrophidion godmani*, *Lachesis melanocephala*, *Lachesis stenophrys*, *Micrurus nigrocinctus*, *Micrurus* spp., *Porthidium nasutum*, *Porthidium* spp.

**El Salvador:** There are about 50 cases of envenoming per year (Gutiérrez *et al.*, 2006).

**Cat 1:** *Crotalus simus* **Cat 2:** *Agkistrodon bilineatus*, *Atropoides occiduus*, *Cerrophidion godmani*, *Micrurus nigrocinctus*, *Porthidium ophryomegas*

**Guatemala:** About 600-1000 envenomings are reported annually (Gutiérrez *et al.*, 2006).

**Cat 1:** *Bothrops asper*, *Crotalus simus* **Cat 2:** *Agkistrodon bilineatus*, *Atropoides* spp., *Bothriechis schlegelii*, *Bothriechis* spp., *Cerrophidion godmani*, *Micrurus nigrocinctus*, *Micrurus* spp., *Porthidium nasutum*, *Porthidium ophryomegas*.

**Honduras:** There are 600-1000 envenomings in Honduras (Gutiérrez *et al.*, 2006). **Cat 1:** *Bothrops asper* **Cat 2:** *Agkistrodon bilineatus*, *Atropoides* spp., *Bothriechis marchi*, *Bothriechis schlegelii*, *Bothriechis* spp., *Cerrophidion godmani*, *Crotalus simus*, *Micrurus nigrocinctus*, *Micrurus* spp., *Porthidium nasutum*, *Porthidium ophryomegas*

**Nicaragua:** About 800 envenomings are reported per year (Gutiérrez *et al.*, 2006). **Cat 1:** *Bothrops asper*, *Crotalus simus* **Cat 2:** *Agkistrodon bilineatus*, *Atropoides mexicanus*,

*Bothriechis lateralis*, *Bothriechis* spp., *Bothriechis schlegelii*, *Cerrophidion godmani*, *Lachesis stenophrys*, *Micrurus nigrocinctus*, *Micrurus* spp., *Porthidium nasutum*, *Porthidium ophryomegas*

**Panamá:** About 2,000-2,500 envenomings occur annually (Gutiérrez *et al.*, 2006). **Cat 1:** *Bothrops asper* **Cat 2:** *Bothriechis lateralis*, *Bothriechis schlegelii*, *Bothriechis* spp., *Cerrophidion godmani*, *Lachesis acrochorda*, *Lachesis stenophrys*, *Micrurus nigrocinctus*, *Micrurus* spp., *Porthidium nasutum*, *Porthidium* spp.

**Caribbean** No medically important snakes occur naturally in Anguilla, Antigua and Barbuda, Bahamas, Barbados, Bermuda, British Virgin Islands, Cayman Islands, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Montserrat, Netherland Antilles, St Kitts and Nevis, St Vincent and Grenadine and Turks and Caicos Island.

**Aruba, Martinique, St Lucia, Trinidad and offshore islands:** About 20 snakebite envenomings have been reported from Martinique each year (Thomas *et al.*, 1996). Among the other islands there are fewer than 50 bites per year with occasional deaths (Warrell 2004).

**Cat 1:** *Crotalus durissus* (Aruba); *Bothrops lanceolatus* (Martinique); *Bothrops caribbaeus* (St Lucia); *Bothrops cf. atrox* (Trinidad) **Cat 2:** *Lachesis muta*, *Micrurus lemniscatus*, *Micrurus circinalis* (Trinidad);

**South America** No venomous snakes are naturally occurring in the Falkland Islands, and no dangerously venomous snakes are naturally occurring in Chile.

**Argentina:** About 2,000 snakebite envenomings are reported from Argentina annually (Fan and Cardoso, 1995), caused mainly by *Bothrops diporus* and *B. alternatus*.

**Cat 1:** *Bothrops alternatus*, *Bothrops diporus*, *Crotalus durissus* **Cat 2:** *Bothrops ammodytoides*, *Bothrops jararaca*, *Bothrops jararacussu*, *Bothrops* spp., *Micrurus corallinus*, *Micrurus lemniscatus*, *Micrurus* spp.

**Bolivia:** An average of 600 snakebite envenomings and about 50 deaths per year are reported by the SNISS (Data: Bolivian Ministry of Health) principally by *Crotalus durissus* and *Bothrops* spp. including *B. santaecrucis*. **Cat 1:** *Bothrops atrox*, *Bothrops mattogrossensis*, *Crotalus durissus* **Cat 2:** *Bothrocophias* spp., *Bothriopsis bilineata*, *Bothrops brazili*, *B. jararacussu*, *B. jonathani*, *Bothrops moojeni*, *Bothrops santaecrucis*, *Bothrops* spp., *Lachesis muta*, *Micrurus lemniscatus*, *Micrurus spixii*, *Micrurus surinamensis*, *Micrurus* spp.

**Brazil:** In 2005, 28,711 bites were reported with 114 deaths (0.4 %) (Data: Secretaria Vigilância em Saúde). In the northern region, there are 28.6 bites/100,000/year. Species involved are *Bothrops* species (*B. atrox*, *B. jararaca*, *B. jararacussu*, *B. moojeni*, *B. erythromelas*) (83.5%), *Crotalus durissus* (13.4%), coral snakes (*Micrurus*) (5.7%) and bushmasters (*Lachesis*) (2.4%).

**Cat 1:** *Bothrops atrox*, *Bothrops jararaca*, *Bothrops jararacussu*, *Bothrops leucurus*, *Bothrops moojeni*, *Crotalus durissus*, **Cat 2:** *Bothrops alternatus*, *Bothrops neuwiedi*, other *Bothrops* spp., *Lachesis muta*, *Micrurus corallinus*, *Micrurus lemniscatus*, *Micrurus spixii*, *Micrurus surinamensis*, *Micrurus* spp.

**Colombia:** Colombia: There are about 2,500-2,700 cases of snakebite envenomings in Colombia annually (Otero *et al.*, 2002). In 2005 there were 2161 cases (7.4/100,000/year) reported to the Ministry of Health (Gutiérrez *et al.*, 2006). *Bothrops*

*asper*, *B. atrox* and other *Bothrops* spp. are mainly responsible.

**Cat 1:** *Bothrops asper*, *Bothrops atrox*, *Bothrops bilineatus*, *Crotalus durissus* **Cat 2:** *Bothriechis schlegelii*, *Bothrops brazili*, *Bothrops* spp., *Lachesis acrochorda*, *Lachesis muta*, *Micrurus lemniscatus*, *Micrurus mipartitus*, *Micrurus spixii*, *Micrurus surinamensis*, *Micrurus* spp., *Porthidium nasutum*, *Porthidium lansbergii*

**Ecuador:** 1,200-1,400 cases of snakebite are treated in hospital each year caused by *Bothrops atrox*, *B. asper*, *B. bilineatus* and *Bothrocophias microphthalmus* (Data: Pan American Health Organisation). However, the total number of snakebite envenomings can be as high as 8,200 (Praba-Egge *et al.*, 2003). There are about 50 fatalities each year. *Bothrops xanthogrammus* is synonymous with *B. asper*.

**Cat 1:** *Bothrops asper*, *Bothrops atrox*, *Bothrops bilineatus*, *Lachesis muta* **Cat 2:** *Bothriechis schlegelii*, *Bothrocophias microphthalmus*, *Bothrocophias hyoprora*, *Bothrops* spp., *Lachesis acrochorda*, *Micrurus lemniscatus*, *Micrurus mipartitus*, *Micrurus surinamensis*, *Micrurus* spp., *Porthidium* spp.

**French Guiana:** Approximately 100-200 snakebite envenomings are reported from French Guiana (Chippaux *et al.*, 1984).

**Cat 1:** *Bothrops atrox*, *Bothrops brazili*, *Bothrops bilineatus*, *Crotalus durissus* **Cat 2:** *Lachesis muta*, *Micrurus lemniscatus*, *Micrurus surinamensis*, *Micrurus* spp.

**Guyana:** About 500 snakebites and 5 deaths are reported annually (Gutiérrez *et al.* 2006) **Cat 1:** *Bothrops atrox*, *Bothrops bilineatus*, *Bothrops brazili*, *Crotalus durissus* **Cat 2:** *Bothrops taeniatus*, *Lachesis muta*, *Micrurus lemniscatus*, *Micrurus surinamensis*, *Micrurus* spp.

**Paraguay:** There are about 100 snakebite envenomings and 10 deaths reported annually (Gutiérrez *et al.* 2006).

**Cat 1:** *Bothrops alternatus*, *Crotalus durissus* **Cat 2:** *Bothrops jararaca*, *Bothrops jararacussu*, *Bothrops moojeni*, *Bothrops* spp., *Micrurus corallinus*, *Micrurus lemniscatus*, *Micrurus* spp.

**Peru:** It is estimated that 4,500 bites occur each year with more than 100 fatalities. In 2005, 1435 snakebites (5.1/100,000/year), including 28 deaths (0.1/100,000/year) were reported (Gutiérrez *et al.*, 2006). Important species include *Bothrops atrox*, *B. bilineatus* and other *Bothrops* spp. **Cat 1:** *Bothrops atrox*, *Bothrops bilineatus*, *Bothrops pictus*, *Crotalus durissus*, *Lachesis muta* **Cat 2:** *Bothriechis schlegelii*, *Bothrocophias* spp., *Bothrops* spp., *Micrurus lemniscatus*, *Micrurus mipartitus*, *Micrurus spixii*, *Micrurus surinamensis*, *Micrurus* spp.

**Suriname:** About 300 snakebite envenomings and two deaths have been reported. **Cat 1:** *Bothrops atrox*, *Bothrops bilineatus*, *Bothrops brazili*, *Crotalus durissus* **Cat 2:** *Lachesis muta*, *Micrurus lemniscatus*, *Micrurus surinamensis*, *Micrurus* spp.

**Uruguay:** Fewer than 100 bites are reported each year with very few fatalities. From 2000-2005 there were 347 cases (1.7/100,000/year) reported (Gutiérrez *et al.*, 2006). *Bothrops alternatus*, *B. jararaca*, *B. newiedi* *sensu lato* and other *Bothrops* spp. are the main causes.

**Cat 1:** *Bothrops alternatus*, *Crotalus durissus* **Cat 2:** *Bothrops pubescens*, *Micrurus corallinus*, *Micrurus* spp.

**Venezuela:** *Bothrops asper* has been cited erroneously as the most important species, but this species is rare in Venezuela and localised to the north-west of the country.

*Bothrops atrox* typically occurs south of Orinoco but a separate population of *Bothrops* cf *atrox* occurs in the north of Venezuela, and has been mistakenly identified as *Bothrops asper*. *Bothrops venezuelensis* may be of medical importance in some areas. The number of snakebite envenomings in Venezuela is about 7,000 per year (JM Gutierrez, Personal Communication). There about 40 deaths due to snakebite annually (De Sousa *et. al*, 2005).

**Cat 1:** *Bothrops atrox*, *Bothrops cf. atrox*, *Bothrops venezuelensis*, *Crotalus durissus* **Cat 2:** *Bothriechis schlegelii*, *Bothrops asper?*, *Bothrops brazili*, *Bothrops bilineatus*, *Bothrops spp.*, *Lachesis muta*, *Micrurus lemniscatus*, *Micrurus mipartitus*, *Micrurus spixii*, *Micrurus surinamensis*, *Micrurus spp.*, *Porthidium lansbergii*

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