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APPENDIX: WORLDWIDE DISTRIBUTION OF MEDICALLY IMPORTANT VENOMOUS SNAKES

This schedule lists venomous snake species considered to represent the greatest threat to public health in various countries or regions around the world. Only species which fall into one of the two categories listed below are shown, and category listings are in alphabetical order according to genus and species. Definitions of the categories used in this listing are:

CATEGORY 1: Highest Medical Importance Definition: Highly venomous snakes which are common or widespread and cause numerous snakebites, resulting in high levels of morbidity, disability or mortality.

CATEGORY 2: Secondary Medical Importance Definition: Highly venomous snakes

capable of causing morbidity, disability or death, but for which (a) exact epidemiological or clinical data may be lacking, and/or (b) are less frequently implicated (due to their activity cycles, behaviour, habitat preferences or occurrence in areas remote to large human populations). There are numerous other venomous species that rank as lesser threats in countries listed here, and interested readers should refer to one of the major references in the bibliography for further information if desired. It should also be noted that the organisation of countries, territories and other areas into regions in this Appendix does not follow the WHO Regional Organisation, but is instead arranged biogeographically in alphabetical region/country order. This was necessary in order to reflect the bio-geographical distribution of major groups of venomous snakes throughout the world. For example, the venomous snakes of the eastern Indonesian Province of Papua have biogeographical origins in Australo-Papua, and are evolutionarily distinct from the venomous snakes of Asian origin which occur west of the Wallace Line. For this reason, we have listed the medically important snakes of Indonesian Papua in the Australo-Papuan region, rather than the South-East Asian region. Users of this Appendix should also recognise that the relative risk of injury from a particular species may vary from one country to another, and in some cases, even within different areas inside the same country. For this reason, some species that have been listed under Category 1 in one country, may have been listed under Category 2 in another country as a reflection of the different risk posed by that species in different locations. Assignment to Category 1 or Category 2 was based in some cases on the importance of a species as a cause of snakebite. In Europe for example the overall incidence of snakebite is trivial compared to that in West Africa or India, but where a European species (such as *Vipera berus*) is a major cause (or sole) cause of envenoming where it occurs, this warrants ranking it as a medically important species in that setting.

AFRICA AND THE MIDDLE-EAST North Africa/ Middle East

There are no published epidemiological data available from Algeria, Morocco, Libya, Tunisia or Western Sahara, the Gulf States, Kuwait, Palestine or Syria.

Algeria: Several bites by *Cerastes cerastes* have been reported from Algeria.

Cat 1: *Naja haje*, *Daboia mauritanica*, *Cerastes cerastes* **Cat 2:** *Echis leucogaster*, *Echis pyramidum*, *Daboia deserti*, *Macrovipera lebetina*.

Bahrain, Kuwait and Qatar: No published epidemiological data available

Cat 1: *Cerastes gasperettii* (Kuwait, Qatar) **Cat 2:** *Walterinnesia morgani*

Cyprus: A few bites occur each year with rare fatalities.

Cat 1: None **Cat 2:** *Macrovipera lebetina*

Djibouti: There are no published epidemiological data available.

Cat 1: *Echis pyramidum* **Cat 2:** *Bitis arietans*, *Naja pallida*

Egypt: The Poison Control Centre in Cairo received 156 cases (one fatality) in 2002, 160 in 2003 and 215 in 2005. Most victims were Bedu farmers at Wahat Bahareya oasis near Fayoum. *Cerastes cerastes* was the only snake identified but paralytic cases (about 10% of all cases) from the Nile Valley were attributed to *Naja haje* and a case of venomophthalmia to the spitting cobra *N. nubiae*.

Cat 1: *Cerastes cerastes*, *Echis coloratus* (east), *Echis pyramidum*, *Naja haje*

Cat 2: *Atractaspis engaddensis* (Sinai), *Naja nubiae*, *Pseudocerastes persicus*, *Walterinnesia*

aegyptia (Sinai),

Libya: There are no published epidemiological data available.

Cat 1: *Cerastes cerastes*, *Echis pyramidum*, *Naja haje* **Cat 2:** *Macrovipera deserti*

Iraq: There are no published epidemiological data available but fatal cases have been attributed to *Macrovipera lebetina*, *Echis* spp. and *Cerastes cerastes*.

Cat 1: *Echis carinatus*, *Macrovipera lebetina* **Cat 2:** *Cerastes gasperettii*, *Pseudocerastes persicus*, *Walterinnesia morgani*

Iran: There are no published epidemiological data available. *Echis carinatus*, *Macrovipera lebetina*, *Pseudocerastes persicus* and *Naja oxiana* are said to be the most important causes of snakebite.

Cat 1: *Echis carinatus*, *Macrovipera lebetina*, *Naja oxiana*, *Pseudocerastes persicus* **Cat 2:** *Eristicophis macmahoni* (east), *Walterinnesia morgani* (west)

Israel: There are about 100-120 snakebite envenomings per year (Abraham *et al.*, 2001). The most important species are *Daboia palaestinae*, *Echis coloratus*, *Pseudocerastes fieldi*, *Cerastes cerastes*, *Walterinnesia aegyptia* and *Atractaspis engaddensis*.

Cat 1: *Daboia palaestinae*, *Echis coloratus* **Cat 2:** *Atractaspis engaddensis*, *Cerastes cerastes*, *Cerastes gasperettii*, *Pseudocerastes fieldi*, *Walterinnesia aegyptia*

Jordan: Few bites are reported (112 with 7 deaths during a 9 year period; 65 cases during a 5 year period) attributed to *Daboia palaestinae*, *Echis coloratus*, *Cerastes gasperettii* and *Pseudocerastes persicus*.

Cat 1: *Echis coloratus*, *Daboia palaestinae* **Cat 2:** *Atractaspis engaddensis*, *Cerastes gasperettii*, *Macrovipera lebetina*, *Pseudocerastes fieldi*, *Walterinnesia aegyptia*

Lebanon: There are no published epidemiological data available.

Cat 1: *Daboia palaestinae*, *Macrovipera lebetina* **Cat 2:** None

Morocco: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Cerastes cerastes*, *Daboia mauritanica*, *Naja haje* **Cat 2:** *Echis leucogaster*, *Daboia deserti*,

Oman: Snakebites, mainly attributable to *Echis* spp, are not uncommon. About 400-600 cases of snakebite envenomings are reported from Oman per year (Data: Oman Central Poison Registry; Hanssens *et al.*, 2001).

Cat 1: *Atractaspis andersonii* (south-west), *Bitis arietans*, *Echis carinatus* (north), *Echis coloratus*, (south-west), *Echis omanensis*, (north) **Cat 2:** *Naja haje*, *Cerastes gasperettii*, *Echis khosatzkii* (south-west)

Saudi Arabia: Snakebites are most common in the south west (Asir) region. *Echis coloratus*, *Cerastes gasperettii* and *Atractaspis microlepidota andersoni* are implicated. Annually, there are 1,500-2,000 cases of snakebite envenomings reported in Saudi Arabia (Mahaba, 2000).

Cat 1: *Atractaspis andersonii* (south-west),

Cerastes gasperettii, *Echis coloratus*, *Echis cf. khosatzkii* (south-west) **Cat 2:** *Atractaspis engaddensis*, *Bitis arietans*, *Cerastes cerastes* (south-west), *Naja haje*, *Walterinnesia aegyptia* (west), *Walterinnesia morgani* (central, south)

Sudan: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Echis pyramidum*, *Naja haje*, *Naja nigricollis* **Cat 2:** *Atractaspis fallax*, *Atractaspis irregularis* (south), *Bitis gabonica*, *Bitis nasicornis* (south), *Cerastes cerastes*, *Dendroaspis jamesoni* (south), *Dendroaspis polylepis* (south), *Naja melanoleuca*, *Naja*

nubiae, *Naja pallida* (south-east),

Syria: There are no published epidemiological data available.

Cat 1: *Daboia palaestinae*, *Macrovipera lebetina* **Cat 2:** *Atractaspis engaddensis*, *Pseudocerastes fieldi*

Tunisia: There are no published epidemiological data available. **Cat 1:** *Daboia mauritanica* **Cat 2:** *Cerastes cerastes*, *Daboia deserti*, *Echis pyramidum*, *Naja haje*, *Macrovipera lebetina*

Turkey: There are no published epidemiological data available.

Cat 1: *Macrovipera lebetina*, *Montivipera xanthina* **Cat 2:** *Montivipera raddei*, *Vipera ammodytes*, *Walterinnesia morgani* (south) **United Arab Emirates:** There are no published epidemiological data available.

Cat 1: *Echis carinatus* (east), *Echis omanensis* **Cat 2:** *Cerastes gasperettii*

Western Sahara: There are no published epidemiological data available.

Cat 1: *Cerastes cerastes* **Cat 2:** *Bitis arietans*, *Naja haje*

Yemen: There are no published epidemiological data available. Snakebite was responsible for 3.4% of cases of renal failure (Al Rohani, 2004).

Cat 1: *Atractaspis andersonii*, *Bitis arietans*, *Echis coloratus*, *Naja haje* **Cat 2:** *Cerastes cerastes*, *Cerastes gasperettii*, *Echis cf. khosatzkii*

Central Sub Saharan Africa

For most parts of Africa, the only available epidemiological data are from small areas, often chosen because of their notoriously high rate of snakebite (e.g. Pugh and Theakston, 1980). Chippaux has used these data to estimate national totals of bites and mortality (Chippaux 1998; Chippaux 2005). For many countries, there are no epidemiological data (e.g. Democratic Republic of Congo, Central African Republic, Chad). **Angola:** There are no published epidemiological data available. **Cat 1:** *Bitis arietans*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Dendroaspis polylepsis*, *Naja anchietae*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris squamigera*, *Atractaspis irregularis*, *Dispholidus typus*, *Naja christyi* (Cabinda), *Naja mossambica* (south), *Naja nigricincta* (south-west), *Pseudohaje goldii*, *Thelotornis capensis*, *Thelotornis kirtlandii* (north)

Burundi: There are no published epidemiological data available. **Cat 1:** *Bitis arietans*, *Naja melanoleuca*, *Naja nigricollis*, **Cat 2:** *Atractaspis irregularis*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Dispholidus typus*, *Pseudohaje goldii*, *Thelotornis mossambicanus*

Central African Republic: There are no published epidemiological data available. **Cat 1:** *Bitis arietans*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Dendroaspis polylepsis*, *Echis ocellatus*, *Echis pyramidum*, *Naja haje*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris broadleyi*, *Atheris squamigera*, *Atractaspis irregularis*, *Dispholidus typus*, *Naja annulata*, *Pseudohaje goldii*, *Thelotornis kirtlandii*

Chad: There are no published epidemiological data available.

Cat 1: *Bitis arietans* (southern), *Echis ocellatus*, *Naja haje*, *Naja nigricollis*, **Cat 2:** *Cerastes cerastes*, *Naja katiensis*, *Naja nubiae*

Congo (Republic): In rural areas, there were 120-450 bites/100,000 population/year and in Brazzaville 11.5/100,000/year. There are 400-600 snakebite envenomings (Carme *et al.*, 1986) and 5-75 snakebite deaths (Chippaux, 2005; Carme *et al.*, 1986).

Cat 1: *Bitis arietans*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris squamigera*, *Atractaspis irregularis*, *Dispholidus typus*, *Naja annulata*, *Naja christyi*, *Pseudohaje goldii*, *Thelotornis kirtlandii*

Democratic Republic of Congo: The number of snakebite envenomings in DR Congo can range from 16,000-37,000 cases (Bokata, 2005). The number of snakebite deaths can range from 200- 2,000 per year (Odio *et al.*, 2005; Bokata, 2005).

Cat 1: *Bitis arietans*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Naja melanoleuca*, *Naja nigricollis*, **Cat 2:** *Atheris squamigera*, *Atractaspis irregularis*, *Dendroaspis polylepis*, *Dispholidus typus*, *Naja anchietae* (Katanga pedicle), *Naja annulata*, *Naja christyi*, *Naja haje* (north), *Pseudohaje goldii*, *Thelotornis capensis*, *Thelotornis kirtlandii*

Equatorial Guinea: There are no published epidemiological data available.

Cat 1: *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Naja melanoleuca* **Cat 2:** *Atheris chlorechis*, *Atractaspis irregularis*, *Naja annulata*, *Pseudohaje goldii*, *Thelotornis kirtlandii*

Gabon: 100-250 envenomings (Tchoua *et al.*, 2002; Chippaux, 2005).

Cat 1: *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris squamigera*, *Atractaspis irregularis*, *Bitis arietans*, *Naja annulata*, *Pseudohaje goldii*, *Thelotornis kirtlandii*

Rwanda: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis jamesoni*, *Naja nigricollis* **Cat 2:** *Atractaspis irregularis*, *Naja melanoleuca*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis polylepis*, *Dispholidus typus*, *Naja annulata*, *Pseudohaje goldii*, *Thelotornis kirtlandii*

East Sub Saharan Africa Eritrea: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis polylepis*, *Echis pyramidum*, *Naja haje* **Cat 2:** *Atractaspis irregularis*, *Dispholidus typus*, *Echis megalcephalus*, *Naja nubiae*

Ethiopia: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis polylepis*, *Echis pyramidum*, *Naja ashei* (southeast), *Naja haje*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atractaspis fallax*, *Atractaspis irregularis* (Mt Bizen), *Bitis parviocula*, *Dispholidus typus*, *Naja pallida*

Kenya: A preliminary survey based on Ministry of Health, hospital, clinic and dispensary records in Kakamega and western Kenya, Lake Baringo and Laikipia, Kilifi and Malindi and northern Kenya suggested an overall average snakebite incidence of 14/100,000/year (range 2- 68) with a minimum mortality rate of 0.45/100,000/year. *Bitis arietans*, *Dendroaspis polylepis*, *Naja nigricollis* and *Naja pallida* were responsible for the fatalities (Coombs *et al.*, 1997). A community based study on the coast in Kilifi district reported adult mortality at 15/100,000/year (Snow *et al.*, 1994). There are estimated to be 5,200-8,200 cases of snakebite envenoming (Coombs *et al.*, 1997; Chippaux, 2005) and 200-1,000 deaths (Coombs *et al.*, 1997; Snow *et al.*, 1994).

Cat 1: *Bitis arietans*, *Dendroaspis angusticeps*, *Dendroaspis polylepis*, *Echis pyramidum*, *Naja ashei* (north, east), *Naja haje*, *Naja nigricollis* **Cat 2:** *Atheris squamigera*, *Atractaspis fallax*, *Atractaspis irregularis*, *Bitis nasicornis*, *Bitis gabonica* (west), *Dendroaspis jamesoni*, *Dispholidus typus*, *Naja melanoleuca* (west and coastal forest), *Naja pallida* (north, east), *Pseudohaje goldii*, *Thelotornis mossambicanus*, *Thelotornis usambaricus* (east coast),

Malawi: There are no published epidemiological data available. **Cat 1:** *Bitis arietans*, *Dendroaspis angusticeps*, *Dendroaspis polylepis*, *Naja annulifera*, *Naja melanoleuca*, *Naja mossambica*, *Naja nigricollis* **Cat 2:** *Dispholidus typus*, *Proatheris superciliaris*, *Thelotornis capensis*, *Thelotornis mossambicanus*

Mozambique: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Bitis gabonica*, *Dendroaspis angusticeps*, *Dendroaspis polylepis*, *Naja annulifera*, *Naja melanoleuca*, *Naja mossambica* **Cat 2:** *Dispholidus typus*, *Proatheris superciliaris*, *Thelotornis capensis*, *Thelotornis mossambicanus*

Somalia: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis polylepis*, *Echis pyramidum*, *Naja ashei* (south), *Naja haje*, *Naja nigricollis* **Cat 2:** *Atractaspis fallax*, *Dispholidus typus*, *Echis hughesi* (north), *Naja pallida*, *Naja melanoleuca*, *Thelotornis kirtlandii*, *Thelotornis mossambicanus*

Tanzania: There are no published epidemiological data available. Tanzania has a large number of highly venomous snake species including two species of mamba (*Dendroaspis* spp.) and seven species of cobra (*Naja* spp.).

Cat 1: *Bitis arietans*, *Dendroaspis angusticeps*, *Dendroaspis polylepis*, *Naja mossambica*, *Naja nigricollis* **Cat 2:** *Atheris squamigera*, *Atractaspis fallax* (north), *Atractaspis irregularis* (northeast), *Bitis gabonica* (west and south-east), *Bitis nasicornis* (north), *Dispholidus typus*, *Naja ashei* (poss. north-east), *Naja annulata*, *Naja haje* (north), *Naja melanoleuca* (west and coast), *Naja pallida*, *Proatheris superciliaris*, *Thelotornis capensis*, *Thelotornis kirtlandii* (Mahali and Udzungwa Mountains), *Thelotornis mossambicanus*, *Thelotornis usambaricus* (East Usambara Mts)

Uganda: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Dendroaspis polylepis*, *Echis pyramidum*, *Naja ashei* (north-east), *Naja haje* (north), *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris squamigera*, *Atractaspis irregularis*, *Dispholidus typus*, *Pseudohaje goldii*, *Thelotornis kirtlandii*

Zambia: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Bitis gabonica*, *Dendroaspis polylepis*, *Naja anchietae*, *Naja annulifera*, *Naja melanoleuca*, *Naja mossambica*, *Naja nigricollis* **Cat 2:** *Dispholidus typus*, *Naja annulata*, *Thelotornis capensis*, *Thelotornis kirtlandii*, *Thelotornis mossambicanus*

South Sub Saharan Africa Botswana: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis polylepis*, *Naja anchietae*, *Naja annulifera* (east), *Naja mossambica*, *Naja nivea* (south-west) **Cat 2:** *Dispholidus typus*, *Thelotornis capensis*,

Lesotho: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Naja nivea* **Cat 2:** *Hemachatus haemachatus*

Namibia: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis polylepis*, *Naja anchietae*, *Naja nivea* (central, southern), *Naja mossambica* (north-east), *Naja nigricincta* **Cat 2:** *Dispholidus typus*, *Naja nigricollis* (Caprivi), *Thelotornis capensis*

South Africa: Three hospital based studies in KwaZulu Natal reported incidences of bites of 31- 89/100,000/year and a study from Transvaal an incidence of 34/100,000/year. The species responsible included *Bitis arietans*, *Naja nivea*, *N. mossambica*, *Dendroaspis polylepis*, *Causus rhombeatus* and *Atractaspis bibronii*. An

estimated 1,500-2,000 snakebite envenomings occur in South Africa annually (Blaylock, 2004). About 300 deaths are estimated (McNally and Reitz, 1987).

Cat 1: *Bitis arietans*, *Dendroaspis angusticeps* (Natal), *Dendroaspis polylepis*, *Naja annulifera* (north-east), *Naja nivea*, *Naja mossambica* **Cat 2:** *Atractaspis bibronii*, *Bitis gabonica* (Natal), *Dispholidus typus*, *Hemachatus haemachatus*, *Naja melanoleuca*, (Natal), *Naja nigricincta* (north-west), *Thelotornis capensis*

Swaziland: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis polylepis*, *Naja annulifera*, *Naja mossambica*, **Cat 2:** *Dispholidus typus*, *Hemachatus haemachatus*, *Thelotornis capensis* **Zimbabwe:** Incidence of bites admitted to hospitals is 3.5/100,000/year with case fatalities of 1.8-5%. 19 deaths were reported in 1980. About 150-160 cases of snakebite envenomings and 20 deaths occur in Zimbabwe annually (Kasilo and Nhachi, 1993; Nhachi and Kasilo, 1994).

Cat 1: *Bitis arietans*, *Dendroaspis polylepis*, *Naja anchietae* (west), *Naja annulifera*, *Naja mossambica* **Cat 2:** *Bitis gabonica* (east), *Dendroaspis angusticeps* (east), *Dispholidus typus*, *Hemachatus haemachatus* (Nyanga Mts), *Naja melanoleuca* (east), *Thelotornis capensis*, *Thelotornis mossambicanus*

West Sub Saharan Africa Benin: It is estimated that the number of snakebite envenomings in Benin can range between 5,000-11,000 per year mainly attributed to *Echis ocellatus* (Fayomi *et al.*, 2002; Chippaux, 2002), with from 650-800 estimated snakebite deaths (Chippaux, 2005).

Cat 1: *Bitis arietans*, *Echis ocellatus*, *Naja nigricollis*, **Cat 2:** *Atractaspis irregularis*, *Dendroaspis jamesoni*, *Dispholidus typus*, *Echis leucogaster* (far north) *Naja haje*, *Naja katiensis*, *Naja melanoleuca*, *Pseudohaje nigra*,

Burkina Faso: Snakebites (*Echis ocellatus*) are said to be common, even in the suburbs of Ougadougou (7.5 envenomings/100,000/year). In rural areas, the incidence is 35-120/100,000/year with a case fatality of 3%. Chippaux (2005) estimates that the number of snakebite envenomings in Burkina Faso is between 1,000-8,000. and that there are about 200- 450 snakebite deaths.

Cat 1: *Bitis arietans*, *Echis ocellatus*, *Naja nigricollis*, *Naja katiensis* **Cat 2:** *Dendroaspis polylepis*, *Echis leucogaster*, *Naja haje*, *Naja melanoleuca*

Cameroon: 200-300 envenomings/100,000/year occur in the Benue valley in northern Cameroon. *Echis ocellatus* is responsible for more than 85% of bites. About 10% are fatal. There are an estimated 2,500-6,000 snakebite envenomings in Cameroon (Chippaux *et al.*, 2002). The number of snakebite deaths may vary between 50-300 (Chippaux, 2005). **Cat 1:** *Dendroaspis jamesoni*, *Naja haje*, *Naja melanoleuca*, *Naja nigricollis*, *Bitis arietans*, *Bitis gabonica*, *Bitis nasicornis*, *Echis ocellatus* **Cat 2:** *Atheris broadleyi* (East Province), *Atheris squamigera*, *Atractaspis irregularis*, *Dendroaspis polylepis*, *Dispholidus typus*, *Naja annulata*, *Naja katiensis*, *Pseudohaje goldii*, *Thelotornis kirtlandii*

Côte d'Ivoire: Incidence of envenomings varies from 200-400/100,000/year in rural areas (especially high in plantation workers) and is 10/100,000/year in Abidjan. From 6,000- 12,000 snakebite envenomings and 200-300 deaths are estimated annually (Chippaux, 2002).

Cat 1: *Bitis arietans*, *Bitis nasicornis*, *Bitis rhinoceros*, *Dendroaspis viridis*, *Echis ocellatus*, *Naja haje*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris chlorechis*, *Atractaspis irregularis*, *Dendroaspis polylepis*, *Dispholidus typus*, *Pseudohaje goldii*, *Pseudohaje nigra*,

Thelotornis kirtlandii

Gambia: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis viridis*, *Echis ocellatus*, *Naja nigricollis* **Cat 2:** *Atractaspis irregularis*, *Dispholidus typus*, *Naja haje*, *Naja katiensis*, *Naja melanoleuca*, **Ghana:** In northern Ghana incidence of envenoming is 86/100,000/year with mortality of 24/100,000/year caused mainly by *Echis ocellatus*.

Cat 1: *Bitis arietans*, *Bitis nasicornis*, *Bitis rhinoceros*, *Dendroaspis viridis*, *Echis ocellatus*, *Naja haje*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris chlorechis*, *Atractaspis irregularis*, *Naja katiensis*, *Pseudohaje goldii*, *Pseudohaje nigra*, *Thelotornis kirtlandii*,

Guinea: In Kindia, the envenoming incidence is 100-150/100,000/year, with a case fatality rate of 18% and amputation rate of 2%. Neurotoxic cobra bites are common in the forests. In Friguilagbe, there were 375 bites with 19.2 deaths /100,000/year. There are an estimated 1,500- 6,500 snakebite envenomings in Guinea per year (Balde *et al.*, 2002; Chippaux, 2005) with 30- 500 deaths (Balde *et al.*, 2002).

Cat 1: *Bitis arietans*, *Bitis nasicornis*, *Bitis rhinoceros*, *Dendroaspis polylepis*, *Dendroaspis viridis*, *Echis ocellatus*, *Naja haje*, *Naja katiensis*, *Naja melanoleuca*, *Naja nigricollis*, **Cat 2:** *Atheris chlorechis*, *Atractaspis irregularis*, *Bitis rhinoceros*, *Dispholidus typus*, *Pseudohaje nigra*, *Thelotornis kirtlandii*

Guinea-Bissau: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Dendroaspis viridis*, *Echis ocellatus*, *Naja haje*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Dispholidus typus*, *Thelotornis kirtlandii*

Liberia: There are no published epidemiological data available.

Cat 1: *Bitis rhinoceros*, *Dendroaspis viridis*, *Naja melanoleuca*, *Naja nigricollis*, *Bitis nasicornis* **Cat 2:** *Atheris chlorechis*, *Atractaspis irregularis*, *Pseudohaje nigra*, *Thelotornis kirtlandii*

Mali: Case fatality rates range from <4% to more than 15%. *Echis leucogaster* is the most important species. There is a minimum of 100 snakebite envenomings and a mortality rate of approximately 4/100,000/year (Chippaux, 2005).

Cat 1: *Bitis arietans*, *Echis jogeri* (west, central), *Echis leucogaster*, *Echis ocellatus*, *Naja haje*, *Naja katiensis*, *Naja nigricollis* **Cat 2:** *Cerastes cerastes*, *Dispholidus typus*, *Naja melanoleuca*,

Mauritania: There are no published epidemiological data available.

Cat 1: *Cerastes cerastes*, *Echis leucogaster*, *Echis ocellatus* *Naja haje* **Cat 2:** *Bitis arietans*, **Niger:** There are about 1,500 snakebite envenomings and 30-80 snakebite deaths in Niger per year (Chippaux and Kambewasso, 2002).

Cat 1: *Bitis arietans*, *Echis leucogaster*, *Echis ocellatus*, *Naja nigricollis*, **Cat 2:** *Cerastes cerastes*, *Naja haje*, *Naja katiensis*, *Naja nubiae*,

Nigeria: In the Benue Valley of north-eastern Nigeria, the incidence of snakebites was found to be 497/100,000/year with a case fatality rate of 12.2% (Warrell & Arnett, 1976). Most bites and deaths were attributed to saw-scaled vipers (*Echis ocellatus*). A community survey of snakebites by the black-necked spitting cobra (*Naja nigricollis*) in Malumfashi, northern Nigeria, found that in a population of 43,500 there were 15-20 bites/100,000/yr. Only 8.5% of the victims had visited a hospital. The case fatality rate was 5% and 19% of survivors had persistent physical disability from the locally necrotic effects of the venom (Pugh *et al.*, 1980).

Cat 1: *Bitis arietans*, *Bitis gabonica*, *Bitis nasicornis*, *Dendroaspis jamesoni*, *Echis ocellatus*, *Naja haje*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris squamigera*, *Atractaspis irregularis*, *Dispholidus typus*, *Echis leucogaster* (north), *Naja katiensis*, *Pseudohaje goldii*, *Pseudohaje nigra*, *Thelotornis kirtlandii*

São Tomé & Príncipe: There are no published epidemiological data available.

Cat 1: *Dendroaspis jamesoni*, *Naja melanoleuca* **Cat 2:** None

Sierra Leone: There are no published epidemiological data available.

Cat 1: *Bitis arietans*, *Bitis nasicornis*, *Bitis rhinoceros*, *Dendroaspis viridis*, *Naja melanoleuca*, *Naja nigricollis* **Cat 2:** *Atheris chlorechis*, *Atractaspis irregularis*, *Dispholidus typus*, *Naja haje*, *Pseudohaje nigra*, *Thelotornis kirtlandii*

Senegal: In Bandafassi (SE Senegal), there are 700-900 bites with mortality of 14/100,000/year caused mainly by *Echis ocellatus*, *Bitis arietans* and *Naja katiensis* (Trape et al, 2001). In the Sahel region the incidence is 30-300/100,000/year. There are an estimated 1,200-2,000 snakebites envenomings and 200-900 deaths/year (Chippaux and Dialloo, 2002; Trape et al., 2002).

Cat 1: *Bitis arietans*, *Echis leucogaster*, *Echis ocellatus*, *Naja katiensis*, *Naja nigricollis* **Cat 2:** *Dendroaspis polylepis*, *Dendroaspis viridis*, *Dispholidus typus*, *Naja haje*, *Naja melanoleuca*

Togo: There are 7,000-9,000 envenomings, with an average of 4,500 reported each year to the Ministry of Health (Gogovor, 2005, Chippaux, 2005).

Cat 1: *Bitis arietans*, *Bitis nasicornis*, *Bitis rhinoceros* (south), *Echis ocellatus*, *Naja haje*, *Naja melanoleuca*, *Naja nigricollis*, **Cat 2:** *Atheris chlorechis*, *Atractaspis irregularis*, *Dendroaspis jamesoni*, *Dendroaspis viridis*, *Dispholidus typus*, *Naja katiensis*, *Pseudohaje goldii*, *Pseudohaje nigra*, *Thelotornis kirtlandii*

ASIA AND AUSTRALASIA Central Asia:

Mongolia: There are no published epidemiological data available. **Cat 1:** *Gloydius halys* **Cat 2:** *Vipera berus*, *Vipera ursinii* **Armenia:** There are no published epidemiological data available.

Cat 1: *Macrovipera lebetina*, *Vipera ammodytes* **Cat 2:** *Montivipera raddei*, *Vipera ursinii*, and other *Vipera* spp.

Azerbaijan: There are no published epidemiological data available.

Cat 1: *Macrovipera lebetina* **Cat 2:** *Gloydius halys*

Georgia: There are no published epidemiological data available.

Cat 1: *Macrovipera lebetina*, *Vipera ammodytes* **Cat 2:** *Vipera ursinii*, and other *Vipera* spp.

Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan: There are no published epidemiological data available.

Cat 1: *Echis carinatus* (Uzbekistan); *Macrovipera lebetina* (Kazakhstan); *Naja oxiana* (Kyrgyzstan, Uzbekistan); *Gloydius halys* **Cat 2:** *Vipera ursinii*

East Asia: China: Snakebites occur throughout this vast country but few epidemiological data are available. A survey of all cause mortality in 1986-8 revealed that in rural areas (accounting for about 80% of China's total population), 24 out of about 400,000 deaths were coded E905.0 (ICD9 code for venomous snakebite), while a further 85 were coded either E905 or E905.9, i.e. poisoning by unspecified venomous animal or plant, many of which may have been snakebites. Based on estimates of China's total population and total annual death rate in 1987, these figures imply a total annual snakebite mortality of between 450 and 2,000. A survey conducted in two cities,

six counties, 54 towns and 153 villages in China reports an incidence rate of 26.6 per 100,000 population amounting to approximately 212,000 snakebites annually. It is estimated that about 4,000 deaths occur due to snakebite each year (Peinan *et al.*, 1989), and that 100,000 to 200,000 bites occur with a fatality rate 5- 10% (Data: National Institute for the Control of Pharmaceutical and Biological Products). In Hong Kong, most bites are caused by *Cryptelytrops albolabris* but fatal cases are attributed to cobras (*Naja atra*) and kraits (*Bungarus multicinctus*). Approximately 400 snakebite envenomings and 5 deaths are reported from Hong Kong annually (Cockram *et al.*, 1990). Hung (2004) reports that the two species responsible for most bites on Taiwan province are *Protobothrops mucrosquamatus* and *Viridovipera stejnegeri* followed closely *Naja atra* and then *B. multicinctus*. *Deinagkistrodon acutus* causes occasional bites. About 3,000 snakebite envenomings occurred annually with a minimum of about 10 deaths during the 1990's (Chen *et al.*, 2000). From 2002 until 2005 there were an average of 972 reported snakebites each year (4.29/100,000 population/year). There were single fatalities in 2000 and 2006, both due to *Daboia siamensis*. 74% of bites are caused by *Protobothrops mucrosquamatus* and *Viridovipera stejnegeri*, 24% by neurotoxic elapids (*Bungarus multicinctus* and *Naja atra*), 1.4% by *Deinagkistrodon acutus* and 0.6% by *Daboia siamensis*.

China Mainland

Cat 1: *Bungarus multicinctus*, *Cryptelytrops albolabris*, *Daboia siamensis*, *Deinagkistrodon acutus*, *Gloydius brevicaudus*, *Naja atra*; *Protobothrops mucrosquamatus* **Cat 2:** *Bungarus fasciatus*, *Gloydius halys*, *Gloydius intermedius*, *Gloydius ussuriensis*, *Rhabdophis tigrinus*, *Ophiophagus hannah*, *Protobothrops mangshanensis*, *Viridovipera stejnegeri*

Hong Kong

Cat 1: *Bungarus multicinctus*, *Cryptelytrops albolabris*, *Naja atra* **Cat 2:** None
Taiwan Province **Cat 1:** *Bungarus multicinctus*, *Naja atra*, *Protobothrops mucrosquamatus*, *Viridovipera stejnegeri* **Cat 2:** *Deinagkistrodon acutus*, *Daboia siamensis*

Democratic People's Republic of Korea: There are few snakebites, and no deaths have been reported from snakebite. *Gloydius ussuriensis*, *G. brevicaudus* and *G. Intermedius* are broadly distributed, with *G. brevicaudus* being most important. *Vipera berus* is known from a single locality in the extreme north of the country (Data: Japan Snake Institute).

Cat 1: *Gloydius brevicaudus* **Cat 2:** *Gloydius intermedius*, *Gloydius ussuriensis*, *Vipera berus*

Japan (including Ryukyu Islands): The habu (*Protobothrops flavoviridis*) is an important cause of snakebite in Japan's Ryukyu Archipelago. Bite incidence rates ranging from 94/100,000/year to 460/100,000/year has been reported in the Amani and Okinawa Islands (Sawai *et al.*, 1976; Tomari 1987). In the rest of Japan, bites by the mamushi (*Gloydius blomhoffii*) causes some 500 bites/year with less than 1% case fatality. The colubrid snake "yamakagashi" (*Rhabdophis tigrinus*) can cause severe or even fatal envenoming. The number of deaths due to snakebite envenoming in Japan is estimated to be 7-13 annually (Japan Snake Institute, unpublished data).

Cat 1: *Gloydius blomhoffii* (mainland); *Protobothrops flavoviridis* (Ryukyu Islands) **Cat 2:** *Gloydius tsushimaensis* (Tushima); *Ovophis okinavensis* *Protobothrops elegans*, *Protobothrops tokarensis* (Ryukyu Islands); *Rhabdophis tigrinus*

Republic of Korea: 82 cases were admitted to a hospital in Wonju over 15 years (1959-73); 4 died. 126 cases were reported from 5 hospitals over 2 years (1976-7). The

snakes involved were *Gloydius ussuriensis* ("caliginosus") and *G. brevicaudus*.

Cat 1: *Gloydius brevicaudus* **Cat 2:** *Gloydius intermedius*, *Gloydius ussuriensis*, *Rhabdophis tigrinus*

South Asia: Afghanistan: There are no published epidemiological data available. **Cat 1:** *Echis carinatus*, *Macrovipera lebetina*, *Naja oxiana* **Cat 2:** *Eristicophis macmahoni* (south-west), possibly *Naja naja* (south-east)

Bangladesh: In 1988-9, a survey of 10% of the country discovered records of 764 bites and 168 deaths (22% case fatality). 34% were cobra (*Naja naja*, *N. kaouthia*) bites, carrying a 40% case fatality. Kraits (*Bungarus caeruleus*, *B. niger*, *B. sindanus*) are responsible for some bites and fatalities. Green pit vipers *Cryptelytrops erythrus* cause many bites but few fatalities. The number of snakebite envenomings in Bangladesh ranges from 4,000 to 8,000 annually (Sarker et al., 1999) with up to 2,000 deaths.

Cat 1: *Bungarus niger*, *Bungarus walli*, *Cryptelytrops erythrus*, *Naja kaouthia* **Cat 2:** *Bungarus caeruleus*, *Bungarus fasciatus*, *Bungarus lividus*, *Cryptelytrops purpureomaculatus*, *Cryptelytrops septentrionalis*, *Daboia russelii*, *Naja naja*, *Ophiophagus hannah*

Bhutan: In 2000, 2,085 bites and stings were reported. Important venomous species include *Naja naja* and *Bungarus niger*. Other species such as *Naja kaouthia*, *Daboia russelii* and several pit vipers may well occur there as well. There are approximate 2,500-3,000 envenomings in Bhutan annually.

Cat 1: *Bungarus niger*, *Naja naja* **Cat 2:** *Bungarus fasciatus*, *Cryptelytrops erythrus*, *Daboia russelii*, *Ophiophagus hannah* **India:** Estimates of mortality vary from 15,000-50,000 per year (Swaroop & Grabb, 1954; Warrell, 1993, Chippaux, 1998). In Bardhaman (Burdwan) District, West Bengal, a field survey in randomly selected villages suggested a snakebite incidence of 160/100,000/year with an average mortality rate of 16.4/100,000/year (Hati et al., 1992). There are four main medically important species: *Naja naja*, *Bungarus caeruleus*, *Daboia russelii* and *Echis carinatus*, and recent studies have also established the importance of *Hypnale hypnale* in the south-west coast and Western Ghats (Joseph et al., 2007; Simpson and Norris, 2007). Annual incidence has been said to range from 66-163/100,000/year (Chippaux, 1998) but accurate figures are lacking due to under-reporting.

Cat 1: *Bungarus caeruleus*, *Daboia russelii*, *Echis carinatus*, *Naja naja* (throughout); *Hypnale hypnale* (south-west); *Naja kaouthia* (east) **Cat 2:** *Bungarus fasciatus*, *Bungarus niger*, *Bungarus walli*, *Cryptelytrops albolabris*, *Cryptelytrops purpureomaculatus* (east); *Bungarus sindanus*, *Naja oxiana* (west); *Trimeresurus malabaricus* (south-west); *Trimeresurus gramineus* (south); *Ophiophagus hannah* (south and north-east)

Nepal: The highest recorded incidence was 162 death/100,000/year determined in the Eastern Terai (Sharma et al., 2004). Only 20% of the deaths occurred in hospitals. Increased risk of fatality was associated with nocturnal bites most probably caused by the common krait (*Bungarus caeruleus*). Medically important species include *Naja naja*, *Bungarus caeruleus*, *B. niger* and *Daboia russelii*. In the country as a whole, 20,000 bites and 200 deaths have been estimated but one survey suggested 1,000 deaths/year. (WHO, 1987). A minimum of 20,000 snakebite envenomings/year was estimated Devkota et al., 2001, while Sharma et al., 2004 estimated a maximum of 143,000 envenomings/year.

Cat 1: *Bungarus caeruleus*, *Bungarus niger*, *Daboia russelii*, *Naja naja* **Cat 2:** *Bungarus*

bungaroides, *Bungarus fasciatus*, *Cryptelytrops septentrionalis*, *Himalayophis tibetanus*, *Ophiophagus hannah*, *Protobothrops jerdonii*, *Viridovipera stejnegeri*

Pakistan: 15,000-18,000 venomous bites are estimated to occur each year with a mortality of 15-18/100,000/year. *Naja naja*, *N. oxiana*, *Bungarus caeruleus*, *B. sindanus*, *Daboia russelii* and *Echis carinatus* are the most important species.

Cat 1: *Bungarus caeruleus*, *Bungarus sindanus*, *Daboia russelii*, *Echis carinatus*, *Naja naja*, *Naja oxiana* **Cat 2:** *Eristicophis macmahoni* (west), *Gloydus himalayanus* (northern), *Macrovipera lebetina* (west)

Sri Lanka: In 2000-2005 there was an average of 36,520 snakebite admissions/year; in 2000 there were 194 deaths, and from 2002-2005 there were a total of 409 deaths (102/year) reported (Data: Epidemiology Unit, Sri Lanka Ministry of Health). Comparison of hospital data with death certifications in Monaragala District during a 5-year period (1999-2003) revealed a 63% underestimate by hospital records of the true number of snakebite deaths (Fox et al., 2006), partly explained by the fact that 36% of snakebite victims did not seek or achieve hospital treatment. The true annual snakebite mortality is likely to number several hundreds. Bites are caused by *Daboia russelii*, (30%), *Hypnale hypnale* (22%), *Naja naja* (17%) and *Bungarus caeruleus* and/or *B. ceylonicus* (15%).

Cat 1: *Bungarus caeruleus*, *Daboia russelii*, *Hypnale hypnale*, *Naja naja* **Cat 2:** *Bungarus ceylonicus*, *Echis carinatus*, *Hypnale nepa*, *Hypnale walli*, *Trimeresurus trigonocephalus*

Southeast Asia: Brunei Darussalam: There are no published epidemiological data available.

Cat 1: *Naja sumatrana* **Cat 2:** *Bungarus fasciatus*, *Bungarus flaviceps*, *Calliophis bivirgatus*, *Ophiophagus hannah*, *Parias sumatranus*

Cambodia: In Kampang Chan, there are 800 bites/year among about 35,000 rubber tappers with a 10% case fatality rate. *Calloselasma rhodostoma* is the principal species. *Daboia siamensis* occurs in the west near the Thai border.

Cat 1: *Bungarus candidus*, *Calloselasma rhodostoma*, *Cryptelytrops albolabris*, *Daboia siamensis*, *Naja kaouthia*, *Naja siamensis* **Cat 2:** *Bungarus fasciatus*, *Cryptelytrops macrops*, *Ophiophagus hannah*

Indonesia (Excluding West Papua): There are no epidemiological data on envenomings or deaths due to snakebite (Data: Poison Information Centre, Jakarta). Fewer than 20 snakebite deaths are registered each year in this vast archipelago although this is almost certainly a significant under-estimate. Species responsible for most bites include *Cryptelytrops albolabris*, *Bungarus candidus*, spitting cobras (*Naja sumatrana* and *N. sputatrix*), *Calloselasma rhodostoma* (Java), and *Daboia siamensis* (Java, Komodo, Flores and Lombok). Indonesia (Sumatra, Java, Borneo, Sulawesi & Lesser Sunda Islands)

Cat 1: *Bungarus candidus* (Sumatra & Java); *Calloselasma rhodostoma* (Java); *Naja sumatrana* (Sumatra, Borneo); *Cryptelytrops albolabris*, *Daboia siamensis*, *Naja sputatrix* (Java & Lesser Sunda Islands) **Cat 2:** *Bungarus fasciatus*, *Calliophis bivirgatus*, *Cryptelytrops insularis*, *Ophiophagus hannah* (Sumatra, Borneo, Java); *Bungarus flaviceps* (Sumatra, Borneo); *Cryptelytrops purpureomaculatus* (Sumatra);

Lao Democratic People's Republic: There are no published epidemiological data available.

Cat 1: *Bungarus candidus*, *Bungarus multicinctus*, *Naja atra* (north); *Calloselasma*

rhodostoma, *Cryptelytrops albolabris*, *Naja siamensis* (south and east) Cat 2: *Bungarus fasciatus*; *Naja kaouthia* (south and east); *Ophiophagus hannah*

Malaysia: Most bites occur in the north-west of peninsular (western) Malaysia and are caused by *Calloselasma rhodostoma*, *Naja kaouthia*, *N. sumatrana* and *Bungarus candidus*. About 12,000 snakebite envenomings are reported from Malaysia annually. (Warrell, 1995).

Cat 1: *Calloselasma rhodostoma*, *Naja kaouthia* (northern Peninsular Malaysia); *Bungarus candidus* (Peninsular Malaysia); *Naja sumatrana* (Peninsular Malaysia, Sabah & Sarawak) **Cat 2:** *Bungarus fasciatus*, *Bungarus flaviceps*, *Calliophis bivirgatus*, *Cryptelytrops purpureomaculatus*, *Parias sumatranus*

Myanmar: Bites are caused mainly by Russell's vipers (*Daboia siamensis*), cobras (*Naja kaouthia* and *N. mandalayensis*), kraits (*Bungarus* spp.) and green pit vipers *Cryptelytrops erythrusus*. Currently there are approximately 9,000-15,000 snakebite envenomings and 300-600 deaths reported from Myanmar annually (Data: WHO Country Office).

Cat 1: *Bungarus magnimaculatus*, *Bungarus multicinctus*, *Cryptelytrops albolabris*, *Cryptelytrops erythrusus*; *Daboia siamensis*, *Naja kaouthia*, *Naja mandalayensis* **Cat 2:** *Bungarus candidus*, *Calloselasma rhodostoma* (southern Peninsula); *Ophiophagus hannah*, *Protobothrops kaulbacki*, *Protobothrops mucrosquamatus*

Philippines: Cobras (*Naja philippinensis* in Luzon, *N. samarensis* in Mindanao and *N. sumatrana* in Palawan) are the most important species. **Cat 1:** *Naja philippinensis* (Luzon), *Naja samarensis* (Mindanao), *Naja sumatrana* (Palawan) **Cat 2:** *Ophiophagus hannah*, *Parias flavomaculatus*, *Tropidolaemus philippensis*, *Tropidolaemus subannulatus*

Singapore: Seow et al (2000) reported a case of envenoming by the red-necked keelback (*Rhabdophis subminiatus*) in Singapore. There are no published epidemiological data available.

Cat 1: *Bungarus candidus*; *Naja sumatrana* **Cat 2:** *Bungarus fasciatus*, *Calliophis intestinalis*, *Cryptelytrops purpureomaculatus*,

Thailand: Improved surveillance explained the reporting of increasing numbers of snakebite cases from an average of 2,316/year in the 1950s to 9,071 (14.5/100,000) in 2002 and 8,299 (13.25/100,000) in 2006. Mortality has declined from an average of 178/year in the 1950s to 9 in 2002 (case fatality 0.1%, 0.01 deaths/100,000) and 5 in 2006 (case fatality 0.06%, 0.01 deaths/100,000). The most dangerous species are *Daboia siamensis*, *Calloselasma rhodostoma*, *Bungarus candidus*, *Naja kaouthia* and *N. siamensis*. *Cryptelytrops albolabris* cause many bites.

Cat 1: *Bungarus candidus*, *Calloselasma rhodostoma*, *Cryptelytrops albolabris*, *Daboia siamensis*, *Naja kaouthia*, *Naja siamensis* **Cat 2:** *Bungarus fasciatus*, *Bungarus flaviceps*, *Cryptelytrops macrops*, *Naja sumatrana*, *Ophiophagus hannah*

Timor Leste: Occasional bites by *Cryptelytrops insularis* have been reported by UN peacekeepers and consular medical officials (Data: Australian Venom Research Unit). There are no published epidemiological data available.

Cat 1: *Cryptelytrops insularis* **Cat 2:** *Naja sputatrix* (unconfirmed)

Viet Nam: There are an estimated 30,000 bites/year but no national data on mortality are available. Among 430 rubber plantation workers in Song Be province bitten by *Calloselasma rhodostoma* between 1993-8, the case fatality was 22%. The most important species are *Naja kaouthia*, *N. siamensis*, *Bungarus candidus* and *Calloselasma*