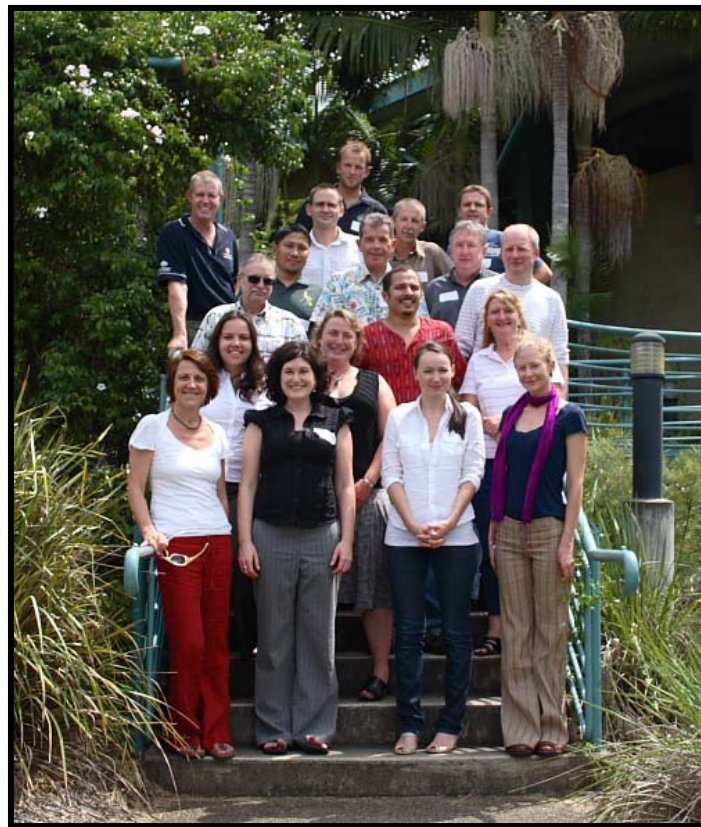




# Status of the World's Sea Snakes IUCN Red List Assessment

**Final Report**  
*August 2009*



**IUCN Global Red List Assessment of Sea Snakes**

**Workshop: 11-14<sup>th</sup> February 2009**

**Brisbane, Australia**

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## **2. Acknowledgements**

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A huge thank you to our financial supporters; Fisheries Research and Development Corporation (Crispian Ashby); the Department of Environment, Water, Heritage and Arts (Emma Fletcher, Narelle Montgomery, Loraine Hitch, Donna Kwan); Australian Government Environmental Protection Agency (Dr Col Limpus); and Conservation International (Dr Russell Mittermeier).

We would also like to thank all the scientific experts that took part in the workshop, for hard work and contributions prior to, during and after the workshop.

## **3. Project Rationale**

The majority of the world's sea snakes are found in the tropical waters of the Indo-West Pacific. As a group, sea snakes, and the impact of perceived threats to their survival, are not well-known or understood. Sea snakes are threatened by a number of human-related activities including bycatch, directed fisheries, habitat degradation and reduction, and pollution. Much of what is currently known about sea snakes is from their capture in fisheries bycatch. Many species of sea snakes prefer near-shore, shallow waters, including estuaries and brackish water habitats, which are areas that are often highly impacted by coastal development and aquaculture. Sea snakes are exploited for their meat, skin and internal organs in many parts of the world, and are sometimes internationally traded, although they are not currently protected under CITES.

Given these potentially serious threats, up until this point there has never been a global assessment of the conservation status and population trends, and threat of extinction to these charismatic species. Without a thorough assessment of the status of sea snake species the appropriate information needed to design, target and implement effective protection and conservation strategies does not exist. This document reports on the first IUCN Red List assessment of all 70 of the world's sea snakes and 40 homalopsid snakes. The workshop held in Brisbane in February 2009 brought together the world's leading international and regional sea snake experts. The final results of this project presented in this report are the first time sea snakes have been assessed for their threat of extinction. The results will be officially published on the IUCN Red List of Threatened Species in March 2010, and will support conservation planning and policy development

to protect the sea snake and homalopsid species most in need of protection. The results are also useful for identifying gaps in knowledge of these species, and can direct research to regions and species lacking data.

The aims of this project were to assess the conservation status of every species of sea snake and homalopsid snake for the following reasons:

- Sea snakes and homalopsids are an important element of coastal and shallow water tropical marine habitats including coral reefs, estuaries, mangroves and soft-sediment inter-reefal habitats: If these species are at risk, then the survival of many associated species in these ecosystems will also be impacted negatively.
- To assess the current available information to determine the highest priorities for conservation action for sea snakes and homalopsids. There was only one sea snake species on the Red List (Crocker's sea snake, *Laticauda crockeri*) listed as Vulnerable, however the assessment was done pre 2001 Red List Criteria and Categories and is now considered out of date.
- Data on the conservation status, threats, and distribution of coral species is an essential basis for conservation planning, and for the development of policies to enhance the future and protection of sea snakes and homalopsids
- This project is urgent and timely - recent information on a number of sea snake species has concluded that the threats are greater than ever, and already may have resulted in some localised extinctions.

## **4. Background**

### **4.1. The Red List of Threatened Species**

Over the past 40 years, the International Union for the Conservation of Nature (IUCN), through its Species Survival Commission (SSC), has been assessing the conservation status of individual species on both global and regional scales to highlight species threatened with extinction ([www.iucnredlist.org](http://www.iucnredlist.org)). The results of these assessments are used to identify and promote conservation action where it is most needed. The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been globally evaluated using the IUCN Red List Categories and Criteria.

Globally, IUCN has recognised that the Red List Programme cannot be achieved and maintained by IUCN and the SSC alone, and has therefore formed partnerships with organisations such as BirdLife International, the Centre for Applied Biodiversity Science (CABS) at Conservation International (CI) and NatureServe. IUCN builds on these existing partnerships to make a significant contribution to conservation through strengthening the information in the Red List and building capacity in regions on the most effective

ways to use and manage Red List data to meet local and regional conservation objectives. The IUCN Red List is widely recognized as the most comprehensive, apolitical approach for evaluating the conservation status of plant and animal species.

#### **4.2. Global Marine Species Assessment**

The IUCN's Global Marine Species Assessment (GMSA) ([www.gmsa.odu.edu](http://www.gmsa.odu.edu)) consolidates information and makes Red List assessments specifically for marine species. Information on taxonomy, distribution, habitat requirements, ecology, life history, past and existing threats, conservation actions and population trends is collected and then used to assess the status of a species in terms of threat of extinction using strict scientific criteria (IUCN 2001). The IUCN Red List Criteria are the most widely accepted and used measure of global threat at the species level.

Information generated by species-level Red List assessments is made publicly available, and forms the foundation for the development of conservation priorities for marine species and Marine Protected Areas around the world. The results of the GMSA will identify the extent to which marine species face extinction, and will be used in collaboration with local, regional and international conservation organizations for marine conservation priority setting. In the first phase of activities, the GMSA is tasked with completing assessments for over 20,000 marine species by 2012. In addition to sea snakes, all marine fishes, marine mammals and other reptiles, selected mollusks and seaweeds, and reef-building corals, seagrasses and mangroves, have been prioritized for assessment.

### **5. Methods**

#### **5.1. Data collection and IUCN Red List assessment process**

The IUCN Red List Categories and Criteria (IUCN 2001) represent a standardized system to assess extinction risk at the species level, designed to be universally applied to species across all taxa. Recent studies of completed taxonomic groups include all the world's amphibians (Stuart et al. 2004), reef-building corals (Carpenter et al. 2008) and mammals (Schipper et al. 2008). Using these criteria, all species are equally assessed; the system is the most widely accepted method for assessing species conservation status on a global scale.

Carrying out an IUCN Red List species assessment involves data collection on specific aspects of biology, geography and threat status. Information on taxonomy, global distribution, population trends, ecology, life history, past and existing threats, and conservation actions was gathered for each sea snake and homalopsid species. Data were collated from published and gray literature, and from consultation with leading world sea snake experts, and entered into the IUCN Data Entry Management (DEM) Species Information System (SIS).

Application of the IUCN Red List Criteria (IUCN 2001) to the existing data on all sea snake and homalopsid snake species was undertaken at a Red List workshop in Brisbane in

February 2009. A total of 15 of the worlds' leading international and regional sea snake and homalopsid experts were brought together to provide knowledge and data, and to reach peer-reviewed consensus on the risk of extinction for each of the world's sea snake and homalopsid species. The expert consultation ensured the use of high quality and current information, and with peer-reviewed referencing, making the assessments both transparent and robust. Each IUCN Red List assessment is supported by a rationale that explains in a summary how the Red List category for each species was reached. All the supporting information and results of the sea snake and homalopsid assessments will be available on the IUCN Red List of Threatened Species in March 2009.

### 5.2 IUCN Red List Categories

The IUCN Red List Criteria were applied to all known species of sea snake and homalopsid and each species was placed within one of eight defined IUCN Red List Categories (IUCN 2001) (Figure 1). The Categories Extinct (EX) and Extinct in the Wild (EW) were not applicable as there are no known recent sea snake extinctions. The three threatened categories are Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) where data supports an elevated risk of extinction. Near Threatened (NT) is used when criteria for a threatened category are near to being met, and Least Concern (LC) is applied to species which do not currently have a high risk of extinction. Data Deficient (DD) is applied when there is insufficient information to make a full assessment of the risk of extinction based on what is known about distribution, population status and/or threats.

Each of the Red List Categories represents a different risk of extinction depending on whether any of the defined thresholds within IUCN Red List Criteria are met (IUCN 2001). Each Criterion deals with different data types depending on what data are available for each species. IUCN Red List Criteria A and B were used to assess sea snake and homalopsid species.

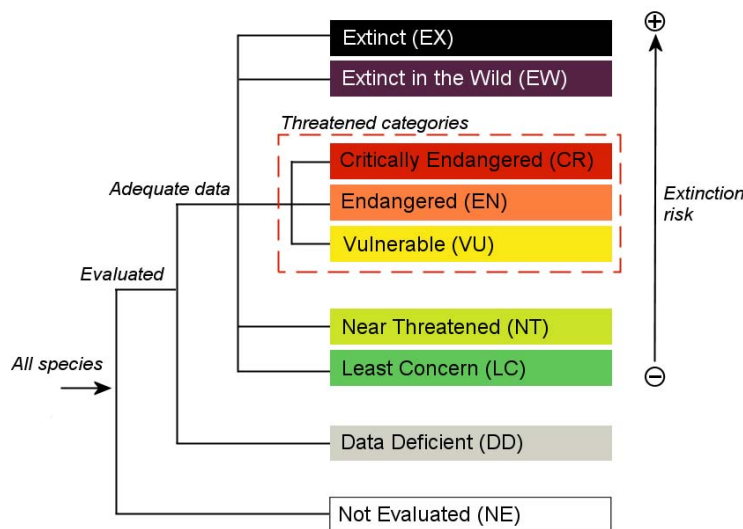


Figure 1. IUCN Red List Categories

## 6. Results

### 6.1. Sea snakes

A total of 70 sea snakes were assessed under IUCN Red List Categories and Criteria at the workshop in Brisbane in February 2009. These include species in the family Elapidae and the three Acrochordidae species (file snakes). The results show that **10%** of sea snakes have an elevated risk of extinction with seven species listed in a threatened Red List Category (Figure 2). Two species are listed as Critically Endangered (CR) which is the category of highest risk. These species are *Aipysurus apraefrontalis* and *Aipysurus foliosquama*, both of which are endemic to Australia. *Aipysurus fuscus* and *Hydrophis semperi* are listed as Endangered (EN), also a high risk of extinction risk. Three species are listed as Vulnerable (VU); *Hydrophis parviceps*, *Laticauda crockeri* and *Laticauda schistorhynchus*. Not surprisingly, all but one of these species exhibit highly restricted distributions and several are endemic to a single location. For example, the two CR species occur only within a limited range in the Ashmore and Hibernia reefs of north-western Australian waters and the two Endangered species also have a restricted range; *Aipysurus fuscus* in the same location as the two CR species, and *Hydrophis semperi* is restricted to one lake in the Philippines. The reason for the declines of the species living in coral reef environments is not clear, particularly as several occur exclusively in Marine Protected Areas. A possible reason is rising sea temperatures resulting in coral bleaching; the majority of threatened sea snake species are coral reef specialists. However, the lack of a clear cause for many declines emphasizes how little we currently know about these animals, making it difficult to decide how best to mitigate their threats.

Although not currently under risk of extinction, four sea snake species (6 %) are listed as Near Threatened (NT), which means that they almost reach the threshold for a threatened category, but do not qualify under one of the sub-criteria. These species are *Hydrophis pacificus*, *Laticauda frontalis*, *Laticauda guineai* and *Laticauda semifasciata*. It is interesting to note that five of the eight species in the genus *Laticauda* are listed as VU or NT. This may be due to the fact that they still need to come to the land to reproduce. This adds additional threats to this part of their life cycle. The one widespread species which is classified as Near Threatened is *Laticauda semifasciata*, which occurs throughout much of Asia, from the Philippines north as far as Japan. Heavy harvesting of these animals for skins and food in the 1970's and 1980's led to large declines in numbers and the collapse of several sea snake fisheries. This species is no longer harvested in such large numbers, however populations are still recovering.

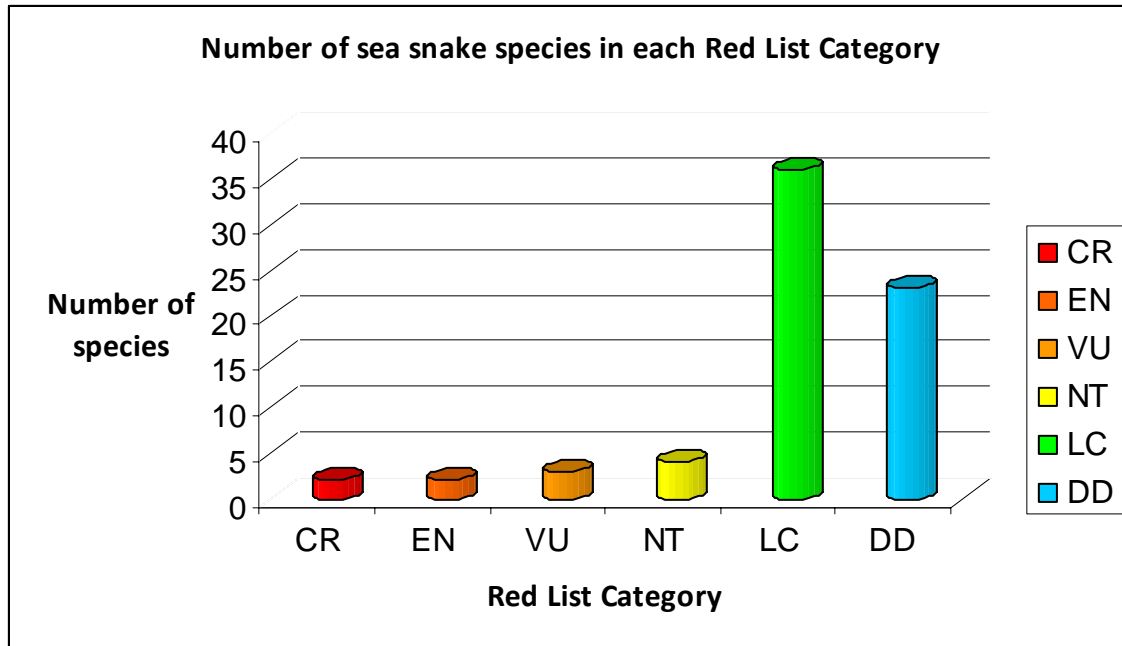


Figure 2. Number of sea snake species in each Red List Category

Just over half of the sea snake species (n=36, 51%) were listed as Least Concern (LC). For these species there is no immediate risk of extinction. Some of these species have experienced declines in their populations due to threats such as bycatch and coastal development causing habitat destruction. However, these declines are not currently at levels which trigger any of the threatened category thresholds. Many threats are localized and are not causing declines on a global basis. Wider-ranging species are less likely to be affected by localized threats, whereas endemic and more restricted range species have an increased risk of extinction. The three file snakes, *Acrochordus arafurae*, *Acrochordus granulatus* and *Acrochordus javanicus* were all listed as Least Concern.

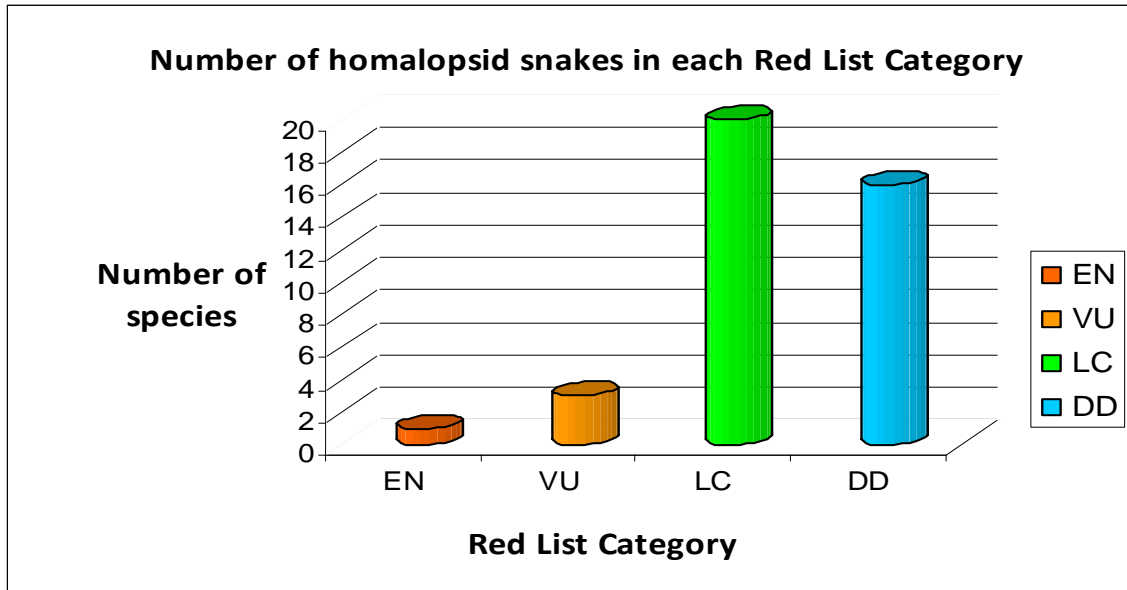
A large proportion of the sea snakes (n=23, 33%) were found to be Data Deficient (DD) which means that there was not enough data available on these species to be able to assign a Red List Category. This highlights the need for more research on these species, as a DD Category does not mean that these species are not threatened with extinction. As sea snakes often live in muddy coastal waters, many are only known from incidental captures in trawls. It is unknown the effects of the bycatch on the population of these species. On this point, at least two of these DD species have not been sighted in over 50 years. Geographically, DD status does not appear to be restricted to any particular region, with species endemic to India, Asia, Papua New Guinea, Australia and the Pacific all being represented in this category. This would suggest that further research is needed across the board, rather than in any one particular area.

## 6.2. Homalopsids

The homalopsid snakes were also assessed at the workshop in February. There are 40 species of homalopsids. The results show that **10%** (n=4) of homalopsid snakes have an



elevated risk of extinction. One species is listed as EN (*Enhydris vorisi*), and three are listed as VU (*Cerberus microlepis*, *Enhydris jagorii* and *Enhydris longicauda*). It is interesting that the percentage of sea snakes and coastal homalopsid snakes are the same.



**Figure 3. Number of homalopsid snake species in each Red List Category**

Half of the homalopsid species (n=20, 50%) were listed as LC (Figure 3). Many homalopsid species live in muddy areas in rivers and other freshwater and brackish habitats. These are often areas that are heavily used by humans and are often polluted and destroyed by human activities. However, many of these snakes are also able to live in artificial aquatic habitats such as rice fields and canal systems; therefore although there are threats to their natural habitat, they can live in other man-made habitats just as well.

Forty % (n=16) of the homalopsids were listed as DD. This is a very high figure and emphasizes the need for additional research on this group of species. As many of these species have small ranges and are restricted to river basins, some are very likely to be threatened. As many of these snakes are burrowing species and live in muddy aquatic habitats, they are difficult to study, and in some cases only a handful of specimens have been collected.

## 7. Conclusions

Sea snakes make up the largest group of extant marine reptiles with approximately 110 species in three families - Elapidae, Acrochordidae and Homalopsidae. They occur in a variety of shallow-water habitats throughout the Indo-West Pacific; one species is found outside this distribution in the Eastern Pacific and Eastern Atlantic. There are a number of endemic species with restricted ranges, which gives them a higher risk of extinction.

Other life history traits, such as low reproductive outputs and reduced dispersal, also increase their vulnerability to threats. With this in mind, surprisingly little is known of the current status and conservation of sea snakes. However, recent reports have suggested declining abundances in local populations due to habitat degradation, bycatch in trawl nets and target fisheries. Most sea snake species are associated with soft sediments, estuaries and other shallow water habitats where trawling is common practice. A number of sea snakes are also closely associated with coral reefs, and there are reports of severe losses of endemic aipysurids on protected Australian coral reefs. Coral reef habitat loss due to disease, climate change related threats and over-fishing is a real threat to species that have constrained dispersal.

A sound knowledge of the ecology and distribution of sea snake and homalopsid species, and information on their conservation status is needed to provide the foundation for making informed decisions to deal with the challenges to conserve these animals at local, regional and global levels. However the results presented here highlight that there are many gaps in our knowledge of these species.

The completed Red List assessments of these groups can aid countries to include these species in the identification of priorities for initiatives such as development of protected area networks, and for implementing laws and regulations for protection of rare, threatened or endemic species. Furthermore, significant funds are available for the conservation of species which have globally threatened status.

## **8. Reporting and Outcomes**

### **8.1. Results on the IUCN Red List of Threatened Species**

The data resulting from this study will be published and posted on the website of *IUCN Red List of Threatened Species* in March 2010. This is one of the most visited environmental websites in the world, with millions of users, and visitors will be able to search for sea snake species using a number of query options (including geographic, threat-level, threat-type, and taxonomic criteria). The shapefiles of all the species distributions will also be available.

### **8.2. Peer-reviewed publications**

There are two manuscripts in preparation on the results of the assessment of these species (one highlighting the homalopsid results and one the status of the world's sea snakes). The experts that have taken part in these assessments are involved in collating the results in more detail than is presented in this report and analysis of the geographic data and associated threats to sea snakes and homalopsids is currently being carried out. There are plans to submit these documents to peer-reviewed journals in the early part of 2010.

### **8.3. Nominations for Australia's EPBC Act**

An immediate outcome of the assessment workshop is that two sea snake species, assessed as Critically Endangered under Red List Criteria, have been nominated by V.

Lukoschek for listing as Critically Endangered under Australia's *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* [www.environment.gov.au/epbc/index.html](http://www.environment.gov.au/epbc/index.html) in the 2009 round of assessments. *Aipysurus apraefrontalis* and *Aipysurus foliosquama* are Australian endemics and only occur on two reefs in the Timor Sea. Previously abundant on these reefs (Guinea and Whiting, 2005), no individual of either species has been seen since 2000 despite intensive surveys (Guinea, 2006; Guinea, 2007) (Lukoschek, unpublished data), some of which have been funded by Australia's Department of Environment, Water, Heritage and the Arts (DEWHA). The annual round of EPBC nominations are assessed together and the two sea snake nominations have passed through the first stage of the process, which ensures that the nominations comply with EPBC regulations. All nominations currently are evaluated and prioritized by the Threatened Species Scientific Committee (TSSC) [www.environment.gov.au/biodiversity/threatened/committee.html](http://www.environment.gov.au/biodiversity/threatened/committee.html), which provides the Minister of the Environment, Water, Heritage and the Arts with a Proposed Priority Assessment List. The Minister decides on the Final Assessment Priority List, which is published on the web <http://www.environment.gov.au/biodiversity/threatened/nominations-fpal.html>, and the assessment process begins. This involves inviting public and expert scientific comment on each nomination, which is then considered by the TSSC in the process of evaluating whether the species is eligible for listing under EPBC and under which category. The Minister makes the final decision, which is published on DEWHAs website along with the TSSCs listing advice.

If a species is listed as threatened under the EPBC Act, conservation advice is developed to assist its recovery. Conservation advice provides guidance on immediate recovery and threat abatement activities that can be undertaken to ensure the conservation of a newly listed species. This includes practical field activities, such as monitoring known sites to identify key threats, which can be implemented by scientists, natural resource management groups, or interested individuals. Conservation advice also may include broader management actions to protect the species or ecological community on a regional level that can be undertaken by organizations, such as government agencies or non-government organizations. Such management actions may include protecting areas that contain populations or which could support populations in the future and/or developing a management plan for the control of threatening processes in the local region. Specific recovery plans also may be developed for selected species.

The workshop brought together many of the world's sea snake experts for the first time. Sharing of information and discussions resulted in a better understanding of threatening processes facing sea snakes, including the potential impacts of the effects of climate change on some species. This information has been integrated into the first Marine Climate Change Impacts and Adaptation Report Card (MaRC) for Australia being funded by: Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) Climate Adaptation Flagship (CAF); Australia's National Climate Change Adaptation Research Facility (NCCARF); and the Australian Climate Change Science

Program (ACCSP). Information on sea snakes has been provided for the marine reptile section of the MaRC by co-author Vimoksalehi Lukoschek.

#### **8.4. Creation of the IUCN Sea Snake Specialist Group**

The sea snake assessment workshop brought together a group of 15 specialists on sea snake taxonomy and conservation biology, fisheries development, and marine resource management. This highlighted a serious gap in the basic and current knowledge needed to support sea snake conservation. However, it was also clear from the workshop that a significant number of international scientists and conservation professionals are presently active in sea snake biodiversity research, management and conservation policy. Following the February workshop, the participants discussed options to better coordinate their varied work to promote sea snake conservation. It was eventually agreed that a Species Survival Commission Specialist Group would provide the ideal framework in which to develop funding, field research, capacity, policy and educational programs. In April-May, the GMSA guided co-chairs Drs Vimoksalehi Lukoschek and Kate Sanders in forming a SSC Sea Snake Specialist Group that includes the 'true' sea snakes, sea kraits, and marine and freshwater homalopsine and acrochordid snakes. Of more than 120+ Specialist Groups currently within the SSC, this is only the second that focuses on squamate reptiles (lizards and snakes).

The structure, priorities and membership of the Sea Snake Specialist Group (SSSG) are now formalized, and invitations to be a member of the SSSG will be distributed in September 2009. Many experts have expressed enthusiastic interest in joining the group. Co-chairs Lukoschek and Sanders are scientists with highly complementary research interests and expertise: Lukoschek is a marine biologist focused mainly on population and ecological genetics of *Aipysurus* group sea snakes in Australasia; Sanders is a herpetologist focused on biodiversity and molecular systematics, primarily of *Hydrophis* and *Acrochordus* species in Southeast Asia.

The SSSG have outlined five priority activities that focus on identifying habitat, fisheries and trade related threats to sea snakes, and promoting sustainable commercial use and marine reserve management. These are: 1) Field surveys to improve basic distributional and ecological data for all sea snakes, but especially Data Deficient species, those for which data are grossly outdated, and species occurring in sparsely sampled regions; 2) Detailed surveys of reefs where sea snake populations are reported to have declined to quantify ecological and environmental parameters correlated with the distribution and abundance of snakes and inform focused campaigns for threatened species; 3) Systematic and population genetic studies to determine how protected areas can be networked to protect sea snake diversity most effectively; 4) Investigations of sea snake mortality resulting from fisheries bycatch and levels of harvest for commercial trade in skins and meat; 5) Collaboration with NGOs and government authorities, providing information and advice to support the development of conservation programs and policies that ensure sustainable management of sea snakes and their habitats.

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- Mr Jonnell Sanciangco, GIS Specialist

### Supporters and Partners:

- ***International Sea Turtle Symposium (ISTS) organizing committee***
- ***Environment Protection Agency, Queensland Government***

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Institutional support

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### Appendix 3 – Sea snake species list and Red List Category

| Species                          | RL Category |
|----------------------------------|-------------|
| <i>Aipysurus apraefrontalis</i>  | CR          |
| <i>Aipysurus foliosquama</i>     | CR          |
| <i>Aipysurus fuscus</i>          | EN          |
| <i>Hydrophis semperi</i>         | EN          |
| <i>Hydrophis parviceps</i>       | VU          |
| <i>Laticauda crockeri</i>        | VU          |
| <i>Laticauda schistorhynchus</i> | VU          |
| <i>Hydrophis pacificus</i>       | NT          |
| <i>Laticauda frontalis</i>       | NT          |
| <i>Laticauda guineai</i>         | NT          |
| <i>Laticauda semifasciata</i>    | NT          |
| <i>Acalyptophis peronii</i>      | LC          |
| <i>Acrochordus arafurae</i>      | LC          |
| <i>Acrochordus granulatus</i>    | LC          |
| <i>Acrochordus javanicus</i>     | LC          |
| <i>Aipysurus duboisii</i>        | LC          |
| <i>Aipysurus eydouxii</i>        | LC          |
| <i>Aipysurus laevis</i>          | LC          |
| <i>Astrotia stokesii</i>         | LC          |
| <i>Emydocephalus annulatus</i>   | LC          |
| <i>Emydocephalus ijimae</i>      | LC          |
| <i>Enhydrina schistosa</i>       | LC          |
| <i>Ephalophis greyae</i>         | LC          |
| <i>Hydrelaps darwiniensis</i>    | LC          |
| <i>Hydrophis atriceps</i>        | LC          |
| <i>Hydrophis brookii</i>         | LC          |
| <i>Hydrophis caeruleus</i>       | LC          |
| <i>Hydrophis cyanocinctus</i>    | LC          |
| <i>Hydrophis elegans</i>         | LC          |
| <i>Hydrophis fasciatus</i>       | LC          |
| <i>Hydrophis gracilis</i>        | LC          |
| <i>Hydrophis kingii</i>          | LC          |
| <i>Hydrophis lamberti</i>        | LC          |
| <i>Hydrophis lapemoides</i>      | LC          |
| <i>Hydrophis macdowellii</i>     | LC          |
| <i>Hydrophis major</i>           | LC          |
| <i>Hydrophis obscurus</i>        | LC          |



|                                 |    |
|---------------------------------|----|
| <i>Hydrophis ocellatus</i>      | LC |
| <i>Hydrophis ornatus</i>        | LC |
| <i>Hydrophis spiralis</i>       | LC |
| <i>Kerilia jerdoni</i>          | LC |
| <i>Lapemis curtus</i>           | LC |
| <i>Laticauda colubrina</i>      | LC |
| <i>Laticauda laticaudata</i>    | LC |
| <i>Laticauda saintgironsi</i>   | LC |
| <i>Pelamis platurus</i>         | LC |
| <i>Thalassophina viperina</i>   | LC |
| <i>Aipysurus tenuis</i>         | DD |
| <i>Enhydrina zweifeli</i>       | DD |
| <i>Hydrophis belcheri</i>       | DD |
| <i>Hydrophis bituberculatus</i> | DD |
| <i>Hydrophis cantoris</i>       | DD |
| <i>Hydrophis coggeri</i>        | DD |
| <i>Hydrophis czeblukovi</i>     | DD |
| <i>Hydrophis inornatus</i>      | DD |
| <i>Hydrophis klossi</i>         | DD |
| <i>Hydrophis laboutei</i>       | DD |
| <i>Hydrophis mamillaris</i>     | DD |
| <i>Hydrophis melanocephalus</i> | DD |
| <i>Hydrophis melanosoma</i>     | DD |
| <i>Hydrophis nigrocinctus</i>   | DD |
| <i>Hydrophis pachycercos</i>    | DD |
| <i>Hydrophis sibauensis</i>     | DD |
| <i>Hydrophis stricticollis</i>  | DD |
| <i>Hydrophis torquatus</i>      | DD |
| <i>Hydrophis vorisi</i>         | DD |
| <i>Hydrophis walli</i>          | DD |
| <i>Kolpophis annandalei</i>     | DD |
| <i>Parahydrophis mertoni</i>    | DD |
| <i>Thalassophis anomalus</i>    | DD |

**Appendix 4 – Homalopsid snake species and Red List Category**

| <b>Species</b>                   | <b>RL Category</b> |
|----------------------------------|--------------------|
| <i>Enhydris vorisi</i>           | EN                 |
| <i>Cerberus microlepis</i>       | VU                 |
| <i>Enhydris jagorii</i>          | VU                 |
| <i>Enhydris longicauda</i>       | VU                 |
| <i>Bitia hydroides</i>           | LC                 |
| <i>Cantoria violacea</i>         | LC                 |
| <i>Cerberus australis</i>        | LC                 |
| <i>Cerberus rynchops</i>         | LC                 |
| <i>Enhydris bocourti</i>         | LC                 |
| <i>Enhydris chinensis</i>        | LC                 |
| <i>Enhydris doriae</i>           | LC                 |
| <i>Enhydris dussumieri</i>       | LC                 |
| <i>Enhydris enhydris</i>         | LC                 |
| <i>Enhydris pakistanica</i>      | LC                 |
| <i>Enhydris plumbea</i>          | LC                 |
| <i>Enhydris polylepis</i>        | LC                 |
| <i>Enhydris sieboldii</i>        | LC                 |
| <i>Enhydris subtaeniata</i>      | LC                 |
| <i>Erpeton tentaculatus</i>      | LC                 |
| <i>Fordonia leucobalia</i>       | LC                 |
| <i>Gerarda prevostiana</i>       | LC                 |
| <i>Homalopsis buccata</i>        | LC                 |
| <i>Homalopsis nigroventralis</i> | LC                 |
| <i>Myron richardsonii</i>        | LC                 |
| <i>Anoplohydrus aemulans</i>     | DD                 |
| <i>Brachyorrhos albus</i>        | DD                 |
| <i>Brachyorrhos jobiensis</i>    | DD                 |
| <i>Cantoria annulata</i>         | DD                 |
| <i>Enhydris albomaculata</i>     | DD                 |
| <i>Enhydris alternans</i>        | DD                 |
| <i>Enhydris bennettii</i>        | DD                 |
| <i>Enhydris chanardi</i>         | DD                 |
| <i>Enhydris gyii</i>             | DD                 |
| <i>Enhydris indica</i>           | DD                 |
| <i>Enhydris innominata</i>       | DD                 |
| <i>Enhydris maculosa</i>         | DD                 |
| <i>Enhydris matannensis</i>      | DD                 |
| <i>Enhydris pahangensis</i>      | DD                 |
| <i>Enhydris punctata</i>         | DD                 |
| <i>Heurnia ventromaculata</i>    | DD                 |