

Approved Conservation Advice for *Hoplocephalus bungaroides* (broad-headed snake)

(s266B of the *Environment Protection and Biodiversity Conservation Act 1999*)

This Conservation Advice has been developed based on the best available information at the time this Conservation Advice was approved; this includes existing and draft plans, records or management prescriptions for this species.

Description

Hoplocephalus bungaroides (broad-headed snake), family Elapidae, is black above with yellow spots forming narrow, irregular cross-bands. Other yellow scales may link these cross-bands laterally to form a straight or zigzagged stripe along the body. These cross-bands help distinguish it from the similar-looking juvenile diamond python (*Morelia spilota*). Its head is flattened on top and is distinct from the body. The belly is grey or greyish-black. The average length is about 60 cm, with a maximum of around 150 cm. Birth occurs in January to March (OEH, 2012). The species is active at dusk (Wells, 1981, cited in NSW NPWS, 1999).

Conservation Status

The broad-headed snake is listed as vulnerable under the name *Hoplocephalus bungaroides* Broad-headed Snake. This species is eligible for listing as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) as, prior to the commencement of the EPBC Act, it was listed as vulnerable under Schedule 1 of the *Endangered Species Protection Act 1992* (Cwlth).

The species is also listed as endangered under the *Threatened Species Conservation Act 1995* (New South Wales) and vulnerable under the IUCN Red List of Threatened Species 2013.1 (Australasian Reptile & Amphibian Specialist Group, 1996).

Distribution and Habitat

The broad-headed snake occurs in New South Wales from Wollemi National Park in the north to the Clyde River catchment (south-west of Nowra) in the south, east to Royal National Park and the Illawarra, and west to the upper Blue Mountains at Blackheath and Newnes (NSW NPWS, 1999). There are four general areas of occurrence: Blue Mountains; southern Sydney; an area north-west of the Cumberland Plain; and the Nowra hinterland (NSW NPWS, 1999). Populations north of Kiama and south of Kiama are two evolutionary significant units that diverged approximately 800 000 years ago (Sumner et al., 2010).

Formerly, the broad-headed snake occurred along rocky sections of the Sydney coastline from the entrance of Port Jackson south to Botany Bay, and around Middle Harbour, Lane Cove and Parramatta (NSW NPWS, 1999). Old outlying records were made in the north-west of the Sydney Basin between Bathurst and Mudgee (NSW NPWS, 1999).

The broad-headed snake typically occurs on exposed rocky sites on sandstone outcrops and benching (NSW NPWS, 1999). It is found on Triassic and Permian sandstones of the Hawkesbury, Narrabeen and Shoalhaven groups (OEH, 2012). Vegetation associations at known sites are variable, but mainly woodland, open woodland and/or heath (NSW NPWS, 1999) and woodland or forest adjacent to the site is essential (Webb & Shine, 1997). Near Bathurst, it has been found in forest growing on shale or conglomerate slopes and bluffs (Shea, pers. comm., cited in Cogger et al., 1993).

During autumn, winter and spring, the species shelters in rock crevices and under flat sandstone rocks on exposed cliff edges (OEH, 2012), especially in areas with a west to

north-west aspect (NSW NPWS, 1999). In summer, it shelters in hollows of large trees within 200 m of escarpments (OEH, 2012).

This species occurs within the Sydney Basin and South Eastern Highlands Bioregion and the Hawkesbury-Nepean, Southern Rivers, Central West and Hunter-Central Rivers Natural Resource Management Regions. The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological community.

The Department of the Environment has prepared survey guidelines for *Hoplocephalus bungaroides*. The survey guidelines are intended to provide guidance for stakeholders on the effort and methods considered appropriate when conducting a presence/absence survey for species listed as threatened under the EPBC Act.
<http://www.environment.gov.au/resource/survey-guidelines-australias-threatened-reptiles-guidelines-detecting-reptiles-listed>

Threats

The main identified threats to the broad-headed snake are:

- disturbance of habitat, in particular the removal of large hollow-bearing trees adjacent to sandstone escarpments (OEH, 2012) and bush rock removal (Shine et al., 1998).
- residential and infrastructure development of ridgetops (Krefft, 1869, cited in NSW NPWS, 1999; Webb & Shine, 1994, cited in NSW NPWS, 1999).
- pine plantation development (Sumner et al., 2009) and associated tracks that increase accessibility (NSW NPWS, 1999).
- inappropriate fire regimes, which have reduced tree hollows (NSW NPWS, 1999) and, in the absence of fire, thickens canopy and increases shading of winter habitat (Pringle et al., 2009).

The main potential threats to the broad-headed snake include:

- habitat disturbance by feral goats (*Capra hircus*) (OEH, 2012).
- predation by European red foxes (*Vulpes vulpes*) and cats (*Felis catus*) (NSW NPWS, 1999).
- vehicle strike (OEH, 2012).
- intentional and unintentional killing of snakes during bush rock collection and other activities (OEH, 2012).
- the loss of habitat caused by climate change (Penman et al., 2010).
- illegal collection (Webb et al., 2002).

Research Priorities

Research priorities that would inform future regional and local priority actions include:

- More precisely assess ecological requirements, the summer life cycle, the type of use (obligatory versus facultative) of winter shelter sites and the relative impacts of threatening processes (OEH, 2012).
- Develop and validate a habitat model for the broad-headed snake (OEH, 2012).
- Investigate the influence of wildfire on the broad-headed snake and its main prey items, to clarify direct and indirect impacts of planned and natural fire (OEH, 2012).
- More precisely assess the species abundance and monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

- Investigate DNA-based or other approaches for the identification of individual and/or populations to provide a means for detecting and prosecuting illegal collection from the wild (see for example Palsboll et al., 2006).

Regional Priority Actions

The following regional priority recovery and threat abatement actions can be done to support the recovery of the broad-headed snake:

Habitat Loss, Disturbance and Modification

- Establish the conservation priorities of the species to identify populations of high conservation priority.
- Ensure there is no disturbance in areas where the broad-headed snake occurs, excluding necessary actions to manage the conservation of the species.
- Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate and/or secure inclusion in reserve tenure if possible.

Trampling, Browsing or Grazing

- Develop and implement a management plan for the control and eradication of feral goats in the region.

Fire

- Develop and implement a suitable fire management strategy for habitat of the broad-headed snake.
- Where appropriate provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigative measures in bush fire risk management plan/s, risk register and/or operation maps.

Conservation Information

- Raise awareness of the broad-headed snake within the local community.
- Engage with private landholders and land managers responsible for the land on which populations occur and encourage these key stakeholders to contribute to the implementation of conservation management actions.
- Maintain colonies in captivity for future re-introduction to depleted sites or sites undergoing restoration (OEH, 2012).
- Investigate options for linking, enhancing or establishing additional populations.
- Review licensed broad-headed snake keepers and establish a database of the genetics of held specimens (OEH, 2012).
- Report suspected illegal reptile collection or sale (OEH, 2012).

Local Priority Actions

The following local priority recovery and threat abatement actions can be done to support the recovery of the broad-headed snake:

Habitat Loss, Disturbance and Modification

- Limit vehicle and pedestrian access to and recreational use of sandstone escarpments where this species occurs (OEH, 2012).
- Control access routes to suitably constrain public access to known sites on public land, possibly through gating of tracks (NSW NPWS, 1999).
- Suitably control and manage access on private land and other land tenure.
- Include appropriate measures in forestry prescriptions, including reduced ridgetop disturbance, appropriate track creation and tree hollow retention.

- Undertake survey work in suitable habitat and potential habitat to locate any additional populations/occurrences/remnants.
- Restore rocky habitat to escarpments that have been disturbed (OEH, 2012).
- Conduct habitat restoration trials using a variety of methods including: vegetation manipulation (canopy thinning, see Pike et al., 2011) and rock replacement using natural, artificial and quarried rock (OEH, 2012).
- Limit the impact of bushrock removal through regulation and promote the use of quarried sandstone (OEH, 2012).
- Retain woodland adjacent to sandstone escarpments, particularly large hollow-bearing trees (OEH, 2012).

Animal Predation or Competition

- Control introduced pests (European red foxes) and feral animals (cats) to manage threats at known sites.

This list does not necessarily encompass all actions that may be of benefit to the broad-headed snake, but highlights those that are considered to be of highest priority at the time of preparing the Approved Conservation Advice.

Existing Plans/Management Prescriptions that are Relevant to the Species

- Threat abatement plans for feral goats (DEWHA, 2008a); predation by feral cats (DEWHA, 2008b) and European red foxes (DEWHA, 2008c)

These prescriptions were current at the time of publishing; please refer to the relevant agency's website for any updated versions.

References

Australasian Reptile and Amphibian Specialist Group (1996). *Hoplocephalus bungaroides*. In: IUCN (International Union for Conservation of Nature and Natural Resources) (2013). IUCN Red List of Threatened Species. Version 2013.1.

Available on the Internet:

www.iucnredlist.org

Cogger HG, Cameron EE, Sadlier RA and Egglar P (1993). *The Action Plan for Australian Reptiles*. Canberra, ACT: Australian Nature Conservation Agency.

Available on the Internet:

<http://www.environment.gov.au/biodiversity/threatened/action/reptiles/index.html>

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008a). *Threat Abatement Plan for Competition and Land Degradation by Feral Goats*. DEWHA.

Available on the Internet at:

<http://www.environment.gov.au/biodiversity/threatened/publications/tap/goats08.html>

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b). *Threat Abatement Plan for predation by feral cats*. DEWHA.

Available on the Internet at:

<http://www.environment.gov.au/biodiversity/threatened/publications/tap/cats08.html>

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008c). *Threat Abatement Plan for Predation by the European red fox*. DEWHA.

Available on the Internet at:

<http://www.environment.gov.au/biodiversity/threatened/publications/tap/foxes08.html>

New South Wales National Parks and Wildlife Services (NSW NPWS) (1999). *Broad-headed Snake, Hoplocephalus bungaroides (Schlegel, 1837), Threatened Species Information*. NSW Government.

- Office of Environment and Heritage (OEH) (2012). *Broad-headed Snake – profile*. NSW Government.
Available on the Internet:
<http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10413>
- Palsboll PJ, Berube M, Skaug HJ and Raymakers C (2006). DNA registers of legally obtained wildlife and derived products as means to identify illegal takes. *Conservation Biology* 20:1284–1293.
- Penman TD, Pike DA, Webb JK and Shine R (2010). Predicting the impact of climate change on Australia's most endangered snake, *Hoplocephalus bungaroides*. *Diversity and Distributions* 16:109–118.
- Pike DA, Webb JK and Shine R (2011). Removing forest canopy cover restores a reptile assemblage. *Ecological Applications* 21(1):274–280.
- Pringle RM, Syfert M, Webb JK and Shine R (2009). Quantifying historical changes in habitat availability for endangered species: use of pixel- and object-based remote sensing. *Journal of Applied Ecology* 46(3):544–553.
- Shine R, Webb JK, Fitzgerald M and Sumner J (1998). The impact of bush-rock removal on an endangered snake species, *Hoplocephalus bungaroides* (Serpentes: Elapidae). *Wildlife Research*. 25:285–295.
- Sumner J, Webb JK, Shine R and Keogh JS (2010). Molecular and morphological assessment of Australia's most endangered snake, *Hoplocephalus bungaroides*, reveals two evolutionary significant units for conservation. *Conservation Genetics* 11:747–758.
- Webb JK, Brook BW and Shine R (2002). *Do reptile collectors threaten Australia's most endangered snake?* In: Australian Society of Herpetologists 29th General Meeting, 11–15 July 2002, Birrigai, ACT.
- Webb JK and Shine R (1997). Out on a limb: conservation implications of tree-hollow use by a threatened snake species (*Hoplocephalus bungaroides*: Serpentes, Elapidae). *Biological Conservation* 81:21–33.