

# Action Statement

Flora and Fauna Guarantee Act 1988

No. 104

## Diamond Python *Morelia spilota spilota*

### Description and Distribution

The Diamond Python *Morelia spilota spilota* (Lacépède 1804) is a colourful and distinctive python distributed along the eastern coast of Australia from East Gippsland north to near Coffs Harbour in NSW.

One of only two pythons occurring in Victoria (the other is the closely related Carpet Python *Morelia spilota variegata*), it has the most southerly distribution of all Australian pythons and, in East Gippsland, occurs at the highest latitudes of any python in the world (Slip & Shine 1988d). Average adult length is about 2m, with a maximum of 4m. Typical colouration above is a glossy olive-black, with cream or yellow spots on most scales, with some of these spots occurring as groups, sometimes in a diamond shape, giving a patterned effect. The lower body is cream or yellow, patterned with dark grey. The lips are cream, barred with black (Cogger 1996). Hatchlings and juveniles are mottled brown, and appear very similar to young Carpet Pythons, changing to adult colouration in the first few years of life (Shine 1991).

The Diamond Python is restricted in Victoria to far East Gippsland (Coventry & Robertson 1991), with few confirmed records, most from within the area bounded by the Cann River, the Princes Highway and the coast. In NSW, the python occurs only east of the Great Dividing Range, but it is not entirely coastal, extending inland along some of the larger river systems north of Sydney. It still occurs extensively in the bushland suburbs of Sydney where, in the late 1980s, it was found to be relatively common, but seldom seen due to its



**Diamond Python** *Morelia spilota spilota*  
(photograph by Ian McCann)



**Distribution in Victoria**  
[source: Atlas of Victorian Wildlife, NRE 1999]

highly effective camouflage and secretive behaviour (Shine 1991). In the north of its range, the Diamond Python occasionally hybridises with the Carpet Python (Ehmann 1993). Both subspecies are slow-moving and non-venomous - although they can inflict a painful bite, they are not considered dangerous to humans.

The ecology of Diamond Pythons has been studied in the Sydney area (Slip & Shine 1988a, b, c, d). Diamond Pythons are ambush predators, with adults feeding almost entirely on mammals, while juveniles feed on mammals, birds and reptiles (Slip & Shine 1988a). A python may lie in wait for prey virtually without moving for several weeks, then move up to 100m to another ambush site. Feeding occurs mainly in the warmer months and only rarely at other times. Diamond Pythons have large, overlapping home ranges (up to 108ha in males and 52ha in females have been recorded). Movement generally takes place during the day, although nocturnal movements may occur on warmer summer nights. Habitat use by Diamond Pythons in the Sydney area varies considerably with season (Slip & Shine 1988c).

Mating occurs in spring, with mating aggregations of males remaining around a single female for up to 8 weeks (Slip & Shine 1988c). The eggs are laid in early summer in a shallow depression under thick leaf litter, generally in an open area close to a creek (Slip & Shine 1988d, Cook 1994). Clutch size ranges from 9-54 eggs (average 21), with larger females producing larger clutches. The female broods the eggs by coiling around them and shivering to produce metabolic heat, although she may leave them on sunny mornings to briefly bask (Harlow & Grigg 1984, Slip & Shine 1988d). Females do not feed during this time. The eggs hatch after 6-12 weeks, with hatchlings measuring 40-50cm total length. Little is known about the ecology of juveniles, as they are very rarely observed in the field.

### **Current conservation status**

NRE (2000) vulnerable (Vic.)

The Diamond Python has been listed as a threatened taxon in Schedule 2 of the Flora and Fauna Guarantee Act 1988. The species has a very restricted distribution in Victoria and seems to be very rare. It is rarely observed, with only 32 records on the *Atlas of Victorian Wildlife* database (as at January 2000), all east of the Cann River and mostly south of the Princes Highway. There has been considerable zoological survey work carried out within the python's Victorian range in the last 20 years, and parts of the area are frequently visited by naturalists who are familiar with the species, so the low rate of reporting is unlikely to be an artefact of lack of observers. It should be noted, however, that this species is secretive and

well camouflaged, making it difficult to detect even by experienced researchers (Shine 1991).

A number of threats to the Diamond Python in Victoria have been identified. They are presented below, in perceived order of relative importance. The first three are likely to have widespread consequences for the Diamond Python population, and will be addressed as a matter of priority.

- population reduction through high intensity bushfires and/or inappropriate fuel-reduction burning;
- habitat alteration due to forest management practices, including timber harvesting and silvicultural treatment;
- predation and attack on adults (particularly brooding females), eggs and hatchlings by introduced predators - the Red Fox *Vulpes vulpes* and the feral Cat *Felis catus*;
- illegal collection by reptile fanciers and traders;
- accidental death through roadkills;
- killing of individuals by a misinformed public.

The Diamond Python is thought, therefore, to have a limited distribution, a low population size, and to be subject to a number of threatening processes - consequently, it is considered vulnerable in Victoria.

In its final recommendation the Scientific Advisory Committee (SAC 1992) determined that the Diamond Python is:

- significantly prone to future threats which are likely to result in extinction; and
- very rare in terms of abundance or distribution.

### **Major Conservation Objective**

The major conservation goal is to ensure that the Diamond Python can survive, flourish and maintain its potential for evolutionary development in the wild. However, as so little is known about the ecology of this species in Victoria, particularly its habitat requirements, the immediate, overriding objective must be to undertake the research necessary to direct appropriate management such that this major conservation goal may be achieved. Consequently, major objectives are to:

- Conduct research into the biology of the Diamond Python in Victoria, including survey to determine the full extent of populations, study of habitat use in East Gippsland environments which are very different to those of the well-studied Sydney populations, demographic research, and assessment of the effects of fire, timber harvesting and introduced predators;

- Ensure that the conservation reserve system in East Gippsland adequately protects currently known and subsequently discovered populations of the Diamond Python;
- Appropriately manage the Diamond Python's habitat within the reserve system, especially in relation to fire regime, to avoid habitat deterioration and population decline;
- Ensure that management within the distribution of the Diamond Python, but outside the reserve system, takes account of the ecological requirements of the Diamond Python;
- Investigate the extent of illegal collection and control as required.

While the ability to achieve the second to fourth objectives is largely dependent upon the outcome of the research work (first objective), it is necessary and possible to implement interim management measures such that these objectives are addressed, based on current knowledge. Such measures are presented in 'Intended Management Actions'.

In the interim, then, the major management objective is to prevent any further disturbance to the habitat or the pythons at any site from which the Diamond Python has been recorded, by adopting a strategy which:

- establishes a special protection zone of 100ha encompassing each known locality on public land (see action 5);
- does not allow any further timber harvesting, roading or recreational activities within these special protection zones, and attempts to reduce the current effects of these activities;
- manages the special protection zones to exclude fire from refuge sites within these zones, and allows for a small scale mosaic of different-aged patches;
- targets predator control to these special protection zones; and
- prevents illegal collection.

This strategy will be applied to up to 50 Diamond Python sites, after which management requirements will be reviewed.

## Management Issues

### Ecological issues specific to the taxon

A variety of habitats are important for the conservation of Diamond Pythons, including rocky areas, woodlands, forest, scrub, and heathlands. They may utilise a number of different habitats, depending on the time of year and the individual's sex and reproductive status. Populations studied in the Sydney area prefer rocky sandstone habitats in winter, and shelter under rocks and logs during cooler days and nights at other times of the year.

During spring, males move long distances (up to 500m a day) through woodland and forest seeking females. Following mating in spring, reproductive females brood their clutch in grassy open areas, while males and non-reproductive females tend to move to ridge-tops and suburban areas, where prey density is higher (Slip & Shine 1988b, Shine 1991). Home ranges of individuals may be up to 108ha (Shine 1994). While waiting to ambush prey, individuals hide in moderately dense vegetation which provides filtering cover. Coastal habitats in East Gippsland are very different from Sydney sandstone areas, but it is likely that Victorian populations may show similar patterns of microhabitat use. Management practices which result in loss or degradation of these habitats may reduce populations of this species.

Female Diamond Pythons lay and brood their eggs in a shallow nest under a thick layer of leaf litter. The insulation provided by leaf litter, combined with generation of heat by shivering, is important in allowing Diamond Pythons to successfully reproduce in more temperate areas than any other python (Harlow & Grigg 1984, Slip & Shine 1988d). Fuel-reduction burning removes leaf litter, thus reducing available nesting sites. In addition, burning during the time that females are incubating the eggs (late spring and summer) is likely to kill both brooding mothers and their clutches. Fuel-reduction burning can also open up the understorey and ground layer and reduce vegetation complexity, which may reduce the habitat value for this species. Intense bush fires may reduce populations by killing brooding females, their clutches, and individuals that cannot find adequate shelter. Burning relatively small areas, producing a mosaic of different-aged patches of habitat, is less likely to affect populations, as areas are left in which individuals can find refuge from fire. Diamond Pythons may eventually disappear from areas that are burnt too frequently and in which adequate refuge habitat is not maintained.

Brooding females, eggs and hatchlings are particularly vulnerable to predation by Red Foxes and feral Cats, due to the position of the nest on the ground. Disturbance of a brooding female may cause her to abandon the clutch (Harlow & Grigg 1984, Slip & Shine 1988c). Aggregations of individuals during the mating season increases their visibility and vulnerability to predation.

The effects of timber harvesting on Diamond Pythons are not known. Where harvesting results in a dense ground layer of vegetation, the habitat may remain suitable for the species. However, where there is loss of vegetation complexity, litter following regeneration burns, prey density or hollow trees and logs following harvesting, habitat value may be reduced.

Physical damage to rocky areas is probably a relatively minor problem but can occur through activities such as quarrying, road and track construction and machinery damage during timber harvesting or fire control.

It is often stated that Diamond Python populations are under threat from illegal collecting (eg. LCC 1985, Richards *et al.* 1990), but little is known about the extent of such collecting, due to the difficulty of detecting offenders and the ease of transport of reptiles. The Diamond Python is an attractive snake which is popular with reptile fanciers, and captive specimens breed only rarely (Harlow & Grigg 1984). It is probable that some collecting occurs, although the numbers affected may be relatively small compared with the effects of habitat alteration, predation by Red Foxes and Cats, and accidental death through roadkills (Ehmann & Cogger 1985).

Female Diamond Pythons do not breed every year, and may reproduce only every third year (Slip & Shine 1988c). As a result, replacement rates are likely to be very low, and populations may take a long time to build up again following a reduction in numbers. Research into the demography of Diamond Pythons is needed. In particular, knowledge of the ecology of juveniles is required to refine management proposals.

#### **Wider conservation issues**

Management for the conservation of the Diamond Python will also be of value for other species that require dense and structurally complex vegetation, and a mosaic of different-aged patches of habitat. Examples include the Ground Parrot, Southern Emu-wren, Swamp Skink, bandicoots and potoroos. Maintenance of a deep organic litter layer may provide habitat for other herpetofauna, such as the threatened Eastern She-oak Skink *Cyclodomorphus michaeli* and Martin's Toadlet *Uperoleia martini* as well as maintaining conditions that are favourable to growth of subterranean fungi - important food items for bandicoots and potoroos, etc.

The existing reserve system in East Gippsland currently covers much of the Diamond Python's known range. The East Gippsland Forest Management Plan contains measures that should assist in the conservation of the species. Survey of potential Diamond Python habitat should increase knowledge of the fauna of those areas. Fire management and predator control may benefit a wide range of flora and fauna.

#### **Previous Management Action**

##### **Flora and Fauna Guarantee Act**

Predation of native wildlife by the Red Fox and feral Cat have been listed as potentially

threatening processes under Schedule 3 of the **Flora and Fauna Guarantee Act 1988**.

#### **Research and Survey**

No specific surveys have been undertaken for Diamond Pythons in East Gippsland, although parts of the area have been well surveyed for fauna in general, including sites of zoological significance surveys in the late 1970s, Ground Parrot surveys (involving visits to most coastal heathlands in 1980, 1983 and 1987), and several recent pre-logging surveys.

The area of the Diamond Python's potential range west of Point Hicks is classified as under-sampled or un-sampled for snakes by Richards *et al.* (1990), and the range of the species may extend further west than is currently known.

#### **Intended Management Action**

The Department of Natural Resources and Environment Parks, Flora and Fauna Division Division, NRE Gippsland Region and Parks Victoria are responsible for all actions.

#### **Research**

1. Survey suitable habitat specifically for Diamond Python populations to determine the extent of their range and habitat. A specific survey effort, based on known aspects of the species' biology, would be considerably more effective than general reptile survey in locating populations of this secretive and cryptic species.
2. Collect and collate all information on sightings, localities and habitat of Diamond Python populations, and record this information on the *Atlas of Victorian Wildlife* (NRE 1998). NRE should not release specific details of Diamond Python locations to the general public.
3. Collect data on the habitat use and demography of Diamond Python populations in East Gippsland. This would include studies of the requirements of juvenile Diamond Pythons, as their habitats and management problems may differ from those of adults.
4. Determine the relative importance of each of the recognised threats to the Diamond Python, particularly habitat alteration, fire, predation, illegal collection and other causes of mortality.
5. Monitor Diamond Python populations as part of the East Gippsland Forest Management Plan and relevant park management plans.

#### **Protect habitat**

6. Until more information on management requirements becomes available from the research actions described above, interim

management actions will be as below. These will be included in the East Gippsland Forest Management and Fire Protection Plans and relevant park management plans.

7. Identify and map Python habitat onto the NRE Geographical Information System (GIS) to aid in management of their populations.
8. Manage the fire regime throughout the general distribution of the Diamond Python to produce a mosaic of different-aged patches of habitat such that patch sizes are in the order of tens of hectares. A smaller scale mosaic (1-10ha or smaller) of different-aged patches is appropriate in areas of known populations of the Diamond Python. Any imposed fire regime should allow for the exclusion from burning of key areas of refuge habitat, such as dense vegetation along watercourses, rock outcrops and known home sites.

#### **Predator control**

9. Direct efforts to control introduced predators (Red Foxes and feral Cats) towards areas with a concentration of Diamond Python records or known areas of relatively high population density. Until such places are located, existing predator control programs within the distribution of the Diamond Python should be modified if necessary to maximise the benefit to the python.

#### **Prevent illegal collection**

10. Determine the extent and likely impact of illegal collection on wild populations, and continue to control as required. Control may be achieved through education (as in action 14), and by increased enforcement activities. In particular, attention to captive collections (possibly including permanent marking of captive and wild individuals) by an enforcement campaign, and imposition of penalties, may be required.
11. Investigate the feasibility of permanent marking of all legally-held captive Diamond Pythons in Victoria, to assist in the detection and control of illegal collecting and trade, if illegal collection is shown to be a significant concern.

#### **Liaison**

12. Liaise with wildlife authorities in south-eastern New South Wales, with regard to:
  - possible cooperation with research to determine management requirements of the Diamond Pythons in the region;
  - assistance with devising overall management strategy for Diamond Pythons in the region;

- co-ordination of enforcement activities.

13. Interview NRE personnel, local naturalists, landholders, timber workers, campers, and bushwalkers about possible sightings (including roadkills).

#### **Community education and involvement**

14. Educate amateur herpetologists, reptile fanciers and members of the general public as to the desirability of protecting Diamond Python populations in the wild. Involve suitably skilled community groups in surveys and monitoring where appropriate.
15. Encourage landholders, campers and bushwalkers not to disturb Diamond Pythons, especially brooding females, and to report any sightings (including roadkills). This could be done through direct contact with interested individuals, production of a leaflet and/or local newspaper articles.

#### **Manage disturbance cause by recreation**

16. Discourage recreational pursuits in localities identified as important for the Diamond Python. This will minimise disturbance to Diamond Pythons (particularly brooding females), their habitat and their prey.

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Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: <http://www.dse.vic.gov.au>

This Action Statement was first published in 2000 and remains current. This version has been prepared for web publication. It retains the original text of the action statement, although contact information, the distribution map and the illustration may have been updated.

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