

1. Family:	Elapidae
2. Scientific Name:	<i>Denisonia maculata</i> (Steindachner, 1867)
3. English Name:	Ornamental Snake

4. **Intraspecific taxa:** None

5. **Species survival status:** Vulnerable.

6. **Former distribution:** Not known to have differed from current distribution.

7. **Current distribution:** Confined to the Brigalow (*Acacia harpophylla*) Belt within the drainage system of the Fitzroy River, mid-eastern Queensland.

8. **Habitat:** Open forest, woodland, riparian habitats.

As well as occurring in Brigalow forest growing on clay and sandy soils, it is found in riverside woodland and open forest growing on natural levees (Ehmann, 1992).

9. **Reasons for decline:** Not known to have declined, but "considering the poor level of habitat protection in the area, and...that at least eight species of mammals have become extinct ...it seems likely, even certain, that frog and reptile species...are also at risk" (McDonald *et al.*, 1991). Threatened probably by a combination of factors including overgrazing by stock, clearance of habitat for agriculture and grazing, pasture improvement, crop production, urban development and possibly poisoning by ingestion of cane toads.

"...beef cattle have tramped, eaten and defecated over most of the Brigalow Belt not used for agriculture or urban development" (McDonald *et al.*, 1991); these authors noted the area had been intensively studied with the goal of improving techniques of clearing, pasture improvement and agriculture.

The diet of *Denisonia maculata* is almost exclusively frogs (Shine, 1983) and it could be poisoned by ingesting cane toads (*Bufo marinus*) which are abundant within its range (Glen Ingram, *in litt.*).

10. **Conservation reserves on which species occurs:** Dipperu NP.

10A. **Other conservation reserves where species might be expected to occur:** Blackdown Tableland NP, Byfield NP, Castle Tower NP, Isla Gorge NP, Mount Archer EP, Palmgrove NP, Precipice NP, Expedition Range NP, Taunton FR.

11. **Other public land on which species occurs:** May occur in the Shoalwater Bay area (Steve Wilson, *in litt.*).

12. **Other land on which species occurs:** Private property in the Moura district; potentially present on private properties throughout the species' range.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.

13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to determine if the species is declining and if so, to identify the major factors contributing to that decline.

14. **Recovery Plan objectives:**

14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.

14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.

14.3: To implement land management

practices which promote the maintenance of secure, viable populations of the species outside reserves.

- 15. Management actions already initiated:**
 15.1: "Surveys are currently underway [by QDEH] to determine remaining locations of various Brigalow and other vegetation communities in the Brigalow Belt so as to maximise representations within the National Park estate and to determine other conservation strategies" (Sattler in McDonald *et al.*, 1991).

- 16. Management actions required:**
 16.1: Survey known and potential habitat in reserves within the species' known range.
 16.2: Survey known habitat outside reserves within the species' known range.

16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.

16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current land use practices on the species outside reserves.

16.5: Develop community awareness within the species' known range.

17. Organisations responsible for conservation of species and individuals involved: Queensland Department of Environment and Heritage.

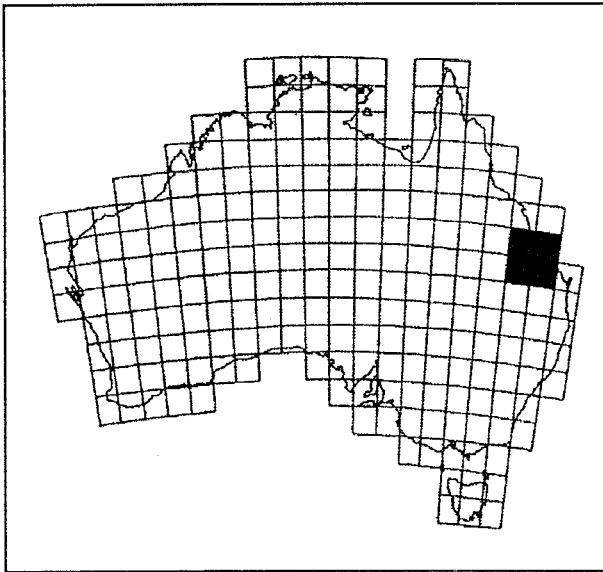
18. Other organisations and individuals involved: Herpetological staff of the Queensland Museum.

19. Can recovery plan be carried out with existing resources?:	No.
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$13,333 expenses. \$40K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 3 months each year for 2 years - \$20,000 salary; \$10,000 expenses. \$30K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. \$12K
	Total \$82K

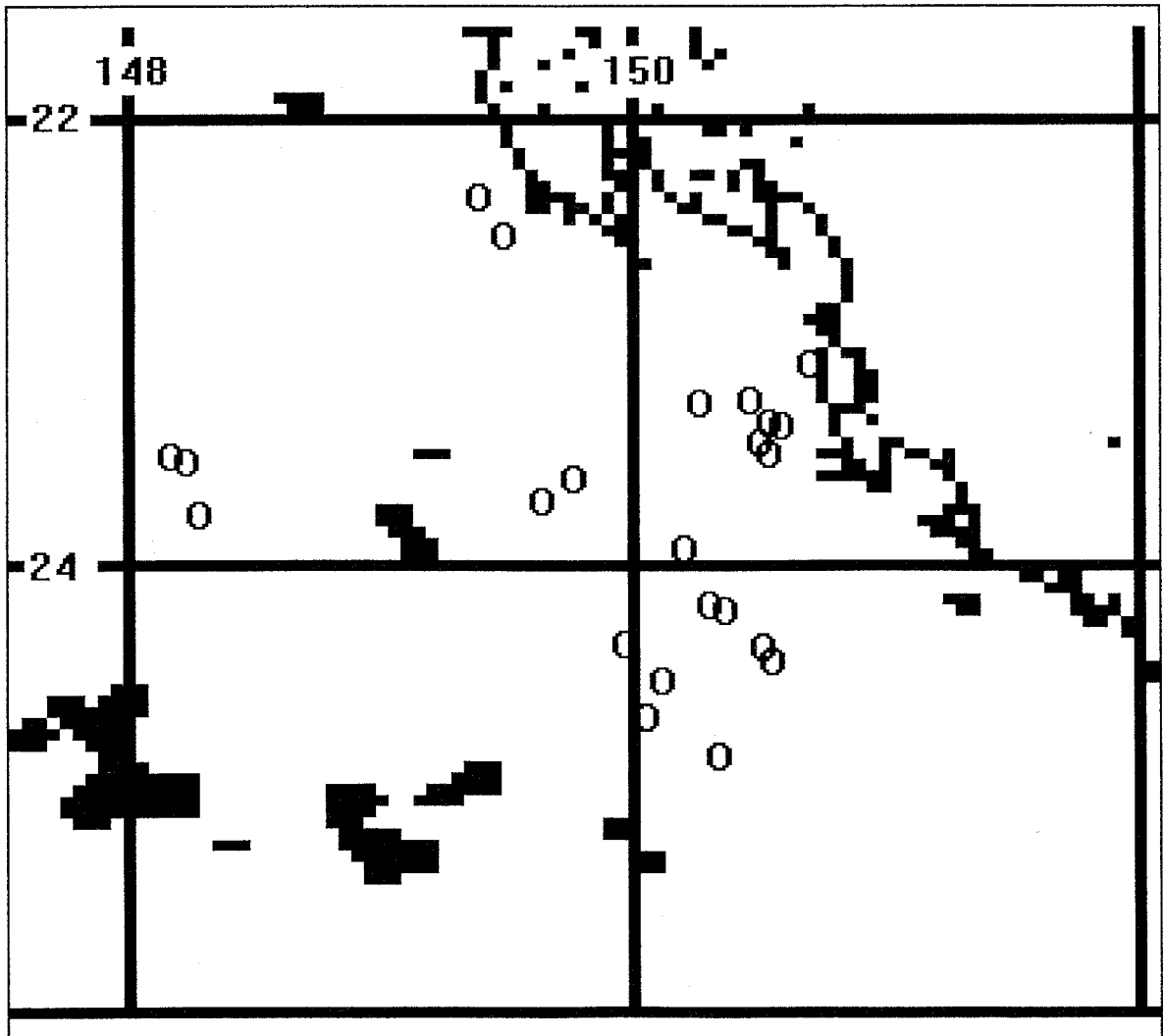
20. Remarks: 66 specimens documented in Australian museum collections.

References:

Ehmann, H.F.W. 1992. Encyclopedia of Australian Animals: Reptiles. Australian Museum with Angus and Robertson, Sydney. xv + 495 pp.
 McDonald, K.R., Covacevich, J.A., Ingram, G.J. and Couper, P.J. 1991. The status of frogs and reptiles. pp. 338-345 *in* G.J. Ingram and R.J. Raven (eds) An Atlas of Queensland's Frogs, Reptiles, Birds and Mammals. Queensland Museum, Brisbane.
 Shine, R. 1983. Food habits and reproductive biology of Australian elapid snakes of the genus *Denisonia*. Journal of Herpetology 17(2): 171-175.



Distribution of *Denisonia maculata*



1. Family:	Elapidae
2. Scientific Name:	<i>Echiopsis atriceps</i> (Storr, 1980) [also appears in the literature as <i>Brachyaspis atriceps</i> and <i>Denisonia atriceps</i>]
3. English Name:	Lake Cronin Snake

- 4. **Intraspecific taxa:** None
- 5. **Species survival status:** Vulnerable.
- 6. **Former distribution:** Not known to have differed from current distribution.
- 7. **Current distribution:** Vicinity of Lake Cronin in the semi-arid interior of southern Western Australia; this is on the eastern margin of the Western Australian wheatbelt.
- 8. **Habitat:** Open woodland, tall shrubland.

Holotype collected in open *Eucalyptus salmonophloia* woodland on sandy loam close to an ephemeral freshwater lake (How *et al.*, 1988). Melaleuca thickets (Wilson and Knowles, 1988) and an understorey of low shrubs (Ehmann, 1992) may be present in association with the eucalypts.

9. **Reasons for decline:** Not known to have declined, but the species is vulnerable as it has a very restricted range surrounded by unsuitable habitat. Probably a combination of factors threaten it, including clearance of habitat for agriculture and grazing, crop production and disturbance by mining activities.

There is a possibility of strip mining for gold in the future, and core holes resulting from mineral surveys in the shrubland surrounding the Lake Cronin Nature Reserve, already present a hazard to *E. atriceps* (Harald Ehmann, *in litt.*). The deep uncapped holes form an extensive grid of permanently open "pitfall traps" with the potential to cause the death of all small animals which fall into them. There is also the possibility of clearance for wheat growing if the wheatbelt expands.

10. **Conservation reserves on which species occurs:** None known.

10A. **Other conservation reserves where species might be expected to occur:** Lake Cronin Nature Reserve.

12. **Other land on which species occurs:** Recorded from vicinity of Lake Cronin and 7 km east-south-east of Mount Holland; potentially present in suitable habitat on private properties throughout the species' range.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.

13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to determine if the species is declining and if so, to identify the major factors contributing to that decline.

14. **Recovery Plan objectives:**

14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.

14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.

14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.

15. **Management actions already initiated:** None known.

- 16. Management actions required:**
- 16.1: Survey known and potential habitat in reserves within the species' known range.
- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Extend Lake Cronin Reserve to include known range of the species and establish further reserves if the existing reserve system is found to be inadequate to secure the survival of the species.
- 16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current

land use practices on the species outside reserves.

- 16.5: Develop community awareness within the species' known range.

17. Organisations responsible for conservation of species and individuals involved: Western Australian Department of Conservation and Land Management (Andrew Burbidge).

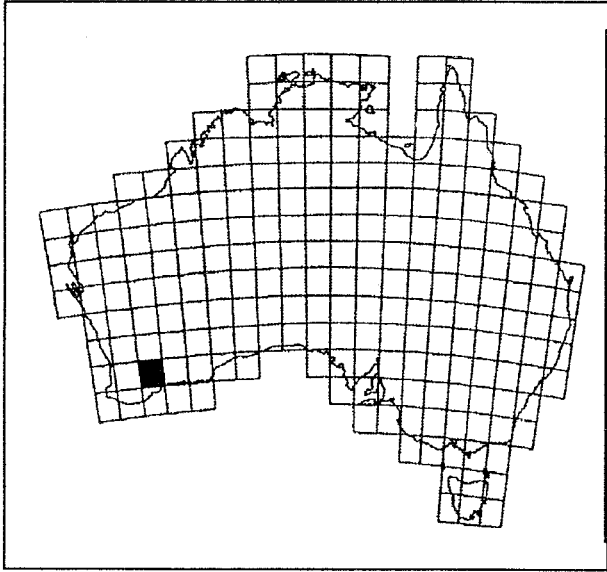
18. Other organisations and individuals involved: Harald Ehmann (Sydney Institute of Technology).

19. Can recovery plan be carried out with existing resources?:	No.
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 1 month each year for 2 years - \$13,333 salary; \$6,667 expenses. \$20K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 3 months each year for 2 years - \$20,000 salary; \$10,000 expenses. \$30K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. \$12K
4:	Purchase of land for the reserve system: uncosted.
	Total \$62K

20. Remarks: Three specimens documented in Australian museum collections. An unidentified elapid (MCZ 142435 from Lake Grace, Western Australia) which was listed by McDowell (ms) from the Museum of Comparative Zoology, Harvard, may be this species (Glenn Shea, *in litt.*).

References:

- Anonymous 1981. New venomous snake found. SWANS 11(1): 23.
- Ehmann, H.F.W. 1992. Encyclopedia of Australian Animals: Reptiles. Australian Museum with Angus and Robertson, Sydney. xv + 495 pp.
- How, R.A., Dell, J. and Muir, B.G. 1988. The biological survey of the Eastern Goldfields of Western Australia. Park 4. Lake Johnston-Hyden Study Area. IV. Vertebrate fauna. Records of the Western Australian Museum Supplement 30: 44-83.
- McDowell, S.B. The zoogeography of the New Guinea region snakes. ms.
- Storr, G.M. 1980. A new *Brachyaspis* (Serpentes: Elapidae) from Western Australia. Records of the Western Australian Museum 8(3): 397-399.
- Wilson, S.K. and Knowles, D.G. 1988. Australia's Reptiles; a photographic reference to the terrestrial reptiles of Australia. Collins Publishers, Australia. 447 pp.



Distribution of *Echiopsis atriceps*



1. Family:	Elapidae
2. Scientific Name:	<i>Echiopsis curta</i> (Schlegel, 1837) [also appears in the literature as <i>Notechis curtus</i>] (population east of Adelaide)
3. English Name:	Bardick

4. **Infraspecific taxa:** Only the population east of Adelaide is considered under threat. Storr (1982) referred to this as population "D" in his revision of the species and listed some morphological characters in which it differed from the other, more western, populations.

5. **Species survival status:** Vulnerable.

6. **Former distribution:** Not known to have differed from current distribution, but there are few recent records from New South Wales and South Australia.

7. **Current distribution:** Mallee areas of south-eastern South Australia, western Victoria, and south-western New South Wales around Balranald. Robertson *et al.* (1989) listed it as having a moderate distribution in the mallee of north-western Victoria (the Big Desert and Sunset Country regions).

8. **Habitat:** Tall shrubland.

The eastern population appears to be dependent on mallee, generally with an understorey of hummock grasses (*Triodia* spp.) and growing on sandy to loamy soils. In Victoria it is found in mallee heath and broombush mallee (Robertson *et al.*, 1989).

9. **Reasons for decline:** Probably a combination of factors, including overgrazing by stock, clearance of habitat for grazing and agriculture, crop production and possibly, inappropriate fire regime.

In the mallee of north-western Victoria, clearing for agriculture has greatly reduced the available habitat and vegetation has also been changed by grazing, altered burning regimes and timber cutting (Robertson *et al.*, 1989).

10. **Conservation reserves on which species occurs:** South Australia: Danggali CP.

10A. **Other conservation reserves where species might be expected to occur:** New South Wales: Nearie Lake NR, Willandra Lakes WHA;

South Australia: Bakara CP, Billiatt CP, Brookfield CP, Carcuma CP, Coorong GR, Coorong NP, Gum Lagoon CP, Karte CP, Lowan NR, Messent CP, Mount Boothby CP, Mount Rescue CP, Ngarkat CP, Peebinga CP, Pike River CP, Pooginook CP, Scorpion Springs CP, Swan Reach CP;

Victoria: Big Desert W, Bronzewing WR, Canunda NP, Dergholm SP, Hattah-Kulkyne NP, Katarapko GR, Kemendok NR, Lake Albacutya SP, Little Desert NP, Little Desert West RA, Lock Luna GR, Mallee Cliffs NP, Moorook GR, Murray-Kulkyne P, Pink Lakes SP, Red Bluff WR, Roseneath RA, Tooloy-Lake Mundi WR, Wandoun FFR, Wandoun WR, Wilken FFR, Wyperfeld NP, Yanga NR.

11. **Other public land on which species occurs:** None known.

12. **Other land on which species occurs:** Kynock Station near Keith, South Australia (1968 specimen); potentially present on private properties throughout the species' range in south-eastern Australia.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to determine the full geographic range of the population, its habitat preferences, and the extent of its occurrence in existing reserves.

13.2: Research is needed into the basic biology and ecology of the population in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to document the extent of the population's decline and to identify the major factors

contributing to that decline.

14. Recovery Plan objectives:

- 14.1: To obtain sufficient information on the biology, ecology and distribution of the population to determine its current conservation status and formulate appropriate management strategies.
- 14.2: To ensure that secure, viable populations are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations outside reserves.

15. Management actions already initiated:

- 15.1: Listed as "vulnerable and rare" on the 1992 Revised (Interim) Schedule 12 of the *NSW Endangered Fauna (Interim Protection) Act 1991*.

16. Management actions required:

- 16.1: Survey known and potential habitat in

reserves within the population's known range.

- 16.2: Survey known habitat outside reserves within the population's known range.
- 16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the population.
- 16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current land use practices on the population outside reserves.
- 16.5: Develop community awareness within the population's known range.

17. Organisations responsible for conservation of species and individuals involved: South Australian Department of Environment and Land Management, Victorian Department of Conservation and Natural Resources (Peter Robertson), New South Wales National Parks and Wildlife Service.

18. Other organisations and individuals involved: None known.

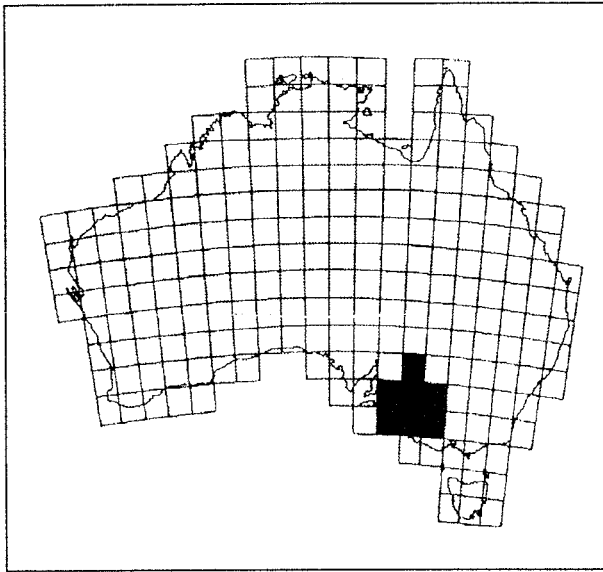
19. Can recovery plan be carried out with existing resources?: No.

- 1: Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 3 months each year for 2 years - \$40,000 salary; \$20,000 expenses. **\$60K**
 - 2: Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 3 months each year for 3 years - \$30,000 salary; \$15,000 expenses. **\$45K**
 - 3: Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. **\$12K**
- Total \$117K**

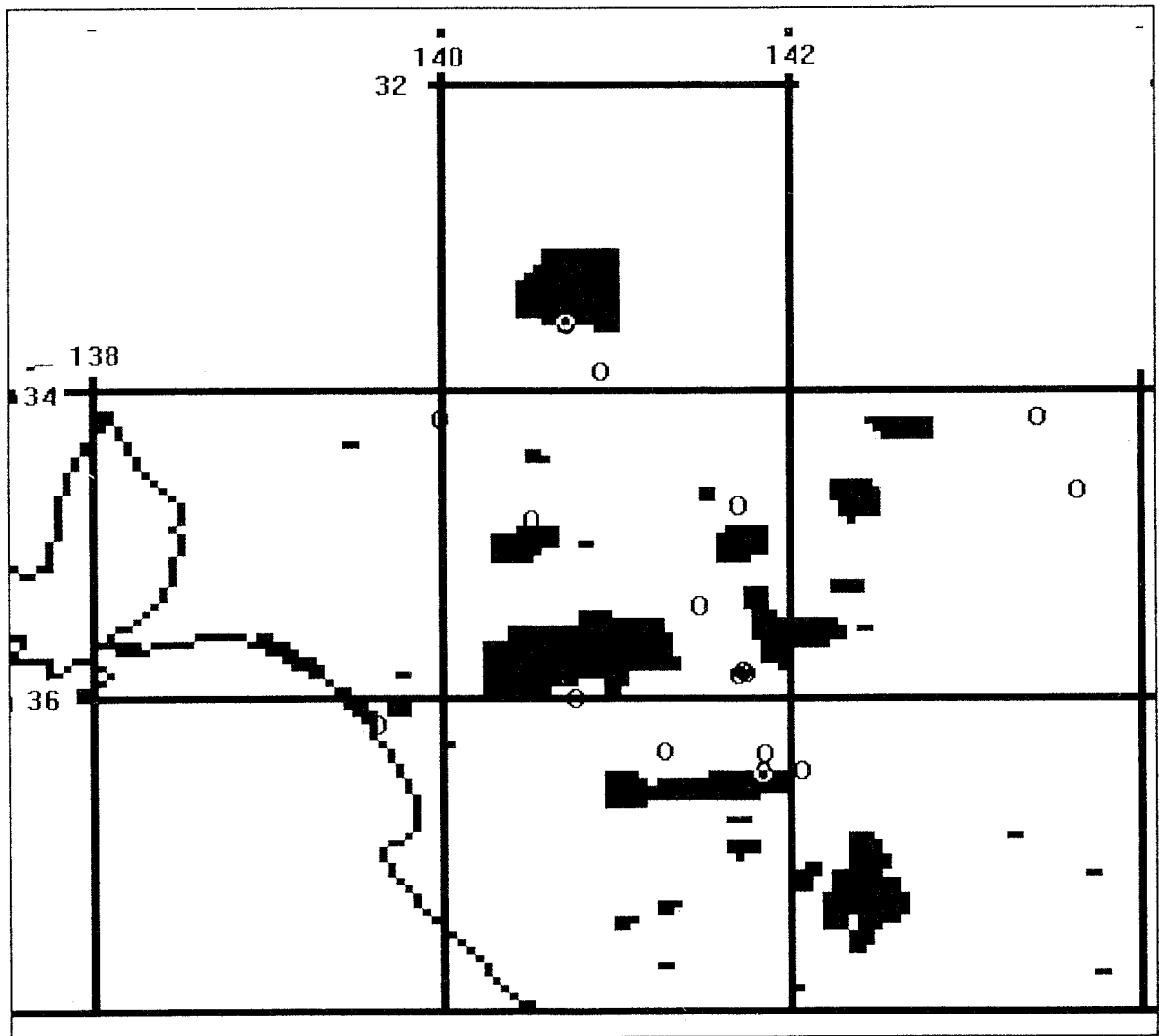
20. Remarks: 29 specimens documented in Australian museum collections. Wilson and Knowles (1988) illustrate a recent individual from Bidura, NSW. Robertson *et al.* (1989) recorded the species as "rare" in their mallee study area of north-western Victoria.

References:

- Robertson, P., Bennett, A.F., Lumsden, L.F., Silveira, C.E., Johnson, P.G., Yen, A.L., Milledge, G.A., Lillywhite, P.K. and Pribble, H.J. 1989. Fauna of the mallee study area north-western Victoria. Arthur Rylah Institute Technical Report No. 87: 1-91.
- Shine, R. 1982. Ecology of the Australian elapid snake *Echiopsis curta*. Journal of Herpetology 16(4): 388-393.
- Storr, G.M. 1982. The genus *Notechis* (Serpentes: Elapidae) in Western Australia. Records of the Western Australian Museum 9(4): 325-340.
- Wilson, S.K. and Knowles, D.G. 1988. Australia's Reptiles; a photographic reference to the terrestrial reptiles of Australia. Collins Publishers, Australia. 447 pp.



Distribution of *Echiopsis curta*
 (population east of Adelaide)



1. **Family:** Elapidae
2. **Scientific Name:** *Elapognathus minor* (Günther, 1863)
3. **English Name:** Short-nosed Snake

4. **Infraspecific taxa:** None
5. **Species survival status:** Vulnerable.
6. **Former distribution:** Not known to have differed from current distribution.
7. **Current distribution:** Humid coastal plains of south-western Western Australia, from Busselton in the north to Two Peoples Bay east of Albany.
8. **Habitat:** Open heath, tall open forest, woodland.
Found in swampy areas amongst dunes, in heathland or the dense tussock understorey of coastal woodland and occasionally, of wet sclerophyll forest growing on sandy soils.
9. **Reasons for decline:** Not known to have declined but the species has a very restricted distribution and there are few recent records in museums. Probably threatened by a combination of factors, including clearance of habitat for agriculture, native forest logging, drainage of habitat, and urban development along the coastal fringe of the south-west. May suffer competition from the more abundant Crowned Snake (*Drysdalia coronata*) (Wilson and Knowles, 1988).
10. **Conservation reserves on which species occurs:** Two Peoples Bay NR.
- 10A. **Other conservation reserves where species might be expected to occur:** Cowaramup NP, D'Entrecasteaux NP, Gingilup Swamps NR, Hamelin Bay NP, Leeuwin-Naturaliste NP, Scott NP, Two Peoples Bay NR, Walpole-Nornalup NP, Warren NP, West Cape Howe NP, William Bay NP, Yallingup NP.
11. **Other public land on which species occurs:** State Forest near the south coast (A. Burbidge, *in litt.*).
12. **Other land on which species occurs:** Potentially present in suitable habitat on private properties throughout the species' range.
13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.
- 13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.
- 13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.
- 13.3: Research is needed to determine if the species is declining and if so, to identify the major factors contributing to that decline.
14. **Recovery Plan objectives:**
- 14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.
- 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
15. **Management actions already initiated:** None known.
16. **Management actions required:**
- 16.1: Survey known and potential habitat in reserves within the species' known range.
- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Establish appropriate reserves if the

existing reserve system is found to be inadequate to secure the survival of the species.

- 16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current land use practices on the species outside reserves.
- 16.5: Develop community awareness within the species' known range.

17. Organisations responsible for conservation of species and individuals involved: Western Australian Department of Conservation and Land Management (Andrew Burbidge).

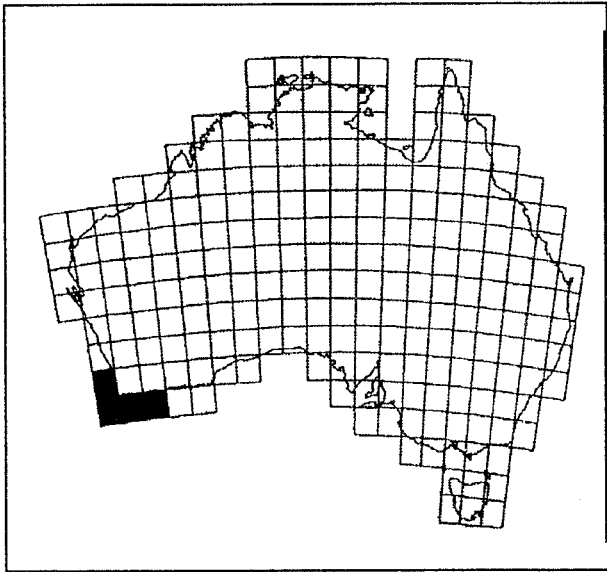
18. Other organisations and individuals involved: None known.

19. Can recovery plan be carried out with existing resources?: No.
1: Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$13,333 expenses. \$40K
2: Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 3 months each year for 2 years - \$20,000 salary; \$10,000 expenses. \$30K
3: Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. \$12K
Total \$82K

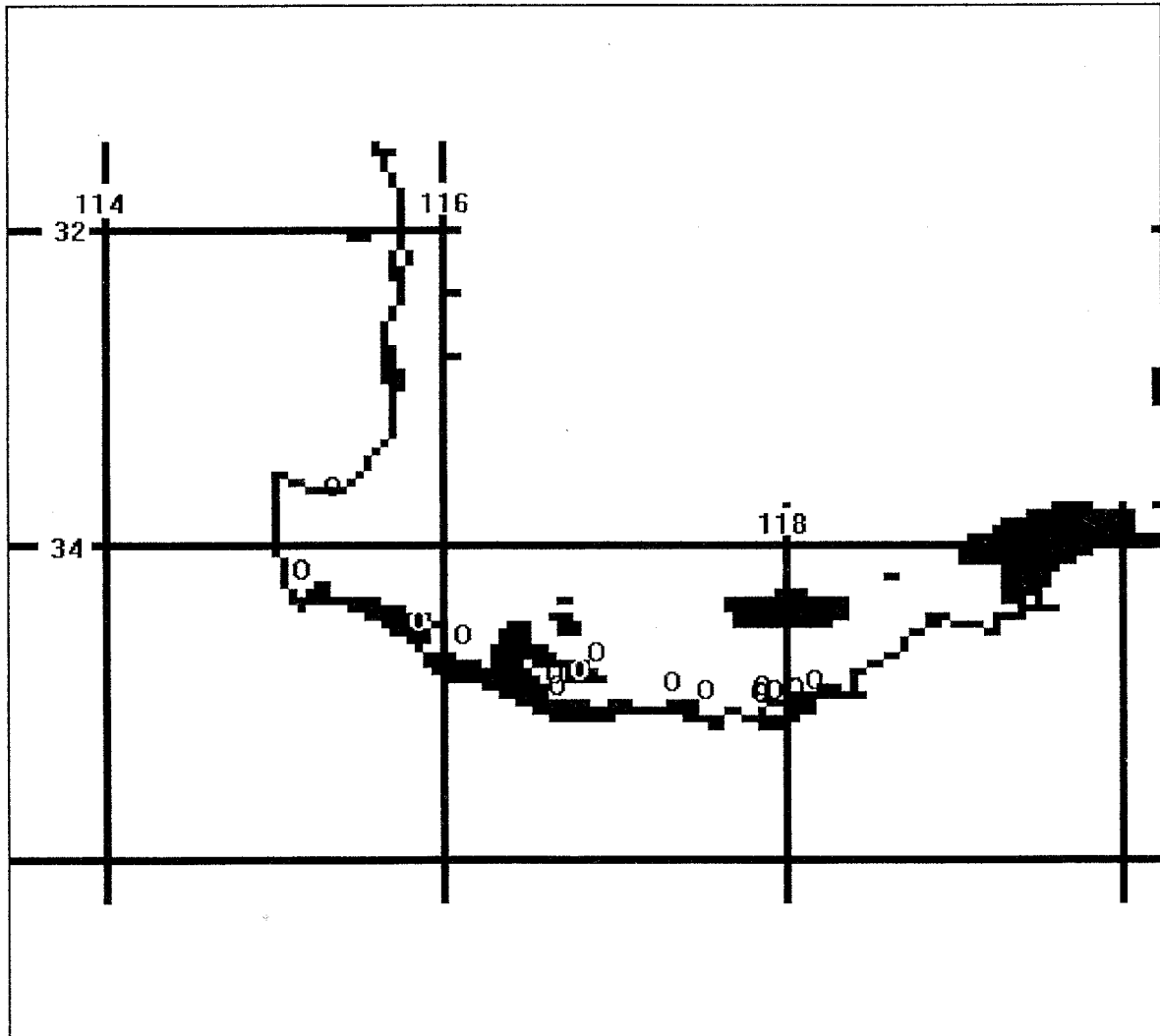
20. **Remarks:** 24 specimens documented in Australian museum collections.

References:

- Shine, R. 1986. Natural history of two monotypic snake genera of south-western Australia, *Elapognathus* and *Rhinoplocephalus* (Elapidae). *Journal of Herpetology* 20(3): 436-439.
- Storr, G.M., Smith, L.A. and Johnstone, R.E. 1986. Snakes of Western Australia. Western Australian Museum, Perth. 187 pp.
- Wilson, S.K. and Knowles, D.G. 1988. Australia's Reptiles; a photographic reference to the terrestrial reptiles of Australia. Collins Publishers, Australia. 447 pp.



Distribution of *Elapognathus minor*



1. Family:	Elapidae
2. Scientific Name:	<i>Furina dunmalli</i> (Worrell, 1955) [also appears in the literature as <i>Glyphodon dunmalli</i>]
3. English Name:	Dunmall's Snake

4. **Intraspecific taxa:** None

5. **Species survival status:** Vulnerable.

6. **Former distribution:** Not known to have differed from current distribution.

7. **Current distribution:** South-eastern interior of Queensland, including the Darling Downs. The range extends from Yeppoon and the Expedition Range in the north, to Oakey, Glenmorgan and Inglewood in the south; most locality records are between 200 and 500 m in altitude.

8. **Habitat:** Open forest, woodland.

Preferred habitat, especially on the Darling Downs, appears to be Brigalow (*Acacia harpophylla*) forest and woodland growing on cracking black clay and clay loam soils.

9. **Reasons for decline:** Not known to have declined, but this species is either rare or very secretive and not many have been recorded. Its association with Brigalow makes it vulnerable to the same threats faced by two other Brigalow reptiles - see entries for *Paradelma orientalis* and *Denisonia maculata*. These threats include extensive habitat changes caused by overgrazing by stock, clearance of habitat for agriculture and grazing, pasture improvement, crop production and urban development.

The Darling Downs have been described as "the most modified, intensely farmed and grazed areas in Queensland" (Covacevich *et al.*, 1988). Drainage of swamps may be another threat (Harald Ehmann, *in litt.*).

10. **Conservation reserves on which species occurs:** Expedition Range NP (including the former Robinson's Gorge NP), Lake Broadwater EP.

10A. **Other conservation reserves where**

species might be expected to occur: Byfield NP, Cania Gorge NP, Carnarvon NP, Castle Tower NP, Deepwater NP, Eurimbula NP, Hurdle Gully Scrub SA, Isla Gorge NP, Lonesome NP, Mount Archer EP, Precipice NP, Southwood NP, Wondul Range NP.

11. **Other public land on which species occurs:** May occur in Dunmore and Barakula State Forests (Steve Wilson, *in litt.*); roadside reserves between Inglewood and Texas, and along the Mitchell Road, Rosedale north-west of Bundaberg (Bob and Steve Irwin, pers. comm.).

12. **Other land on which species occurs:** Potentially present in suitable habitat on private properties throughout the species' range.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.

13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to determine if the species is declining and if so, to identify the major factors contributing to that decline.

14. **Recovery Plan objectives:**

14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.

14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.

14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.

15. **Management actions already initiated:**
None known.

16. **Management actions required:**

16.1: Survey known and potential habitat in reserves within the species' known range.

16.2: Survey known habitat outside reserves within the species' known range.

16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.

16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current land use practices on the species outside reserves.

16.5: Develop community awareness within the species' known range.

17. **Organisations responsible for conservation of species and individuals involved:** Queensland Department of Environment and Heritage.

18. **Other organisations and individuals involved:** Jeanette Covacevich (Queensland Museum).

19.	Can recovery plan be carried out with existing resources?: No.	
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 3 months each year for 2 years - \$20,000 salary; \$10,000 expenses.	\$30K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
		Total \$82K

20. **Remarks:** Ten specimens documented in Australian museum collections (Longmore, 1986). Two sight records near Rosedale (north-west of Bundaberg) in early 1993, and two on the road between Inglewood and Texas in the early 1980s (the Brigalow in this area has since been cleared) (Bob and Steve Irwin, pers. comm.); all four individuals were captured, identified in the hand and released the same night.

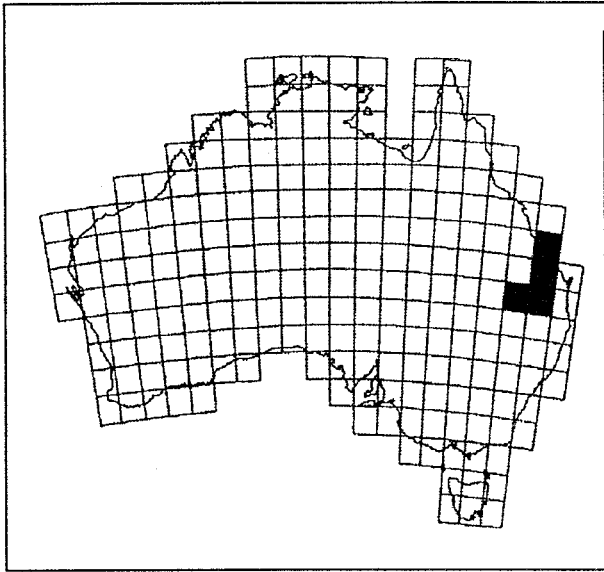
References:

Covacevich, J., Dunmall, W. and Sorley, J.A. 1988. Reptiles. pp. 265-273 in G. Scott (ed.) Lake Broadwater: the natural history of an inland lake and its environs. Lake Darling Downs Institute Press and Lake Broadwater Natural History Association, Toowoomba. 344 pp.

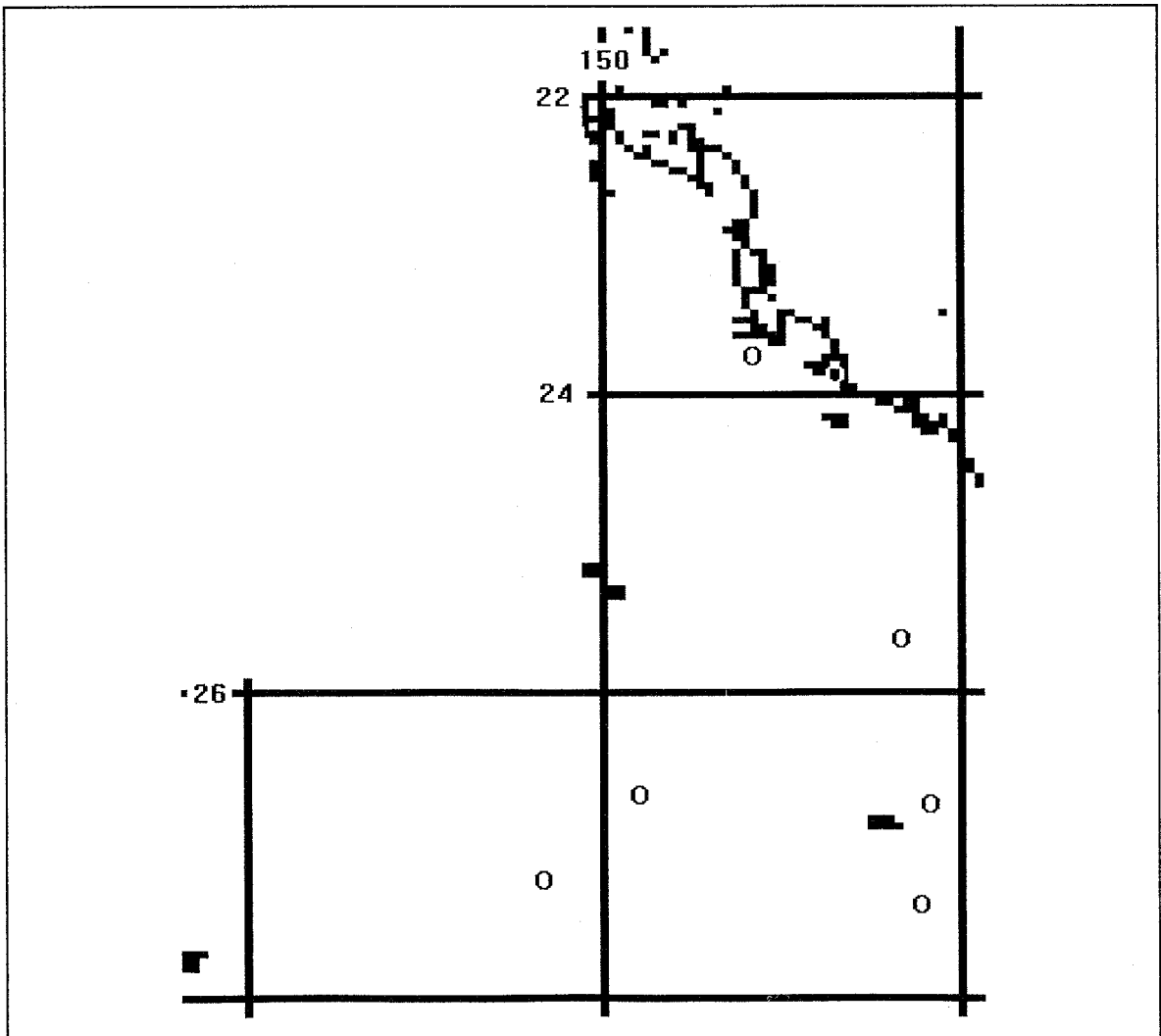
Longmore, R. (ed.) Atlas of Elapid Snakes of Australia. Australian Government Publishing Service. v + 115 pp.

McDonald, K.R., Covacevich, J.A., Ingram, G.J. and Couper, P.J. 1991. The status of frogs and reptiles. pp. 338-345 in G.J. Ingram and R.J. Raven (eds) An Atlas of Queensland's Frogs, Reptiles, Birds and Mammals. Queensland Museum, Brisbane.

Shine, R. 1981. Ecology of Australian elapid snakes of the genera *Furina* and *Glyphodon*. Journal of Herpetology 15(2): 219-224.



Distribution of *Furina dunmalli*



1. **Family:** Elapidae
2. **Scientific Name:** *Hoplocephalus bungaroides* (Schlegel, 1837)
3. **English Name:** Broad-headed Snake

4. **Intraspecific taxa:** None
5. **Species survival status:** Vulnerable.
6. **Former distribution:** In the 1860s the species was common along the rocky coastline around Sydney, from the entrance to Port Jackson south to Botany Bay, and around Middle Harbour, Lane Cove and Parramatta, although its numbers were already declining (Kreff, 1869). No specimens have been recorded from the Sydney metropolitan area since the 1970s.
7. **Current distribution:** Sandstone ranges of the southern central New South Wales coast, extending from Colo north of Sydney to Nowra in the south, and as far inland as Bathurst. The entire range falls within a 200 km radius of Sydney. On the outskirts of Sydney, still considered to occur on the Hornsby and Woronora Plateaus and the lower Blue Mountains (Wells and Wellington, 1989).
8. **Habitat:** Open forest, rocky isolates.

Winter refuges are generally crevices between and under flat rocks created by exfoliating sandstone outcrops which typically occur along ridge tops in dry sclerophyll forest (Hersey, 1980). However in summer the species is often found away from rocks, in hollow limbs of large eucalypts some distance above the ground (Rick Shine and Jon Webb, *in litt.*). On the western edge of its range, near Bathurst, *H. bungaroides* is found in forest growing on shale or conglomerate slopes and bluffs (Glenn Shea, *in litt.*). The distribution of suitable habitat is patchy throughout the species' range.

9. **Reasons for decline:** Probably a combination of factors, including habitat clearance, urban development, rock removal and possibly, trapping for captivity, and disturbance by frequent visitation.

Habitat clearance has led not only to an overall

loss of habitat, but also to fragmentation of remaining habitat, so the population has been broken up into small isolated units. The species' range coincides with the highest density of human population in Australia and with wide-scale habitat degradation. The type of sandstone boulders preferred by the snakes are also those preferred by collectors of "bushrock" for landscape gardening; Schlesinger and Shine (*in press*) found that bushrock removal is likely to have a very significant effect on the sandstone herpetofauna. Although there are many national parks within the species' range, they are subject to high visitation and illegal habitat destruction has occurred even within these areas (Shine & Fitzgerald, 1989). Illegal collecting has been suggested as a reason for decline (Burbidge and Jenkins, 1984) but the magnitude of this threat is unknown; in 1980 the NSW NPWS was aware of seven people holding this species in captivity (Hersey, 1980).

10. **Conservation reserves on which species occurs:** Blue Mountains NP, Heathcote NP, Morton National Park, Royal National Park, Wollemi NP.

10A. **Other conservation reserves where species might be expected to occur:** Budderoo NP, Conimbla NP, Dharug NP, Jervis Bay NR, Kanangra-Boyd NP, Macquarie Pass NP, Pantoneys Crown NR, Parr SRA, Yengo NP.

11. **Other public land on which species occurs:** Colymea SF, Yalwal SF and Yerriyong SF (all in the Nowra region), Woronora Dam Catchment Area, Mount Keira.

12. **Other land on which species occurs:** Potentially present in suitable habitat on private properties throughout the species' range.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to determine the full geographic range

- of the species, its habitat preferences, and the extent of its occurrence in existing reserves.
- 13.2: Further research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.
- 13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.
- 14. Recovery Plan objectives:**
- 14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.
- 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
- 15. Management actions already initiated:**
- 15.1: Listed on Schedule 1 of the Commonwealth's *Endangered Species Protection Act 1992* and listed as

"threatened" on the 1992 Revised (Interim) Schedule 12 of the *NSW Endangered Fauna (Interim Protection) Act 1991*.

- 16. Management actions required:**
- 16.1: Survey known and potential habitat in reserves within the species' known range.
- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.
- 16.4: Develop and promote guidelines for landowners and users to reduce the impact of current land use practices on the species outside reserves.
- 16.5: Develop community awareness within the species' known range.
- 16.6: Police bushrock removal and sales.

17. Organisations responsible for conservation of species and individuals involved: New South Wales National Parks and Wildlife Service; Forestry Commission of New South Wales.

18. Other organisations and individuals involved: Rick Shine and Jon Webb (University of Sydney).

19.	Can recovery plan be carried out with existing resources?: No.	
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 3 months each year for 2 years - \$40,000 salary; \$20,000 expenses.	\$60K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 4 months each year for 3 years - \$40,000 salary; \$20,000 expenses.	\$60K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
		Total \$132K

20. Remarks: 78 specimens documented in Australian museum collections. Krefft (1869) referred to "many hundreds" of specimens distributed to kindred institutions in addition to the collection held at that time in the Australian Museum.

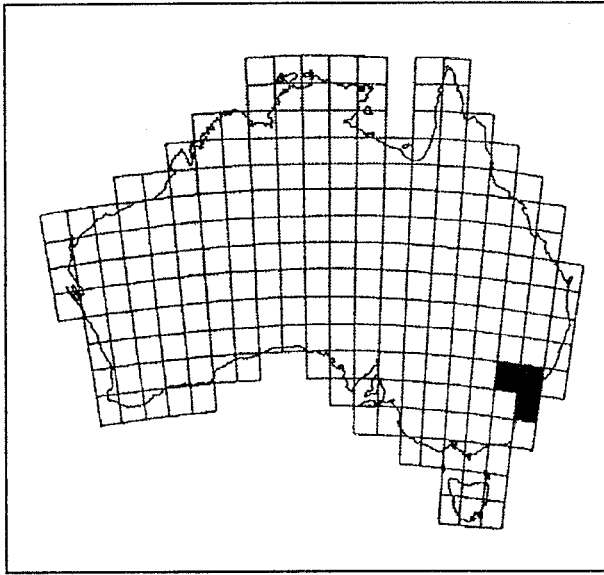
Jonathon Webb (University of Sydney) is enrolled in a PhD on "The Ecology of the Broad-headed Snake".

References:

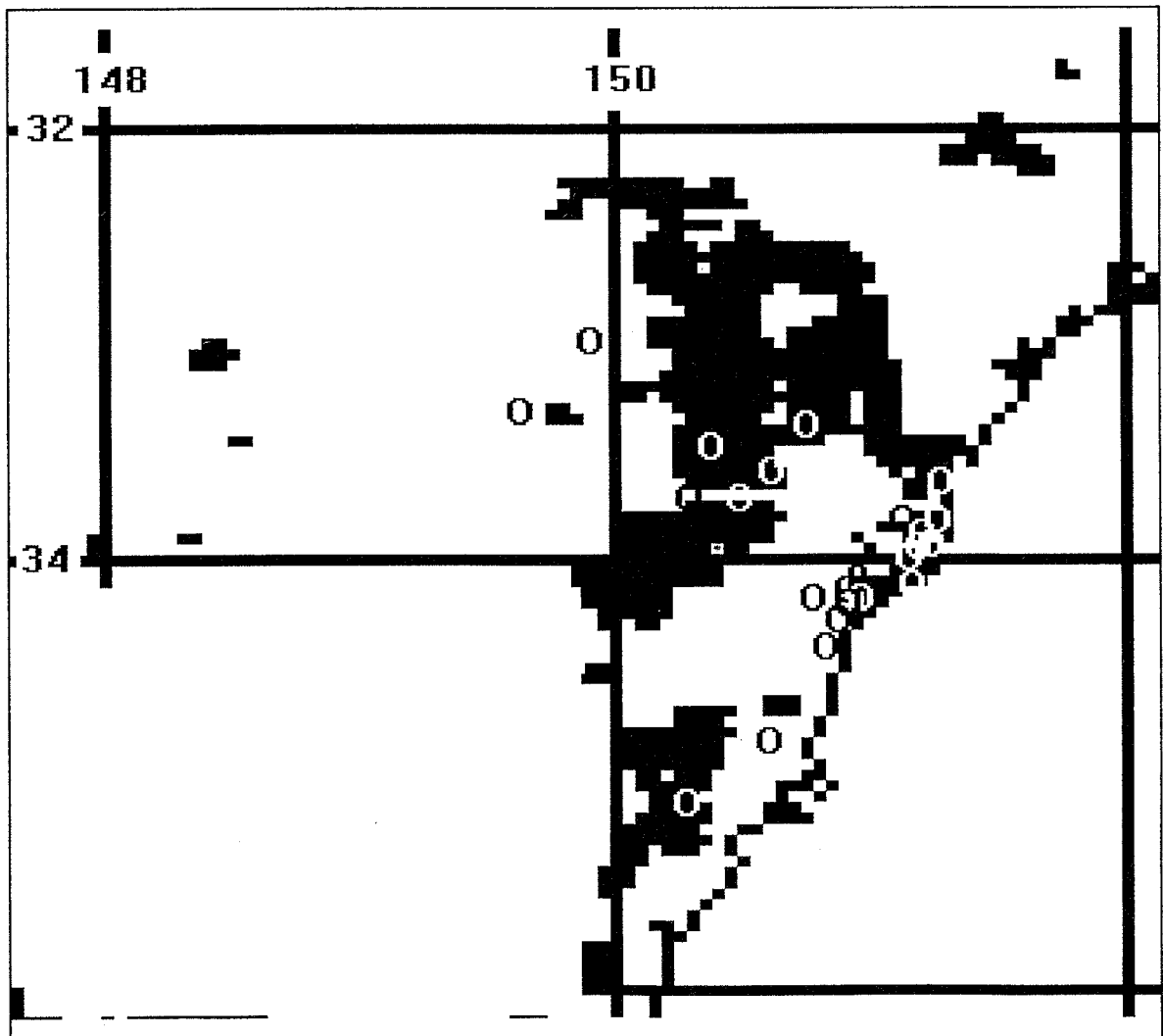
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- Shine, R. 1983. Arboreality in snakes: ecology of the Australian elapid genus *Hoplocephalus*. *Copeia* 1983(1): 198-205.
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- Wells, R.W. 1981. Remarks on the prey preferences of *Hoplocephalus bungaroides*. *Herpetofauna* 12(2): 25-28.
- Wells, R.W. and Wellington, C.R. 1989. A checklist of the amphibians and reptiles known from the Cumberland Plain region, Sydney Basin, New South Wales, Australia. *Australian Herpetologist* 506: 1-34.
- White, G. 1973. The Broad-headed Snake *Hoplocephalus bungaroides* (Boie). *Herpetofauna* 6(1): 7-8.



Distribution of
Hoplocephalus bungaroides



1. **Family:** Elapidae
2. **Scientific Name:** *Notechis ater ater* (Krefft, 1866) (population in the Flinders Ranges, SA)
3. **English Name:** Krefft's Tiger Snake

4. **Intraspecific taxa:** Relationships of the various species, subspecies and populations of *Notechis* are obscure and Schwaner (1990) has referred all populations to "the *Notechis scutatus-ater* complex". Only the population restricted to the Flinders Ranges (the type locality for *Notechis ater*), is of immediate conservation concern.

5. **Species survival status:** Vulnerable.

6. **Former distribution:** The present patchy distribution suggests a relictual population which was once more widespread (Hutchinson, 1992); Mirtschin and Bailey (1990) cite anecdotal evidence for tiger snakes being more widespread in the Flinders Ranges earlier this century.

7. **Current distribution:** Confined to several stream systems in the southern Flinders Ranges, South Australia. The range extends approximately from Wilmington in the north to Crystal Brook in the south, westwards towards the mouth of the Broughton River and possibly as far east as Burra Creek. The average annual rainfall in this area is 600 mm or above.

8. **Habitat:** Open woodland, riparian habitats, rocky isolates.

Found only along the margins of watercourses which may diminish in the dry summer climate to isolated pools. The creeks are typically lined by woodland of River Red Gums (*Eucalyptus camaldulensis*) and Sugar Gums *E. cladocalyx*, with Long-leafed Box (*E. goniocalyx*) growing on the sloping valley sides. The snakes shelter in flood debris in creek beds, rocky screes on the slopes, and shrubby undergrowth on the plains country (Mirtschin and Bailey, 1990).

9. **Reasons for decline:** Probably a combination of factors, including overgrazing by stock, clearance of habitat, soil erosion, water pollution, inappropriate fire regimes and possibly loss of food source (frogs) to an

introduced competitor (trout).

Diversion and eutrophication of streams (resulting from the aerial spreading of fertilisers) and clearing of undergrowth have probably been the main factors contributing to the decline of the species (Hutchinson, 1992). Timber was cleared on the slopes for charcoal production early this century (Mirtschin and Bailey, 1990). Bushfires in Mount Remarkable National Park may also pose a threat: a fire in 1988 burnt much natural vegetation and a subsequent decline in the number of snakes was recorded. Mirtschin and Bailey (1990) noted that the accessibility of this population of tiger snakes had resulted in individuals being taken for taxidermy. The introduction of trout into several streams within the species' range (Waterfall Creek, Burra Creek), resulting in the disappearance of frogs from those streams, may be another cause of decline in some populations of *N. ater* (Peter Mirtschin, *in litt.*).

10. **Conservation reserves on which species occurs** (including a list of other Action Plan species in each conservation reserve): South Australia: Mount Remarkable National Park; *Aprasia pseudopulchella* (Vulnerable) also occurs here.

10A. **Other conservation reserves where species might be expected to occur:** Telowie Gorge CP.

11. **Other public land on which species occurs:** Doughby Reserve south-east of Melrose.

12. **Other land on which species occurs:** Spring Creek and Cannons Swamp, north of Melrose; mouth of the Broughton River south of Port Pirie. Most populations occur on private land (Hutchinson, 1992).

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted

to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.

- 13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.
- 13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.
- 13.4: Genetic study needed to determine the taxonomic status of this population.
- 14. Recovery Plan objectives:**
 - 14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.
 - 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
 - 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
- 15. Management actions already initiated:**
 - 15.1: Krefft's Tiger Snake Action Committee convened by the South Australian co-ordinator of the of the National Threatened Species Network.
 - 15.2: The Network has selected a water-course near Doughby Reserve as

suitable for fencing to exclude stock and promote rehabilitation of habitat for *N. ater*.

- 16. Management actions required:**
 - 16.1: Survey known and potential habitat in reserves within the species' known range.
 - 16.2: Survey known habitat outside reserves within the species' known range.
 - 16.3: Develop and promote guidelines (such as heritage agreements, fencing of watercourses to reduce soil erosion and encourage regeneration, and the provision of alternative stock watering points) and provide incentives for landowners and users to reduce the impact of current land use practices on the species outside reserves.
 - 16.4: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.
 - 16.5: Develop community awareness within the species' known range.

17. Organisations responsible for conservation of species and individuals involved: South Australian Department of Environment and Land Management.

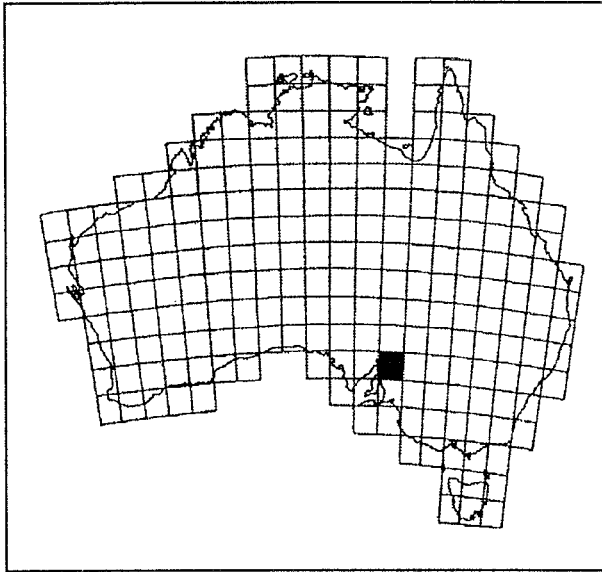
18. Other organisations and individuals involved: Peter Mirtschin (Venom Supplies, Tanunda), Mark Hutchinson (South Australian Museum), National Threatened Species Network (SA) Krefft's Tiger Snake Action Committee.

19.	Can recovery plan be carried out with existing resources?: No.	
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 3 months each year for 2 years - \$40,000 salary; \$20,000 expenses.	\$60K
2:	Research into basic biology, taxonomy and ecology, including assessment of threatening processes: 1 worker for 4 months for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
		Total \$112K

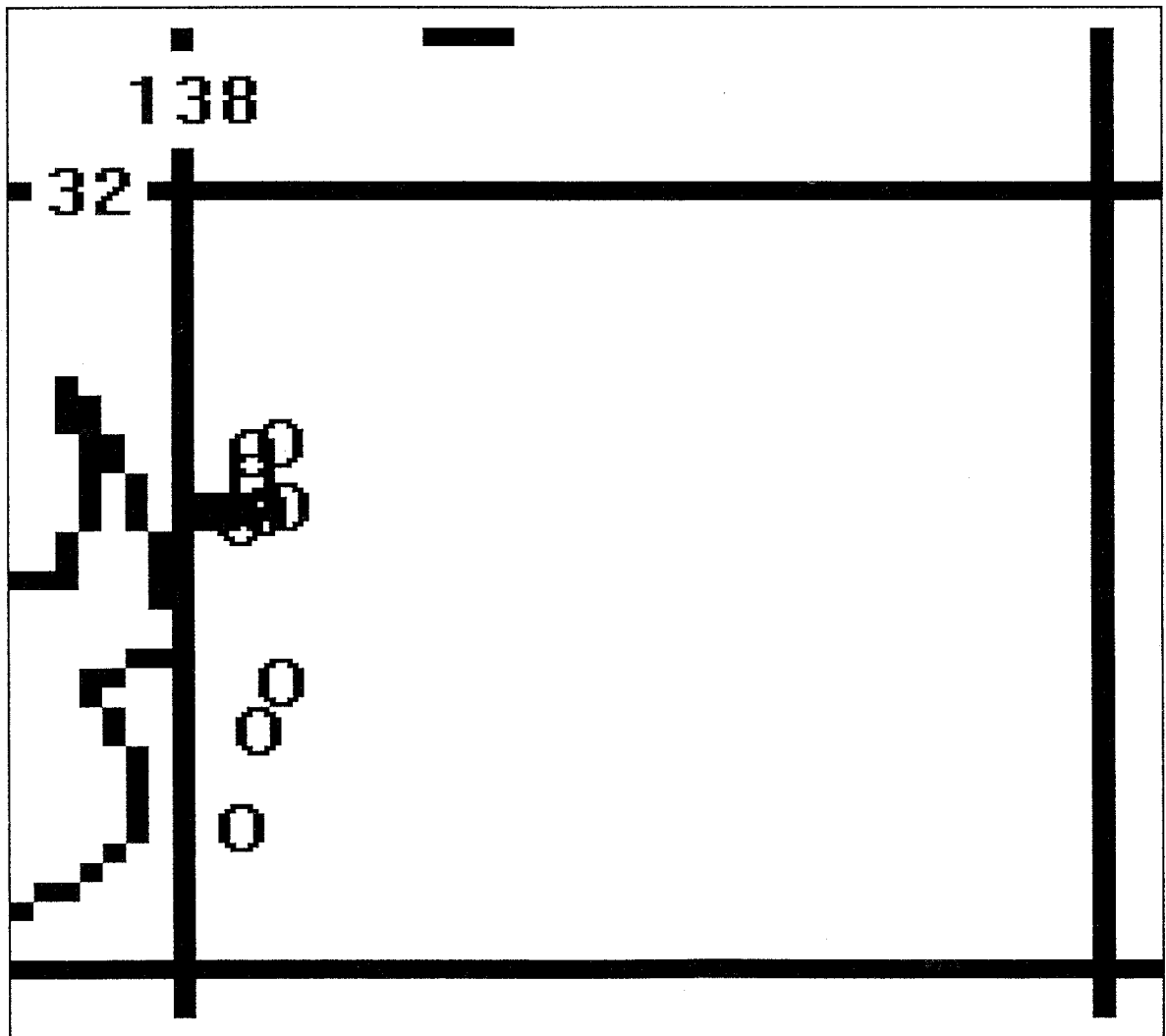
20. Remarks: 19 specimens documented in Australian museum collections. Mirtschin and Bailey (1990) captured and measured 47 individuals during a four-year study of the population on one private property.

References:

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- Mirtschin, P.J. and Bailey, N. 1990. A study of Krefft's Black Tiger Snake *Notechis ater ater* (Reptilia: Elapidae). South Australian Naturalist 64(3/4): 52-61.
- Rawlinson, P.A. 1991. Taxonomy and distribution of the Australian tiger snakes (*Notechis*) and copperheads (*Austrelaps*) (Serpentes, Elapidae). Proceedings of the Royal Society of Victoria 103(2): 125-135.
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Distribution of
Notechis ater ater



1. Family:	Elapidae
2. Scientific Name:	<i>Simoselaps calonotus</i> (Duméril, Bibron and Duméril, 1854) [also appears in the literature as <i>Neelaps calonotus</i> and <i>Vermicella calonotos</i>]
3. English Name:	Black-striped Snake

4. **Intraspecific taxa:** None

5. **Species survival status:** Endangered.

6. **Former distribution:** Two specimens registered in the Western Australian Museum prior to 1940 are purported to have come from Bickley and York - towns approximately 100 km inland from Perth and well east of any other records for the species. These locality data are probably erroneous (Laurie Smith and John Dell, *in litt.*).

7. **Current distribution:** Confined to a narrow strip of sand dunes on the lower west coast of Western Australia, extending from Lancelin and Cooljarloo in the north to Mandurah in the south, a total distance of only 220 km. Within this range, the species has a patchy distribution dependent on suitable habitat (Laurie Smith and John Dell, *in litt.*). An individual was photographed by Michael Morcombe in the Darling Range east of Perth within the past few years (Andrew Burbidge, *in litt.*).

8. **Habitat:** Woodland, low woodland, open heath.

Preferred habitat appears to be deep, white coastal sand that supports *Banksia* woodland with a heathy understorey. On the coastal dunes of Bold Park, 11 km west of Perth, the species was recorded in coastal heath, *Dryandra sessilis* thicket, *Banksia* woodland and Tuart (*Eucalyptus gomphocephala*) woodland (How and Dell, 1990).

9. **Reasons for decline:** Probably a combination of factors, including clearance of habitat for urban development and small-scale agricultural crops, weed invasion, frequent fires and habitat fragmentation.

The Black-striped Snake's range coincides with

the region of greatest population density in Western Australia. Habitat clearance has led to an overall loss of habitat and also to fragmentation of remaining habitat, so the population has been broken up into small isolated units. How and Dell (1990) mentioned weed invasion and increasingly frequent fires as threats to the remaining urban bushland in Bold Park, where the Black-striped Snake has been recorded on a number of recent occasions.

10. **Conservation reserves on which species occurs:** Boonanarring NR.

10A. **Other conservation reserves where species might be expected to occur:** Alexander Morrison NP, Drovers Cave NP, Moore River NP, Nambung NP, Yanchep NP.

11. **Other public land on which species occurs:** Bold Park (Perth), Melaleuca Park, Trigg Scrub, Scarborough Beach.

12. **Other land on which species occurs:** Pearce Aerodrome at Bullsbrook, Quarantine Station at Woodman Point.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Further ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.

13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.

14. Recovery Plan objectives:

- 14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.
- 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.

15. Management actions already initiated:

- 15.1: In 1985 the species was listed as "rare" under Western Australian legislation and was recognised as "endangered fauna" by the Australian Conservation Council of Nature Conservation Ministers (the forerunner of ANZECC) (Jenkins, 1985) but by 1990 it had been removed from both lists.
- 15.2: Urban bushland in Perth has been surveyed for vertebrates by the Western Australian Museum biological survey unit (How and Dell, 1990, Laurie Smith, *in litt.*).

16. Management actions required:

- 16.1: Survey known and potential habitat in

reserves within the species' known range.

- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.
- 16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current land use practices on the species outside reserves; these should include careful control of fire regimes on public lands.
- 16.5: Develop community awareness within the species' known range.
- 16.6: Review policies for further development of the coastal dunes and sandplains which might have deleterious effects on the preferred habitat of this species.

17. Organisations responsible for conservation of species and individuals involved: Western Australian Department of Conservation and Land Management (Andrew Burbidge).

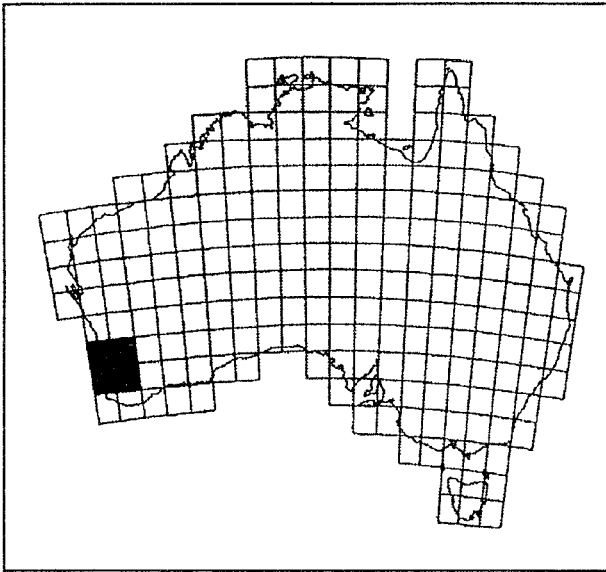
18. Other organisations and individuals involved: Laurie Smith and John Dell (Western Australian Museum).

19. Can recovery plan be carried out with existing resources?: No.
1: Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$13,333 expenses. \$40K
2: Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 2 months each year for 2 years - \$13,333 salary; \$6,667 expenses. \$20K
3: Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. \$12K
Total \$72K

20. Remarks: 107 specimens documented in Australian museum collections. Trapped in four different study sites within a 300 ha urban bushland park between 1986 and 1989 (How and Dell, 1990).

References:

- How, R.A. and Dell, J. 1990. Vertebrate fauna of Bold Park, Perth. *Western Australian Naturalist* 18(4/5): 122-131.
- Jenkins, R.W.G. 1985. Rare and endangered: the Black-Striped Snake. *Australian Natural History* 21(9): 380.
- Shine, R. 1984. Ecology of small fossorial Australian snakes of the genera *Neelaps* and *Simoselaps* (Serpentes, Elapidae). pp. 173-183 in R.A. Seigel, L.E. Hunt, J.L. Knight, L. Malaret and N.J. Zuschlag (eds) *Vertebrate Ecology and Systematics - a tribute to Henry S. Fitch*. Museum of Natural History, the University of Kansas, Lawrence.



Distribution of *Simoselaps calonotus*

