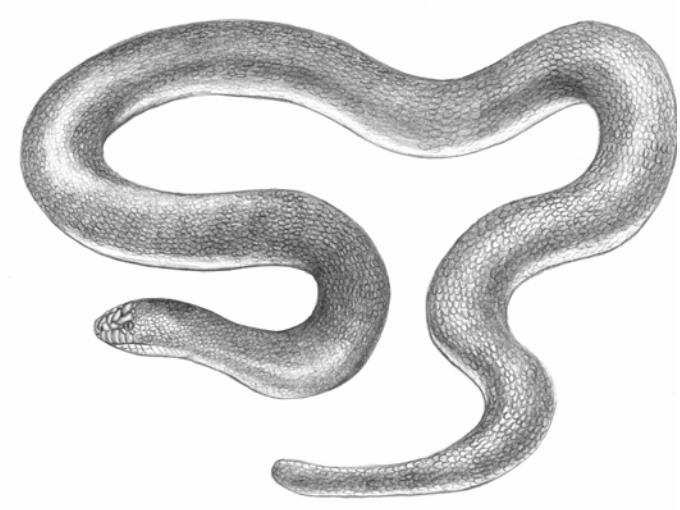
COSEWIC
Assessment and Status Report

on the

Rubber Boa
Charina bottae

in Canada



SPECIAL CONCERN
2003

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION DES
ESPÈCES EN PÉRIL
AU CANADA

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COSEWIC
Assessment Summary

Assessment Summary – May 2003

Common name
Rubber boa

Scientific name
Charina bottae

Status
Special Concern

Reason for designation
Although this species may be widespread in British Columbia its status is difficult to determine because the species is cryptic. However, searches indicate that this species is uncommon and patchily distributed. Because the species' abundance is poorly documented, it could qualify as Data Deficient, but the species' life history traits — low reproductive rate, delayed age at maturity and extended longevity, make it sensitive to human activity. Therefore, this species merits the current status until further investigation shows that it is at higher risk or is secure.

Occurrence
British Columbia

Status history
Designated Special Concern in May 2003. Assessment based on a new status report.

COSEWIC
Executive Summary

Species information

The Rubber Boa, *Charina bottae*, is a small (75 cm) member of the family Boidae and the only boid in Canada. There are two subspecies of Rubber Boa, the Northern Rubber Boa (*Charina bottae bottae*) and the Southern Rubber Boa (*Charina bottae umbratica*). Only the Northern Rubber Boa is found in Canada. The Rubber Boa is easily distinguished from other Canadian snake species by its brownish colouration, rubbery appearance (due to its small, smooth scales), and short, blunt tail that resembles a second head.

Distribution

The Rubber Boa is found throughout western North America from British Columbia south to California, and eastward as far as Montana, Wyoming and northwestern Colorado. Within Canada, populations of the Rubber Boa are patchily distributed within major river basins in the southern third of British Columbia. The only population that has been studied in Canada is in the Creston Valley Wildlife Management Area.

Habitat

Rubber Boas occupy a wide variety of habitats including riparian, grassland, montane forest and, occasionally, vacant city lots. The major habitat requirement of the Rubber Boa are rocky outcrops and an abundance of coarse woody debris which the snakes use for protective cover and to aid in thermoregulation. Rubber boas spend a considerable amount of time underground in abandoned rodent burrows and rock crevices.

Biology

The Rubber Boa is a nocturnal feeder and is active at temperatures much lower than the majority of reptile species (6-28^{o}C); however, in Creston Valley the daily preferred temperature was 30^{o}C. Low temperature activity may be the result of a trade-off between the benefit of feeding at night when fewer snake predators are active and the cost of being active at less than optimal temperatures. Female Rubber Boas give birth to 2 to 8 offspring in late August and early September. Clutch frequency is less than annual and perhaps as infrequently as every 4 years. Rubber Boas are long-lived, surviving from 20 to 30 years in the wild and longer in captivity.

Population sizes and trends

The number and size of Rubber Boa populations and subpopulations in Canada are unknown. Rubber Boas do not seem to be particularly abundant in the Creston Valley Wildlife Management Area, despite being in an area that is considered prime habitat for the species.

Limiting factors and threats

Rubber Boas may be limited in their distribution by the short summers experienced in much of Canada that do not provide pregnant females with enough warm days to complete embryonic development. Where populations do exist in Canada, the population growth rate may be low due to the combination of late maturation and small litter size and, therefore, slow to respond to disturbance. Forestry, agriculture and urban development all reduce the quality and amount of habitat available to the Rubber Boa, particularly if rock outcrops are damaged or destroyed and coarse woody debris is removed from the affected areas.

Special significance of the species

The Rubber Boa is the only member of the ancient family Boidae in Canada, and one of only two boids found outside the tropics and subtropics. It is of interest because of its unusual appearance, its apparent rarity in Canada, and its ability to forage nocturnally at very low body temperatures.

Existing protection or other status designations

Globally, the Rubber Boa is ranked G5 (Secure – Common, typically widespread and abundant) and in the United States it is ranked S5 or S4 in all states except for Wyoming (S2S3). In British Columbia, the species is ranked S3S4 (Vulnerable, but apparently secure — uncommon, but not rare, and usually widespread. Possibly cause for long-term concern) and is on the provincial Blue List — vulnerable and at risk. The Rubber Boa is also 'Identified Wildlife' under the Forest Practices Code, therefore forest licensees are legally obligated to manage harvest areas and protect critical habitat for the species.

Summary of status report

The Rubber Boa is widely distributed across the northern edge of its range (British Columbia); however, sightings of the species are very rare even when substantial effort is expended in search of the snake. Behavioural traits, such as noctural feeding and thermoregulating under cover, make the Rubber Boa appear rare because it is difficult to capture, or the species may be truly rare in Canada. The distribution and reproductive potential of the Rubber Boa is likely limited by length of the summer (reproductive) season, as short and cool growing seasons do not allow females to complete development of their offspring before hibernation. Assuming that the Rubber Boa is in fact rare in Canada, the species' patchy distribution and low reproductive potential make it vulnerable to local extinctions where habitat quality is reduced by forest management practices, agriculture or urban settlement, or where increased urban road development leads to higher mortality rates.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

COSEWIC MEMBERSHIP

COSEWIC comprises representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

DEFINITIONS

Species	Any indigenous species, subspecies, variety, or geographically defined population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list.

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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Rubber Boa
Charina bottae

in Canada

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2003

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SPECIES INFORMATION

Name and classification

The Rubber Boa, *Charina bottae*, is the only member of the family Boidae in Canada, and one of only two boids found north of the tropics (the other is the Rosy Boa, *Lichanura trivirgata*). The genus name, *Charina*, means 'graceful' in the Greek language, while the specific epithet, *bottae*, is named after a 19th century Italian explorer, Paolo Emilio Botta, who first described the Rubber Boa in his book "Observations on the Inhabitants of California" (Hoyer 2001). The Rubber Boa was originally classified as 3 separate genera due to the variability of specimens collected throughout its range; however, recent morphological and genetic evidence indicate that the Rubber Boa belongs to a monotypic genus and has two subspecies, *C.b. bottae* (the Northern Rubber Boa) and *C.b. umbricata* (the Southern Rubber Boa) (Nussbaum and Hoyer 1974; Rodriguez-Robles et al. 2001). Only *C.b. bottae* is found in Canada.

Description

The Rubber Boa is a small snake, reaching a maximum length of 75 cm (Cook 1984). It is a reddish-brown to yellow-brown on the dorsal side and yellowish on the belly, with no blotches or stripes although there may be dark flecks along the sides (Cook 1984). This boa has a wrinkled appearance, and the wrinkling combined with smooth, small dorsal scales gives the species a rubbery appearance (Stewart 1977). The tail is short and blunt, giving the appearance of another head, and hardened for use as a defensive weapon by the fusion of the terminal vertebrae (Hoyer and Stewart 2000b). Sexual dimorphism is present in adult Rubber Boas, with females attaining on average a 20% greater length and 96% greater mass than males (Hoyer and Stewart 2000a).

DISTRIBUTION

Global range

The Rubber Boa is found in British Columbia and the western United States, from Washington south to central California and eastward as far as Montana, Wyoming and northwestern Colorado (Figure 1). The southern subspecies is restricted to a few locales in the San Bernardino and San Jacinto mountain ranges east of Los Angeles in southern California. Rubber Boas are found from sea level up to 3050 m (Nussbaum *et al.* 1983).

Canadian range

The distribution of the Rubber Boa in Canada is patchy and confined to the southern third of mainland British Columbia (Figure 2). Most records are from the Thompson River basin south, and the northernmost record is from Quesnel, BC (Cannings et al. 1999). The only population of Rubber Boas that has been studied in Canada is in the Creston Valley Wildlife Management Area.

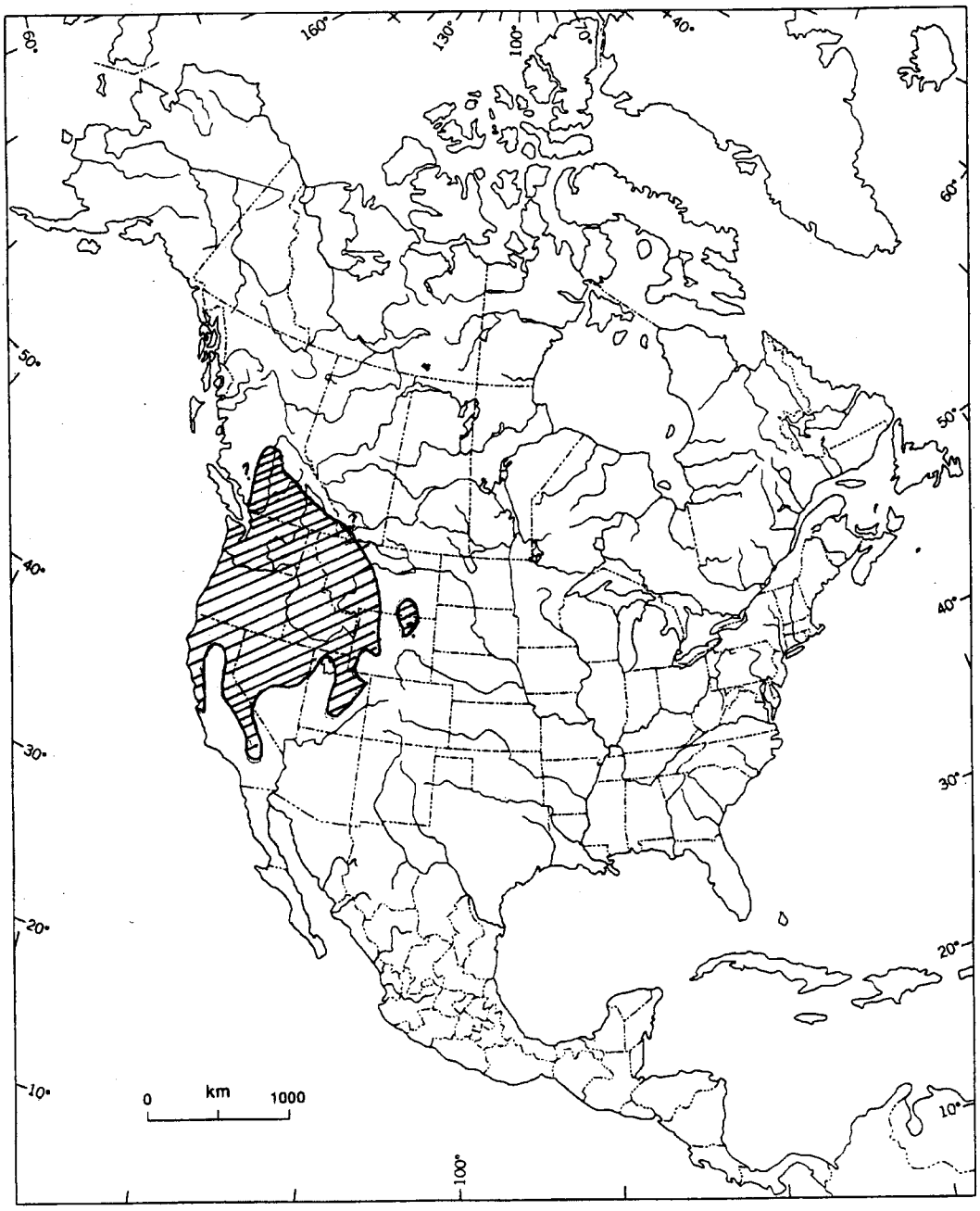

Figure 1. Range of the Rubber Boa in North America (after Stewart 1977; Gregory and Campbell 1984).

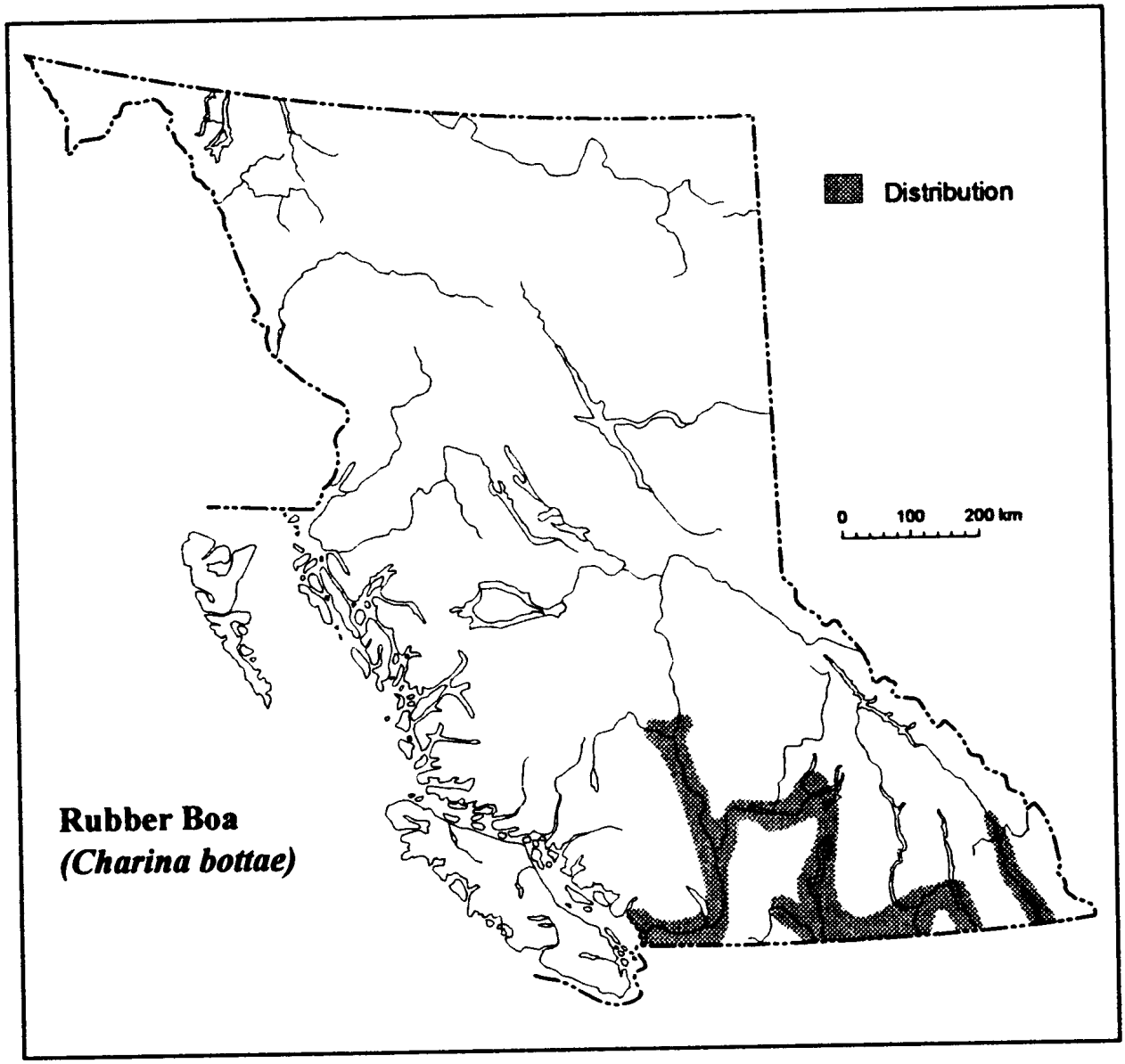

Figure 2. Range of the Rubber Boa in British Columbia (taken from Cannings et al. 1999).

HABITAT

Habitat requirements

Rubber Boas occupy a wide variety of habitats including riparian, chapparal, grassland and montane forest (Hoyer 2001; Gregory and Campbell 1984; Stebbins 1966). In Western Oregon, the Rubber Boa occurs in most habitats except where regular grazing and cultivation are practiced, and has even been captured in vacant city lots, near railroads and highways, and in areas adjacent to industrial plants (Hoyer 1974). The major habitat requirement appears to be an abundance of coarse woody debris

(Hoyer and Stewart 2000a; Cannings et al. 1999) which the snakes use for protective cover and to aid in thermoregulation (Dorcas and Peterson 1998). As well, artificial cover (such as plywood) has proven to attract Rubber Boas; the capture rate of Rubber Boas in southern California under artificial cover was one every 34 minutes compared with one every 2 hours and 29 minutes under natural cover (Hoyer and Stewart 2000a). Rubber Boas also spend a considerable amount of time underground in rock crevices and abandoned rodent burrows (Dorcas and Peterson 1998). Telemetry data from the Creston Valley population in British Columbia indicates that Rubber Boas spend 25% of their time under cover and the rest underground (St. Clair 1999). These boas are found primarily in rocky outcrops in forest clearings. There is some evidence to support that Rubber Boas select rocks of varying thicknesses and, therefore, varying temperatures, to regulate body temperature (R. St. Clair, unpublished data).

Trends

Increasing urbanization, intensive agriculture and forest practices that remove coarse woody debris are all likely to cause a decrease in the amount of suitable habitat available to Rubber Boas.

Protection/ownership

Under the British Columbia Forest Practices Code, the Rubber Boa is considered 'Identified Wildlife' (at some level of risk) and consequently forest licensees are legally obligated to manage areas of harvest that provide critical habitat for the snake. Critical habitats include breeding, den and feeding sites. Unfortunately, such specific information on habitat use is not available for the Rubber Boa. The Creston Valley population is protected within the Creston Valley Wildlife Management Area.

BIOLOGY

Reproduction

Courtship and copulation begin immediately following emergence from hibernation in March and April, and usually continue into early or mid-May. Female Rubber Boas produce clutches of 2-8 offspring, 180 to 280 mm long, in late August and early September (St. Clair 1999; Dorcas and Peterson 1998; Hoyer and Stewart 2000a). The relative clutch mass for Oregon boas was 0.360, which is within the normal range for other small North American snakes (Hoyer and Stewart 2000a). Clutch frequency is likely less than annual (perhaps as infrequently as every 4 years; Hoyer and Stewart 2000a), and females may be unable to successfully reproduce in years where low temperatures reduce the rate of embryonic development (Dorcas and Peterson 1998). In one unseasonably cool summer, female Rubber Boas in Idaho were unable to stay as warm as in previous years, even using the same microhabitat; consequently, embryos did not complete development by the end of the normal hatching period. Two pregnant females captured and brought into captivity aborted their young and one female died the following spring (Dorcas and

Peterson 1998). In the Creston Valley population, two live births of 4 and 6 offspring and one stillbirth of 4 offspring have been recorded (St. Clair 1999).

Physiology

Rubber boas are frequently cited as one of Canada's more cold tolerant snakes, although this claim must be taken with caution. While the Rubber Boa is active at temperatures lower than the majority of reptiles studied to date (range 6°C to 28°C), the preferred daily body temperature of Rubber Boas in the Creston Valley population was 30°C (St. Clair 1999) and 31°C in Idaho (Dorcas and Peterson 1998). Also, data on the relationship between embryonic development and temperature suggest that it may be cool temperatures that limit the reproductive potential and distribution of the species (Dorcas and Peterson 1998). Low temperature activity in the Rubber Boa may be the result of a tradeoff between the benefit of feeding at night when fewer snake predators are active and the cost of being active at less than optimal temperatures (Dorcas and Peterson 1998).

Hibernating Rubber Boas in Idaho had body temperatures (T_b) between 4 and 9°C and T_b did not vary more than 0.3°C during any 24h period. Pregnant females maintained T_b between 27 and 34°C by moving toward the surface to warm during the day and then retreating deep into rock crevices or gathering together at night, although such high T_b's could not be achieved when environmental temperatures were low (Dorcas and Peterson 1998). Rubber Boas also regulate their head temperature, generally maintaining temperatures 2-3°C above T_b unless T_b exceeds the thermal preference of 30-31°C (Dorcas and Peterson 1997).

Movements/dispersal

Little is known of movements or dispersal of Rubber Boas. In the Creston Valley population, the hibernation site was contiguous with areas where Rubber Boas were found in summer. One individual traveled a distance of 1.5 km in one week to reach the hibernaculum, perhaps indicating an intentional return to a favourable den site (R. St. Clair, unpublished data).

Nutrition and interspecific interactions

Throughout its range, the Rubber Boa feeds primarily on nestling rodents and insectivores, although it will occasionally eat lizards and their eggs, bats, baby rabbits, and small birds (Hoyer 1974; Hoyer and Stewart 2000b). Smaller boas (144-268 mm) favour squamate eggs and lizards, whereas larger boas (352-711 mm) for go eggs and add mammals and birds to their diet (Rodriguez-Robles et al. 2001). The blunt and hardened tail of the Rubber Boa is used as a diversion or a defensive weapon against small mammal parents attempting to defend their litter from being consumed (Hoyer and Stewart 2000b). Known predators of the Rubber Boa in the United States include the common raven (*Corvus corax*), red-tailed hawk (*Buteo jamaicensis*), raccoon (*Procyon lotor*) and the ringneck snake (*Diadophis punctatus*) (Hoyer and Stewart 2000b).

Survival

Rubber Boas are long-lived, frequently surviving 20 to 30 years in the wild and longer in captivity (Hoyer 2001). Fewer than 10% of boas captured in Oregon were juveniles, indicating that reproductive potential is low, or that juvenile survivorship is low, or perhaps that juveniles have behavioural differences from adults that make them unlikely to be captured (Hoyer 1974). Females are more subject to severe injury (heavy scarring or shortened tail tip) than males, but are also larger in size. The nutritional requirements of females for growth and reproduction probably require that the female spend more time foraging and, consequently, must more frequently ward off attacks from the prey species' parent.

Behaviour/adaptability

Due to their nocturnal feeding habits and preference for covering debris when at the surface, Rubber Boas are rarely seen. When handled, they are docile and have never been known to bite, although they will excrete a smelly musk if handled too roughly (Hoyer 2001). This species may sustain populations within short distances of human habitation and disturbance; however, the presence of coarse woody debris remains a major habitat requirement.

POPULATION SIZES AND TRENDS

The number and size of Rubber Boa populations and subpopulations in Canada are unknown. In the Creston Valley Wildlife Management Area, 361 250 m^2 were searched over 3 three years in the late 1990s (>1000 hours search effort) and yet only 65 snakes were found. Seven of the 65 snakes were recaptured once and two snakes were recaptured in subsequent years; however, the recapture rate of marked snakes is too low to calculate population density. Rubber Boas do not seem to be particularly abundant in Creston Valley, despite being in an area that is considered prime habitat for the species.

LIMITING FACTORS AND THREATS

Although relatively cold tolerant and active at low temperatures, Rubber Boas may be limited in their distribution by the short summers experienced in much of Canada that do not provide pregnant females with enough warm days to complete development of their embryos. Where populations do exist in Canada, the population growth rate may be low due to the combination of late maturation, small litter size and biennial or less frequent parturition. Therefore, populations will be slow to respond to disturbance. Forest management practices that remove coarse woody debris from harvest areas will severely reduce habitat quality for Rubber Boas living in the area, unless significant rock cover remains. Other human activities, such as intensive agriculture and urban development, are likely to decrease the amount of suitable habitat available to the

Rubber Boa and also increase road area and traffic. As with many snakes, Rubber Boas are known to bask on roadways at night and are periodically killed by vehicular traffic. The species' long-lived life history makes it intolerant of even small chronic increases in mortality rates.

SPECIAL SIGNIFICANCE OF THE SPECIES

The Rubber Boa is the only member of the ancient family Boidae in Canada, and one of only two Boids found outside the tropics and subtropics. It is of interest because of its unusual appearance, its apparent rarity in Canada, and its ability to forage nocturnally at very low body temperatures.

EXISTING PROTECTION OR OTHER STATUS

Globally, the Rubber Boa is ranked G5 (Secure – Common, typically widespread and abundant) and in the United States it is ranked S5 or S4 in all states except for Wyoming (S2S3). In British Columbia, the species is ranked S3S4 (Vulnerable, but apparently secure – uncommon, but not rare, and usually widespread. Possibly cause for long-term concern). A double rank indicates uncertainty about the status of the species (NatureServe 2002). The Rubber Boa is on the British Columbia Blue List – vulnerable and at risk. It is also 'Identified Wildlife' under the Forest Practices Code, therefore forest licensees are legally obligated to manage harvest areas and protect critical habitat for the species.

SUMMARY OF STATUS REPORT

The Rubber Boa is widely distributed across the northern edge of its range (British Columbia); however, sightings of the species are very rare even when substantial effort is expended in search of the snake. Behavioural traits, such as noctural feeding and thermoregulating under cover, may make the Rubber Boa difficult to capture or the species may actually be rare in Canada. The distribution and reproductive potential of the Rubber Boa is likely limited by length of the summer (reproductive) season, because short and cool summers do not allow females to complete development of their offspring before hibernation. Rubber Boas require rock outcrops and an abundance of coarse woody debris for cover while thermoregulating, and are unlikely to survive in areas where forest licensees remove all woody debris. Conversion of forested areas and grasslands into agriculture plots or urban developments decreases the quality and amount of habitat available to the Rubber Boa, while increased road-building in those areas is likely to cause an increase in mortality for snakes crossing roads or basking on the warm pavement. If the Rubber Boa is in fact rare in Canada, then the species' patchy distribution and low reproductive potential make it vulnerable to local extinctions and, consequently, to a loss of genetic diversity.

TECHNICAL SUMMARY

Charina bottae
Rubber Boa — Boa Caoutchouc
British Columbia

Extent and Area information	
• *extent of occurrence (EO)(km²)*	73,000 km^2
• *specify trend (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in EO (> 1 order of magnitude)?*	Unknown
• *area of occupancy (AO) (km²)*	24,300 km^2
• *specify trend (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in AO (> 1 order magnitude)?*	Unknown
• *number of extant locations*	Unknown
• *specify trend in # locations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in # locations (>1 order of magnitude)?*	Unknown
• *habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat*	Declining quality
Population information	
• *generation time (average age of parents in the population) (indicate years, months, days, etc.)*	>5 years
• *number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)*	Unknown
• *total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals*	Unknown
• *if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)*	--
• *are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?*	--
• *is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., ≤ 1 successful migrant / year)?*	No
• *list each population and the number of mature individuals in each*	Populations are associated with the following major watersheds: Fraser (south), Thompson, Similkameen, Okanagan, Columbia, Kootenay
• *specify trend in number of populations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	Unknown
Threats (actual or imminent threats to populations or habitats)	
- Forest practices that remove all coarse debris from the harvest area - Increased area used for agriculture and urban development - Increased road-building in agricultural and urban areas	

Rescue Effect (immigration from an outside source)	Low
• *does species exist elsewhere (in Canada or outside)?*	Western United States
• *status of the outside population(s)?*	Secure in north
• *is immigration known or possible?*	Unknown, unlikely
• *would immigrants be adapted to survive here?*	Unknown
• *is there sufficient habitat for immigrants here?*	Yes
Quantitative Analysis	

ACKNOWLEDGEMENTS

R. St. Clair would like to thank the B.C. Conservation Data Centre staff for providing information on the status of the Rubber Boa in Canada and globally. The study of Rubber Boas in the Creston Valley Wildlife Management Area is funded by Forest Renewal B.C. and the Columbia Basin Fish and Wildlife Compensation Program. Patrick Gregory (University of Victoria) provided logistic support and equipment. Pamela Rutherford (University of Victoria) captured almost all of the Rubber Boas while searching for Alligator Lizards for her Ph.D. research. Laura Strom did most of the radio tracking. The Creston Valley Wildlife Management Area under Brian Shushnoff has been very supportive. Laboratory space and accommodation was available through Ron Ydenburg at Simon Fraser University. Richard Hoyer gave access to his vast knowledge of Rubber Boa natural history. M. Cameron would like to thank Ron Brooks for giving her the opportunity to contribute to the Rubber Boa report.

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THE AUTHORS

Robert St. Clair: For my Master's Degree at the University of Victoria under P.T. Gregory, I studied the population ecology of painted turtles in eastern B.C. During this study, I became interested in the physiological costs incurred by northern turtles when they hibernate under ice. I continued this interest in physiological ecology when I did my doctorate under V.H. Hutchinson at the University of Oklahoma. There, I studied differences in growth and metabolic rate when box turtle eggs are incubated at different temperatures. Because the box turtle has environmental sex determination, these differences are also differences between the sexes. As a post-doctoral fellow at the University of Victoria, I began to study habitat preferences of Rubber Boas in Creston, B.C. This study continues at a reduced level. In addition to this, I teach at the University of Alberta on a contract basis. I have published on growth and maturation in painted turtles and box turtles, physiological costs of hibernation in painted turtles, patterns of paternity and male parental care in birds, and, with Colleen Cassady St. Clair, patterns of egg loss in crested Penguins.

Melissa Cameron:

From September 2001 to May 2002 I worked for Ron Brooks, co-chair of the Reptiles and Amphibians Species Specialist Group for COSEWIC, as an editor of numerous reptile species status reports. I am currently studying the demographics and long-term viability of a population of wood turtles, *Clemmys insculpta*, in southern Ontario, as well as developmental strategies and reproductive energetics of three mud turtle (genus *Kinosternon*) species in Arizona, New Mexico and northern Mexico.

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