COSEWIC
Assessment and Status Report

on the

Western Skink
Eumeces skiltonianus

in Canada

SPECIAL CONCERN
2002

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 2002. COSEWIC assessment and status report on the western skink *Eumeces skiltonianus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 19 pp.

Ovaska, K.E. and C. Engelstoft. 2002. COSEWIC status report on the western skink *Eumeces skiltonianus* in Canada, *in* COSEWIC assessment and status report on the western skink *Eumeces skiltonianus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-19 pp.

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Également disponible en français sous le titre Rapport du COSEPAC sur la situation du la Scinque de l'Ouest (*Eumeces skiltonianus*) au Canada

Cover illustration:
Western skink — Jacob Dulisse

Catalogue No. CW69-14/347-2003E-PDF
ISBN 0-662-75544-8
HTML: CW69-14/347-2003F-HTML
0-662-75545-6


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COSEWIC
Assessment Summary

Assessment Summary – May 2002

Common name
Western Skink

Scientific name
Eumeces skiltonianus

Status
Special Concern

Reason for designation
This species has a very small area of occupancy, apparently in low numbers, and undergoes large fluctuations in numbers. The species' Canadian range is undergoing extensive development, and habitat loss is occurring due to agriculture and urbanization. No quantitative studies have been conducted on this species; however, its restricted range, low densities, population fluctuations and loss of habitat make it a species of concern.

Occurrence
British Columbia

Status history
Designated Special Concern in May 2002. Assessment based on a new status report.

COSEWIC
Executive Summary

Western Skink
Eumeces skiltonianus

Species information

The western skink (*Eumeces skiltonianus*) is a medium-sized lizard with smooth, shiny scales, a pointed head, and short legs characteristic of skinks. Four longitudinal, light-coloured stripes extend from the head to the base of the tail. The stripes contrast with the dark-coloured, brown dorsum and grey or black sides. The tail is blue, often vividly coloured in juveniles. The western skink belongs to the family Scincidae, of which there are three species native to Canada.

Distribution

The species reaches the northern extremity of its distribution — which extends south to Baja California — in south-central British Columbia. Its distribution is restricted to a small portion of the province south of latitude 51^{o} N, between Kootenay Lake in the east and Princeton in the west. One recent sighting and an older listing indicate that the species might also inhabit Vancouver Island, but its persistence there remains unconfirmed.

Habitat

In south-central British Columbia, the species is found in the Bunchgrass, Ponderosa Pine and Interior Douglas Fir Biogeoclimatic Zones but is not restricted to these relatively arid areas; it is also found in the Engelmann Spruce-Subalpine Fir Zone and the moister Cedar Hemlock Zone in the West Kootenay region. Western skinks occupy woodland, grassland, and forested areas in diverse biotic communities. Important habitat attributes include openings along south-facing slopes for nesting, herbaceous vegetation cover for foraging and predator avoidance, loose soil for burrow excavation, and abundance of rocks or downed logs for shelter.

Biology

The western skink is oviparous, laying one clutch of 2-6 eggs per season. Mating takes place in May-June, females lay their eggs in June-July, and the eggs hatch in July-August; the exact timing varies with geographical location. The females provide care for the eggs until hatching, often protecting the nest from predation. Western

skinks reach sexual maturity at about three years of age, and can live to a maximum age of about 9 years. They consume a variety of different species of insects at all stages of the insect life cycle, including caterpillars, moths, beetles, grasshoppers and crickets. Skinks are vulnerable to mammalian, avian and reptilian predators in addition to many parasites. They are diurnally active and hibernate in communal dens during the winter. Nesting females can be territorial.

Population sizes and trends

Nothing is known of population densities or trends of *E. skiltonianus* in Canada. Populations appear to be locally distributed within suitable habitats. Recent (since 1990) distribution records exist from southern Okanagan and from near Creston, indicating persistence in the southern part of the species' Canadian range. No recent distribution records are available from the western and northern extremities of the range; records from the northeast are also lacking. As a result, the persistence of the species throughout its known Canadian range cannot be evaluated at this time.

Limiting factors and threats

The occurrence and range expansion of *E. skiltonianus* in Canada is limited by natural, climate-related factors and human activities. The greatest immediate threat is habitat alteration and fragmentation, including residential development, road construction, and talus extraction associated with an increasing human population. Factors that increase the vulnerability of the species in Canada include a small geographic range centred in densely populated areas, a local distribution pattern, increasing pressures on habitats, and increasing predation by domestic and feral pets, especially cats. Ameliorating factors include some degree of tolerance to human activities and life history characteristics such as small body size that allow populations to persist in small habitat patches.

Special significance of the species

Western skinks in British Columbia are of considerable scientific and conservation significance, as populations at the extremities of a species' distribution often form reservoirs of genetic variation. Only three species of lizards live in western Canada and only two are currently present in British Columbia; the western skink contributes significantly to the biological diversity of the communities that it occupies.

Existing protection

The western skink is on British Columbia’s Yellow List, indicating that it is not considered to be at immediate risk. Globally, it is considered common to very common, except in Arizona where it is ranked S2. Provincially, the species is considered apparently secure; however, it has a restricted distribution in B.C. and there are perceived future threats. The B.C. Wildlife Act prohibits the collection, handling, and trade of all native wildlife species without a permit.

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

Western Skink
Eumeces skiltonianus

in Canada

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2002

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SPECIES INFORMATION

Species Description

The Western Skink, *Eumeces skiltonianus* (Baird and Girard), is a medium-sized lizard (up to 83 mm in snout-vent length) with smooth, shiny scales, a pointed head, and short legs characteristic of skinks (Gregory and Campbell 1984, Tanner 1988). Four longitudinal, light-coloured stripes extend from the head to the base of the tail. The stripes contrast with the dark-coloured, brown dorsum and grey or black sides (Stebbins 1954, Storm and Leonard 1995). The tail is blue, often vividly coloured in juveniles. Apart from fading in brightness, the colouration of adults is similar to that of young (Tanner 1957, Stebbins 1985). Reddish patches may be present on the chin and sides of the head of breeding adults of both sexes but is brighter in males (Stebbins 1954, Gregory and Campbell 1984).

Taxonomy

The family Scincidae is a large group of lizards (about 85 genera and over 1000 species) with a worldwide distribution (Cook 1984). Three species occur in Canada: *Eumeces fasciatus*, *E. septentrionalis*, and *E. skiltonianus*. *Eumeces skiltonianus* is closely related to *E. gilberti* in southwestern United States (Rodgers and Fitch 1947, Tanner 1957). Four subspecies of *E. skiltonianus* are recognized: *skiltonianus*, *utahensis*, *interparietalis*, and *lagunensis* (Tanner 1988). The range of *E. s. skiltonianus* extends northward into south-central British Columbia. [**Editor's note**: The Society for the Study of Amphibians and Reptiles (SSAR) Committee on Standard English and Scientific Names identifies "Skilton's skink" as a common name for *E. s. skiltonianus* (Crother 2000).]

Research

The natural history of *E. skiltonianus* is poorly known, particularly for populations at the northern portion of the species' geographical distribution. The most comprehensive ecological studies are those of Tanner (1943, 1957) in Utah. Rogers and Memmler (1943) and Punzo (1982) reported on reproduction of the species in California. Vitt and Pianka (1994), and Farley and coworkers (Farley and Emshwiller 1996, Farley 1997, Farley and Ko 1997) examined the efficiency and mechanics of locomotion. Brattstrom (1965), and Cunningham (1966) reported on thermal preferences. Rogers and Fitch (1947), and Tanner (1957) examined systematics of western *Eumeces*. Tanner (1988) provided a summary of distribution and available literature on the species. Other summary accounts are in Van Denburgh (1922), Smith (1946), Stebbins (1954, 1972, 1966, 1985), Nussbaum et al. (1983), and Storm and Leonard (1995); summaries with emphasis on British Columbia are in Carl (1944), Cook (1984), and Gregory and Campbell (1984).

In addition to published literature, information available for this report consisted of distribution records based on museum specimens and inventory reports. Recent

distribution records from the Okanagan were available from data bases compiled as part of various inventory projects and from personal files of Mike Sarrell. Distribution records and some preliminary data from an ongoing study on reproductive biology of lizards in the Creston Wildlife Management area were also available (Ph.D. dissertation work by Pam Rutherford, Department of Biology, University of Victoria).

DISTRIBUTION

Eumeces skiltonianus ranges from south-central British Columbia southward to the southern tip of Baja California (Fig. 1, Tanner 1988). From west to east, the range extends from the Pacific coast in Oregon and northern California to extreme western Montana, Idaho, and Utah, just reaching the northwestern portion of Arizona. Disjunct populations are present in southern Baja California and east of the Sierra Nevada in California. The species has been reported at elevations up to 2134-2440 m in the southern parts of its range (7000-8000', Smith 1946, Tanner 1957) and at elevations up to 1524 m in southern Oregon (5000'; Storm and Leonard 1995).

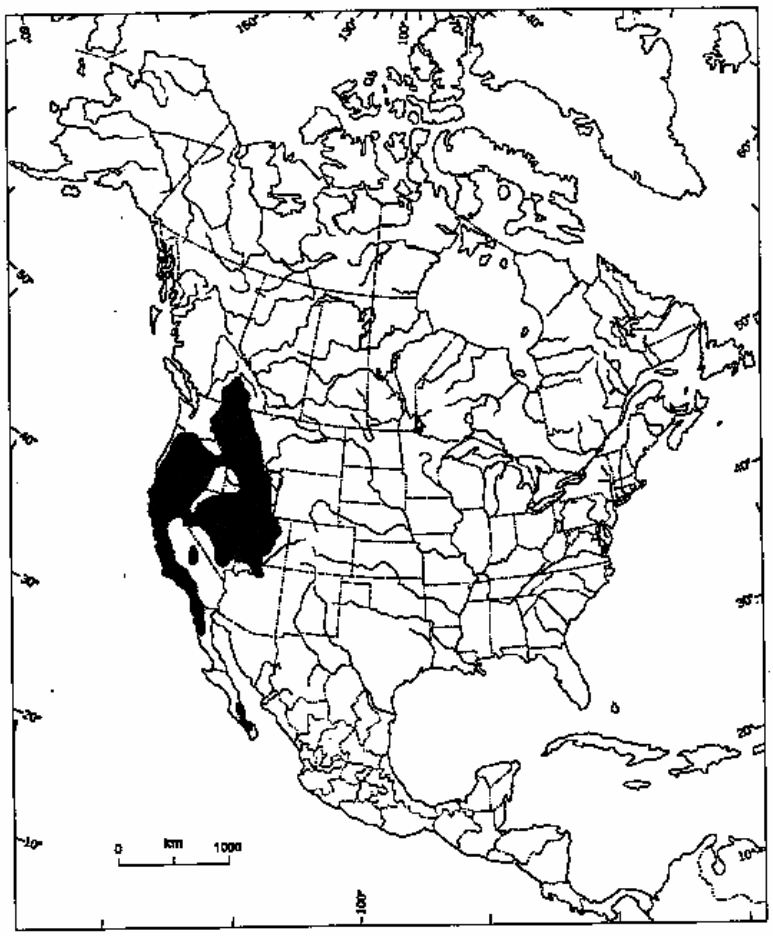

Figure 1. Geographic distribution of *Eumeces skiltonianus* in North America based on range map in Tanner (1988).

In Canada, the species is restricted to a small portion of British Columbia between Kootenay Lake in the east and Princeton in the west, south of latitude 51° N (Fig. 2). Western skinks in British Columbia have been sighted at elevations up to 1080 m.

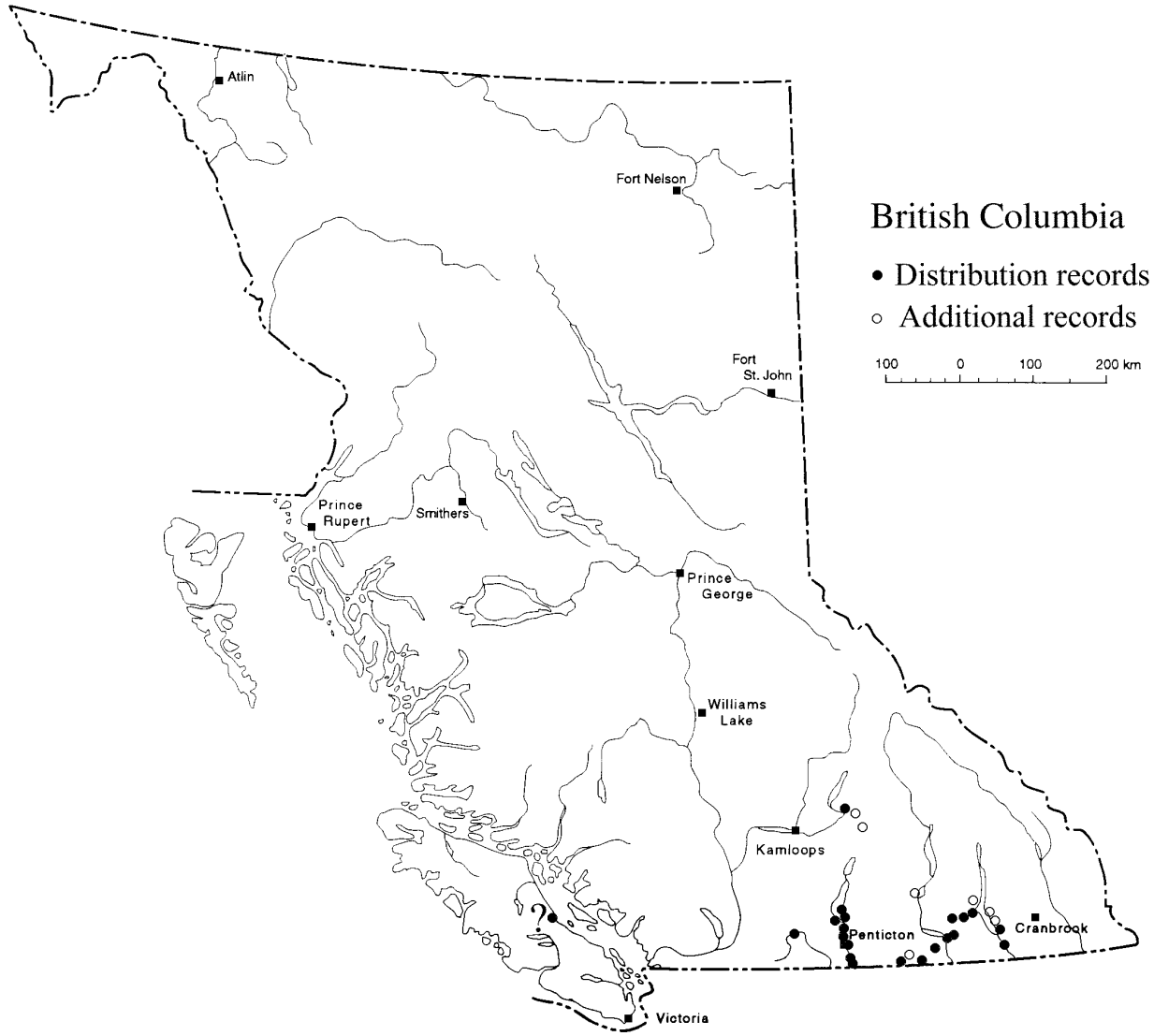

Figure 2. Geographic distribution of *Eumeces skiltonianus* in Canada. Adapted from Ovaska and Engelstoft, unpubl. data and Gregory and Campbell, 1984.

One recent sighting and an older listing indicate that the species might also inhabit Vancouver Island (McNicholl 1975). Boulenger (1887, cited in McNicholl 1975) listed Vancouver Island as the locality for a specimen donated to the British Museum of Natural History but gave no further details. This record was considered invalid by most

authorities (but see Van Denburgh 1922) until the publication of a sight record from near Courtney on Vancouver Island (McNicholl 1975). No further observations have been recorded, and whether the sighting represented a recent introduction or possibly only a single introduced animal is unclear. Gregory and Campbell (1984) included the sighting in their range map for *E. skiltonianus* in British Columbia, and Tanner (1988) included it as a questionable location in his species account for the Catalogue of American Amphibians and Reptiles. The existence of *E. skiltonianus* populations on Vancouver Island remains enigmatic.

HABITAT

Habitat Description

Within its wide geographical range, *E. skiltonianus* occupies woodland, grassland, and forested areas in diverse biotic communities (Rogers and Fitch 1947, Stebbins 1954, 1966, Tanner 1957, Nussbaum et al. 1983, Cook 1984). The skinks seem to prefer habitats with abundant herbaceous cover (Rogers and Fitch 1947, Stebbins 1954, 1966). The presence of abundant cover provided by rocks or decaying logs, stumps, and bark is also an important habitat attribute (Van Denburgh 1922, Carl 1944, Stebbins, 1954, 1966, 1972, 1985, Smith 1946, Rogers and Fitch 1947, Tanner 1957, Leviton 1972, Nussbaum et al. 1983, Gregory and Campbell 1984, Applegarth 1994, Storm and Leonard 1995). Herrington (1988) classified *E. skiltonianus* as a species frequently associated with talus.

The skinks appear to avoid heavy brush (Tanner 1957) and are often found in sunny openings in forested habitats (Stebbins 1985). Both Bury and Corn (1988) in Oregon, and Raphael (1988) in northwestern California caught *E. skiltonianus* most often in young Douglas fir stands (<20 years old), but the species was also present in lower numbers in older seral stages, including dry old-growth stands. In contrast, based on a small number of captures (n=10), Welsh and Lind (1988) found the species most abundant in dry old-growth and mature stands in northwestern California and southwestern Oregon; no individuals were found in wet old growth.

In south-central British Columbia, the range of *E. skiltonianus* overlaps the Bunchgrass, Ponderosa Pine, Interior Douglas Fir, Interior Cedar-Hemlock, and Engelmann Spruce-Subalpine Fir Biogeoclimatic Zones. A concentration of distribution records exists from the Okanagan Valley, particularly from its southern portion. Hot summers, cold winters, and little precipitation in all seasons are climate characteristics of the Ponderosa Pine and Bunchgrass Zones (Pitt and Hooper 1994). The species is not confined to the arid zones, however, and concentrations also occur in the moister Cedar-Hemlock zone west of the Kootenay Mountains. The single record from Vancouver Island is from the Coastal Western Hemlock Biogeoclimatic Zone Trends.

As in areas farther south, the skinks in British Columbia require an abundance of rocks or decaying wood for cover (Carl 1944, Orchard 1980, Gregory and Campbell

1984). The skinks are often found in relatively damp habitats, including riverbanks (Carl 1944, Gregory and Campbell 1984), but they also occupy drier upland areas (Cook 1984). In southern Okanagan, the skinks inhabit rock (primarily gneiss) outcrops and stable talus slopes, but they can also be found in lacustrine escarpments and along creek banks (Mike Sarell, pers. comm.). Habitats with *E. skiltonianus* observations frequently have a southern aspect.

In Utah, rocky areas with a southern exposure and some shading from vegetation are typically used for nesting (Tanner 1943, 1957). Southern exposure and associated higher temperatures may be particularly important at the northern extremity of the species' range in British Columbia, where relatively short summers limit the time available for embryonic development and juvenile growth. Habitats required for hibernation are poorly known, but access to subterranean refugia below the frost line is required. Some evidence from Washington suggests that the skinks use south-facing rock outcrops or fissures in bedrock for hibernation (Storm and Leonard 1995, Columbia NWR files 1989).

Habitat Trends and Protection

Excluding coastal areas in the southwest, the range of *E. skiltonianus* is within the most densely populated part of the province. The human population in south-central British Columbia continues to expand, encroaching on habitats occupied by the skinks. For example, the human population in southern Okanagan tripled from 1947 to 1987 and is expected to continue to grow to 112,000 by the year 2021 (Cannings et al. 1998).

Grasslands within the Bunchgrass, Ponderosa Pine, and Interior Douglas Fir zones in south-central British Columbia are perhaps the most threatened ecosystems in the province (Scudder 1980, Pitt and Hooper 1994). Forested habitats within these arid zones also face major threats from human activities. The activities that pose the greatest threats to habitats of *E. skiltonianus* are probably residential development and road construction; gravel extraction from talus slopes is also a considerable threat in some areas (M. Sarell, pers. comm., Pam Rutherford, pers. comm.). Agricultural developments, including increased conversion of the land into vineyards, can also result in habitat loss. Habitats within the Cedar-Hemlock zone in the West Kootenays face threats from residential development and road construction associated with an increasing human population.

Overgrazing by cattle, together with associated invasions of introduced weeds, also pose threats to both woodland and grassland habitats in south-central British Columbia (Pitt and Hooper 1994). In recent years, wooded areas have increasingly been used for cattle grazing. Grazing may adversely affect herbaceous cover in forest openings used by *E. skiltonianus*. Grazing on crown lands — including stocking densities and patterns of range use — is governed by the rules and regulations of the Forest Practices Code of British Columbia; the effectiveness of these habitat protection measures is unknown.

The vast majority of the habitats within the range of *E. skiltonianus* are privately owned. The largest parks are the Okanagan Mountain (10,000 ha) and Vaseaux Lake (32 ha) parks.

BIOLOGY

General

In California, body temperatures of field-caught *E. skiltonianus* are highly variable and range from 14°C to 34°C (Brattstrom 1965, Cunningham 1966); the lizards appear to become lethargic at temperatures below 14°C (Brattstrom 1965). Brattstrom (1965) determined that after a two-week acclimation period at 13-14°C the critical thermal maximum for one animal was 41.3°C. In the field, the lizards appear to retreat underground during unsuitable thermal conditions.

Vitt and Pianka (1994) compared the stamina of several lizards, including seven species of skinks, in treadmill-endurance tests. The stamina of *E. skiltonianus* was relatively low (2.0-3.8 min at running speeds of 1 km/h), reflecting its small body size (1.4-7.8 g for the animals tested) and possibly also its habits of remaining near cover in the natural habitat; this behaviour reduces the need for sustained running to avoid predators. In the Creston Valley, the skinks seldom run for more than 2 m from a disturbance before seeking shelter (Pam Rutherford, pers. comm.).

Farley (1997) examined running speeds of *E. skiltonianus* on level and sloping surfaces and concluded that the power-producing capacity of the muscular system did not limit maximum speeds. The efficiency of locomotion on vertical surfaces was relatively low when compared to that of the arboreal gecko, *Coleonyx variegatus* (Farley and Emshwiller 1996). The mechanics of locomotion of the skinks was similar to that of other vertebrates with legs, although the skinks exhibited pronounced lateral bending of the trunk while running (Farley and Ko 1997).

Reproduction

The reproductive biology of *E. skiltonianus* has been studied in the southern portion of the species' range, mainly in Utah (Tanner 1943, 1957) and California (Rogers and Memmler 1943, Punzo 1982); very little information exists on British Columbia populations. The species is oviparous with one clutch laid per year. The clutch size is 2-6 eggs (Tanner 1957, Stebbins 1985). The number of oviductal eggs is positively correlated with the body size of the female (Punzo 1982).

Mating takes place in May-June, females lay their eggs in June-July, and the eggs hatch in July-August (Rogers and Memmler 1943, Smith 1946, Tanner 1957, Stebbins 1985). The exact timing of the events varies among geographic locations. During an ongoing study in the Creston Wildlife Management Area, British Columbia, two egg masses, each consisting of 4 eggs, were found in July, and hatchling-sized skinks were found in August and early September (Pam Rutherford, pers. comm.).

Tanner (1943, 1957) described nests of *E. skiltonianus* from Utah in detail. The

clutches were typically located in enlarged, 5-9 cm (2-3.5") wide and 2.5-3.8 cm (1-1.5") high chambers at the end of burrows terminating under rocks. The chambers were up to 25 cm (10") underground. A female was in attendance of each nest. Female parental care is widespread among *Eumeces* species and probably functions in protection from predators (Noble and Mason 1933). Females of some species rotate the eggs, possibly facilitating normal development. They may also increase the temperature of their clutches with their body heat by periodically leaving the nest to bask in the sun (Noble and Mason 1933). Female *E. skiltonianus* have been reported to repair the nest, move eggs, and show aggression in response to disturbance (Tanner 1943, 1957).

Growth and Survivorship

Based on data from California and Utah, the mean SVL at hatching is ca 25 mm (Rogers and Memmler 1943, Tanner 1957). Rogers and Memmler (1943) estimated mean growth rates of 25 mm, 15 mm, and 3-4 mm for the first three years of life, respectively; after the third year, growth was minimal, approximately 1-2 mm/year.

Tanner (1957) and Rogers and Memmler (1943) both recognized three distinguishable size classes in the populations studied: hatchlings or same-year young, yearlings or previous year's young, and larger animals, including both breeding adults and maturing individuals. In the California population, the smallest breeding individuals were 61-62 mm in SVL but most were between 68-75 mm (Rogers and Memmler 1943). In Utah, the SVL at first breeding was somewhat smaller (males: 53 mm, females: 56 mm); maximum adult body size was also smaller (70 mm; Tanner 1957).

Based on growth rates and the distribution of body sizes, Rogers and Memmler (1943) estimated that in California, both females and males typically reach sexual maturity at the age of three years, although some individuals might mature at the end of their second year of life. Similarly, Tanner (1957) concluded that in his study population in Utah, maturation occurred at 2.5 years of age but noted that many younger males (1.5 years old in spring) might have bred. Longevity of *E. skiltonianus* is poorly known. A reproductive life span of 5-6 years has been suggested, resulting in a maximum age of 9 years (Rogers and Memmler 1943). Survival rates also have not been studied.

Adult males and females are either similar in mean body size (Rogers and Memmler 1943) or females are slightly larger (ca 5%) than males (Tanner 1957, Stamps 1983). Demographic parameters — growth rates, body size at sexual maturity, and mean body size — might vary along altitudinal and latitudinal gradients within the wide geographical range of the species (Tanner 1957), but little information of such variation is available.

Movements and Home Range

Home ranges and movement patterns of *E. skiltonianus* have not been documented. Both sexes excavate burrows (Tanner 1957), suggesting that individuals

might maintain defined home ranges in the vicinity of these shelters. In spring and fall, movements of the skinks appear to be restricted to areas under and near rocks and other cover objects, whereas they appear to be more active on the surface in summer when vegetation growth provides additional escape cover (Rogers and Memmler 1943). Whether there is a corresponding seasonal change in movement distances and home range sizes is presently unknown.

Food Habits

E. skiltonianus will consume a variety of insects at different life history stages, including eggs of various species — caterpillars, moths, beetles, grasshoppers, and crickets (Van Denburgh 1922, Tanner 1943, 1957, Smith 1946, Stebbins 1954, 1966). Ants have not been found in stomach contents (Tanner 1957). The skinks also consume a variety of other invertebrates, such as spiders and isopods, but less frequently. The skinks may occasionally be cannibalistic (Stebbins 1954, Zweifel 1954), but this behaviour appears not to occur in the Great Basin populations (Tanner 1957).

Predation, Parasites and Predator Defense

A variety of birds, mammals, and snakes probably prey on *E. skiltonianus*, but known predators are few. The species has been found in stomach contents of rattlesnakes (*Crotalus viridis*) and garter snakes (*Thamnophis elegans*; Tanner 1943, 1957); ring-necked snakes (*Diadophis* spp.) will prey on western skinks in captivity (Vitt et al. 1977). In British Columbia, a yellow-bellied racer (*Coluber constrictor*) was observed attempting to catch *E. skiltonianus* (M. Sarell, pers. comm.), and adult skinks were found in the stomachs of two juvenile rubber boas (*Charinae bottae*; Pam Rutherford, pers. comm.). Ectoparasites include ticks (*Ixodes pacificus*) and chigger mites (*Tromicula belkini*; Tanner 1957). Endoparasites include flagellates (*Proteromonas lacertaeviridis*, *Monocercomonas colubrorum*, *Hexamastix* spp., *Retortamonas saurarum*), amoebas (*Endoclimax* and undetermined spp.), nematodes (*Psylaloptera retusa*), and cestodes (*Mesocestoides* spp. larvae; Telford 1970).

The initial response of the skinks to predators is usually a rapid retreat (Vitt et al. 1977); females attending eggs may either retreat or attempt to defend the nest by biting (Tanner 1943, 1957). The skinks readily autotomize their tails if seized by a predator or a collector (Carl 1944, Stebbins 1966, 1972, Vitt et al. 1977). Tail autotomy is widespread among lizards and is thought to distract the attention of the predator away from the body while the lizard makes its escape. The trashing of the detached tail and its blue colour, which is particularly vivid in juveniles, might enhance this distractive effect in *E. skiltonianus* (Carl 1944, Tanner 1957, Stebbins 1966, 1972); the bright colour of the tail of juveniles may also reduce attacks by adult males (Stebbins 1972). Vitt et al. (1977) found a high frequency of tail breaks (62%) in natural populations of *E. skiltonianus*, suggesting that tail autotomy is highly effective against predators. In captivity, the tails regenerated relatively slowly (mean of 0.35 mm/day) when compared to other lizard species tested (*Coleonyx variegatus*, *E. gilbertii*, *Gerrhonotus* (*Elgaria*) *multicarinatus*). The regenerated tails were similar in volume to, or larger than the

original tails (Vitt et al. 1977). Regenerated tails are seldom, if ever, blue in colour (Pam Rutherford, pers. comm.).

Daily and Seasonal Activity

The skinks are diurnally active on the surface, but the period of activity appears to be variable. Stebbins (1954) found them most active in late afternoon in California, whereas Tanner (1957) reported an apparent preference for both morning and afternoon hours in Utah. Applegarth (1994) noted that the skinks were active during the warm parts of the day in Oregon. Similarly, in the Creston Valley, British Columbia, Pam Rutherford (pers. comm.) has seen skinks active on the surface during hottest parts of the day when the sympatric alligator lizards were inactive.

The seasonal activity period of *E. skiltonianus* ranges from spring to fall, but skinks are observed most easily during various periods between March and July, depending on the locality (Rogers and Fitch 1947, Stebbins 1954, Tanner 1957). The skinks suspend activities during cold periods in winter (Rodgers and Fitch 1947) and probably hibernate in underground refugia. Western skinks have been found together with northern alligator lizards (*Elgaria coerulea*) and rubber boas (*Charina bottae*) in an apparent hibernaculum under and among rocks in Klickitat County, Washington (Storm and Leonard 1995). During a study of rattlesnakes (*Crotalus viridis oreganus*) in southern Washington, 17 individual skinks were caught entering or leaving an enclosure around a snake hibernaculum from April to October (Columbia NWR files 1989). Whether the skinks used the location for communal or individual hibernation is unknown. In the Creston Wildlife Management Area in British Columbia, *E. skiltonianu*s was trapped or found under surface cover objects from April to September; whether activity occurred before or after this period was not studied (Pam Rutherford, pers. comm.).

Behaviour

The skinks are secretive and most often found when turning over rocks or other cover (Smith 1946, Tanner 1943, 1957, Stebbins 1954, 1985). Both sexes excavate burrows in loose soil, often under or by rocks or other cover objects (Tanner 1943, 1957, Smith 1946). The burrows of males are longer (up to 48 cm (18") long) and narrower than those of females; nesting females construct enlarged terminal chambers to their burrows (Tanner 1957). Smith (1946, p. 383) noted that the skinks "burrow with some ease, utilizing the snout while adpressing the limbs to the sides of the body and tail."

There is no evidence of territoriality with the possible exception of nesting females (Tanner 1957, Stamps 1983). Tanner (1957) noted that the burrows of adult males, juveniles, and non-breeding females were irregularly spaced in the habitat and concluded that the protection of territories was improbable. Females attending egg clutches, however, were more regularly spaced and resisted intrusions from predators; they might similarly attempt to repel intruding conspecifics from their burrows.

Vulnerability

With their blue tails and striped patterns, the skinks are potentially attractive to the pet trade. Such collecting poses a major threat to populations of the similarly attractive *E. fasciatus* in Ontario (COSEWIC report by C. and D. Seburn cited in Green 1998). No information, however, is available on whether *E. skiltonianus* is collected for the pet trade or what the extent of such activities might be. The secretive habits of the skinks might protect them to some extent from collecting and other direct human disturbance. Illegal collecting appears not to take place in the Creston Wildlife Management Area (Pam Rutherford, pers. comm.).

The greatest immediate threats to *E. skiltonianus* are habitat loss and alteration (see section on Habitat Trends). In particular, residential development, road construction, and talus/gravel extraction associated with increasing human populations are a major threat. The small geographic range of the species in Canada, together with the local distribution of populations, increases its vulnerability to habitat-related disturbances.

POPULATION SIZES AND TRENDS

Population Density

Nothing is known of population densities of *E. skiltonianus* in British Columbia. At all but one site sampled in the Creston Valley Wildlife Management Area from 1996-1998, the skinks were caught much less frequently than were alligator lizards (*Elgaria coerulea*) and appeared to be less abundant (Pam Rutherford, pers. comm.). At one rocky site, however, the skinks were more numerous than alligator lizards. No estimates of population densities are available from the United States.

Population Distribution and Persistence

Tanner (1957) noted that the skinks are locally abundant in California and Utah. He attributed the local distribution pattern primarily to habitat suitability but also noted that, "field data suggest a definite tendency towards gregariousness in this species" (p. 89). The skinks appear to be similarly unequally distributed within their range in British Columbia. Distribution records are concentrated in the major valleys and their vicinities, including the Kootenay Lake, Lower Arrow Lake, Shuswap Lake, Okanagan, Slocan, and Similkameen River valleys (Fig. 2). Orchard (1980) noted that the species is locally abundant with concentrations centered in some areas, such as around Nelson and in the southern Okanagan. The skinks also appear to be locally distributed at smaller scales. For example, Pam Rutherford (pers. comm.) caught skinks only at a few of her study sites in the Creston Wildlife Management Area.

Recent distribution records (since 1990) exist only from the Creston and Grand Forks areas and from southern Okanagan. Notably, there are no recent records from the vicinity of Penticton in the west and from West Kootenays apart from the Creston area. The most recent record from near Salmon Arm is from 1987. The lack of recent

records from the above areas may well reflect a lack of search effort rather than the disappearance of the species.

Population Trends

Population trends of *E. skiltonianus* in British Columbia are unknown. In the United States, populations have been reported to fluctuate widely from year to year (Fitch 1936, Smith 1946, Tanner 1957). Tanner (1957) attributed such fluctuations to vegetation succession that altered habitat suitability and to adverse weather conditions, such as droughts, that affected reproductive success in a given year.

LIMITING FACTORS

Factors limiting the occurrence and range expansion of *E. skiltonianus* in Canada are both natural and climate-related or related to human activities. The species reaches the northern extremity of its distribution in southern British Columbia. The dependence of *E. skiltonianus* on relatively warm, dry conditions probably restricts its distribution and range expansion in the province. Locally, critical habitat features that likely govern patterns of distribution and abundance include openings along south-facing slopes for nesting, herbaceous vegetation cover for foraging and predator avoidance, loose soil for burrow excavation, and the presence of rocks and downed logs for shelter.

Habitat fragmentation caused by human activities and developments is probably a major factor limiting the distribution and persistence of populations of *E. skiltonianus* within suitable areas. Habitat fragmentation is likely to curtail movements between habitat patches and may result in reduced rates of colonization of new areas and recolonization of areas where populations have been extirpated due to other causes and stochastic fluctuations. The importance of such metapopulation processes to *E. skiltonianus* have not been studied but may be significant in light of the presumably poor dispersal ability and wide population fluctuations of these small lizards.

SPECIAL SIGNIFICANCE OF THE SPECIES

Populations of E. skiltonianus in British Columbia are of considerable scientific and conservation significance, although the species has a wide distribution farther south. Populations at the extremities of a species' distribution form reservoirs of genetic variation, which might enable adaptations to changing environmental conditions (Scudder 1980). Such populations also provide excellent subjects for monitoring ecological effects of large-scale environmental changes, such as global climate change. They also provide subjects for studies on factors that limit the northern expansion of a species' distribution. Only three species of lizards live in western Canada and only two are currently present in British Columbia; E. skiltonianus contributes significantly to the biological diversity of the communities that it occupies.

EXISTING PROTECTION

Eumeces skiltonianus is on the provincial Yellow List (S4), indicating that it is frequent to common, apparently secure, but may have a restricted distribution or there may be perceived future threats (Conservation Data Centre, Victoria; 23 January 1998, draft list). Globally, it is considered common to very common, with the exception of Arizona where it is ranked S2 (NatureServe 2002). The B.C. Wildlife Act prohibits the collection, handling, and trade of all native wildlife species without a permit; there are no specific legislation or regulations pertaining to *E. skiltonianus*.

EVALUATION

Eumeces skiltonianus in Canada is vulnerable because of its small geographic range centred in densely populated areas, local distribution of populations, and increasing pressures on habitats through alteration and fragmentation associated with the activities of a growing human population. Ameliorating factors include some degree of tolerance to some human activities, such as logging, and life history characteristics, such as a small body size, that allow populations to persist in relatively small habitat patches.

TECHNICAL SUMMARY

Eumeces skiltonianus
Western skink — Scinque de l'ouest
British Columbia

Extent and Area information	
• *extent of occurrence (EO)(km²)*	<2000 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)*	<200 km^2
• *specify trend (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in AO (> 1 order magnitude)?*	Possibly
• *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
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)?*	Possibly
• *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)?*	Probably yes
• *list each population and the number of mature individuals in each*	Unknown
• *specify trend in number of populations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	Possibly
Threats (actual or imminent threats to populations or habitats) [add rows as needed]	
-habitat fragmentation and destruction caused by human development -limited distribution -large population fluctuations -predation by feral and domestic cats and dogs -collection for the pet trade	
Rescue Effect (immigration from an outside source)	
• *does species exist elsewhere (in Canada or outside)?*	Yes
• *status of the outside population(s)?*	stable
• *is immigration known or possible?*	Possible
• *would immigrants be adapted to survive here?*	Yes
• *is there sufficient habitat for immigrants here?*	Unknown
Quantitative Analysis	

ACKNOWLEDGEMENTS

We thank Pam Rutherford and Mike Sarrell for generously sharing their unpublished data and knowledge of the skinks with us. Pam Rutherford also provided useful comments on an earlier version of this paper. Orville Dyer kindly provided access to distribution records from wildlife inventory reports from the Okanagan. Michèle Steigerwald, Christine Adkins, and Kelly Sendall provided access to specimen records in collections. We also appreciate the help of Laura Friis, Tom Ethier, Anthea Bryan, John Surgenor, and Mike Burwash in suggesting contacts and information sources. We are grateful to Ron Brooks and the Reptile and Amphibian Subcommittee of COSEWIC for the opportunity to prepare this report.

Funding for this report provided by the Canadian Wildlife Service, Environment Canada.

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Kristiina Ovaska, M.Sc., Ph.D. completed her dissertation on social behaviour and ecology of the Western Red-backed Salamander, *Plethodon vehiculum*, at the University of Victoria in 1987. Subsequently, she carried out two post-doctoral studies: At the Bellairs Research Institute of McGill University in Barbados, she studied life history and male mating behaviour of the frog *Eleutherodactylus johnstonei*. At the University of British Columbia, she studied agonistic behaviour and territoriality in three species of syntopic,

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