

**SURVEYS AND STEWARDSHIP FOR BLUE-GREY TAILDROPPER ON
SOUTHERN VANCOUVER ISLAND IN 2014**



Prepared for

**Habitat Acquisition Trust
PO Box 8552 Victoria BC V8W 3S2**

Prepared by

Kristiina Ovaska PhD² and Lennart Sopuck MSc, RPBio¹

¹1759 Colburne Place, North Saanich, B.C., Canada V8L 5A2

tel: 250 655-4602; e-mail: biolinx@shaw.ca

²424 Viaduct Avenue, Victoria BC; e-mail: kovaska@shaw.ca

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Blue-grey Taildropper found at Matheson Lake Regional Park, 2 Nov. 2014.

EXECUTIVE SUMMARY

The Blue-grey Taildropper is a small, endangered forest slug, the Canadian distribution of which is restricted to scattered localities on southern Vancouver Island. Information on its distribution and habitat use is needed to help direct recovery efforts and to reduce threats. Here we present the results of studies conducted in 2014 as part of Habitat Acquisition Trust's (HAT) stewardship program, building on previous work by HAT and CRD Regional Parks. The goal in 2014 was to continue clarifying the distribution of the Blue-grey Taildropper and to engage landowners, managers, and other community members in stewardship and habitat restoration activities.

The study sites were located on private residential properties in the vicinity of known sites or within potentially suitable habitat, and in regional and municipal parks or other municipal lands. The survey sites included 14 residential properties, six of which were surveyed for the first time in 2014, while the remaining represented continued monitoring efforts from previous years. Capital Regional District (CRD) parks surveyed included Matheson Lake, Devonian, Mt. Work, Francis-King, and Thetis Lake parks; Saanich municipal lands included Logan and Calvert parks and Haliburton Organic Farm, which supports an urban biodiversity project. The main sampling method consisted of artificial cover-objects (ACOs) constructed of corrugated cardboard, which imitate pieces of fallen bark and attract gastropods, augmented by hand searches of natural cover on the forest floor. In total, 319 ACOs at 191 sampling stations were checked multiple times for gastropods in autumn 2014. The surveys were carried out in autumn (September – November) because past experience indicated that Blue-grey Taildroppers are detected most readily at this time.

A total of 745 individual gastropods, representing 24 species, were found during artificial cover-object surveys at the 11 sites surveyed by HAT biologists; landowners checked ACOs on the remaining sites. The species included three native and six introduced species of slugs, and 13 native and two introduced species of snails. Natural cover searches of the forest floor at three sites, representing 8.4 person-hours of intensive search, resulted in the finding of eight species of gastropods (59 individuals). The gastropods found do not represent the full complement of species at the study sites because of the timing of the surveys in late autumn, which is not necessarily optimal for other species, such as small snails.

The Blue-grey Taildropper was found at three sites: Matheson Lake Regional Park in Metchosin (4 slugs), Mt. Work Regional Park in Saanich (1 slug), and a rural residential property in West Saanich (1 slug). The latter site on the rural residential property represents a new site record for the Blue-grey Taildropper, located 1.2 – 2.5 km from nearest known sites to the east and southwest, respectively. This observation was reported to us by a dedicated landowner, who has been checking ACOs on the property each autumn since 2011. The site is at the base of a rocky Garry oak – arbutus knoll within mixed-wood forest. Interestingly, at Matheson Lake and Mt. Work regional parks, Blue-grey Taildroppers were found at exactly the same sites as in previous years,

although the surrounding area and other sites were also searched. The slugs appear to aggregate in specific areas very late in the season, possibly for courtship, mating and egg-laying or in preparation for hibernation. The life cycle of the slugs remains poorly known.

Excessive trail networks, off-trail mountain bike and ATV use, invasive plants and animals, and coniferous forest encroachment into arbutus and Garry oak ecosystems all threaten Blue-grey Taildropper habitat in parks and other protected areas. Habitat restoration was carried out by CRD Parks and HAT volunteers during two work sessions in 2014 and consisted of the removal of invasive, alien plants, mainly Laurel-leaved Daphne and decommissioning of unauthorized trails at a known Blue-grey Taildropper site in Thetis Lake Park. These activities need to be continued to be effective in the long term. Additional areas that would benefit from habitat restoration and/or visitor management include Mt. Work Regional Park, where a mountain biking trail was unofficially constructed through a Blue-grey Taildropper site and the moss ground cover was disturbed, and Matheson Lake Regional Park, where charred remains of several campfires, partially burned logs, and trash were found at a Blue-grey Taildropper aggregation site.

Recommendations for 2015 include:

1. Continuing habitat restoration efforts at Thetis Lake Regional Park and initiating restoration activities at Blue-grey Taildropper sites in Mt. Work and Matheson Lake regional parks.
2. Continuing surveys within CRD Regional Parks and Trails System and municipal lands.
3. Continue working with landowners to expand search effort within CRD.
4. Continue working with landowners to expand search effort within the CRD and northwards towards Cowichan Valley.

TABLE OF CONTENTS

Acknowledgments	1
Executive Summary	2
List of Tables	5
List of Figures.....	5
List of Appendices	5
1.0 Introduction	6
2.0 Objectives	6
3.0 Study Site and Methods	7
3.1 Study sites.....	7
3.2 Sampling methods.....	9
Artificial cover-objects	9
Surveys of natural cover objects	11
3.3 Identification and data recording	12
4.0 Results	13
4.1 Artificial cover-object surveys.....	13
4.2 Searches of natural cover	15
4.3 Blue-grey Taildropper.....	16
4.4 Habitat Restoration at Thetis Lake Regional Park.....	17
5.0 Discussion.....	18
5.1 Blue-grey Taildropper.....	18
5.2 Volunteer involvement.....	20
6.0 Threats and Recommended Mitigation.....	20
7.0 Recommendations for 2015	21
8.0 Literature Cited.....	22
APPENDICES	24

LIST OF TABLES

Table 1. Summary of search effort using artificial cover-objects (ACOs) to survey terrestrial gastropods in autumn 2014.....	10
Table 2. Dates of artificial cover-object surveys by HAT biologists in 2014.....	11
Table 3. Dates and sites of searches of natural cover on the forest floor for gastropods in 2014.	12
Table 4. Terrestrial gastropod species and numbers found during surveys by HAT biologists in 2014.	13
Table 5. Blue-grey Taildropper records from Vancouver Island, autumn 2014.	17

LIST OF FIGURES

Figure 1. Location of study sites surveyed for terrestrial gastropods on southern Vancouver Island in 2014.....	8
Figure 2. Proportional abundance of native and introduced slugs and snails (all species combined) by site in artificial cover-object surveys in 2014.....	16
Figure 3. Summary of Blue-grey Taildropper localities in British Columbia, showing records obtained as part of this and concurrent projects in 2014.....	19

LIST OF APPENDICES

Appendix 1. Detailed locations of study sites in CRD Regional Parks and Saanich Municipal Parks in 2014.	24
Appendix 2. Terrestrial gastropod species and numbers found during artificial cover-object searches by HAT biologists in autumn 2014.....	25

1.0 INTRODUCTION

The Blue-grey Taildropper (*Prophysaon coeruleum*) is a small forest slug that is listed as endangered in Canada (COSEWIC 2006). Its Canadian range is restricted to southern Vancouver Island, where it occurs at scattered localities in Douglas-fir and Garry Oak ecosystems. The distribution and habitats of the slugs are incompletely known, although surveys over the past several years have resulted in new records and greatly increased our knowledge. Such information is essential for habitat protection and appropriate management.

Here we present the results of fieldwork conducted in 2014. This project builds on previous work conducted as part of Habitat Acquisition Trust's (HAT) stewardship program since 2010 (Ovaska and Sopuck 2010, 2012, 2013, 2014) and earlier surveys conducted in the CRD Regional Parks and Trails System on behalf of CRD Parks (Ovaska and Sopuck 2006, 2007, 2008, 2009a). Regional and municipal parks provide refuges for this and other wildlife within developed and modified landscapes and an opportunity to actively manage habitats for species at risk. Much of the distribution of the Blue-grey Taildropper probably occurs on private lands, where survey effort has been limited.

The goal for 2014 was to continue clarifying the distribution and habitat use of the Blue-grey Taildropper and to engage landowners and managers in stewardship activities. Working with landowners and managers contributes to the ultimate goal of achieving protection and reducing threats for Blue-grey Taildropper populations and their habitats.

2.0 OBJECTIVES

The objectives for 2014 were to:

- Survey suitable habitats in regional and municipal parks and on private residential lands for the Blue-grey Taildropper on southern Vancouver Island in an effort to better delineate the distribution of this species and confirm occupancy.
- Work with private landowners and install artificial cover-objects on properties with potentially suitable habitat for the species, targeting areas near known occurrences.
- Describe habitats and threats at sites where the Blue-grey Taildropper is found, and provide management recommendations.
- Document other species of terrestrial gastropods found during surveys for the Blue-grey Taildropper.
- Improve habitat at one site where invasive plants and secondary trails disrupt habitat.

3.0 STUDY SITE AND METHODS

3.1 Study sites

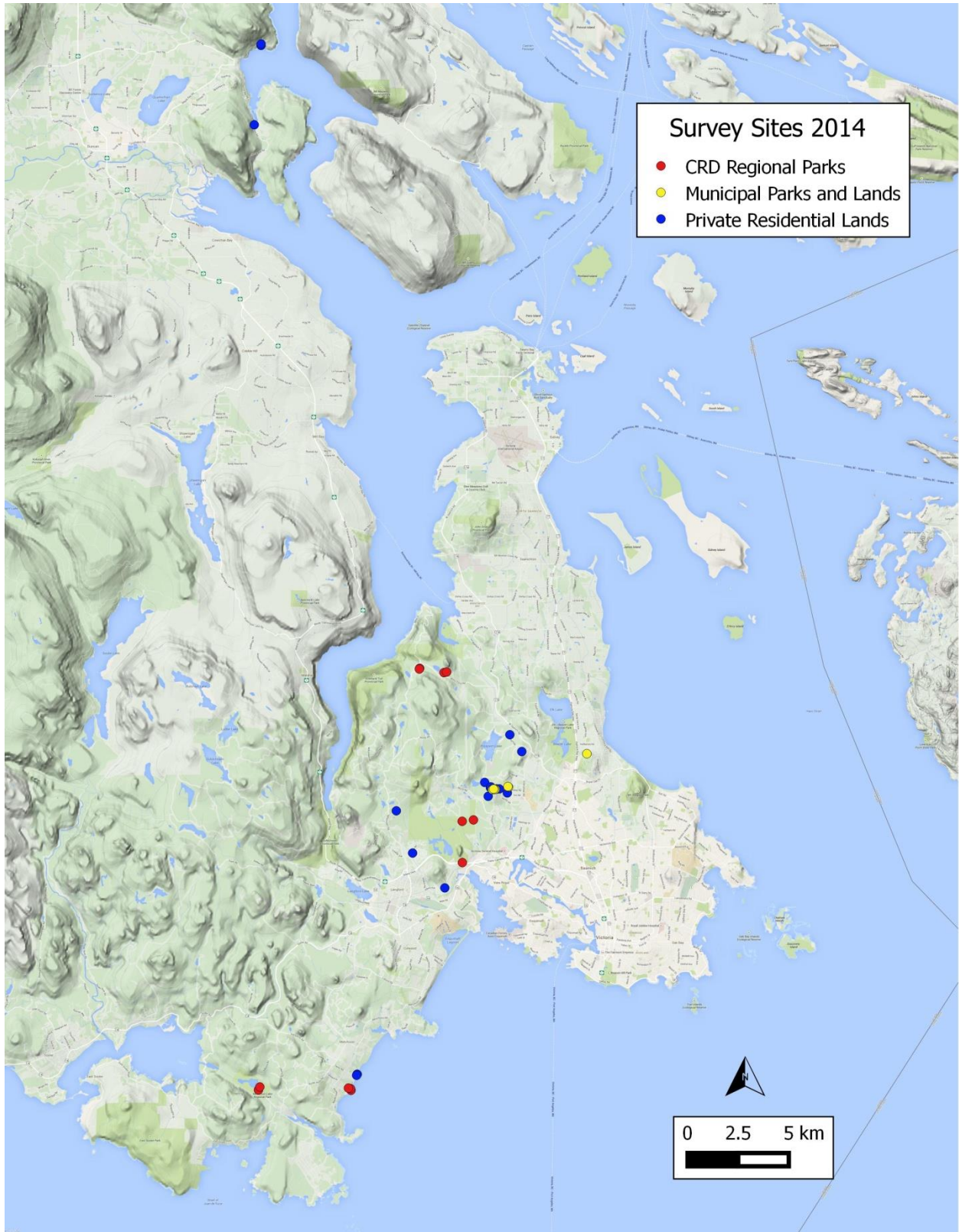
The study sites were located on private residential properties in the vicinity of known sites or within potentially suitable habitat, and in regional and municipal parks or other municipal lands (Figure 1). The survey sites included 14 private residential properties, six of which were surveyed for the first time in 2014, while the remaining represented continued monitoring efforts started in 2011 – 2013.

On residential properties, we selected sites where landowners showed interest in participating in the surveys, focusing on areas with suitable habitat in the vicinity of known sites. In addition to sites within CRD, in collaboration with Cowichan Land Trust, we also surveyed two private residential properties near Mt. Tzouhalem in Maple Bay near a site where the species was detected for the first time outside the CRD in 2013.

Saanich municipal parks and lands included Logan and Calvert parks and Haliburton Organic Farm, owned by the municipality of Saanich and operated by the Haliburton Community Organic Farm Society. A portion of the 4 ha property is managed by the Urban Biodiversity Enhancement Project, which provided an opportunity to include surveys for the Blue-grey Taildropper and other rare gastropods in forest and riparian habitats present at the site.

In the CRD Regional Park system, we conducted surveys in five parks: Matheson Lake, Devonian, Mt. Work, Francis-King, and Thetis Lake. The species has been previously found in all the above parks except at Francis-King. In these parks, the surveys focused on specific sites where the species was previously found to confirm its persistence and to obtain information on abundance, but new sites were also surveyed (see Appendix 1 for coordinates of survey sites within parks). Two additional CRD Parks' properties (Sooke Wilderness and the Galloping Goose Trail near Sooke River) were surveyed as part of a concurrent study to support the preparation of the COSEWIC status report update for the Blue-grey Taildropper; the results of these surveys are included in the Discussion section only.

Figure 1. Location of study sites surveyed for terrestrial gastropods on southern Vancouver Island in 2014.



3.2 Sampling methods

The main sampling method consisted of using artificial cover-objects (ACOs) constructed of corrugated cardboard (Hawkins *et al.* 1998, Ovaska and Sopuck 2001, 2008). This method was supplemented by searches of natural cover on the forest floor at selected sites.

Artificial cover-objects

In total, 319 ACOs at 191 sampling stations were checked multiple times for gastropods in autumn 2014 (Tables 1, 2). The cover-objects consisted of layered 30 cm x 30 cm sheets of cardboard, placed flush with the ground, imitating pieces of fallen bark. This method has been used with success to detect the Blue-grey Taildropper and other gastropods (Ovaska and Sopuck 2001, 2008, 2009b). It is particularly useful in parks and sensitive habitats, as it allows for repeated surveys of the same sites with minimal habitat disturbance.

In CRD Parks and Logan Park, the ACOs were placed along 100 m or 50 m long transects at sampling stations that were 10 m apart. Each transect station had two ACOs, within 1 m of each other. At one site in Thetis Lake Regional Park, the cover-objects were placed within a 30 x 30 m grid with stations 5 m apart, one ACO per station. This grid was established in 2012 at a site where the Blue-grey Taildropper had been found to obtain information on abundance. Various sampling designs were used at Haliburton Farm and Calvert Park, where ACOs were placed in small groups in different habitats. At Haliburton Farm, a 100 m transect was placed along a small channelized creek with one ACO on both sides of the creek; additional 18 stations, each with two ACOs were randomly distributed among three habitats: old field, deciduous fringe, and mixed-wood forest. At Calvert Park, there was a grid of 10 sampling stations, each station with a cardboard cover-object and a layered, wooden salamander board, set up as part of another project. In addition, we placed three groups of three ACOs in potentially suitable habitats throughout the park. On residential properties surveyed, the ACOs were set in sites deemed most suitable, depending on available habitat, size of the property, and ease of access. At one site (Trevlac, Grid 1), there was a grid of 10 sampling stations, similar to that in Calvert Park.

We checked the ACOs in CRD regional parks, Saanich municipal lands, and four residential properties (Table 1). On most residential properties, landowners checked the ACOs multiple times from October to November and reported their findings to us.

The surveys in 2014 were carried out in autumn because past experience indicated that Blue-grey Taildroppers are detected most readily at this time (Ovaska and Sopuck 2008, 2009a & b, 2012, 2013). Conditions during the ACO checks in autumn 2014 were mild (air temperature 8 – 14°C) and moist, suitable for gastropod activity.

Table 1. Summary of search effort using artificial cover-objects (ACOs) to survey terrestrial gastropods in autumn 2014.

A. CRD Regional Parks & municipal & private properties with ACOs checked by HAT biologists in October – November 2014:

Site Name (Transect or plot ID)	Land ownership	Initial ACO set up (year)	No. of transects or plots*	# sampling stations**	# ACOs^	# surveys	# of ACO flips
Francis- King Regional Park (T2)	CRD Park	2014	1	5	10	3	30
Mt Work Regional Park (T1, T2)	CRD Park	2014	2	10	20	3	60
Mt Work Regional Park (Durrance Lake) (T3, T4)	CRD Park	2010	2	20	40	3	120
Thetis Lake Regional Park (Grid)	CRD Park	2012	1	20	49	3	147
Thetis Lake Regional Park (T1)	CRD Park	2014	1	5	10	3	30
Calvert Park (Grid 2), Saanich	Saanich municipal park	2011	1	10	10	3	30
Calvert Park (S2 – S4), Saanich	Saanich municipal park	2014	3	3	9	3	27
Haliburton Farm, Saanich	Saanich municipal land	2013	2	22	44	1	44
Logan Park (T1, T2), Saanich	Saanich municipal park	2014	2	10	20	3	60
Philippa Lake, Prospect Lake	Private, undeveloped	2012	1	5	10	3	30
Trevlac, Saanich (Grid 1)	Private residential	2011	1	10	10	3	30
Trevlac, Saanich (Sites 5-6)	Private residential	2014	1	2	6	2	12
Trevlac, Saanich (Site 1)	Private residential	2014	1	1	3	2	6
Sub-total:			19	123	241	35	626

B. Residential properties with ACOs checked by landowners multiple times in September – November 2014:

Site Name	Initial ACO set up (year)	# sampling stations	# ACOs*
Highlands (Site 1)	2012	5	10
Langford (Site 1)	2012	5	5

Site Name	Initial ACO set up (year)	# sampling stations	# ACOs*
Maple Bay (Sites 1a, b)	2014	5	5
Metchosin (Sites 1a, b)	2014	10	10
Mill Hill (Site 1)	2012	5	10
Prospect Lake (Site 3)	2014	10	10
West Saanich (Site 1)	2011	8	8
West Saanich (Site 2)	2012	10	10
West Saanich (Site 3)	2013	10	10
Sub-total:		68	78
Grand total (A +B):		191	319

Table 2. Dates of artificial cover-object surveys by HAT biologists in 2014.

Site Name (transect of plot)	Check 1	Check 2	Check 3
Francis- King Regional Park (T2)	13-Oct	22 Oct	8-Nov
Mt Work Regional Park (T1 – T4)	12-Oct	26-Oct	9-Nov
Thetis Lake Regional Park (Grid)	13-Oct	22-Oct	5-Nov
Thetis Lake Regional Park (T1)	13-Oct	22 Oct	8-Nov
Calvert Park (Grid 2)	13 Oct	31-Oct	9-Nov
Calvert Park (Sites 2,3,4)	31-Oct	9-Nov	NA
Logan Park (T1, T2)	11-Oct	29-Oct	9-Nov
Haliburton Farm (T1, Plots)	21-Oct	NA	NA
Philippa Lake (T1)	13-Oct	31-Oct	9-Nov
Trevlac, Saanich (Grid 1)	13 Oct	31-Oct	9-Nov
Trevlac, Saanich (Site 1)	31-Oct	9-Nov	NA
Trevlac, Saanich (Sites 5-6)	30-Oct	9-Nov	NA

Surveys of natural cover objects

Artificial cover-object surveys were supplemented by searches of natural cover on the forest floor. Searches were carried out in two CRD Regional Parks in Metchosin where the Blue-grey Taildropper had been found previously (Matheson Lake, Devonian) and at a relatively large residential property in Maple Bay near a previous observation of the species at Mt. Tzouhalem (Table 3). The searches consisted of visual examination of downed logs, sloughed-off bark, handfuls of leaf litter, and other microhabitats for the presence of gastropods. The cover-objects were carefully replaced, and no logs were taken apart to avoid damage to the habitat. In total, 8.4 person hours were spent in intensive searches of natural cover in late autumn, when the Blue-grey Taildropper is most likely to be found.

Table 3. Dates and sites of searches of natural cover on the forest floor for gastropods in 2014.

Site Name	Date	Start time (h)	Search time (person-hours)	# of persons	Air temp. (C°)	Notes
Maple Bay (Site 2), North Cowichan	24-Oct	11:25	1.3	2	9.5	Private residential property; 2 nd growth mixed-wood forest with bigleaf maple and some large conifers
Devonian Regional Park (Site A), Metchosin	4-Nov	14:00	1.0	3	13	Garry oak meadow on rocky knoll; site of previous Blue-grey Taildropper observations
Devonian Regional Park (Site B), Metchosin	4-Nov	14:30	1.3	3	13	Coniferous fringe of Garry oak knoll; site of previous Blue-grey Taildropper observations
Devonian Regional Park (Site C), Metchosin	4-Nov	15:10	1.0	3	13	Coniferous fringe behind small grassy meadow with Garry oak
Matheson Lake Regional Park (Site A), Metchosin	4-Nov	11:25	3.0	3	12	Older coniferous forest on gently sloping terrain with sparse understorey; numerous pieces of wood/bark; site of previous Blue-grey Taildropper observations
Matheson Lake Regional Park (Site B), Metchosin	4-Nov	12:50	0.8	3	12	Moist mixed-wood forest with maples on sloping terrain
Total			8.4			

3.3 Identification and data recording

We identified and recorded all gastropods found during the study. Nomenclature follows Forsyth (2004). Identification was done in the field using external characteristics, and all animals were released after examination. Photos of Blue-grey Taildroppers were taken as vouchers. We also recorded the dominant overstorey and understorey vegetation where the species was found and noted any habitat disturbance or potential threats to the site. At sites monitored by landowners or residents, identification was done based on photos sent to us. While we received photos of several other species of gastropods and other invertebrates, only observations of Blue-grey Taildroppers and other listed species of gastropods are reported here.

The data were entered into Microsoft® Excel 2007 spreadsheets. Raw data are submitted together with this report as an Excel file.

4.0 RESULTS

4.1 Artificial cover-object surveys

A total of 745 individual gastropods, representing at least 24 species, were found during artificial cover-object surveys at the 11 sites surveyed by HAT biologists (Table 4). The species included three native and six introduced species of slugs, and 13 native and two introduced species of snails. Of the native species, two large snails, the Northwest Hesperian, a herbivore/fungivore, and the Robust Lancetooth, a carnivore, were found at 54.5% and 36.4% of the sites, respectively, and several small snails such as the Tightcoil snails were also widespread and relatively abundant. The Glossy Pillar, an inhabitant of open woodlands and meadows, was found only at Haliburton Farm but in high numbers. It should be noted that the gastropods found do not represent the full complement of species at the study sites because of the timing of the surveys in late autumn, which was deemed optimal for detecting the Blue-grey Taildropper but is not necessarily optimal for other species. Small snails in particular are under-represented in the samples.

Relatively few native slugs were found during the ACO surveys. The Pacific Banana Slug was widespread but found in low numbers. Other native slugs found during the surveys were the Reticulate/Yellow-bordered Taildroppers in Thetis Lake Regional Park and at Haliburton Farm, and the Blue-grey Taildropper at Mt. Work Regional Park (Durrance Lake) at a site with previous records of the species.

On residential properties, one of the landowners who checked cover-objects reported finding an adult Blue-grey Taildropper (West Saanich site) and submitted a photograph, confirming the identification (see Section 4.3). Other residents and landowners checked cover-objects multiple times in September – November 2014 but reported finding no Blue-grey Taildroppers.

Table 4. Terrestrial gastropod species and numbers found during surveys by HAT biologists in 2014.

*after species' name denotes introduced species; n = # of sites (see Appendix 2 for a list of sites) or total number of animals found; RP – Regional Park

SPECIES	<u>ACO searches:</u> Sites where found	<u>ACO searches:</u> No. of gastropods found	<u>ACO searches:</u> % of all gastropods (n=745; all sites)	<u>ACO searches:</u> % of all sites (n=11 sites)	<u>Natural cover searches (n=3 sites):</u> Sites where found	<u>Natural cover searches:</u> No. of animals found
Slugs:						
Pacific Banana-slug, <i>Ariolimax columbianus</i>	Logan Park, Trevlac (private lands), Calvert Park, Philippa Lake, Francis-King RP, Mt Work RP, Thetis	10	1.3	72.7	Devonian RP, Matheson Lake RP, Maple Bay (private lands)	26 & 1 egg clutch

SPECIES	ACO searches: Sites where found	ACO searches: No. of gastropods found	ACO searches: % of all gastropods (n=745; all sites)	ACO searches: % of all sites (n=11 sites)	Natural cover searches (n=3 sites): Sites where found	Natural cover searches: No. of animals found
	Lake RP					
Brown-banded Arion, <i>Arion circumscriptus</i> *	Haliburton Farm	4	0.5	9.1		
Hedgehog Arion, <i>Arion intermedius</i> *	Thetis Lake RP	13	1.7	9.1		
Chocolate Arion, <i>Arion rufus</i>	NA	0	NA	NA	Matheson Lake RP	1
Dusky Arion, <i>Arion subfuscus</i> *	Haliburton Farm	1	0.1	9.1		
<i>Arion</i> species* (unidentified juveniles)	Haliburton Farm, Calvert Park	2	0.3	18.2		
Longneck Fieldslug, <i>Deroceras panormitanum</i> *	Thetis Lake RP	8	1.1	9.1		
Grey Fieldslug, <i>Deroceras reticulatum</i> *	Haliburton Farm, Thetis lake RP	5	0.7	18.2		
Giant Gardenslug, <i>Limax maximus</i> *	Calvert Park, Thetis Lake	2	0.3	18.2		
Blue-grey Taildropper, <i>Prophysaon coeruleum</i>	Mt. Work RP	1	0.1	9.1	Matheson Lake RP	4
Reticulate & Yellow- bordered Taildroppers, <i>Prophysaon andersonii</i> & <i>P. foliolatum</i>	Haliburton Farm, Thetis Lake RP	3	0.4	18.2	Devonian RP	1
Snails:						
Glossy Pillar, <i>Cochlicopa lubrica</i>	Haliburton Farm	43	5.8	9.1		
Pygmy Oregonian, <i>Cryptomastix germana</i>	Mt. Work	3	0.4	9.1		
Brown Hive, <i>Euconulus fulvus</i>	Logan Park, Calvert Park, Francis-King RP, Thetis Lake RP	8	1.1	36.4		
Robust Lancetooth, <i>Haplotrema vancouverense</i>	Logan Park, Calvert Park, Francis-King RP. Mt. Work RP	8	1.1	36.4	Devonian RP, Maple Bay (private lands)	14
Chrysalis Snail, <i>Lauria cylindracea</i> *	Haliburton Farm	513	68.9	9.1		
Blue Glass, <i>Nesovitrea binneyana</i>	Logan Park, Calvert Park, Francis-King RP, Mt. Work RP	6	0.8	36.4		
Glass Snails, <i>Oxychilus</i> species*	Haliburton Farm	33	4.4	9.1		
Pinhead Spot,	Thetis Lake RP	4	0.5	9.1		

SPECIES	ACO searches: Sites where found	ACO searches: No. of gastropods found	ACO searches: % of all gastropods (n=745; all sites)	ACO searches: % of all sites (n=11 sites)	Natural cover searches (n=3 sites): Sites where found	Natural cover searches: No. of animals found
<i>Paralaeoma servilis</i>						
Tightcoil snails, <i>Pristiloma</i> sp. (<i>P. stearnsii</i> and/or <i>P. lansingii</i>)	Trevlac (private lands), Calvert Park, Mt. Work RP, Thetis Lake RP	11	1.5	63.6		
<i>Vallonia</i> species*	Haliburton Farm	1	0.1	9.1		
Conical Spot, <i>Punctum randolphii</i>	Haliburton Farm, Mt. Work	2	0.3	18.2	Devonian RP	1
<i>Vertigo</i> species	Mt. Work RP, Thetis Lake RP	3	0.4	18.2		
Northwest Hesperian, <i>Vespericola columbianus</i>	Logan Park, Calvert Park, Philippa Lake, Mt. Work RP, Thetis Lake RP	55	7.4	54.5	Devonian RP, Matheson Lake RP, Maple Bay (private lands)	11
Western Glass-snail, <i>Vitrina pellucida</i>	Thetis Lake RP	1	0.1	9.1		
Quick Gloss, <i>Zonitoides arboreus</i>	Logan Park, Trevlac (private lands), Francis-King RP, Mt. Work RP	5	0.7	36.4	Devonian RP	1
Total (number of animals)		745				59

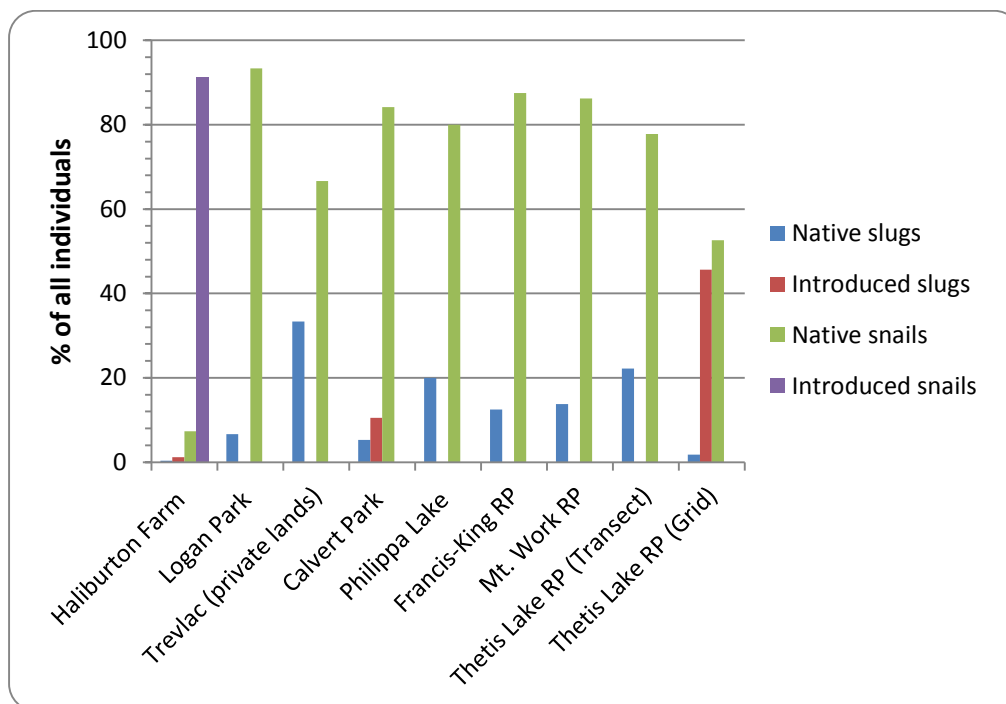
Several introduced species of gastropods were found during the surveys (Table 4). Introduced species were numerous and abundant at Haliburton Farm, as expected based on the proximity of the survey sites to cultivated areas (Figure 2). The small Chrysalis Snail was particularly abundant at this site. Introduced gastropods were also relatively abundant at one of the sites sampled in Thetis Lake Regional Park. The abundance of native versus introduced slugs and snails by site, as reflected in the ACO samples, is shown in Figure 2.

4.2 Searches of natural cover

Eight species of gastropods were found during 8.4 person-hours of intensive searches of natural cover-objects at three sites (Table 4). The species included four species of slugs and four species of snails. The low number of species found reflected the focus of the surveys on locating the Blue-grey Taildropper in late autumn. This species was found at one of two sampling sites in Matheson Lake Regional Park, from where it has been recorded previously. The species was not found at any of the three sampling sites in Devonian Regional Park, where it is also known to occur. Surveys of a relatively large property of potentially suitable habitat in Maple Bay near a previous record at the base of Mt. Tzouhalem resulted in no observations of this species.

Figure 2. Proportional abundance of native and introduced slugs and snails (all species combined) by site in artificial cover-object surveys in 2014.

RP – Regional Park



4.3 Blue-grey Taildropper

Surveys in 2014 carried out as part of this project resulted in the finding of the Blue-grey Taildropper at three sites: Matheson Lake Regional Park in Metchosin, Mt. Work Regional Park in Saanich, and a rural residential property in West Saanich (Table 5). The latter site on the rural residential property represents a new site record for the Blue-grey Taildropper, while the species was previously known from the two sites in the parks. The landowner has been monitoring ACOs on this property each autumn since 2011 without success until this year. In 2014, the sampling stations were shifted slightly from Garry oak – arbutus meadow on a rocky knoll to moister habitat at the base of the knoll. Eight ACOs were checked twice (on 16 and 23 October) this autumn, before the species was found on 2 November.

At Matheson Lake, four adults were found close together (within about a 30 m area; two slugs were within centimetres from each other) at exactly the same site where previous observations had taken place. A similar search a few hundred metres away produced no Blue-grey Taildroppers, illustrating the patchy distribution of the species even at known sites. Interestingly, at Mt. Work Regional Park, a Blue-grey Taildropper was found at the same sampling station as the previous observation in December 2010; the other 29 sampling stations produced no Blue-grey Taildroppers.

Table 5. Blue-grey Taildropper records from Vancouver Island, autumn 2014.

See Figure 3 for the locations of these sites.

Date	# found	Site name	Newly discovered or known site	Habitat description	Survey method	Observer(s)	Comments
12 Oct-14	1	Mt. Work Regional Park (Durrance Lake)	Known (since 2007)	South-facing slope with semi-open Douglas fir/arbutus forest. Sparse understory with extensive moss cover and cobbly substrate	Artificial cover-object	L. Sopuck	Adult (24 mm long) at exactly the same place (within 1 m) as previous observation in Dec 2010
2 Nov-14	1	West Saanich	New	Mixed-wood forest with bigleaf maple and Douglas-fir at base of Garry oak – arbutus dominated rocky knoll	Artificial cover-object	L. Ramsay	Adult slug; photos sent to HAT
9-Nov-14	4	Matheson Lake Regional Park	Known (since 2011)	Older coniferous forest on gently sloping terrain with sparse understory; numerous mushrooms & pieces of wood/bark	Natural cover search	K. Ovaska, L. Sopuck, L. Belcher	Adults (20 – 25 mm long) found within ca. 30 m area at same place as in 2013 and 2011. 1 slug under soggy paper right by mushroom; 2 slugs within cm of each other under log; 1 slug under bark by log

4.4 Habitat Restoration at Thetis Lake Regional Park

Habitat restoration was carried out in collaboration with CRD Parks and consisted of the removal of invasive, alien plants, mainly Laurel-leaved *Daphne* (*Daphne laureola*) and decommissioning of unauthorized trails at a known Blue-grey Taildropper site in Thetis Lake Park. The activities were carried out by CRD Parks and HAT volunteers under the supervision of HAT biologists (Todd Carnahan and Kristiina Ovaska) and CRD Parks volunteer coordinator (Colleen Long) on 28 July 2014 (7 persons each spent 2.5 h) and 15 October 2014 (16 persons each spent 3 h). The total person-hours spent in the restoration efforts at the site was 100.5 hours.

Laurel-leaved *Daphne* is prevalent over much of the park, and complete eradication is not feasible. However, removal of the plant from small areas and controlling its further spread was deemed possible and beneficial for maintaining natural ecosystems. The focal area was approximately 0.5 ha of Garry oak/arbutus/Douglas-fir dominated woodland where several observations of the Blue-grey Taildropper have been made in the past. The plants were clipped at ground level and removed from the site.

In addition to alien plant removal, volunteers blocked unauthorized trails through the site by piling up coarse woody debris and brush along these trails. The materials were obtained from brush piles already present near the site; fallen logs and other woody material naturally present at the site were left undisturbed. The objective was to reduce soil compaction and other disturbance to the Blue-grey Taildropper site caused by park visitors, including hikers and mountain bikers.

5.0 DISCUSSION

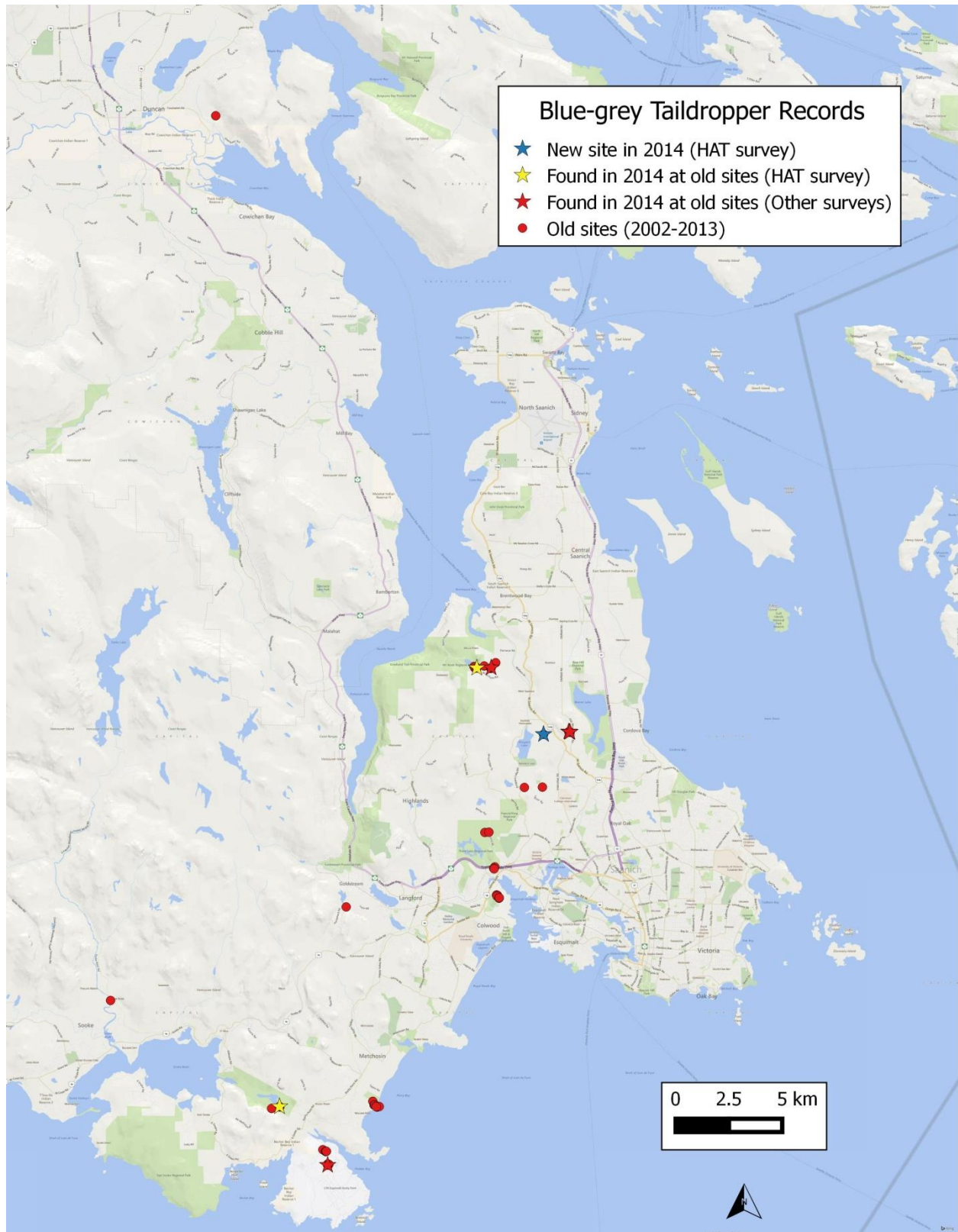
5.1 Blue-grey Taildropper

During this study, the Blue-grey Taildropper was found at three sites, including two previously known sites and a new site within the known range on southern Vancouver Island. The new site is 1.2 km from the nearest site on Observatory Hill to the east, but the intervening habitat is fragmented and contains a busy road (West Saanich Road) that is deemed an insurmountable barrier for dispersal. The next closest known localities are to the southwest in Logan Park and near Calvert Park at straight-line distances of 2.5 and 2.6 km, respectively. The landscape consists of rural residential properties and is largely wooded. Whether slugs at the new site are part of a larger population that extends to these parks is unknown.

The new site is the result of dedicated monitoring of artificial cover-objects by the landowner each autumn since 2011, showing that persistence is needed to locate this species even where it is present. Small size, low density, and apparently highly seasonal surface activity, coupled with patchy distribution, underline difficulties in accurately delineating the species' distribution. The Blue-grey Taildropper appears to be most easy to detect in late autumn, just before the first heavy frost, when most other gastropods are already inactive. At this time, aggregations of slugs have been found in specific areas that seem to persist from year to year (e.g., 9 individuals found in a small area at Matheson Lake Regional Park in autumn 2013 and 4 individuals again in 2014; Ovaska and Sopuck 2013). The reason for these aggregations is unknown, but they may represent gatherings of slugs for courtship, mating and egg-laying or in preparation for hibernation. Unfortunately, little is known of the life cycle of the species. The Blue-grey Taildropper is thought to exhibit an annual life cycle, possibly overwintering as eggs (COSEWIC 2006), but recent observations indicate that at least some adults survive to the following spring (Ovaska *et al.* 2014).

Despite survey efforts in potentially suitable habitats in different areas as part of this and other concurrent projects, the record from the rural residential property in West Saanich remains the only new site for the species discovered in 2014. In addition to the Matheson Lake and Mt. Work sites, the species was found at three previously known localities, at Rocky Point, Observatory Hill, and at another locality near Durrance Lake, as part of other, concurrent projects (Ovaska and Sopuck, unpubl. data). Figure 3 shows the distribution of the Blue-grey Taildropper in BC, as currently understood.

Figure 3. Summary of Blue-grey Tailedropper localities in British Columbia, showing records obtained as part of this and concurrent projects in 2014.



5.2 Volunteer involvement

The project provided opportunities for landowners and managers to participate in the surveys and habitat restoration efforts and appreciate the role of terrestrial gastropods as components of the region's biodiversity. The BC distribution of the Blue-grey Taildropper is located within the Coastal Douglas-fir biogeoclimatic zone, which contains several rare ecosystems. Apart from park lands scattered throughout the region, remaining natural habitats are fragmented and threatened by residential and industrial developments, roads and landscaping practices. Landowner involvement in stewardship activities aimed towards protecting remaining natural habitats and managing threats are thus vital for the conservation of wildlife and plants that depend on these habitats.

Landowners interested in participating in the surveys were identified through HAT's habitat stewardship and landowner contact program. Several landowners who participated in the program previously chose to continue this year and check artificial cover-objects on their lands. Monitoring that spans several years is often needed to locate rare species, which may occur in low numbers and be patchily distributed across the landscape. Long-term monitoring is particularly important for species such as the Blue-grey Taildropper that is generally difficult to detect.

Outreach materials, including the Blue-grey Taildropper Identification Guide (HAT 2011) and Habitat Monitoring Guide (HAT 2013), were provided to landowners and volunteers. HAT provided follow-up support through email updates, identifying gastropods from photographs sent to us, and site visits upon request. Efforts by landowners and CRD Parks volunteers greatly increased survey coverage, and one Blue-grey Taildropper was found on a residential property in 2014.

In addition to surveys and monitoring, community involvement associated with this project consisted of habitat restoration at a Blue-grey Taildropper site in Thetis Lake Regional Park. The dedication of the volunteers, many of whom attended both work sessions, attests to the importance that residents place on conserving natural ecosystems and biodiversity, which includes poorly known micro-fauna such as this small slug.

6.0 THREATS AND RECOMMENDED MITIGATION

As previously identified (COSEWIC 2006, Ovaska and Sopuck 2012), the main threats to Blue-grey Taildropper populations on southern Vancouver Island are the loss and degradation of habitat due to urbanization, agriculture, logging, heavy recreational use, and the spread of invasive plants and animals. Habitats of Blue-grey Taildroppers within this largely modified landscape are becoming increasingly fragmented, and small isolated populations are increasingly at risk from various stressors including severe weather resulting from climate change, such as prolonged droughts or flooding. These impacts could be mitigated by maintaining a network of suitably-connected protected areas and other suitable habitat.

Blue-grey Taildropper populations in protected areas, including regional and municipal parks, community watersheds and other conservation lands, are not necessarily safe from habitat degradation. Excessive trail networks, off-trail mountain bike and ATV use, invasive plants and animals, and coniferous forest encroachment into arbutus and Garry oak ecosystems all threaten Blue-grey Taildropper habitat. Additional trail signage, decommissioning of unofficial trails, invasive plant control, and habitat restoration of trampled areas can be used to mitigate these threats.

Several Blue-grey Taildropper sites suffer from invasive, introduced plants, such as Laurel-leaved Daphne and Scotch Broom. Examples of such sites are located in Thetis Lake and Devonian regional parks. Efforts to remove Laurel-leaved Daphne were started at the Blue-grey Taildropper site at Thetis Lake in 2014 but need to continue for several years to be effective. Monocultures of Laurel-leaved Daphne are thought to be harmful to the Blue-grey Taildropper and other native gastropods, as these invasive noxious plants form dense thickets and replace native understorey vegetation, which provide food for gastropods. Toxins contained in these plants render them unpalatable and may contaminate soils.

Networks of unauthorized trails are present at many of the sites. An example is the Durrance Lake area of Mt. Work Regional Park, where a mountain biking trail was unofficially constructed through a Blue-grey Taildropper site and the moss ground cover was disturbed. This site would benefit from habitat restoration and blocking of the trail. At the Blue-grey Taildropper site in Matheson Lake Regional Park, we noticed charred remains of several campfires, partially burned logs, and trash. Compaction of the forest floor and damage to coarse woody debris degrades habitat at this important site for the species. Ideally, the trail would be rerouted away from the Blue-grey Taildropper site; if this is not feasible, signage to remind visitors to stay on the trail, borders to mark the sides of the trail, and increased monitoring of visitor activities during summer evenings are recommended.

7.0 RECOMMENDATIONS FOR 2015

Recommendations include the following:

- In collaboration with CRD Regional Parks continue habitat restoration, including removal of invasive plants and reducing unauthorized trails at Thetis Lake Regional Park and initiate restoration activities at other sites, such as Mt. Work Regional Park and Matheson Lake, where these actions are deemed beneficial.
- Continue surveys within CRD Regional Parks and Trails System and municipal lands within the CRD in an effort to better delineate the distribution of this species and to obtain information on patterns of abundance at known sites.
- Continue working with landowners to expand search effort within CRD.
- Expand search effort to suitable habitats north of the CRD towards Cowichan Valley.

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APPENDICES

Appendix 1. Detailed locations of study sites in CRD Regional Parks and Saanich Municipal Parks in 2014.

Site name	Transect or Plot ID*	UTM East (start)	UTM North (start)	UTM East (end)	UTM North (end)	ACO set-up date in 2014	No. stations	No. ACOs
Artificial cover-objects:								
Francis - King Regional Park	T2	466395	5370029	466370	5370016	07-Sep-14	5	10
Mt. Work Regional Park	T1	463794	5377484	463836	5377490	07-Sep-14	5	10
Mt. Work Regional Park	T2	463776	5377448	463753	537740	07-Sep-14	5	10
Mt. Work Regional Park (Durrance)	T3	464988	5377264	465045	5377305	11-Oct-2014**	10	20
Mt. Work Regional Park (Durrance)	T4	465117	5377295	465075	5377223	12-Oct-2014***	10	20
Thetis Lake Regional Park	Grid	465835	5367939	465852	5367962	07-Sep-14	49	49
Thetis Lake Regional Park	T1	465839	5369965	465806	5369950	07-Sep-14	5	10
Logan Park	T1	468128	5371634	468150	5371677	06-Sep-14	5	10
Logan Park	T2	468098	5371658	468087	5371713	06-Sep-14	5	10
Calvert Park (grid)	P2 (Grid)	467336	5371513	467317	5371540	06-Sep-14	10	10
Calvert Park (Site 2)	S2	467483	5371521			14-Oct-14	1	3
Calvert Park (Site 3)	S3	467443	5371515			14-Oct-14	1	3
Calvert Park (Site 4)	S4	467395	5371541			14-Oct-14	1	3
Searches of natural cover:								
Devonian Regional Park (Site A), Metchosin, BC	A	460274	5356779					
Devonian Regional Park (Site B), Metchosin, BC	B	460249	5356865					
Devonian Regional Park (Site C), Metchosin, BC	C	460147	5356890					
Matheson Lake Regional Park (Site A), Metchosin, BC	A	455708	5356830					
Matheson Lake Regional Park (Site B), Metchosin, BC	B	455778	5356977					

*Transects consisted of 10 or 5 sampling stations, 10 m apart and each with 2 cardboard cover-objects; Thetis Lake Grid consisted of a 30 m x 30m grid with 1 cardboard cover-object every 5m.

**Old ACOs checked on Oct 11, 2014

***Old ACOs checked on Oct 12, 2014

SPECIES	Haliburton Farm (T1, T2; n=44)	Logan Park (T1,T2; n=20)	Trevlac Saanich (Grid 1, n=10)	Trevlac Saanich (Sites 1,5,6; n=9)	Calvert Park (Sites 2,3,4 Grid 2; n=19)	Philippa Lake (T1; n=10)	Francis King (T2; n=10)	Mt. Work (T1, T2; n=20)	Mt. Work (T3,T4; n=40)	Thetis Lake (T1; n=10)	Thetis Lake (GRID, n=49)
<i>Prophysaon andersonii</i> & <i>P. foliolatum</i>											
Snails:											
Glossy Pillar, <i>Cochlicopa lubrica</i>	43	0	0	0	0	0	0	0	0	0	0
Pygmy Oregonian, <i>Cryptomastix germana</i>	0	0	0	0	0	0	0	0	3	0	0
Brown Hive, <i>Euconulus fulvus</i>	0	1	0	0	4	0	2	0	0	1	0
Robust Lancetooth, <i>Haplotrema vancouverense</i>	0	2	0	0	2	0	2	0	2	0	0
Chrysalis Snail, <i>Lauria cylindracea*</i>	513	0	0	0	0	0	0	0	0	0	0
Blue Glass, <i>Nesovitrea binneyana</i>	0	3	0	0	1	0	1	1	0	0	0
Glass Snails, <i>Oxychilus</i> species*	33	0	0	0	0	0	0	0	0	0	0
Pinhead Spot, <i>Paralaoma servilis</i>	0	0	0	0	0	0	0	0	0	0	4
Tightcoil snails, <i>Pristiloma</i> sp. (<i>P. stearnsii</i> and/or <i>P. lansingii</i>)	0	0	0	1	1	0	0	2	1	5	1
<i>Vallonia*</i> species	1	0	0	0	0	0	0	0	0	0	0
Conical Spot, <i>Punctum randolphii</i>	1	0	0	0	0	0	0	0	1	0	0
<i>Vertigo</i> species	0	0	0	0	0	0	0	0	2	1	0

SPECIES	Haliburton Farm (T1, T2; n=44)	Logan Park (T1,T2; n=20)	Trevlac Saanich (Grid 1, n=10)	Trevlac Saanich (Sites 1,5,6; n=9)	Calvert Park (Sites 2,3,4 Grid 2; n=19)	Philippa Lake (T1; n=10)	Francis King (T2; n=10)	Mt. Work (T1, T2; n=20)	Mt. Work (T3,T4; n=40)	Thetis Lake (T1; n=10)	Thetis Lake (GRID, n=49)
Northwest Hesperian, <i>Vespericola columbianus</i>	0	7	0	0	8	4	0	2	10	0	24
Western Glass-snail, <i>Vitrina pellucida</i>	0	0	0	0	0	0	0	0	0	0	1
Quick Gloss, <i>Zonitoides arboreus</i>	0	1	1	0	0	0	2	1	0	0	0