SURVEYS AND STEWARDSHIP FOR BLUE-GREY TAILDROPPER ON SOUTHERN VANCOUVER ISLAND IN 2015

Prepared for

Habitat Acquisition Trust
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Cover photo: Blue-grey Taildropper (*Prophysaon coeruleum*) in Metchosin, Vancouver Island, June 2015.

EXECUTIVE SUMMARY

The Blue-grey Taildropper is a small, relatively poorly known native forest slug that is designated as endangered in Canada due to its restricted range and threats to its habitats. This report presents results of surveys and stewardship activities for this and other gastropod species at risk in 2015 on private lands and in regional and municipal parks on southern Vancouver Island. The study is part of Habitat Acquisition Trust's species at risk program and continues efforts began in 2010.

The study sites were located on private residential properties in the vicinity of known sites within potentially suitable habitat and in regional and municipal parks or other municipal lands within the Capital Regional District (CRD). We conducted surveys in five CRD regional parks: Matheson Lake, Devonian, Mt. Work (Durrance Lake and Killarney Lake portions), Francis-King, and Thetis Lake; three Saanich municipal parks: Calvert, Layritz, and Logan; and 11 private properties. The main sampling method consisted of artificial cover-objects (ACOs) constructed of corrugated cardboard, supplemented by a night search of the forest floor at one site (Matheson Lake). In total, there were 473 ACOs at 310 sampling stations. Of these, 115 stations (180 ACOs) were on private properties, 44 stations (72 ACOs) in Saanich Parks, and 151 stations (221 ACOs) in CRD regional parks. The cover-objects were checked multiple times in October – November when the Blue-grey Taildropper is most readily found.

The artificial cover-object surveys resulted in the finding of a total of 287 gastropods, representing 15 species at 11 sites surveyed by HAT biologists (all parks and two private properties). The species consisted of three native and six introduced species of slugs, and 12 species of snails, all native. The Blue-grey Taildropper was found at two sites, Devonian Regional Park and a private property in Metchosin. There are several previous records of the species from the Devonian Regional Park, while the Metchosin record extends the area of occupancy of the species at a site located during the Metchosin Bioblitz in June 2015 and reported to us. The species was not found in Matheson Lake Regional Park during a night survey of a locality where a concentration of the slugs was encountered in previous years. Landowners checked the remaining private sites with ACOs and reported no Blue-grey Taildroppers.

In 2015, we received three reports of Blue-grey Taildroppers, substantiated by photographs, from three previously undocumented sites: two sites in Metchosin in the vicinity of Witty's Lagoon, reported to us by Kevin Trim and Alanah Nasadyk, respectively, and one site in the Cowichan Regional District, reported to us by Todd Carnahan. The two Metchosin sites are separated from the nearest known locality in Devonian Regional Park by 3 - 4 km, respectively, and are 0.7 km from each other, and represent a new subpopulation. The Cowichan observation is one of only two records of the species north of CRD. It is separated by approximately 11 km from the other Cowichan area record at Mt Tzouhalem and extends the known distribution of the species on Vancouver Island to the northwest.

The new observations continue to expand our understanding of both the distribution and habitats of the Blue-grey Taildropper. The new Cowichan Valley Regional District

observation is of particular interest, as it is one of only two site records that are in mainly coniferous forest and of three sites within the Coastal Western Hemlock (CWH) biogeoclimatic zone. Most of the sites are in Coastal Douglas-fir (CDF) biogeoclimatic zone, where they inhabit woodlands with Douglas-fir, Arbutus, and Bigleaf Maple, and Garry Oak knolls and their fringes. The CDF zone contains many ecosystems listed to be at risk and is among the most threatened zones in British Columbia.

In Thetis Lake Regional Park, habitat restoration began in 2014 in collaboration with CRD Parks and continued in autumn 2015 and January 2016. It consisted of the removal of invasive, alien plants, mainly Laurel-leaved Daphne (*Daphne laureola*) at a known Blue-grey Taildropper site during three sessions by CRD Parks volunteers, organized by Colleen Long. The number of volunteers per session ranged from 12 – 18 for a total of 126 volunteer hours spent in restoration efforts at the site. The removal of Daphne was carried out as part of a pilot study to examine the effects of this invasive plant on the Blue-grey Taildropper and other gastropods with three study plots monitored with artificial cover-objects. Preliminary results suggest that introduced slugs persist and may even thrive in Daphne thickets. Continued efforts, including the establishment of replicate study plots are necessary to more effectively examine the impacts of Daphne on native gastropod faunas at the site.

Recommendations for future work include the following:

- CRD Regional Parks:
    - Continue removal of invasive plants from Blue-grey Taildropper sites in Thetis Lake Regional Park and establish additional study plots to examine the effects of Laurel-leaved Daphne and its removal on gastropod faunas.
    - Use signage, marking the sides of trails, and/or decommissioning of unauthorized trails to reduce damage to sensitive Blue-grey Taildropper habitat at sites, such as Thetis Lake, Mt. Work, and Matheson Lake.
    - Continue surveys in an effort to better delineate the distribution of this species and to obtain information on patterns of abundance at known sites; expand search effort in Metchosin around newly discovered sites, including Witty's Lagoon Regional Park.
- Municipal parks and lands:
    - Continue surveys to better delineate the distribution of this species and to obtain information on patterns of abundance at known sites in Logan and Calvert Parks.
- Private lands:
    - Continue working with landowners, including existing and new habitat stewards, to expand search effort and protect habitat within CRD.
    - Expand search effort in Metchosin around newly discovered sites to determine the extent of occupancy of this subpopulation.

- In collaboration with Cowichan Valley Naturalist Society, expand search effort to suitable habitats north of the CRD working outward from the newly documented localities in the Cowichan District.

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1.0 INTRODUCTION

The Blue-grey Taildropper is a small, native forest slug (<3 cm in length) that in Canada is known only from southern Vancouver Island. It occurs in moist, low-elevation (<250 m above sea level) mixed-wood forests, which are becoming increasingly fragmented by human activities (COSEWIC 2006). The recovery strategy for the species (Environment Canada 2015) states that insufficient habitat has been identified to meet recovery objectives for the species. There is an urgent need to protect and mitigate threats at known sites of the Blue-grey Taildropper and to conduct surveys so that additional habitat can be identified and protected both in the vicinity of known sites and at other possible undiscovered sites.

This report presents the findings of surveys and stewardship activities for the Blue-grey Taildropper and other gastropods at risk in 2015 on private lands and in regional and municipal parks on southern Vancouver Island. This study is a continuation of previous conservation and stewardship efforts conducted by Habitat Acquisition Trust from 2010 – 2014 (Ovaska and Sopuck 2010, 2012, 2013, 2014a,b).

2.0 OBJECTIVES

The objectives for 2015 were to:

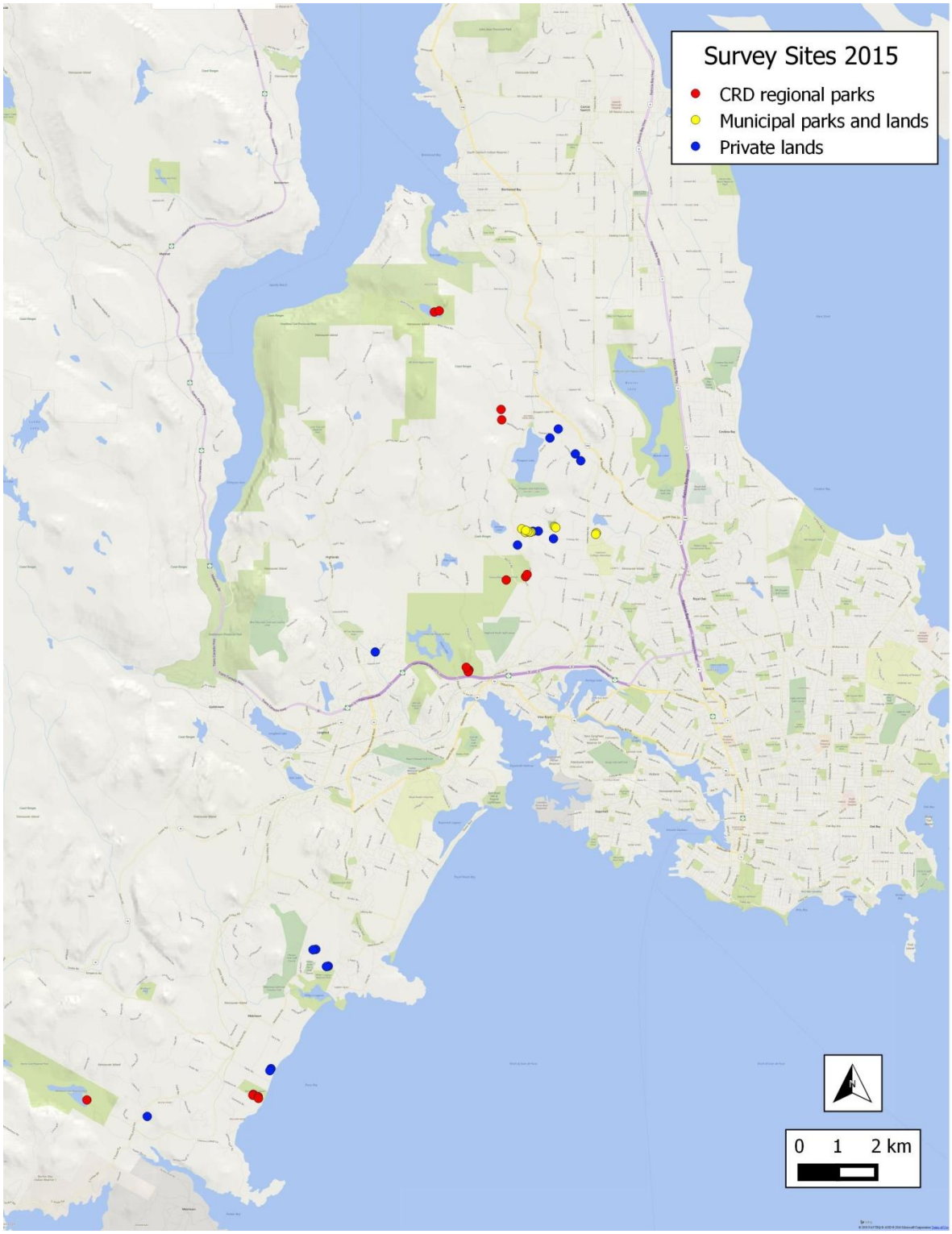
- Survey suitable habitats in regional and municipal parks and on private residential lands for the Blue-grey Taildropper on southern Vancouver Island in an effort to better delineate the distribution of this species and confirm occupancy.
- Work with private landowners and install artificial cover-objects 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).

Figure 1. Location of study sites surveyed for terrestrial gastropods on southern Vancouver Island in 2015.



In the CRD Regional Park system, we conducted surveys in five parks: Matheson Lake, Devonian, Mt. Work (Durrance Lake and Killarney Lake portions), Francis-King, and Thetis Lake. The species has been previously found in all the above parks except at Francis-King and at the Killarney Lake portion of Mt. Work. In parks with previous observations, the surveys focused on the vicinity of known sites 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). Saanich municipal parks and lands surveyed were Logan and Calvert parks, both with previous observations of the Blue-grey Taildropper, and Layritz Park with no observations of the species to date.

On private 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 2015, the survey sites included 11 private properties, four of which were surveyed for the first time, while the remaining represented continued monitoring efforts started in 2011 – 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 a night-time survey of the forest floor at Matheson Lake Regional Park, where a concentration of Blue-grey Taildroppers was found in 2013 (Ovaska and Sopuck 2013).

Artificial cover-objects

In total, 473 ACOs at 310 sampling stations were checked multiple times for gastropods in autumn 2015 (Table 1; Table 2). Of these, 115 stations (180 ACOs) were on private properties, 44 stations (72 ACOs) in Saanich Parks, and 151 stations (221 ACOs) in CRD regional parks.

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 in the past with success to detect the Blue-grey Taildropper and other gastropods (e.g., 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 parks, the ACOs were placed along 100 m or 50 m long transects at sampling stations that were 10 m apart (i.e., 5 or 10 sampling stations/transect). Each station had two cardboard ACOs, approximately 1 m of each other. An exception was Thetis Lake Regional Park, where the cover-objects were placed in a grid pattern at three plots: 1) 30 x 30 m grid that has been monitored each fall since 2012; 2) 15 x 15 m grid where the removal of invasive, introduced Laurel-leaved Daphne (*Daphne laureola*) took place in 2014; 3) 15 x 15 m grid in adjacent habitat with dense thicket of Daphne. In the grids, the sampling stations were 5 m apart with one ACO per station, for a total of 49 ACOs in the 30 x 30 m grid and 16 ACOs in the 15 x 15 m grids. The grids were placed at a site where the Blue-grey Taildropper had been found in previous years to obtain information

on its abundance and preliminary information on the effects of Daphne on gastropod faunas.

At Calvert Park, the ACOs were set in two grids originally established for monitoring terrestrial salamanders. Each grid consisted of 10 sampling stations, each of which had a cardboard cover-object and a layered, wooden salamander board. 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.

We checked the ACOs in CRD regional parks, Saanich municipal lands, and three private properties (Table 1). On most private properties, landowners checked the ACOs multiple times from October to November and reported their findings to us. One of the sites was on a property with a conservation covenant in West Saanich near a known Blue-grey Taildropper site; the cover-objects at this site were installed and monitored by Bryana Matthews, a University of Victoria student as part of her environmental restoration course project with advice from us (Matthews 2015).

The surveys in 2015 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, 2014a,b). Conditions during the ACO checks in the autumn were mild (air temperature: mean = 12°C; range = 7 – 17°C) and moist, suitable for gastropod activity.

Table 1. Summary of search effort using artificial cover-objects (ACOs) to survey for terrestrial gastropods in autumn 2015.

A. CRD Regional Parks, Saanich municipal parks, and private properties with ACOs checked by HAT biologists in October and November 2015:

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
Devonian Regional Park (T1, T2, T3, T4)	CRD Park	2006	4	20	40	3	120
Francis-King Regional Park (T1, T2, T3)	CRD Park	2014-2015	3	20	40	3	120
Mt Work Regional Park (Durrance Lake) (T1, T2)	CRD Park	2010	2	20	40	3	120
Mt Work Regional Park (Killarney Lake) (T1, T2)	CRD Park	2015	2	10	20	3	60
Thetis Lake Regional Park (Grid Main, DL, R1)	CRD Park	2012-15	3	81	81	3	243
Calvert Park (Grids 1 & 2), Saanich	Saanich municipal park	2011	2	20	20	3	60
Calvert Park (Sites 2 – 4), Saanich	Saanich municipal park	2014, 2015	3	3	9	3	27

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
Calvert Park (Site 7), Saanich	Saanich municipal park	2014, 2015	1	1	3	2	6
Layritz Park (T1, T2), Saanich	Saanich municipal park	2015	2	10	20	3	60
Logan Park (T1, T2), Saanich	Saanich municipal park	2014	2	10	20	3	60
Metchosin (Site 3: T1, T2, T3, T4)	Private	2015	4	10	40	3	120
Trevlac, Saanich (Site 1), Saanich	Private	2014	1	1	3	2	6
Sub-total:			29	206	336	34	1002

B. Residential properties with ACOs checked by landowners in 2015:

Site Name	Initial ACO set up (year)	# sampling stations	# ACOs*
Langford (Site 1)	2012	3	6
West Saanich (Site 1)	2011-2012	13	13
West Saanich (Site 2)	2012	10	10
West Saanich (Site 3)	2014	10	10
West Saanich (Site 4)	2015	8	8
West Saanich (Site 5)*	2015	30	60
Prospect Lake (Site 3)	2014	10	10
Metchosin (Sites 1a & 1b)	2014	10	10
Metchosin (Site 2)	2015	10	10
Sub-total:		104	137
Grand total (A +B):		310	473

*ACOs checked by Bryanna Matthews (2015).

Table 2. Dates of artificial cover-object surveys by HAT biologists in 2015.

Site Name (transect of plot)	Check 1	Check 2	Check 3
Devonian Regional Park (T1, T2, T3, T4)	13-Oct	28-Oct	11-Nov
Francis-King Regional Park (T1, T2, T3)	12-Oct	26-Oct	9-Nov
Mt Work Regional Park (Durrance Lake) (T1, T2)	5-Oct	9-Oct	5-Nov
Mt Work Regional Park (Killarney Lake) (T1, T2)	5-Oct	27-Oct	5-Nov
Thetis Lake Regional Park (3 grids)	12-Oct	24-Oct	14-Nov
Calvert Park (Grids 1, 2; Plots Sites 2 - 4), Saanich	8-Oct	27-Oct	8-Nov
Calvert Park (Site 7), Saanich	NA	27-Oct	8-Nov
Layritz Park (T1, T2), Saanich	4-Oct	31-Oct	15-Nov
Logan Park (T1, T2), Saanich	3-Oct	31-Oct	15-Nov

Site Name (transect of plot)	Check 1	Check 2	Check 3
Metchosin (Site 3: T1, T2, T3, T4)	13-Oct	28-Nov	11-Nov
Trevlac, Saanich (Site 1)	8-Oct	27-Oct	8-Nov

Night survey of the forest floor

We carried out a night-time search of the forest floor in Matheson Lake Regional Park on 31 October 2015. The search took place after dark on a wet, mild (air temperature 11°C) evening conducive for gastropod activity and focused on a site where several Blue-grey Taildroppers were found in 2013 and 2014. The search consisted of visual examination of the forest floor with spot lights and examination of spaces under coarse woody debris for a total of 2.7 person-hours by two observers. All cover-objects examined were carefully replaced, and no logs were taken apart to avoid damage to the habitat.

Visits to sites with observations reported to HAT

We carried out follow-up visits to three sites from where observations of the Blue-grey Taildropper had been reported to HAT and where identification had been confirmed from photographs. Two sites were in Metchosin and one was in the Cowichan Valley Regional District. The objective was to describe habitat features at the sites. The visits took place on 16 June 2015 at one of the Metchosin site, 1 February 2016 at the other Metchosin site, and 4 February 2016 at the Cowichan site. During each visit, we were accompanied by the person who found the slug.

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 overstory and understory vegetation where this species was found and noted any habitat disturbances and potential threats. At sites monitored by landowners and for opportunistic observations reported to HAT, identification was done based on photos sent to us.

4.0 RESULTS

4.1 Artificial cover-object surveys

The artificial cover-object surveys resulted in the finding of a total of 287 gastropods, representing at least 15 species at the 11 sites surveyed by HAT biologists (Table 3). The species included three native and six introduced species of slugs, and 12 species of snails, all native (see Appendix 2 for number of animals per site). The Northwest Hesperian snail was the most widespread and abundant species encountered, representing 21% of the observations. Native slugs included the Pacific Banana Slug, Reticulate-Yellow-bordered Taildropper complex, and Blue-grey Taildropper (see Section 4.3). 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 that was deemed optimal for detecting the Blue-grey Taildropper but is not necessarily optimal for all species. Small snails, in particular, are under-represented in the samples.

On private properties where residents and landowners checked cover-objects in autumn 2015, there were no observations of Blue-grey Taildroppers.

Table 3. Terrestrial gastropod species and numbers found during surveys by HAT biologists from October – November 2015.

*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

Gastropods found	Sites where found with ACOs^	No. of gastropods found with ACOs^	No. of gastropods found during night-search at Matheson Lake RP^^	ACO searches: % of all gastropods (n=287)
Slugs:				
Pacific Banana-slug, *Ariolimax columbianus*	Calvert Park, Devonian RP, Mt Work RP: Durrance Lake & Killarney Lake, Francis-King RP, Metchosin: Site 3	17	12	5.9
Hedgehog Arion, *Arion intermedius**	Devonian RP, Thetis Lake RP, Metchosin: Site 3	45		15.7
Chocolate Arion, *Arion rufus**	Calvert Park, Thetis Lake RP	2	8	0.7
Dusky Arion, *Arion subfuscus**	Thetis Lake RP	5		1.7
Arion species* (unidentified juveniles)	Logan Park, Thetis Lake RP	2		0.7
Longneck Fieldslug, *Deroceras panormitanum**	Thetis Lake RP	22		7.7
Grey Fieldslug, *Deroceras reticulatum**	Thetis Lake RP, Metchosin: Site 3	13		4.5
Giant Gardenslug, *Limax maximus**	Devonian RP, Francis-King RP, Calvert Park, Logan Park	10	5	3.5
Blue-grey Taildropper, *Prophysaon coeruleum*	Devonian RP, Metchosin: Site 3	3		1.0
Reticulate & Yellow-bordered Taildroppers, *Prophysaon andersonii* &*P. foliolatum*	Francis-King RP, Metchosin: Site 3	4		1.4
Snails:				
Glossy Pillar, *Cochlicopa lubrica*	Thetis Lake RP, Metchosin: Site 3	5		1.7
Pygmy Oregonian, *Cryptomastix germana*	Mt Work RP: Durrance Lake, Calvert Park	4		1.4

Gastropods found	Sites where found with ACOs^	No. of gastropods found with ACOs^	No. of gastropods found during night-search at Matheson Lake RP^^	ACO searches: % of all gastropods (n=287)
Brown Hive, *Euconulus fulvus*	Francis-King RP, Mt Work RP: Killarney Lake; Calvert Park, Layritz Park	15		5.2
Robust Lancetooth, *Haplotrema vancouverense*	Devonian RP, Francis-King RP, Mt Work RP: Killarney Lake; Thetis Lake RP, Logan Park, Calvert Park	21		7.3
Blue Glass, *Nesovitrea binneyana*	Francis-King RP, Mt Work RP: Durrance & Killarney lakes; Calvert Park, Calvert Park, Logan Park	25		8.7
Pacific Sideband, *Monadenia fidelis*		0	5	0.0
Pinhead Spot, *Paralaeoma servilis*	Devonian RP, Thetis Lake RP, Metchosin: Site 3	4		1.4
Tightcoil snails, *Pristiloma* sp. (*P. stearnsii* and *P. lansingii*)	Devonian RP, Francis-King RP, Mt Work RP: Killarney Lake, Calvert Park, Logan Park, Metchosin: Site 3	18		6.3
Northwest Striate, *Striatura pugetensis*	Devonian RP, Francis-King RP	4		1.4
Conical Spot, *Punctum randolphii*	Devonian RP, Francis-King RP, Metchosin: Site 3	3		1.0
Vertigo species	Mt Work RP: Killarney Lake	1		0.3
Northwest Hesperian, *Vespericola columbianus*	Devonian RP, Francis-King RP Mt Work: Durrance & Killarney lakes, Thetis Lake RP, (Matheson Lake RP), Calvert Park, Logan Park, Metchosin: Site 3, Trevlac: Site 1	60	1	20.9
Quick Gloss, *Zonitoides arboreus*	Francis-King RP	4		1.4
	Total (number of animals)	287	31	100

^ACO-artificial cover-object constructed of layers of corrugated cardboard

^^A night search of the forest floor was conducted at Matheson Lake on 31 Oct-15; there were no ACOs at this site.

4.2 Night search at Matheson Lake

A night search on a wet night on 31 October 2015 at Matheson Lake Regional Park focused on slugs and larger snails and resulted in the finding of five species gastropods (Table 3). The Pacific Sideband (provincially Blue-listed) was found at this site. The Blue-grey Taildropper was not found, although a site where a concentration of the slugs was found in autumn 2013 was searched.

4.3 Blue-grey Taildropper

The artificial cover-object surveys in 2015 resulted in the finding of the Blue-grey Taildropper at two sites in Metchosin: Devonian Regional Park and a private property (Site 3), the latter of which represents a new site for the species (Table 4). In addition, observations of the Blue-grey Taildropper, supported with photographs, were reported to us from two additional localities, from a conservation covenant on a private property near Witty's Lagoon in Metchosin and from a residential property in the Cowichan Valley Regional District; both records represent new localities for the species (Table 4).

In Devonian Regional Park, one slug was found along the edge of Douglas-fir dominated forest and Garry Oak meadow. There are several previous observations from the park and from this particular site (Ovaska and Sopuck 2004, 2007, 2008, 2009a).

Our attention to the Metchosin site (Site 3) was directed by Kevin Trim, who found three specimens there during the Metchosin Bioblitz in June 2015. Subsequent surveys with artificial cover-objects in the nearby forest resulted in the finding of an additional locality within the property. The habitats consisted of a grassy knoll with Garry-oak – Arbutus and its fringes and woodland with Douglas-fir, Garry Oak, and Arbutus with grass and moss ground cover.

The other new Metchosin record on the covenant property was reported to us by Alanah Nasadyk, who discovered the slug during an invasive plant removal event. The habitat consisted of Douglas-fir/Grand Fir dominated forest with scattered Arbutus and Bigleaf Maple and moss, leaf, and herb ground cover. The shrub understory was sparse, but the site contained a large decaying stump and abundant woody debris that would provide cover for the slugs. The two new Metchosin sites (Site 3 and the covenant) are separated from the nearest known locality in Devonian Regional Park by 3 - 4 km, respectively, and are 0.7 km from each other.

The Cowichan Valley Regional District observation, reported to us by Todd Carnahan, extends the known distribution of the species to the northwest. It is separated by approximately 11 km from the other Cowichan area record at Mt Tzouhalem. The slug was found on a mushroom approximately 2 – 3 m from forest edge on a mossy lawn. The surrounding forest is mostly coniferous but with scattered Bigleaf Maples, as well as introduced ornamentals, including an Eastern Red Maple tree near the house site. The understory is dominated by Salal, Ocean Spray, and Sword Fern. The forest was logged approximately 50 years ago but has some scattered large-diameter, older conifers.

Table 4. Summary of Blue-grey Taildropper observations from June 2015 to January 2016 by HAT biologists and observations reported to HAT.

Site name	Land tenure	BEC Zone^	Elev (m)	Method^^	Date	No. found	Adult/ juvenile	Habitat	Microhabitat	Comments	Observer(s)
Devonian Regional Park, Metchosin (T1: ACO2B)	Regional Park	CDFmm	42	ACO	11-Nov-15	1	A	Forest edge near Garry Oak meadow with grass/moss substrate	Cardboard cover-object	Site with several observations in previous years	L. Sopuck & D. Sopuck
Metchosin Road, Site 3	Private	CDFmm	59	Opportunistic	13-Jun-15	2	?	Patch of woodland with Garry Oak, Arbutus, and Douglas-fir; grass, herb and moss ground cover	Under plywood rubble on small mossy bluff	Isolated patch of woodland surrounded by agricultural fields, busy road, and rural residence	K. Trim
Metchosin Road, Site 3	Private	CDFmm	59	Opportunistic	13-Jun-15	1	?	Patch of woodland with Garry Oak, Arbutus, and Douglas-fir; grass, herb and moss ground cover	Under partially decayed log at base of bluff	Isolated patch of woodland surrounded by agricultural fields, busy road, and rural residence	K. Trim
Metchosin Road, Site 3	Private	CDFmm	59	Opportunistic	16-Jun-15	1	J	Patch of woodland with Garry Oak, Arbutus, and Douglas-fir; grass, herb and moss ground cover	Under plywood rubble on small mossy bluff	Isolated patch of woodland surrounded by agricultural fields, busy road, and rural residence	K. Trim, K. Ovaska
Metchosin Road, Site 3 (T4: ACO 3A)	Private	CDFmm	72	ACO	28-Oct-15	1	A	Woodland with Douglas-fir, Garry Oak, and Arbutus; grass, herb and moss ground cover	Cardboard cover-object	Under cardboard cover-object (2A), 10 m apart from other slug	K. Ovaska, L. Sopuck

Site name	Land tenure	BEC Zone^	Elev (m)	Method^^	Date	No. found	Adult/ juvenile	Habitat	Microhabitat	Comments	Observer(s)
Metchosin Road, Site 3 (T4: ACO 2A)	Private	CDFmm	74	ACO	28-Oct-15	1	A	Woodland with Douglas-fir, Garry Oak, and Arbutus; grass, herb and moss ground cover	Cardboard cover-object	Under cardboard cover-object (3A) 10 m apart from other slug	K. Ovaska, L. Sopuck
Kinsol Road, Cowichan Regional District	Private	CWHxm2	205	Opportunistic	27-Nov-15	1	A	Opening (grass/moss lawn) within 2-3 m from mainly coniferous forest edge; dense shrub understory with salal and ocean spray. Fairly well-drained SW slope with small streams and seepages.	Mushroom	Adult on mushroom in opening in Douglas-fir and Western Redcedar forest with Oceanspray, Salal, and Sword Fern in understory	T. Carnahan
Metchosin Road near Witty's Lagoon	Private	CDFmm	45	Opportunistic	23-Jan-16	1	A	Mixed-wood forest on SE slope with Douglas-fir, Grand-fir, and Bigleaf Maple with few shrubs but abundant herbaceous plants	Surface of litter by stick	Opportunistic observation during invasive species removal event.	Alanah Nasadyk

^Biogeoclimatic zone (subzone)

^^ACO-Artificial cover-object search or Opportunistic observation

4.4 Habitat restoration for the Blue-grey Taildropper

Habitat restoration began in 2014 in collaboration with CRD Parks and continued in autumn 2015 and January 2016. It consisted of the removal of invasive, alien plants, mainly Laurel-leaved Daphne (*Daphne laureola*) at a known Blue-grey Taildropper site in Thetis Lake Regional Park. The plants were clipped at ground level and removed from the site. The activities were carried out by CRD Parks and HAT volunteers and organized by CRD Parks volunteer coordinator Colleen Long. The activities took place on 24 October and 12 November 2015 and 28 January 2016. The number of volunteers per session ranged from 12 – 18 for a total of 126 volunteer hours spent in restoration efforts at the site.

The removal of Daphne was carried out as part of a pilot study to examine the effects of this invasive plant on the Blue-grey Taildropper and other gastropods. The three study plots, monitored with artificial cover-objects, consisted of a Daphne removal plot (Grid R1 – removal carried out in 2014), plot within a dense Daphne thicket (Grid D1), and a larger grid with some Daphne ((main grid; removal conducted after the autumn 2015 gastropod surveys). Relatively few gastropod species were found within all study plots, and all slugs found were of introduced species (Table 5). Introduced slugs were most abundant in the plot with Daphne, whereas snails (all native) occurred at approximately equal abundance at all plots when adjusted to the number of cover-objects present (see rows with # /ACO; Table 5).

Table 5. Gastropods found during surveys of artificial cover-object (ACO) grids at Thetis Lake Regional Park in autumn 2015.

Species	Grid main^	Grid R1^^	Grid D1^^^	Total
Slugs (#/ACO for all slugs*):	*0.33*	*1.13*	*1.81*	
Hedgehog Arion, *Arion intermedius**	3	10	10	23
Dusky Arion, *Arion subfuscus**	1	1	3	5
Arion species* (unidentified juveniles)	1	0	0	1
Longneck Fieldslug, *Deroceras panormitanum**	9	6	7	22
Grey Fieldslug, *Deroceras reticulatum**	2	1	9	12
Snails (#/ACO for all snails):	*0.29*	*0.25*	*0.31*	
Glossy Pillar, *Cochlicopa lubrica*	0	0	1	1
Robust Lancetooth, *Haplotrema vancouverense*	6	0	0	6
Pinhead Spot, *Paralaeoma servilis*	0	0	1	1

Species	Grid main^	Grid R1^^	Grid D1^^^	Total
Northwest Hesperian, *Vespericola columbianus*	8	4	3	15
Total	30	22	34	86

*refers to introduced species; note that all slugs found were introduced.
^Some Daphne present; 30 x 30 m grid (49 ACOs)
^^Daphne removed in 2014; 15 x 15 m grid (16 ACOs)
^^^Dense Daphne: 15 x 15 m grid (16 ACOs)

4.5 Opportunistic observations of amphibians and reptiles

Western Red-backed Salamanders and Northwestern Gartersnakes were found under the artificial cover-objects set for gastropods on two occasions (Table 6). The Wandering Salamander (COSEWIC: Special Concern; provincial Blue-list) was found during a night survey at Matheson Lake Regional Park.

Table 6. Amphibian and reptile species found opportunistically during surveys by HAT biologists for gastropods in October - November 2015.

Species	Site*	# found	Date
Wandering Salamander, *Aneides vagrans*	Matheson Lake RP	1	31-Oct-15
Western Red-backed Salamander, *Plethodon vehiculum*	Mt Work RP: Durrance Lake, Logan Park	2	9 Oct-15; 3 Oct-15
Northwestern Gartersnake, *Thamnophis ordinoides*	Layritz Park	2	4-Oct-15

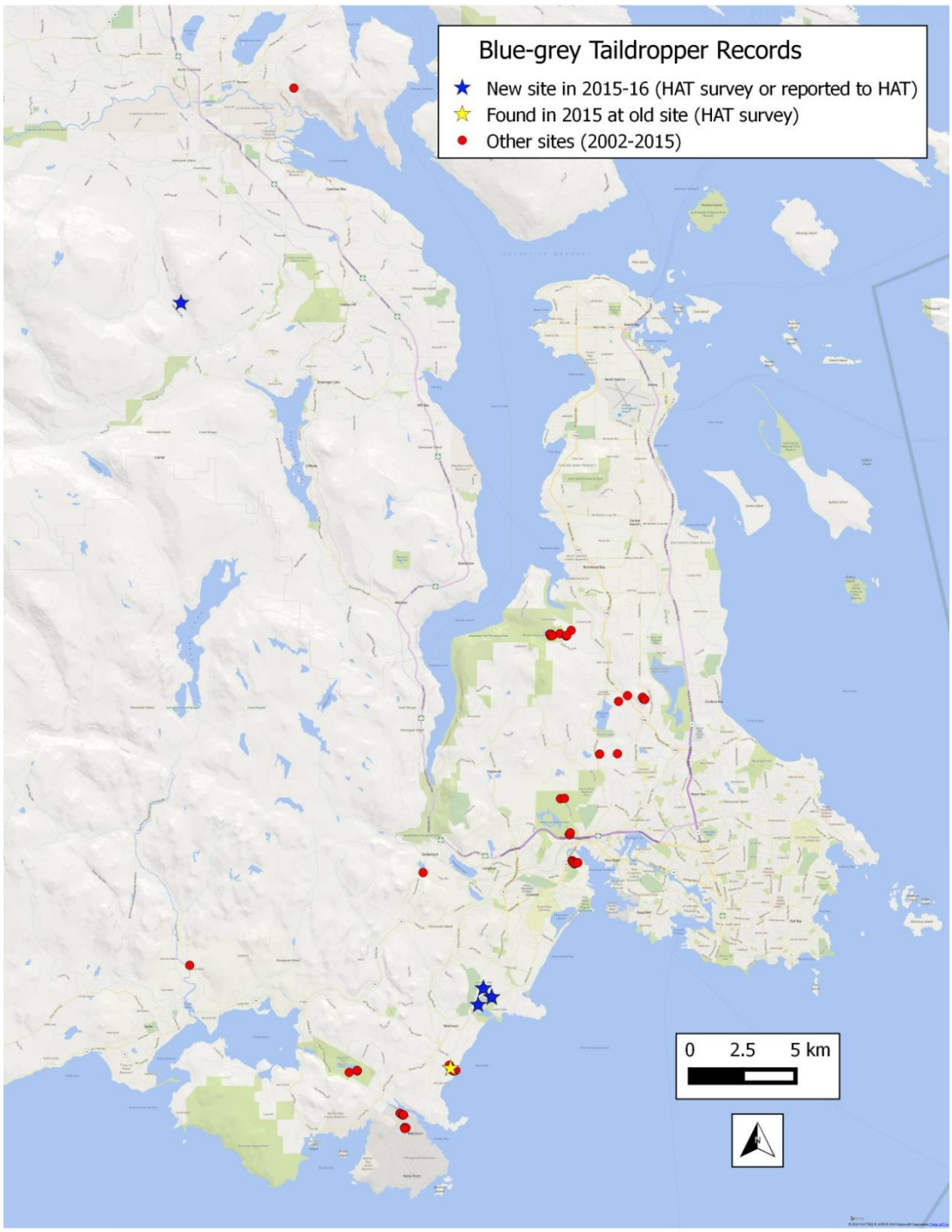
*RP – Regional Park

5.0 DISCUSSION

5.1 Blue-grey Taildropper

Surveys and opportunistic observations reported to HAT in 2015 resulted in the finding of nine Blue-grey Taildroppers at four properties, so continuing to expand our knowledge of the distribution and habitats of this species (see Figure 2 for a summary of records to date). Three of the records were from previously undocumented sites, while one was from Devonian Regional Park, where there are several records of the species since 2004 (see Appendix 3 for gastropod survey history in CRD regional parks). To date the species is known from six CRD regional parks, which provide important refuges for this species and other wildlife within developed landscapes.

Figure 2. Summary of Blue-grey Taildropper localities in British Columbia, showing records obtained as part of this and other projects from 2002 to January 2016.



Two of the sites with observations of the Blue-grey Taildropper in 2015 are from private properties in the vicinity of Witty's Lagoon in Metchosin, 3 – 4 km from the nearest known site in Devonian Regional Park. The properties are on opposite sides of a busy paved road, which probably acts as a barrier to slug movements. However, all records from these two sites are within 1 km of each other and therefore can be considered part of the same subpopulation, which at one time were probably connected. Further search efforts between and around the sites of these observations, including Witty's Lagoon Regional Park, are desirable to delineate the extent of distribution of this subpopulation.

The new Cowichan Valley Regional District observation is of particular interest, as it is only the second record of the species north of the Capital Regional District and extends the known distribution of the species to the northwest. It is also one of only two sites records that are in mainly coniferous forest and of three sites within the Coastal Western Hemlock (CWH) biogeoclimatic zone (the other two are Matheson Lake and Sooke River sites).

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. There are three records of adults from winter – early spring: March 2014 (Ovaska *et al*. 2014), January 2016 (this report), and February 2016 (L. Sopuck, unpubl. data). The winter 2015 – 2016 was very mild and wet with no prolonged periods of subfreezing weather, which may have contributed to the survival of individual Blue-grey Taildroppers beyond their regular life span.

5.2 Habitat restoration at Thetis Lake Regional Park

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, where volunteers carried out three sessions to continue efforts to remove invasive, introduced Laurel-leaved Daphne from the site.

Laurel-leaved Daphne is prevalent over much of the park, and complete eradication is not feasible. However, removal of the plant from small areas was deemed possible and beneficial for maintaining natural ecosystems and Blue-grey Taildropper habitat. The focal area was in Garry Oak/Arbutus/Douglas-fir dominated woodland, where several observations of the Blue-grey Taildropper have been made in previous years. In addition to forming dense thickets and crowding out native plants, toxins from leaves and stems of Laurel-leaved Daphne could have adverse impacts on soil and litter organisms, including gastropods. While the plant is known to contain several compounds toxic to browsing animals and humans (Natural Resources Canada 2003), little information is available on its effects on forest floor organism, including gastropods.

A pilot experiment was started in conjunction with invasive plant removal efforts to examine the abundance of gastropods in plots with and without Daphne. Preliminary results indicate that introduced slugs persist and may even thrive in Daphne thickets. Introduced slugs may be more tolerant of this plant because they both originate from

Eurasia. No native slugs and only a few snails were found on the study plots in autumn 2015, precluding conclusions. Continued efforts, including the establishment of replicate study plots are necessary to more effectively examine the impacts of Daphne on native gastropod faunas at the site.

6.0 THREATS AND RECOMMENDED MITIGATION

Main threats to Blue-grey Taildropper populations on southern Vancouver Island are from the loss and degradation of habitat due to urbanization, agriculture, logging, heavy recreational use, and the spread of invasive plants and animals (COSEWIC 2006, Blue-grey Taildropper Recovery Team 2012). Habitats of Blue-grey Taildroppers within this largely modified landscape are becoming increasingly fragmented, and small isolated populations are at risk from various stressors including severe weather resulting from climate change, particularly prolonged droughts. These impacts could be mitigated by maintaining a network of suitably-connected protected areas and other suitable habitat. HAT's landowner stewardship activities are intended to address this issue.

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.

Networks of unauthorized trails are present in several parks in the vicinity of Blue-grey Taildropper sites, particularly in Mt. Work (Durrance Lake) and Matheson Lake regional parks. Both sites would benefit from habitat restoration and blocking of excessive trails at Blue-grey Taildropper sites. Signage to remind visitors to stay on the trail, borders to mark the sides of the trail, and increased monitoring of visitor activities would be beneficial.

7.0 RECOMMENDATIONS FOR 2016

Recommendations for future work include the following:

- In collaboration with CRD Regional Parks continue removal of invasive plants in Thetis Lake Regional Park and establish additional study plots to examine the effects of Laurel-leaved Daphne and its removal on gastropod faunas.
- Use signage, marking the sides of trails, and/or decommissioning of unauthorized trails to reduce damage to sensitive Blue-grey Taildropper habitat at sites, such as Thetis Lake, Mt. Work, and Matheson Lake regional parks, 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 and protect habitat within CRD.
- Expand search effort in Metchosin around newly discovered sites, including Witty's Lagoon Regional Park, to determine the extent of occupancy of this subpopulation.
- In collaboration with Cowichan Valley Naturalist Society, expand search effort to suitable habitats north of the CRD working outwards from the newly documented localities in the Cowichan District.

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APPENDICES

Appendix 1. Details of sites surveyed for terrestrial gastropods with artificial cover-objects in CRD regional parks and Saanich municipal parks in October - November 2015.

Site name	Transect or Plot ID	Land ownership	Elevation (m)	UTM Easting (start)	UTM Northing (start)	UTM Easting (end)	UTM Northing (end)	No. stations 2015	No. ACOs 2015
Devonian Regional Park	T1	CRD regional park	40	460116	5356899	460153	5356879	5	10
Devonian Regional Park	T2	CRD regional park	36	460105	5356877	460136	5356863	5	10
Devonian Regional Park	T3	CRD regional park	24	460245	5356840	460298	5356836	5	10
Devonian Regional Park	T4	CRD regional park	45	460251	5356793	460274	5356774	5	10
Francis-King Regional Park	T1	CRD regional park	103	467333	5370358	467293	5370388	5	10
Francis-King Regional Park	T2	CRD regional park		467372	5370415	467351	5370449	5	10
Francis-King Regional Park	T3	CRD regional park		466825	5370275	466785	5370365	10	20
Mt Work Regional Park (Durrance Lake)	T3	CRD regional park	155	464988	5377264	465045	5377305	10	20
Mt Work Regional Park (Durrance Lake)	T4	CRD regional park	160	465117	5377295	465075	5377223	10	20
Mt Work Regional Park (Killarney Lake)	T1	CRD regional park	93	466732	5374447	466759	5374484	5	10
Mt Work Regional Park (Killarney Lake)	T2	CRD regional park	114	466717	5374718	466696	5374750	5	10
Thetis Lake Regional Park	D1	CRD regional park	102	465805	5367939			16	16
Thetis Lake Regional Park	Grid (main)	CRD regional park	70	465835	5367939	465852	5367962	49	49
Thetis Lake Regional Park	R1	CRD regional park	89	465818	5367889			16	16
Calvert Park (Site 2)	P2	Saanich municipal park	80	467483	5371521			1	3
Calvert Park (Site 3)	P3	Saanich municipal park	67	467443	5371515			1	3
Calvert Park (Site 4)	P4	Saanich municipal park	80	467395	5371541			1	3
Calvert Park (Site 7)	P7	Saanich municipal park		467342	5371565			1	3
Calvert Park (grid)	P1 (grid)	Saanich municipal park		467239	5371603			10	10
Calvert Park (grid)	P2 (grid)	Saanich municipal park		467336	5371513	467317	5371540	10	10
Layritz Park	T1	Saanich municipal park	57	469187	5371489			5	10
Layritz Park	T2	Saanich municipal park	65	469172	5371454			5	10
Logan Park	T1	Saanich municipal park	63	468128	5371634	468150	5371677	5	10
Logan Park	T2	Saanich municipal park	67	468098	5371658	468087	5371713	5	10

Appendix 2. Terrestrial gastropod species and numbers found per site during surveys with artificial cover-objects in CRD regional and Saanich municipal parks during from October - November 2015.

Numbers in cells denote total number of individuals found by site.

*after species name denotes introduced species

RP- CRD Regional Park

Gastropods found	Devonian RP	Francis-King RP	Mt Work RP (Durrance Lake)	Mt Work RP (Killarney Lake)	Thetis Lake PR	Calvert Park	Layritz Park	Logan Park
Slugs:								
Pacific Banana-slug, *Ariolimax columbianus*	0	4	3	1	0	3	0	0
Hedgehog Arion, *Arion intermedius**	15	0	0	0	23	0	1	0
Chocolate Arion, *Arion rufus*	0	0	0	0	0	1	0	0
Dusky Arion, *Arion subfuscus**	0	0	0	0	5	0	0	0
Arion species* (unidentified juveniles)	0	0	0	0	1	0	0	0
Longneck Fieldslug, *Deroceras panormitanum**	0	0	0	0	22	0	0	0
Grey Fieldslug, *Deroceras reticulatum**	0	0	0	0	12	0	0	0
Giant Gardenslug, *Limax maximus**	2	1	0	0	0	6	0	1
Blue-grey Taildropper, *Prophysaon coeruleum*	1	0	0	0	0	0	0	0
Reticulate & Yellow-bordered Taildroppers, *Prophysaon andersonii* &*P. foliolatum*	0	3	0	0	0	0	0	0
Snails:								
Glossy Pillar, *Cochlicopa lubrica*	0	0	0	0	1	0	0	0
Pygmy Oregonian, *Cryptomastix germana*	0	0	3	0	0	1	0	0
Brown Hive, *Euconulus fulvus*	0	2	0	4	0	5	3	1
Robust Lancetooth, *Haplotrema vancouverense*	4	2	0	2	6	3	0	2

Gastropods found	Devonian RP	Francis-King RP	Mt Work RP (Durrance Lake)	Mt Work RP (Killarney Lake)	Thetis Lake PR	Calvert Park	Layritz Park	Logan Park
Blue Glass, *Nesovitrea binneyana*	0	7	1	5	0	8	0	4
Pinhead Spot, *Paralaeoma servilis*	2	0	0	0	1	0	0	1
Tightcoil snails, *Pristiloma* sp. (*P. stearnsii* and *P. lansingii*)	5	5	1	1	0	3	0	0
Northwest Striate, *Striatura pugetensis*	3	1	0	0	0	0	0	0
Conical Spot, *Punctum randolphii*	1	1	0	0	0	0	0	0
Vertigo species	0	0	0	1	0	0	0	0
Northwest Hesperian, *Vespericola columbianus*	8	14	4	1	16	11	2	0
Quick Gloss, *Zonitoides arboreus*	0	4	0	0	0	0	0	0

Appendix 3. History of terrestrial gastropod surveys in CRD Regional Parks and Trails System, 2003 – 2015.

Red text - sites where the Blue-grey Taildropper (endangered) has been found one or more times
Warty Jumping-slug (Special Concern) has been found at East Sooke Park and Galloping Goose Trail at Sooke Sooke River
Note: Additional surveys were conducted in Matheson Lake as part of Metchosin bioblitz in May 2011, during which the Blue-grey Taildropper was found.

Park or Trail	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bear Hill						Oct-Nov		Oct-Dec					
Coles Bay									Oct-Nov				
Devonian		Sep-Nov		Oct-Nov	Nov	Apr-June; Oct-Nov	Oct-Dec					Nov	Oct-Nov
East Sooke	Oct	Sep-Nov					Oct-Nov		Oct-Nov				
Elk/Beaver Lake										Oct-Nov			
Francis/King		Sep-Nov					Oct-Nov			Oct-Nov		Oct-Nov	Oct-Nov
Galloping Goose Trail at Sooke River		Nov		Oct-Nov	Nov	May-Jun; Oct-Nov							
Horth Hill									Oct-Nov				
Lone Tree Hill		Sep-Nov											
Matheson Lake		Sep-Nov							Oct-Nov	Oct-Nov	Oct-Nov	Nov	Oct
Mill Hill				Nov						Oct-Nov			
Mount Wells						Oct-Nov	Oct-Nov	Oct-Dec					
Mount Work		Sep-Nov		Oct-Nov	Nov-Dec	Apr-Jun; Oct-Nov	Oct-Nov	Oct-Dec	Oct-Nov			Oct-Nov	Oct-Nov
Roche Cove									Oct-Nov	Oct-Nov			
Sooke Hills Wilderness				Oct-Nov			Oct-Nov	Oct-Dec					
Thetis Lake						Oct-Nov	Oct-Nov	Oct-Dec	Oct-Nov	Oct-Nov		Oct-Nov	

Park or Trail	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Witty's Lagoon		Sep-Nov											
Survey effort (search of forest floor; person-minutes)	160	54*			160						60**	426***	160^
Survey effort (# ACO flips)		660		1390	260	2360	1620	1460	860	1076	805	387	663

* At Galloping Goose Trail, where there were no ACOs
**At Matheson Lake
***At Matheson Lake and Devonian, where there were no ACOs
^At Matheson Lake , where there were no ACOs