

Etude du parasitisme par les strongles gastro-intestinaux chez le mouflon des Rocheuses de l'Ouest canadien par séquençage haut-débit.



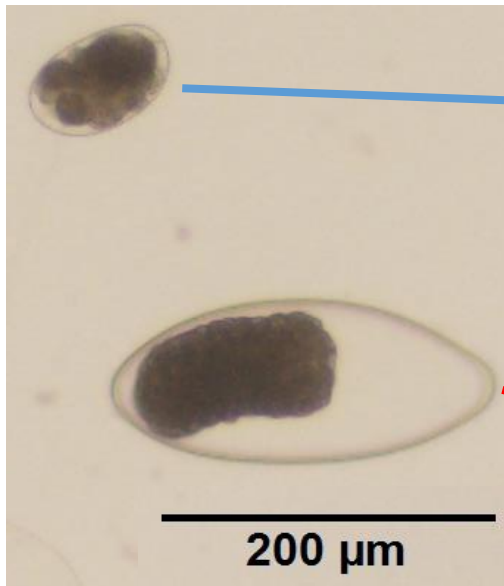
Bourgoin G, Poissant J, Wit J, Ruckstuhl K, Hough G, Letain C,
Gilleard J, Kutz S



36èmes Rencontres du GEEFSM, réserve d'Orlu, France – 13-16 septembre 2018

Contexte

- Etude du parasitisme digestif/respiratoire :
 - Analyse des fèces: Coproscopie / coproculture
 - Suivi temporel, facilité collecte/analyse
 - Lien infestation/copro, resolution identification, ...



?

Haemonchus contortus
Haemonchus placei
Ostertagia ostertagi
Trichostrongylus colubriformis
Cooperia oncophora
Cooperia surnabada
Chabertia ovina

Pathogeny ≠
among species

?

Nematodirus abnormalis
N. andersoni
N. davtiani
N. helvetianus
N. maculosus
N. oiratianus
N. spathiger
Nematodirella antilocaprae

Pathogeny ≠
among species

Contexte

- Etude du parasitisme digestif/respiratoire :
 - Nécropsie
 - Identification et quantification précises
 - Long, laborieux, expertise, pas de suivi individuel, espèces protégées, chasse à des périodes spécifiques

→ Limite les études en écologie du parasitisme



« Nemabiome » ~ « Microbiome »
Bovins, ovins, bison





Mais...

- Peu de connaissances récentes sur le parasitisme du mouflon
- Or changements récents importants:
 - Changement climatique
 - Introduction et développement en Alberta de
 - *Dicrocoelium dendriticum*
 - *Haemonchus contortus* chez les ovins domestiques

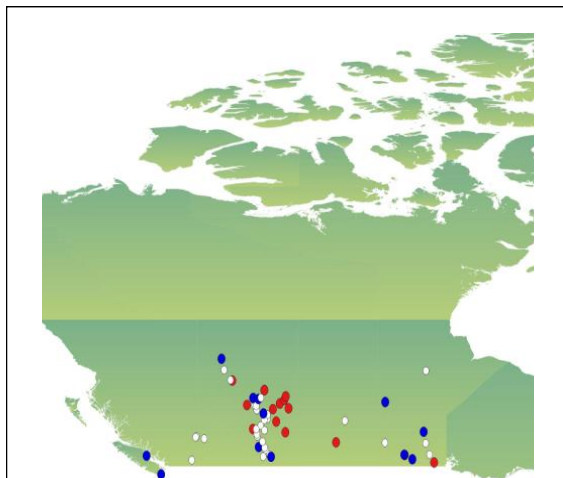


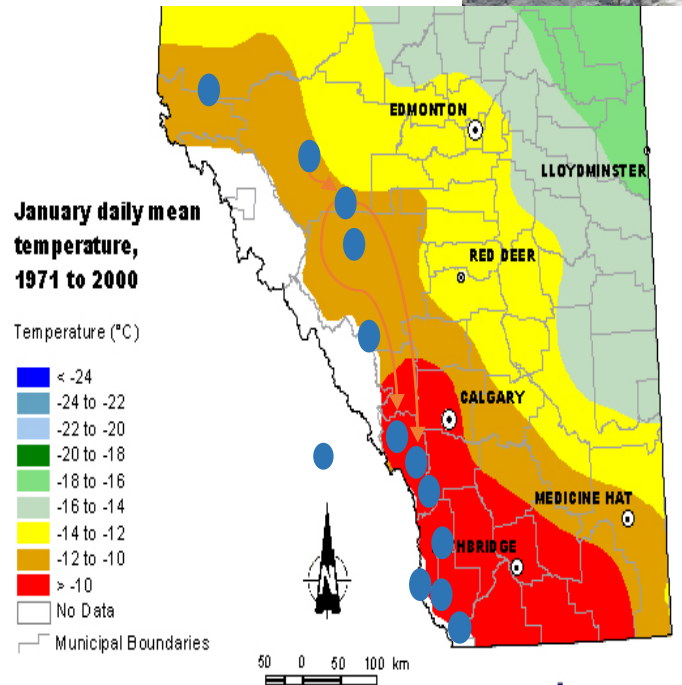
Figure 1. Strongyle eggs per gram of feces in western Canadian sheep flocks (○ <math>< 500</math>, ● 500-1000, ● >1000). Molecular metabarcoding analyses indicated that the vast majority of these eggs are from *H. contortus*.



Objectifs

1. Adapter la méthode moléculaire du néomabiome pour l'étude non-invasive de la communauté de strongles du mouflon des rocheuses.
2. Quantifier le parasitisme et décrire la diversité des espèces de strongles dans différentes populations de mouflons des rocheuses dans l'ouest canadien (présence de *Haemonchus contortus* ?).

Echantillonnage



Based on 1971 to 2000 data from Environment Canada, Alberta Environment and the U.S. National Climate Data Center. Map displayed on Township generalization.

Analyses

Analyses coproscopiques

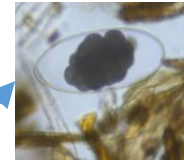
Isolement et quantification
des oeufs

Fèces provenant de 13
populations of bighorn sheep

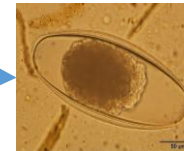
Mélange (1 analyse /pop)



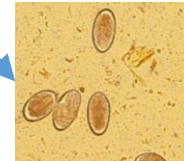
Identification et quantification de
3 types d'oeufs de strongles



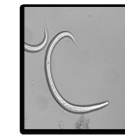
Nematodirus spp.



*Marshallagia
marshalli*



Strongles
digestifs



Protostrongylidae

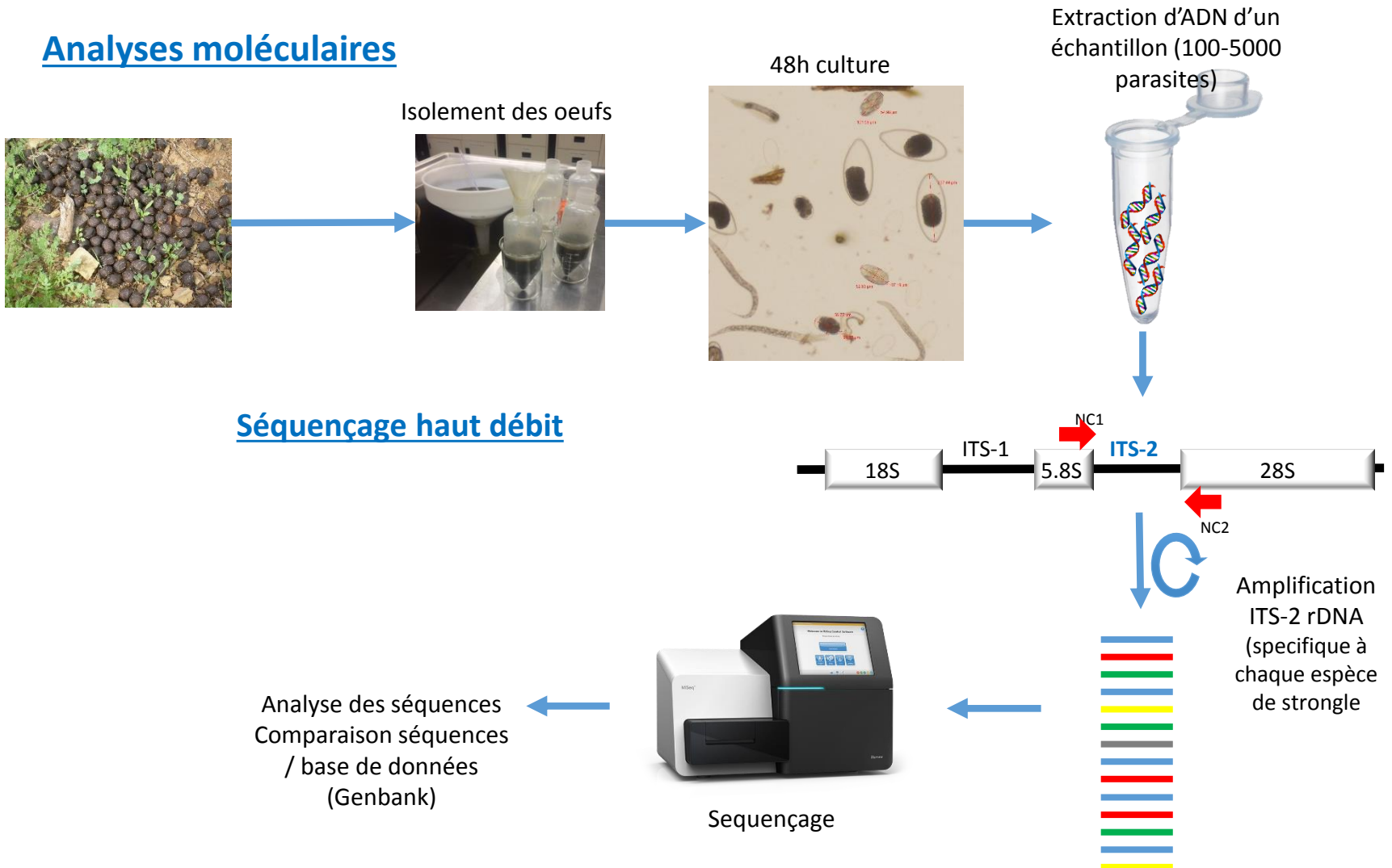
Identification et
quantification de 2
types de larves
respi/tissulaires



*Dorsal spined
larvae (DSL)*

Analyses

Analyses moléculaires



Necropsies, identification et séquençage

- Necropsies



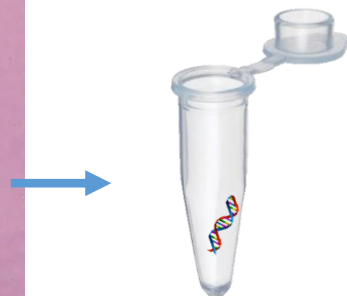
N. lanceolatus



N. andersoni



N. davtiani



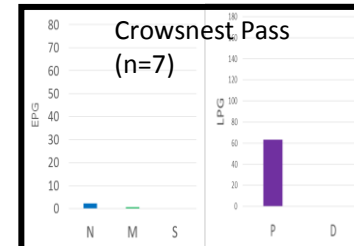
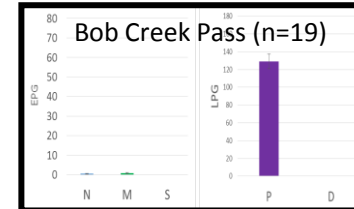
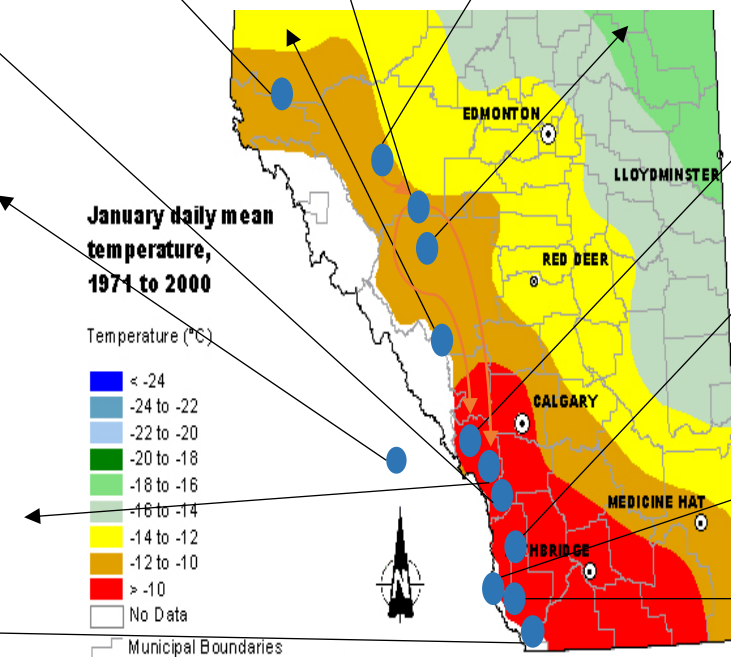
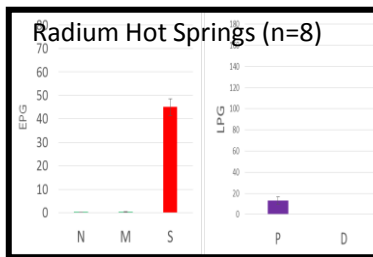
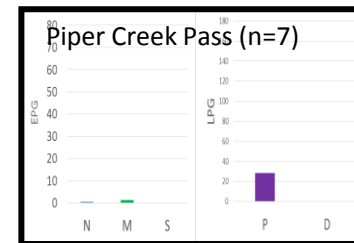
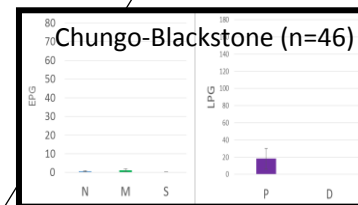
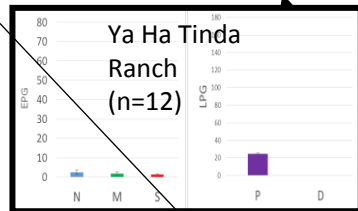
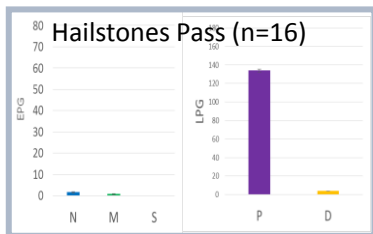
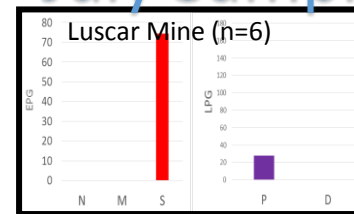
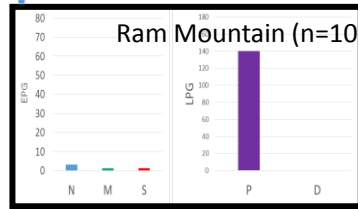
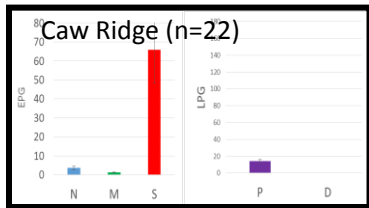
Résultats

June Samples

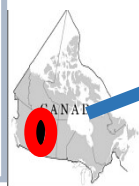
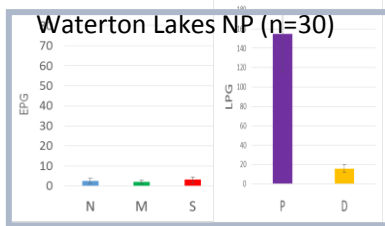
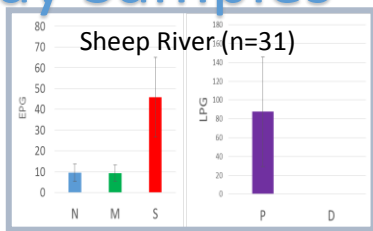
July Samples

Legend

- N = *Nematodiurs spp.*
- M = *Marshallagia marshalli*
- S = *Strongyles*
- P = *Protostrongylus spp.*
- D = Dorsal spined larvae



May Samples

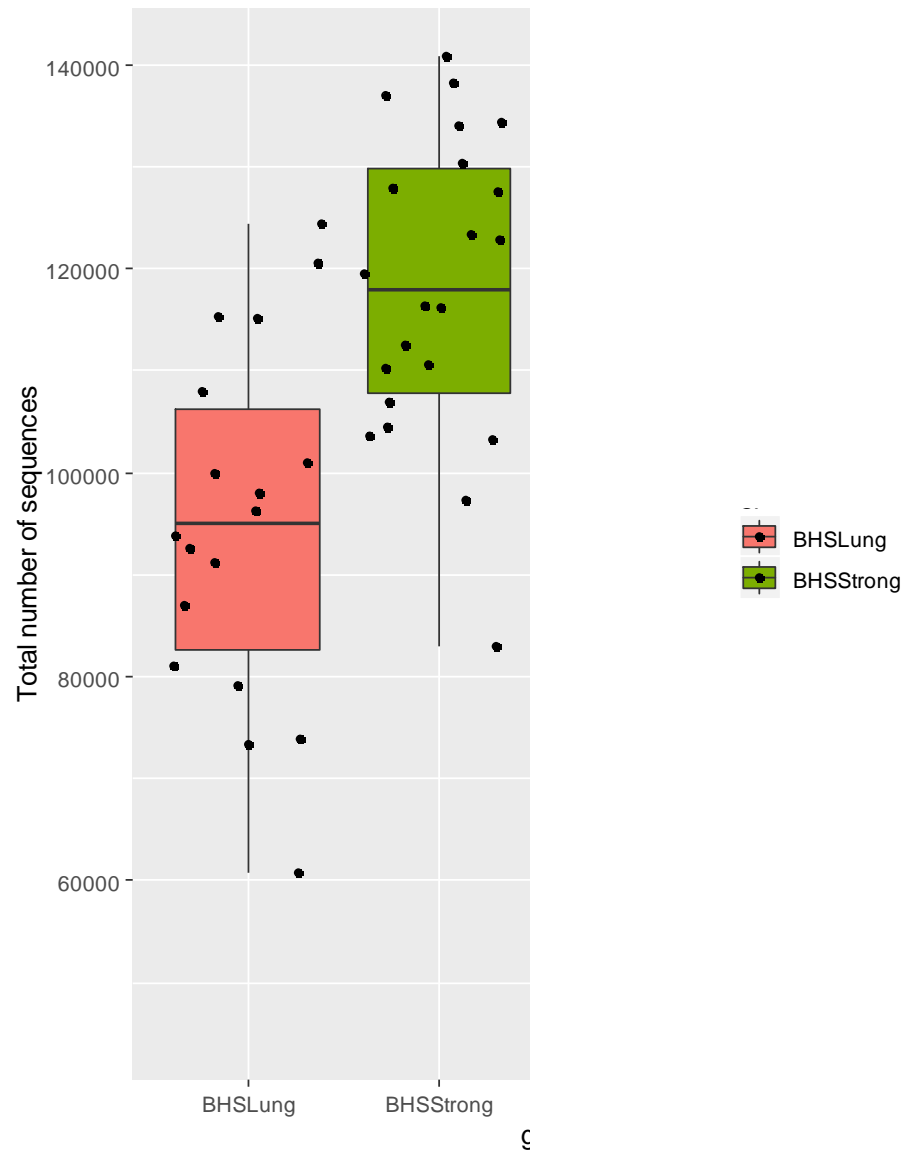


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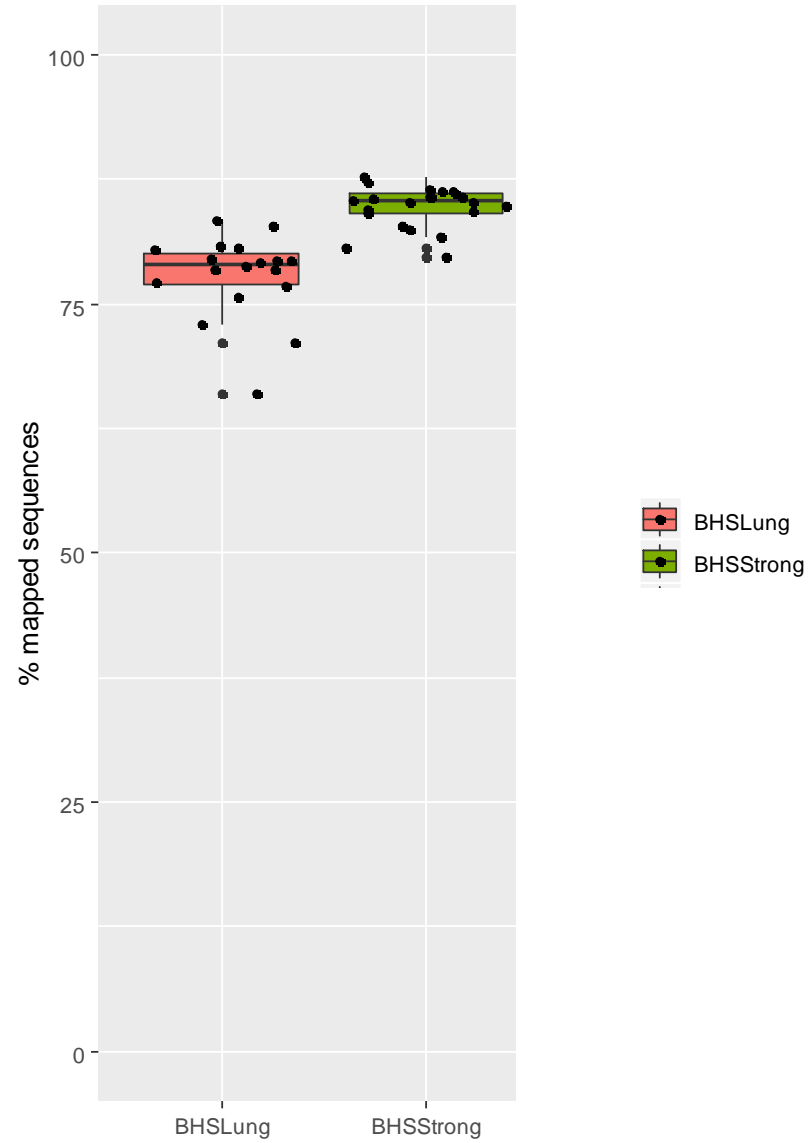


Séquençage

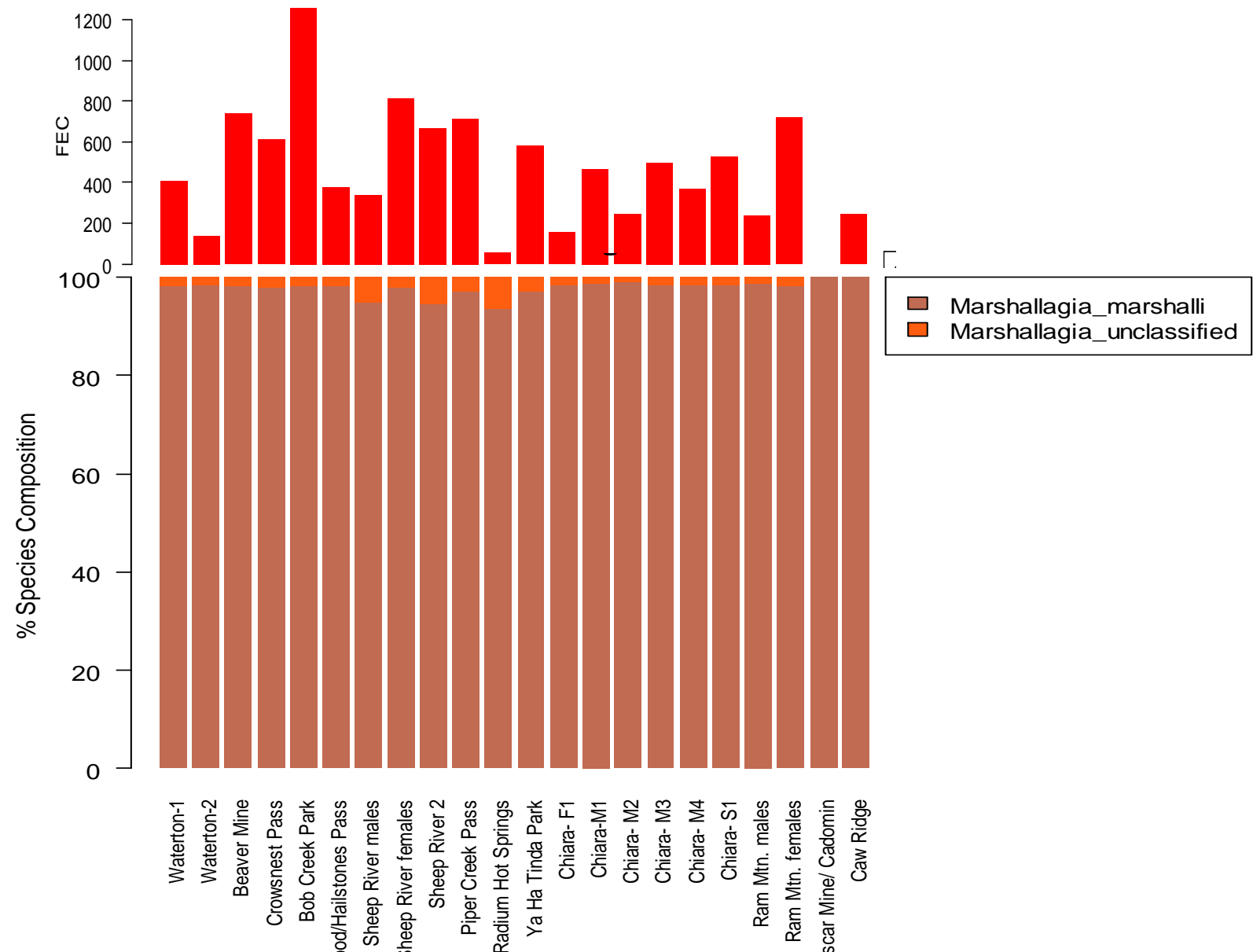
Nombre total de copies ITS2



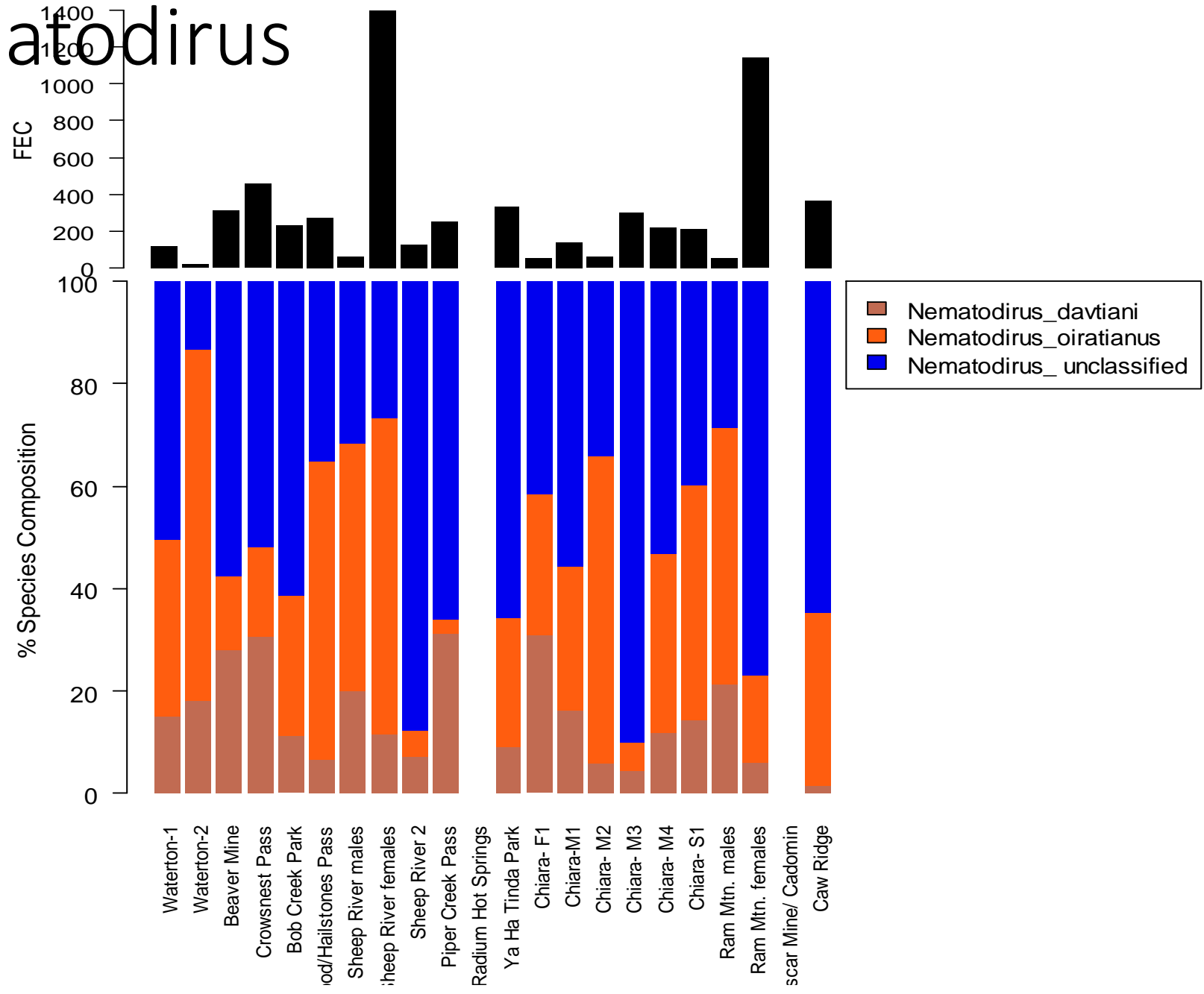
% de copies ITS2 identifiées



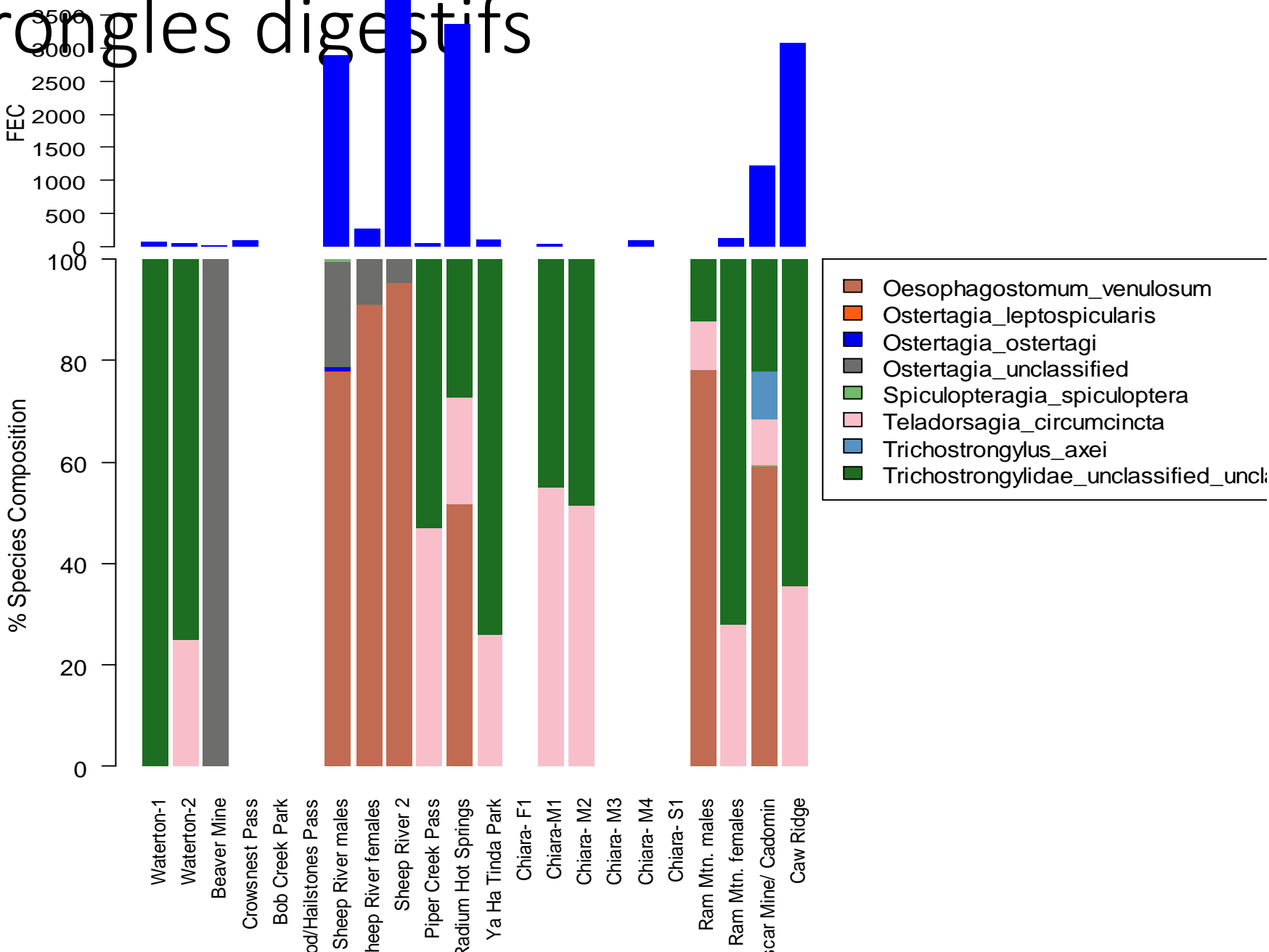
Marshallagia



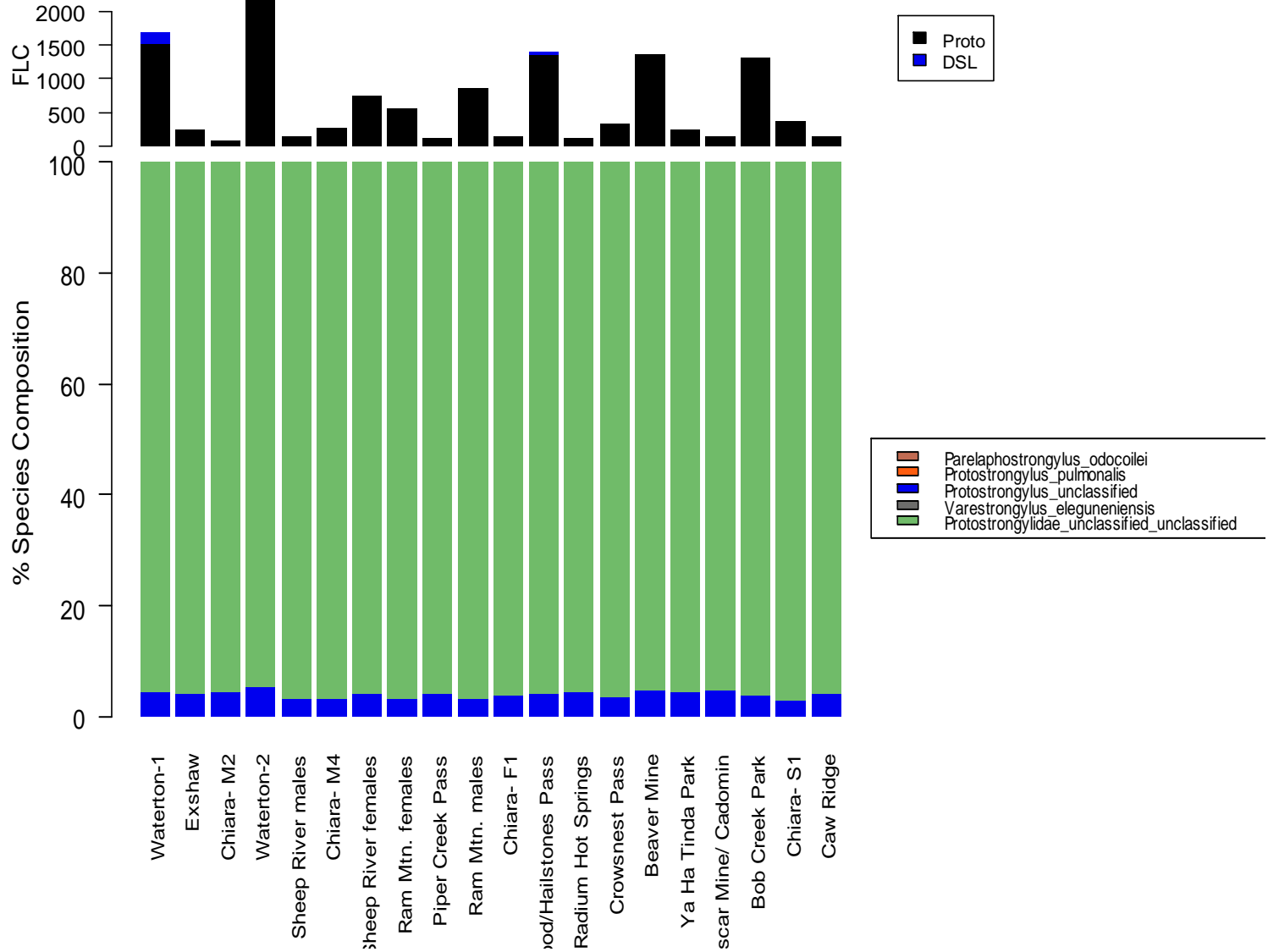
Nematodirus



Strongyles digestifs



BHS - Lungworms



Discussion

- Identification + semi-quantification des espèces de strongles présentes
 - Amélioration du niveau hiérarchique d'identification des parasites présents
 - *Haemonchus contortus* non détecté
- Mais...
 - Séquences non classées
 - Séquences identifiées à un niveau hiérarchique élevé
 - Long, laborieux <- labo, informatique
 - Coût

- Augmenter la base de données de séquences ITS2 pour les espèces manquantes
- Réviser le traitement informatique des données de séquençage (séquences longues, petites erreurs de séquençage, ...)

Bighorn sheep - Lungworms

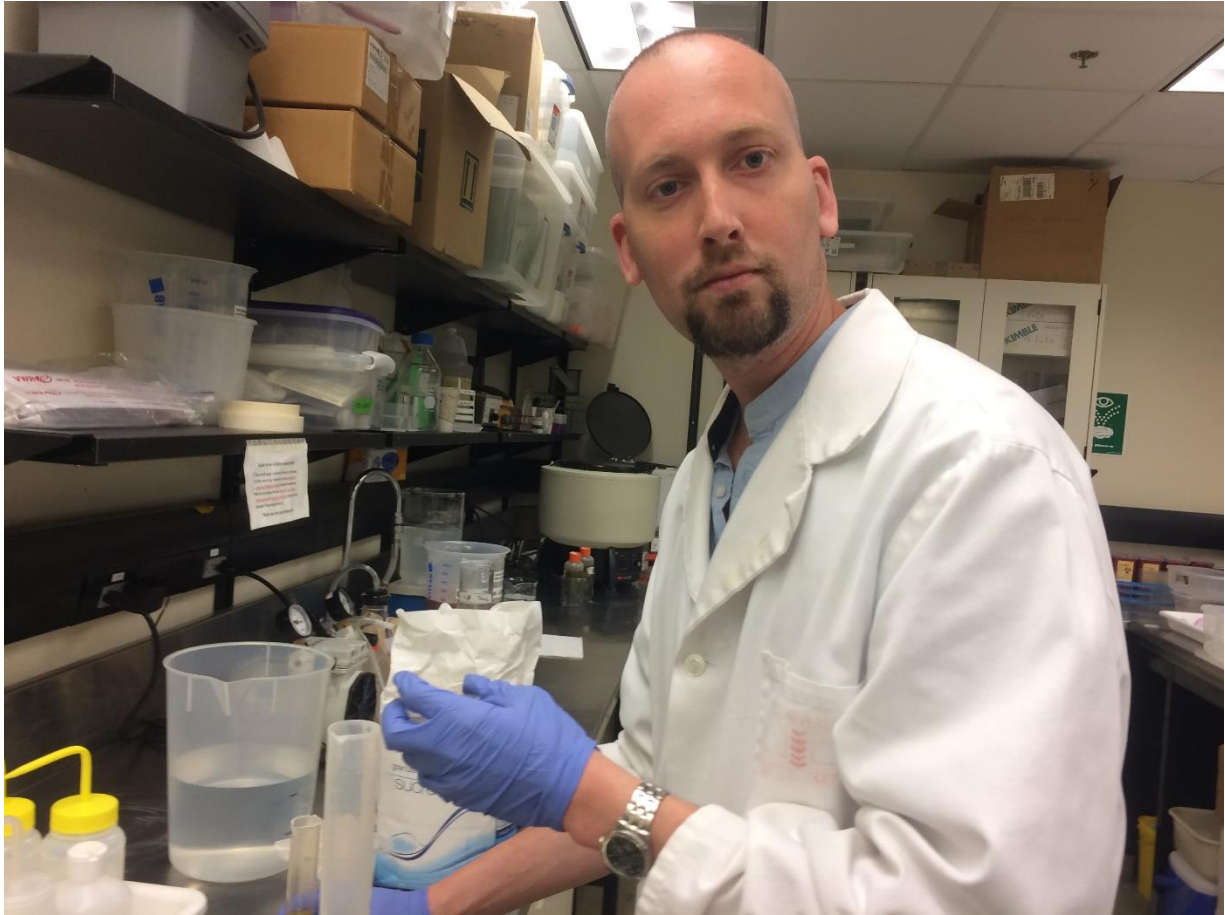
Nb mapped sequences	Mean	Range
Lungworms + Digestive nematodes	74 224	47 673 – 98 618
Lungworms only	33 334	5667 – 64 399

Remerciements

- James Wang
- Samridhi Rijal
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- Jacalyn Normandeau
- Jeff Kneteman
- Greg Hale
- Trainees

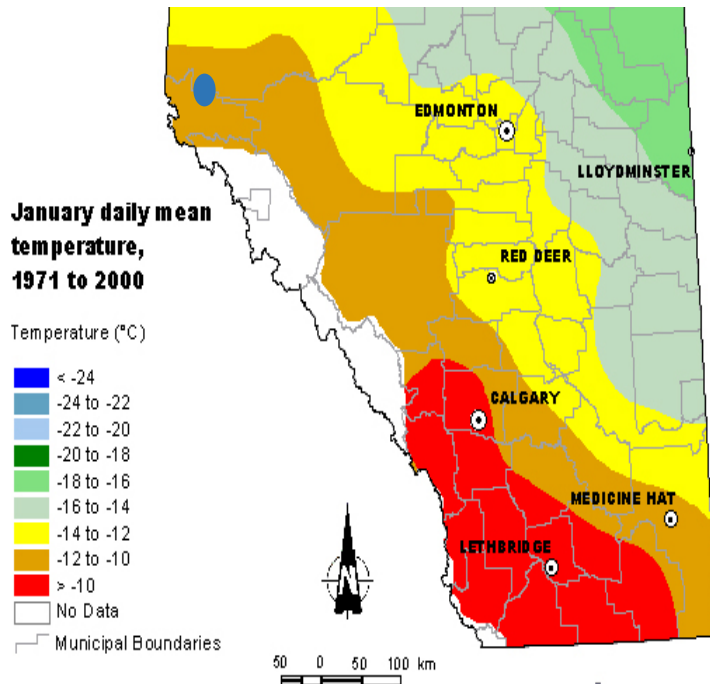


Co-funded by
the European Union



Mountain goats (Caw ridge)

- 22 individual samples



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Alberta
AGRICULTURE, FOOD AND
RURAL DEVELOPMENT
Conservation and Development Branch
Resource Management and Irrigation Division

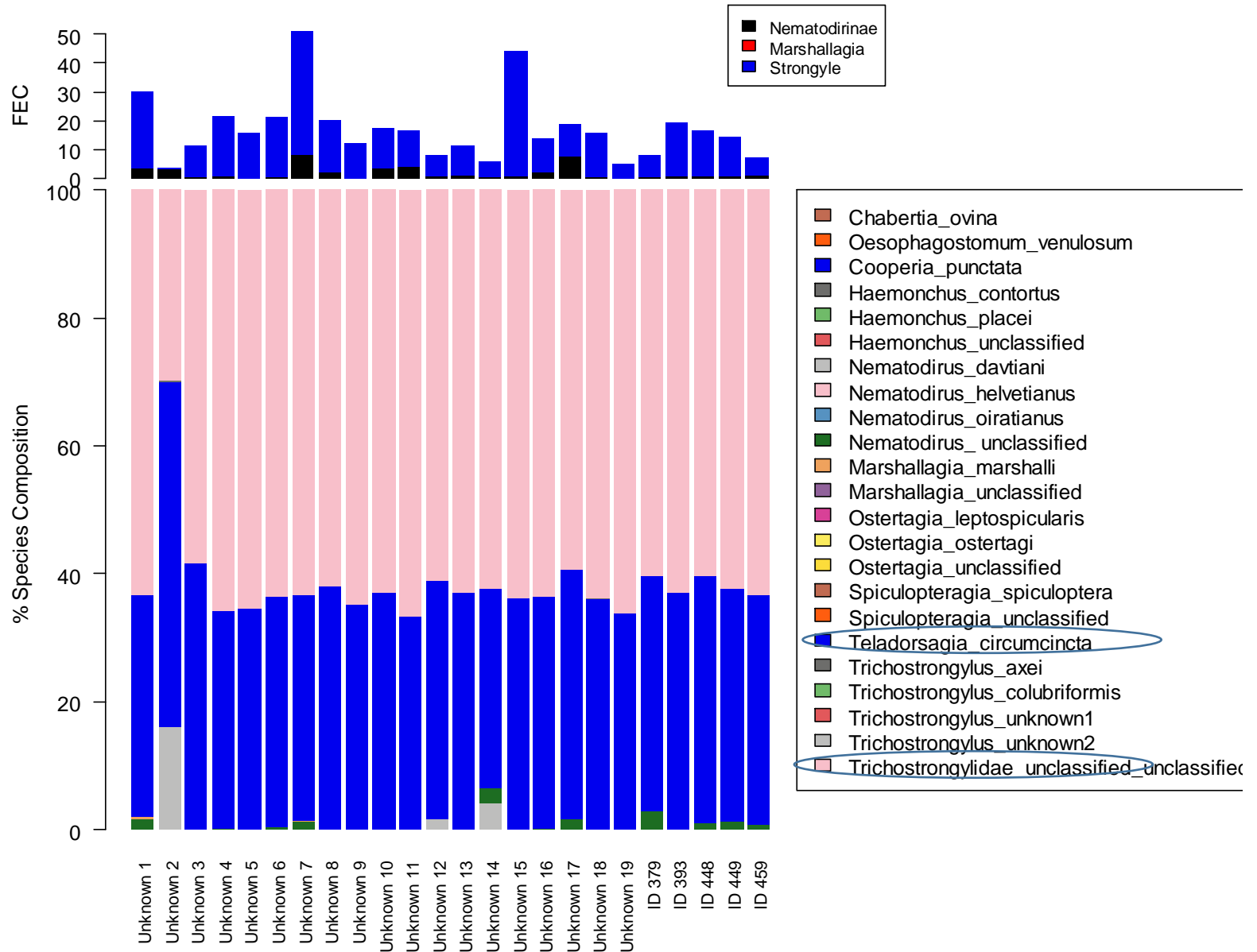


MG– Digestive nematodes

- N = 22 samples

Nb mapped sequences	Mean	Range
Digestive + Lungworms nematodes	78 396	24321 – 105 797
Digestive nematodes only	77 970	24 321 – 105 669

MG– Digestive nematodes



MG - lungworms

Nb mapped sequences	Mean	Range
Digestive + Lungworms nematodes	11 305	26 – 61 737
Lungworms only	2177	0 – 19 370

MG - lungworms

