



University of Akureyri
School of Business and Science
Faculty of Natural Resource Sciences
LOK1126 and LOK1226

Bioindicators to detect pollution from dumping sites and landfills

Bioaccumulation in *Mytilus edulis* and *Nucella lapillus*
in Iceland

Mæva Marlene Urbschat

Supervisor:

Arnheiður Eyþórsdóttir (M.Sc.), University of Akureyri

May 2013



Háskólinn
á Akureyri
University
of Akureyri

University of Akureyri
School of Business and Science
Faculty of Natural Resource Sciences
LOK1126 and LOK1226

Bioindicators to detect pollution from dumping sites and landfills

Bioaccumulation in *Mytilus edulis* and *Nucella lapillus*
in Iceland

Mæva Marlene Urbschat

A thesis for 12 ECTS credits towards a B.Sc. degree in Biotechnology

University	University of Akureyri
School	School of Business and Science
Subject of study	Biotechnology
Title	Bioindicators to detect pollution from dumping sites and landfills - Bioaccumulation in <i>Mytilus edulis</i> and <i>Nucella lapillus</i> in Iceland
Title Icelandic	Mengun í sigvatni frá ruslahaugum og urðunarstöðum – mælt með lífviðmiðun (örverum og nákuðungum) á Íslandi
Project time	August 2011 - May 2013
Author	Mæva Marlene Urbschat
Supervisor	Arnheiður Eyþórsdóttir
Printed copies	4
Number of pages	77
Appendices	5
Visibility	open

Declaration

I hereby declare that I am the only author of this thesis and that it is the product of my own research.

Mæva Marlene Urbschat

It is hereby declared that in my opinion, this project fulfills the learning outcomes of the course LOK1126 & LOK1226 (Final project).

Arnheiður Eyþórsdóttir

Acknowledgements

My gratitude for the contribution of Blönduóssbær.

To my supervisor, Arnheiður Eyþórsdóttir, thank you for giving me the opportunity to work on this project.

I would like to thank two biologists, Halldór Palmar Halldórsson and Sigrún Guðmundsdóttir, for motivating me during my studies.

I want to thank my husband, Raimund Bernhard. This thesis is dedicated to our children, Sólmundur Hrafn Raimundsson and Sunneva Jasmín Bernharðsdóttir.

Mæva Marlene Urbschat

Akureyri, 26nd of April, 2013

Abstract

This study is an attempt to explain a complex environmental situation at the shore beneath a dumping site in Iceland.

Heavy metals, originated outside Iceland, are distributed by oceanic currents and airpollution. Another pathway to Icelandic nature are products, containing heavy metals, which are thrown uncontrolled at dumping sites after use.

Today the content of still existing dumping sites around Iceland is unknown, but composition and quantities of different waste-categories can be estimated from the activities during the period, when the waste was produced.

From these waste-filled places leachate transports irregulary heavy metals to the marine biota. Bioaccumulated arsen, cadmium, copper, chromium, lead, mercury, zinc were measured in *Nucella lapillus*, preying on *Mytilus edulis* and *Semibalanus balanoides*.

The results show higher cadmium concentrations in dogwhelks compared to Gufunes/Reykjavík harbour. Copper and zinc concentrations exceed the Icelandic overall mean. Chromium, copper, zinc concentrations in dogwhelks at this small village overtop values in Irland.

Presence of mercury-resistant bacteria in the leachate was confirmed by microbiological test. The anthropogenic impact of the dumping site occurs not in sporadic taken analyses of leachate.

The results indicate the vital necessity to register all dumping sites, additionally to monitor with bioindicators their impact on aquatic ecosystems.

Keywords: *Mytilus edulis*, *Nucella lapillus*, accumulation, dumping site, Iceland

Útdráttur

Markmið rannsóknar er að varpa ljósi á mengun í fjöru neðan við gamlan ruslahaug.

Þungmálmar, upprunir utan Íslands, dreifast með sjávarstraumum og loftmengun. Önnur flutningsleið þungmálma að íslenskri náttúru er með afurðum sem innihalda þungmálma og var fargað með stjórnlausum hætti á ruslahaugum í lok líftíma afurðanna. Innihald og staðsetningar gamallra ruslahauga á Íslandi eru ekki þekktar. Hægt er að áætla um efnasamsetningu og efnamagn með því að taka mið af framleiðsluaðferðum og neysluvenjum þess tímabils sem ruslahaugarnir urðu til.

Sigvatn frá gömlum ruslahaugum seytir óreglulega þungmálum í vistkerfi sjávarlífvera. Uppsöfnun arsens, blýs, kadmíums, kopars, króms, kvikasilfurs, sinks mældist í vefjum nákuðunga (*Nucella lapillus*), sem nærist á kræklingum og hrúðurkörlum. Niðurstöðurnar sýna meiri uppsafnaðan styrkleika kadmíums í vefjum nákuðungs frá gömlum ruslahaugum samanborið við nákuðung úr Gufunesi/Reykjavíkurhöfn. Styrkleiki kopars og sinks mældist yfir meðaltali íslenskrar rannsóknar á Suðvestur- og Norðurlandi 1999. Styrkleiki kopars, króms og sinks í nákuðungi í litla byggðalaginu reyndist vera yfir mældum gildum á Írlandi. Tilvist kvikasilfurs-ónæmra baktería í sigvatni ruslahaugsins var staðfest með örverufræðilegu prófi.

Niðurstöðunar gefa til kynna mikla nauðsyn þess að staðsetja og skrá gamla ruslahauga. Til vöktunar er mælt með notkun á lífvísum til að fylgja eftir áhrifum ruslahauga og urðunarstaða á vistkerfi sjávar.

Lykilorð: nákuðung, krækling, hrúðurkarl, lífviðmiðun, gamlir urðunarstaðir