



Regional occurrence of heavy metals in the common whelk, *Buccinum undatum* Implications for an evolving industry in Norway



Background

Preliminary resource investigations indicate that there is potential for commercial harvesting of common whelk (*Buccinum undatum*) in several areas along the coast of Norway. Growing demand for whelk, especially from Asia, has sparked an interest from both fishermen and producers who see the potential in harvesting and exporting this species. However, due to lack of information about the content of heavy metals in common whelk from Norwegian waters it has been difficult for the industry to document that contaminant levels do not exceed legal limits in importing countries. For the time being the Norwegian Food Safety Authority (NFSA) maintains the maximum limit for heavy metals set for bivalve molluscs in the European Commission Regulation (EC) 1881/2006. In order to gather more information about regional occurrence of heavy metals and other major, minor and trace elements in whelk, samples were taken for analysis from different geographical locations along the coast of Norway.

Methods Whelk samples were taken during May/June 2011 from three different geographical locations (Smøla, Frøya and Lofoten); all locations showing potential for future whelk fishery. Whelks were fished using baited pots, frozen immediately after catch and kept frozen until analysis. Content of heavy metals was measured in pure white muscle and in all soft tissues excluding shell and foot-plate (*in toto*). For each location and tissue the analysis was conducted on a pooled sample consisting of 25 whelks (Table 1). The pooled sample was homogenised and freeze-dried prior to analysis. Quantitative analysis was carried out by ICPMS (Agilent 7500 series) following microwave assisted digestion with HNO₃/H₂O₂. The determination of inorganic arsenic (As(III) + As(V)) was carried out by HPLC-ICPMS analysis after microwave assisted HCl and H₂O₂ dissolution.

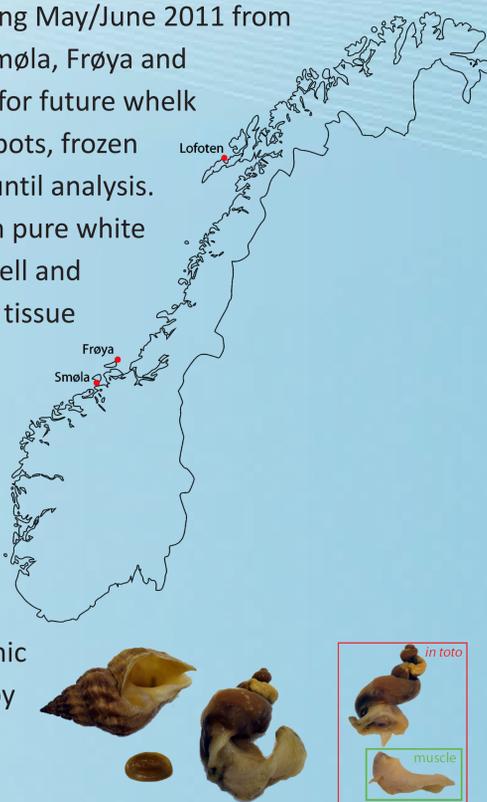


Table 1 - Size and weight data from sampled whelk (values ± st.dev.)

Location	Length (mm)	Weight whole (g)	Weight soft parts (<i>in toto</i>) (g)	Weight muscle (g)
Smøla (n=50)	74.93 ± 8.58	48.65 ± 15.11	27.24 ± 8.76	10.96 ± 4.35
Frøya (n=50)	82.98 ± 13.28	89.91 ± 41.17	36.54 ± 16.14	15.04 ± 7.37
Lofoten (n=50)	72.89 ± 8.94	47.23 ± 16.36	22.85 ± 7.53	9.72 ± 3.52

Results

Table 2 present levels of elements in the analysed samples. Content of the heavy metals Cd, Hg, and Pb in pure muscle were well below maximum legal limits (MLL) employed by the NFSA. Measured *in toto*, the level of Cd was up to seven times the MLL. Levels of Pb and Hg were below the MLL measured *in toto*.

Table 2 - Content of elements in whelk soft tissue (mg/kg wet weight)

	Smøla		Frøya		Lofoten		MLL ^{*1}
	muscle	<i>in toto</i>	muscle	<i>in toto</i>	muscle	<i>in toto</i>	
Ag	0.029	0.91	0.011	0.79	0.018	0.99	-
As (Tot)	28	30	46	36	15	21	-
As (Inorganic)	<0.0027	0.27	0.0069	0.010	0.0026	0.019	-
Ba	0.014	0.045	0.011	0.026	0.009	0.043	-
Cd	0.078	4.9	0.055	2.7	0.053	6.9	1.0
Co	0.005	0.093	< 0.004	0.045	0.005	0.11	-
Cu	4.4	7.7	6.1	20	6.2	10	-
Fe	6.1	33	6.8	38	3.8	21	-
Hg	0.042	0.081	0.068	0.11	0.008	0.031	0.5
Mn	0.53	1.0	0.44	0.89	0.44	1.0	-
Mo	< 0.1	0.203	< 0.1	0.13	< 0.08	0.19	-
Pb	0.017	0.11	0.079	0.31	0.007	0.048	1.5
Se	0.27	0.79	0.22	0.53	0.18	0.66	-
Sn	0.004	0.006	0.006	0.018	0.003	0.023	-
Sr	5.2	7.9	6.1	7.6	2.6	5.7	-
V	0.013	0.25	0.018	1.8	0.006	0.084	-
Zn	12	280	11	190	9.6	160	-

^{*1} MLL - Maximum Legal Level employed by NFSA and set for bivalve molluscs in the European Commission Regulation (EC) 1881/2006.

Conclusion

- Preliminary investigation show elevated levels of cadmium in the visceral content which favours processing of whelk and export of muscle from Norway.
- Export of non-processed product by companies should be approved by NFSA and conducted in accordance with the legislation set in the receiving country. Approval from local food safety authority allowing import of whelk with elevated levels of cadmium should be obtained.

On-going and future studies include:

- Fine-scale investigations to survey local variations in cadmium content. Fishing areas with low levels of Cd could allow export of live and non-processed whelk to European and Asian markets, which have an increasing demand for these products.
- Effect of size and age on whelk heavy metal content, and its implications for prospective management (minimum and maximum legal landing size).
- Seasonal variations in heavy metal content.

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