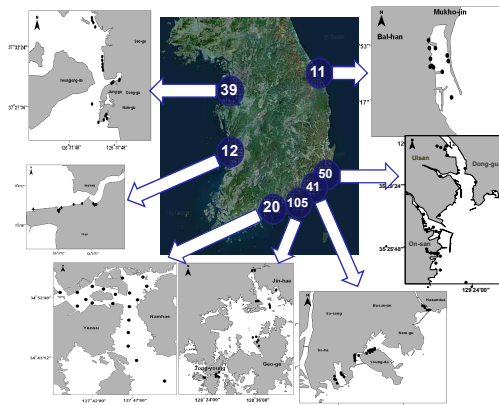


Abstract

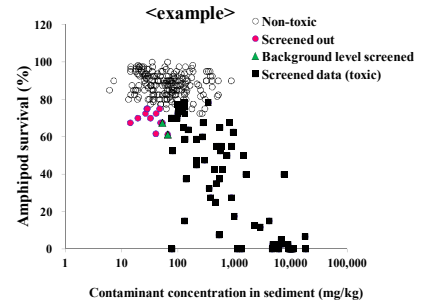
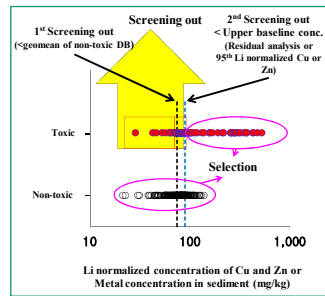
During the recent several decades, the management and control of contaminants in sediments of marine environment have been risen as one of the most important issue for the environmental scientists, industrial engineers, and regulatory authorities. Since there is no standards or guidelines prepared for the sediment contaminants in Korean coasts, several guidelines developed by other countries (such as ERLs, ERM, TELs, PELs) were considered as references for the management of coastal sediments. In 2008, Ministry of Land and Transport and Maritime Affairs in Korea launched a new project to develop marine environmental standards for sediments. For deriving sediment quality guidelines for protection of marine organisms, not only chemical data but also toxicity data should be obtained in parallel. For 278 sediments sampled from coast of Korea, we applied sediment toxicity testing methods previously developed using Korean indigenous species (benthic amphipods, copepods and sea urchin) to the sediment quality assessment and derived new sediment quality guidelines for metals as TEL (threshold effect level) and PEL (probable effect level) with the consideration of regional specificity, grain size characteristics, and background concentrations.

Materials and Methods



- Location map of 278 sampling sites.
- The sampling were conducted from 2009 to 2011.
- Map of Korea displaying the location of sediments sample.
- Each number on map was individuals of sediment samples.
- The numbers pointed out zoom-up the sampling sites.

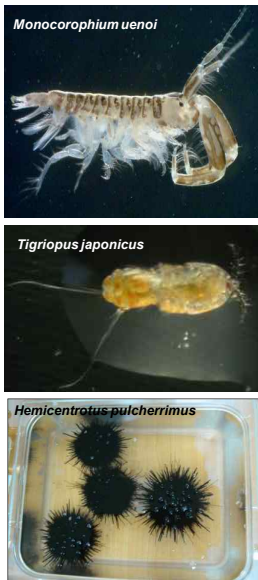
3) Data Analysis



1. Confirm toxic or non-toxic samples.
2. Screen out toxic samples with metal concentration lower than those of non-toxic samples in the same region.
3. Screen out toxic samples below background concentration.
4. Calculation of possible and probable effect ranges from screened database

1) Database Establishment

Test organisms



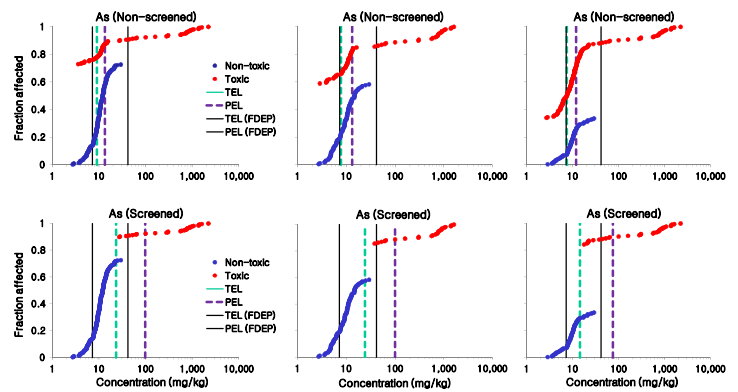
Test method (End-point)

Marine amphipod
10 days acute
sediment toxicity test
(Survival)

Marine copepod
14 days chronic
sediment toxicity test
(Reproduction)

Sea urchin
Pore-water fertilization test
(Fertilization)

Results (Arsenic as an example)



Amphipod Copepod Sea urchin

Minimum value

Unit: mg/kg

Conclusions

Chemicals	Canada		Australia		NOAA		Hong kong		FDEP		This study	
	ISQG	PEL	ISQG-Low	ISQG-High	ERL	ERM	ISQV-Low	ISQV-High	TEL	PEL	TEL	PEL
As	7.24	41.6	20	70	8.2	70	8.2	70	7.24	41.6	14.5	75.5
Cu	18.7	108	65	270	34	270	65	270	18.7	108	50.5 ⁽¹⁾	126 ⁽¹⁾
Cr	52.3	160	80	370	81	370	80	370	52.3	160	88.7 ⁽²⁾	123 ⁽²⁾
Ni	-	-	21	52	20.9	51.6	40	-	15.9	42.8	45.5 ⁽²⁾	62.1 ⁽²⁾
Pb	30.2	112	50	220	46.7	218	75	218	30.2	112	44.0	119
Zn	124	271	200	410	150	410	200	410	124	271	179 ⁽¹⁾	421 ⁽¹⁾
Cd	0.7	4.2	1.5	10	1.2	9.6	1.5	9.6	0.68	4.21	0.75	2.72
Hg	0.13	0.7	0.15	1	0.15	0.71	0.28	1	0.13	0.7	0.11	0.62

ISQG: Interim Sediment Quality Guideline, ISQV: Interim Sediment Quality Value, ERL: Effect Range Low, ERM: Effect Range Median, FDEP: Florida Department of Environmental Protection, TEL: Threshold Effect Levels, PEL: Probable Effect Levels

- 1) Used concentrations of Cu and Zn were normalized by Li concentration
- 2) Cr and Ni are necessary to refine by constructing further sediment toxicity database

Further study

Additional construct DB for Cr, Ni sediment spiking test are necessary.

2) Derivation of SQGs (TEL, PEL)

$$TEL = \sqrt{EDS-L \times NEDS-M}$$

TEL = Threshold effect level
EDS-L = 15th percentile concentration in the effects data set
NEDS-M = 50th percentile concentration in the no effects data set

$$PEL = \sqrt{EDS-M \times NEDS-H}$$

PEL = Probable effect level
EDS-M = 50th percentile concentration in the effects data set (ERM)
NEDS-H = 85th percentile concentration in the no effects data set