



ELSEVIER

Contents lists available at ScienceDirect

Data in brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Mercury concentration data from Matang Mangrove Forest Reserve, Malaysia



Giovanna Wolswijk^{a,*,1}, Behara Satyanarayana^{a,b,**,1},
 Quang Dung Le^b, Yin Fui Siau^b, Ahmad Nazila Bin Ali^b,
 Ibrahim Sunkanmi Saliu^a, Muhammad Amir Bin Fisol^b,
 Cristina Gonnelli^c, Farid Dahdouh-Guebas^{a,d}

^a Systems Ecology and Resource Management, Department of Organism Biology, Faculté des Sciences, Université Libre de Bruxelles (ULB), Avenue F.D. Roosevelt 50, CPi 264/1, B-1050, Bruxelles, Belgium

^b Mangrove Research Unit (MARU), Institute of Oceanography and Environment (INOS), Universiti Malaysia Terengganu (UMT), 21030, Kuala Nerus, Terengganu, Malaysia

^c Laboratorio di Ecologia e Fisiologia Vegetale, Dipartimento di Biologia, Università degli studi di Firenze (UNIFI), Via Micheli 1, 50121, Firenze, Italy

^d Laboratory of General Botany and Nature Management, Biocomplexity Research Focus, Department of Biology, Faculty of Sciences and Bio-engineering Sciences, Vrije Universiteit Brussel (VUB), Campus Oefenplein, VUB-APNA-WE Pleinlaan 2, B-1050, Brussels, Belgium

ARTICLE INFO

Article history:

Received 21 November 2019

Received in revised form 7 December 2019

Accepted 7 January 2020

Available online 14 January 2020

Keywords:

Mangrove sediment

Plant tissue

Fauna

Toxic elements

Pollution

Rhizophora

Hg partitioning

ABSTRACT

This paper presents the results of mercury analysis on 786 abiotic (surface sediments) and biotic (plant and animal tissues) samples collected from 10 sites at Matang Mangrove Forest Reserve in Peninsular Malaysia. Sediment samples were collected at the surface level from both river bank and forest understory. Whereas plant tissues obtained from *Rhizophora apiculata* Blume and *Rhizophora mucronata* L. consisted of leaves (in four stages namely young, mature, senescent and decomposing), bark and roots (divided into xylem, cortex and epidermis), the animal samples were represented by muscle tissue of the gastropod *Cassidula aurisfelis* Bruguière and the cockle *Tegillarca granosa* L. The mercury concentration measurements were obtained through a cold vapor atomic absorption spectrometer. The core data have been

DOI of original article: <https://doi.org/10.1016/j.jhazmat.2019.121665>.

* Corresponding author.

** Corresponding author. Systems Ecology and Resource Management, Department of Organism Biology, Faculté des Sciences, Université Libre de Bruxelles (ULB), Avenue F.D. Roosevelt 50, CPi 264/1, B-1050, Bruxelles, Belgium.

E-mail addresses: giovannawolswijk@gmail.com (G. Wolswijk), satyam@umt.edu.my (B. Satyanarayana).

¹ Co-first authors of this work.

<https://doi.org/10.1016/j.dib.2020.105134>

2352-3409/© 2020 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

analysed and interpreted in the paper “Distribution of mercury in sediments, plant and animal tissues in Matang Mangrove Forest Reserve, Malaysia” [1].

© 2020 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Specifications Table

Subject	Environmental Science
Specific subject area	Pollution
Type of data	Table
How data were acquired	Cold vapor atomic absorption spectrometer (MA-3000 Nippon Instruments Corp., Japan)
Data format	Raw
Parameters for data collection	1. Surface sediment samples from river bank and understory 2. Plant tissue samples from <i>Rhizophora apiculata</i> and <i>R. mucronata</i> leaves (young, mature, senescent and decomposing stages), bark and roots (xylem, cortex and epidermis) 3. Animal muscle tissue samples from <i>Cassidula aurisfelis</i> and <i>Tegillarca granosa</i>
Description of data collection	Both abiotic and biotic samples were collected during June–July 2018 from 10 sites within Kuala Sepetang administrative range of Matang Mangrove Forest Reserve. All biotic samples were first washed with distilled Milli Q water (Millipore Corporation, USA) and then freeze-dried (−40 °C) (LABCONCO Freeze Dry System/Freezezone 4.5) before grinding to fine powder with mortar and pestle. The sediment samples were subjected to manual sieving with 60 µm mesh size. Grounded samples were finally analyzed for mercury concentration with the help of a cold vapor atomic absorption spectrometer (MA-3000 Nippon Instruments Corp., Japan).
Data source location	Kuala Sepetang, Matang Mangrove Forest Reserve, Perak, Malaysia Station 1: N04°50'36.6", E100°38'02.1" Station 2: N04°50'19.2", E100°37'05.8" Station 3: N04°50'24.7", E100°35'38.9" Station 4: N04°51'09.4", E100°33'24.6" Station 5: N04°49'15.1", E100°35'14.8" Station 6: N04°49'32.2", E100°33'39.4" Station 7: N04°48'56.4", E100°37'19.2" Station 8: N04°47'25.3", E100°37'34.6" Station 9: N04°47'59.9", E100°38'41.8" Station 10: N04°45'46.7", E100°36'18.0" Cockle culture: N04°51'29.4", E100°34'43.6"
Data accessibility	With the article
Related research article	Giovanna Wolswijk, Behara Satyanarayana, Le Quang Dung, Yin Fui Siau, Ahmad Nazila Bin Ali, Ibrahim Sunkanmi Saliu, Muhammad Amir Bin Fisol, Cristina Gonnelli, Farid Dahdouh-Guebas, 2019, Distribution of Mercury in sediments, plant and animal tissues in Matang Mangrove Forest Reserve, Malaysia. <i>Journal of Hazardous Materials</i> , https://doi.org/10.1016/j.jhazmat.2019.121665 .

Value of the Data

- The data represents, for the first time, an in-depth analysis of Hg pollution at Matang mangroves in Peninsular Malaysia. The large sample size (n = 786) allows to get reliable information on the distribution of mercury in *Rhizophora* spp.
- The data is beneficial to a wider scientific community as few detailed investigations are available on the subject, making this study a benchmark for future research. In addition, the data enables the scientific and local management community to understand the levels of mercury pollution in one of the longest silviculturally managed mangrove forests in the world.
- At a local scale, the data can help to take necessary measures for controlling/monitoring the pollution (especially of industrial origin) by concerned authorities like National Hydrological Research Institute of Malaysia, Department of Irrigation and Drainage, Forestry Department, etc.
- The present data can be a strong baseline for future studies to define mercury pathways in the mangroves. In addition, the data can be compared with other toxic elements and offer appropriate safety guidelines for the environment as well as the public.
- The collection of 786 samples requires time (sample collection and preparation) and energy (manpower and analyses) that can be saved in the planning for future studies on mercury in Matang by other scientists.

1. Data description

The data reported in Table 1 consists of raw data on mercury concentrations ($n = 786$) obtained from 10 sampling sites at Matang Mangrove Forest Reserve in Peninsular Malaysia, that were analyzed and discussed in the study by Wolswijk et al. [1]. The data are subdivided according to the sampling sites (St 1 to St 10). The Hg concentrations in plant tissues are from *R. apiculata* for all sampling sites except St 4 and St 6 (located seaward side) where *R. mucronata* was collected. The value of mercury concentration in sediments collected from the riverbank and inside the forest is the result of the analysis of 5 replicates each. For mangrove leaves we used 10 replicates for each of the four stages (young, mature, senescent and decomposing) considered, and for bark and root samples 6 replicates. For the xylem tissue, the measurements were repeated twice due to difficulty in obtaining a fine powder from the sample grinding. The gastropod - *Cassidula aurisfelis* samples were analysed in 6 replicates per station (found in St 1 to St 6). The measurement of Hg concentration of 10 samples of the mangrove cockle *Tegillarca granosa*, collected from a cockle culture farm in Sangga Besar River, are reported in Table 2. The data accuracy assessment through recovery of the certified reference materials (CRMs) is reported in Table 3.

2. Experimental design, materials, and methods

At each sampling station, surface sediments (upper 2–5 cm) were collected (with a hand shovel) from both the riverbank (at the water edge) and the inside of the mangrove forest (10–15 m) in 10 replicates, at a distance of 3–5 m following a linear geometry. For the plant tissues, leaves and roots were collected from *Rhizophora apiculata* in all stations except for St 4 and 6, where *R. mucronata* was abundant instead. Samples were taken from ten randomly chosen adult trees inside the forest. Leaf samples were collected in relation to the young, mature, senescent and decomposing stages. Ten replicates were taken per leaf stage per site. Young and mature leaves were hand-collected from the trees, while senescent and decomposing leaves were collected from the forest floor. Root and bark samples were collected (six replicates per station from six different trees) using a knife. Small roots near the sediment surface were targeted for the sampling. The specimens of mangrove gastropod - *Cassidula aurisfelis* were collected manually under the trees selected for plant tissues sampling (St 1 to 6). The edible and economically important mangrove cockles - *Tegillarca granosa* were collected from a cockle culture area in Sangga Besar river. All samples were placed in labeled polythene zip-lock covers and kept in an icebox before transferring to the laboratory for further preservation and analyses.

At the Institute of the Institute of Oceanography and Environment (INOS) laboratory (Universiti Malaysia Terengganu-UMT), sediment samples were put into 15 ml test tubes with a spatula. Samples other than sediments were carefully washed with tap water and then with distilled Milli-Q water (Millipore Corporation, USA) to remove the debris. After washing, 2–6 leaves were pooled together and wrapped in sterile aluminium foil (that was put in furnace at 260 °C for 1 hour to avoid any Hg contamination). Roots were cut with a steel knife and three different tissues were separated per each root sample: epidermis, cortex and xylem. Samples were cut into small pieces and put in 15 ml test tubes.

For gastropods and cockles, the muscle tissue was gently extracted from the shell with aid of tweezers and separated from the visceral tissue. Three gastropods were pooled together in order to get enough material to perform the Hg analysis (for a total of six replicates per station). In the case of cockles two individuals were pooled to make one sample and ten replicates were made. Afterwards the samples were put in 15 ml tubes. For the handling of gastropods and cockles, ethical approval was obtained by the Ethical Biosecurity Committee of the INOS, UMT.

For the drying process all samples were kept in a deep freezer at -80 °C for 48 hours and subsequently put in a freeze dryer (LABCONCO Freeze Dry System/Freezezone 4.5) with pressure lower than 0.133 mBar and temperature of -40 °C for 48–72h. Sediments samples were grinded to fine powder with mortar and pestle, then sieved with 60 μm mesh size, to get homogeneous samples and to separate the sediment particles from other materials (e.g. plant debris). Leaf, root and mollusc samples were grinded with mortar and pestle till a fine powder was obtained. For the

Station 9									
SED IN	SED RB	Y L	M L	S L	D L	B	RE	RC	R X
71.165	64.784	-0.174	21.396	27.32	48.585	2.493	3.747	-0.188	-0.478
68.157	59.296	-0.165	12.983	32.734	19.73	0.48	4.436	0.386	-0.337
58.737	48.058	-0.547	13.697	35.701	33.731	0.843	7.813	-0.545	-0.213
71.934	56.894	-0.544	21.215	28.68	34.918	0.323	5.537	-0.195	-0.32
66.949	67.209	0.531	14.851	30.713	41.228	0.029	5.9	-0.432	-0.606
		0.275	17.5	34.67	36.439	0.657	3.502	-0.289	-0.601
		0.11	23.122	28.09	35.178				-0.29
		1.303	25.673	31.174	38				-0.371
		-0.327	11.116	36.794	32.839				-0.374
		0.023	19.113	27.952	31.446				-0.472
									-0.352
									-0.401
Station 10									
SED IN	SED RB	Y L	M L	S L	D L	B	RE	RC	R X
56.485	45.495	0.633	16.077	39.552	44.158	0.464	2.165	-0.506	-0.474
81.203	43.121	0.078	29.665	34.291	31.068	0.358	2.898	-0.407	-0.376
76.61	84.061	-0.099	36.64	32.969	48.354	2.945	1.426	-0.304	-0.32
82.962	73.026	0.45	27.571	35.381	31.907	0.309	1.814	-0.407	-0.498
79.519	40.92	1.174	23.599	33.94	34.561	0.178	2.928	-0.36	-0.579
		0.487	11.619	35.554	37.925	1.077	2.582	-0.36	-0.586
		0.329	13.381	37.046	41.622				-0.463
		-0.055	20.568	34.96	41.686				-0.387
		0.485	22.94	27.035	33.962				-0.462
		1.336	28.614	27.529	32.838				-0.653
									-0.493
									-0.345

Table 2

Mercury concentration in mangrove cockles - *Tegillarca granosa* L. collected from Matang Mangrove Forest Reserve (raw data from 10 replicates) (S = sample).

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
33.636	29.333	25.37	32.282	21.971	25.249	31.333	29.046	26.267	21.477

xylem samples, it was not possible to get a homogeneous result, so two Hg measurements per sample were taken to validate the data (Table 1). Total Hg concentration was measured with a direct mercury analyser (MA-3000, Nippon Instruments Corporation) with detection limit of 0.02 ng of total Hg. Measurements were done at wavelength of 253.7 nm. Prior to analysis, a calibration curve was made with seven Hg standards (STD) with Hg content from 0 to 100 ng (namely 0, 5, 10, 15, 20, 50 and 100 ng). Linear regression was done with the function “lm” in R software, multiple R^2 was equal to 0.9961 and the p-value was 3.145×10^{-7} .

For the accuracy assessment of the measurements, a STD solution of 0.1 ppb covered with additive B (Nippon Instrument Corporation) and certified reference materials (CRM) were run before and after the samples. For plant tissues and mollusks, the CRM NIST-SRM2976 (freeze-dried mussel tissue) with a concentration of $61.0 (\pm 3.6) \mu\text{g Kg}^{-1}$ was chosen, whereas for sediments the CRM NIST-SRM2702 (marine sediments) with a concentration of $447.4 (\pm 6.9) \mu\text{g Kg}^{-1}$ was used.

Table 3

Data accuracy assessment. Recovery percentage of the CRM NIST-SRM 2976 (freeze-dried mussel tissue) and CRM NIST-SRM2702 (marine sediments).

date	measured value	certified value	recovery %
SRM 2976			
August 02, 2018	59.576	61	97.7
August 05, 2018	58.615	61	96.1
August 06, 2018	57.989	61	95.1
August 07, 2018	62.595	61	102.6
August 08, 2018	63.942	61	104.8
August 09, 2018	59.884	61	98.2
August 12, 2018	57.097	61	93.6
August 13, 2018	60.917	61	99.9
August 14, 2018	52.913	61	86.7
August 15, 2018	55.391	61	90.8
August 16, 2018	57.130	61	93.7
August 17, 2018	57.891	61	94.9
August 19, 2018	58.092	61	95.2
August 20, 2018	49.939	61	81.9
August 20, 2018	53.039	61	86.9
SRM2702			
July 03, 2018	337.381	447.4	75.4
July 03, 2018	455.431	447.4	101.8
July 04, 2018	421.724	447.4	94.3
July 05, 2018	382.092	447.4	85.4
August 17, 2018	568.737	447.4	127.1
August 17, 2018	425.107	447.4	95.0

Acknowledgments

This study was supported by the Erasmus Mundus Master Course in Tropical Biodiversity and Ecosystems TROPIMUNDO and by the Institute of Oceanography and Environment (INOS) of the Universiti Malaysia Terengganu (UMT). The Ethical Biosecurity Committee of the UMT has approved this study prior to fieldwork. The authors are also grateful to the Perak State Forestry Department for their kind permission to conduct this research at Kuala Sepetang. Special thanks are due to the INOS for the lab facilities provided, and to the ULB-SERM and VUB-APNA members for their critical assessment. The research was presented at the Mangrove Macrobenthos and Management meeting (MMM5), 1–5 July 2019 in Singapore.

Competing Interests

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

Reference

- [1] Giovanna Wolswijk, Behara Satyanarayana, Le Quang Dung, Fui Siau Yin, Ahmad Nazila Bin Ali, Ibrahim Sunkanmi Saliu, Muhammad Amir Bin Fisol, Cristina Gonnelli, Farid Dahdouh-Guebas, Distribution of mercury in sediments, plant and animal tissues in Matang mangrove forest Reserve, Malaysia, *J. Hazard Mater.* (2019), <https://doi.org/10.1016/j.jhazmat.2019.121665>.