Data Article

Data on metals (Zn, Al, Sr, and Co) and metalloid (As) concentration levels of ballast water in commercial ships entering Bushehr port, along the Persian Gulf

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A B S T R A C T

In this article, we determined the concentration levels of metals including Zn, Al, Sr, and Co and metalloid of As of ballast water in commercial ships entering Bushehr port, along the Persian Gulf. Ballast water samples were taken from commercial ships entering Bushehr port from 34 ports around the world during 15 February and 25 August 2016. The concentration levels of metals and metalloid were determined by using a graphite furnace absorption spectrometer (AAS).

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### Specifications Table

| Subject area                   | Chemistry                                                                 |
|-------------------------------|---------------------------------------------------------------------------|
| More specific subject area    | Metals and metalloid of ballast water                                   |
| Type of data                  | Table, figure                                                            |
| How data was acquired         | Graphite furnace absorption spectrometer (AAS) method (Varian, SpectrAA 240, Australia). |
| Data format                   | Raw, analyzed                                                            |
| Experimental factors          | Each sample was collected in a 100 ml sterile container, placed in a cooler at –4 °C, and transported to the laboratory in the same day they were obtained from the ships tanker. Samples acidified with nitric acid, and kept for analysis. |
| Experimental features         | Determine the concentration levels of metals including Zn, Al, Sr, and Co and metalloid of As in ballast water in commercial ships entering the Bushehr port. |
| Data source location          | Bushehr harbor, Iran                                                     |
| Data accessibility            | Data is with this article.                                               |

### Value of the data

- Data can be used as a base-line data for metals and metalloid contents in ballast water of commercial ships.
- Data shown here may motivate further studies on evaluate risk associated with ballast water discharge.
- Data show that ballast waters discharged by ship tankers in harbors are the main source of metal contamination for sea waters and coral reef in the discharge areas.
- Data confirmed stricter inspection and supervision as well as permanent monitory program (with respect to ballast water treatment) are necessary for management of ballast water in harbors.

### 1. Data

In the data, as shown in Table 1, the concentration levels of Zn, Al and Co of ballast water in commercial ships ranged from 1.23 to 6.58, 0.74 to 3.8 and 1.49 to 12.3 ppb respectively. The concentration levels of Sr was not detected (ND) in all examined samples. The concentration levels of As ranged from 0.11 to 1.84 ppb. The highest Zn concentration level was 6.58 ppb in sample S6 (Kuwait - Kuwait), whereas the lowest Zn concentration level was 1.23 ppb in sample S17 (Muscat - Oman). The highest and lowest concentration levels of Al were 3.8 and 0.74 ppb in samples S34 (Nagoya - Japan) and S11 (Kandla port - India) respectively. The highest and lowest content levels of Co were 12.3 and 1.49 ppb in samples S22 (Navlakhi - India) and S26 (Salalah - Oman) respectively. Finally, the highest concentration level of As was 1.84 ppb in sample S22 (Navlakhi - India) and the lowest level was 0.11 ppb in sample S12 (Ajman port - Emirate).

### 2. Experimental design, materials and methods

Ballast water samples were taken from commercial ships entering Bushehr port along the Persian Gulf during 15 February and 25 August 2016. Samples were from 34 different ports (see Fig. 1). Each sample was deposited in a 100 ml sterile container, placed in a cooler at –4 °C, and transported to the laboratory at the same day that they were obtained from ship tanker. Samples acidified with nitric acid, and kept for analysis. The concentrations levels of metals and metalloid were determined by using a graphite furnace absorption spectrometer (AAS) method [1] (Varian, SpectrAA 240, Australia).
Table 1
Concentration levels (ppb) of metals (Zn, Al, Sr, and Co) and metalloid (As) in ballast water of commercial ships.

| Samples code | Location of harvesting ballast water | Zn  | Al  | Sr  | Co  | As  |
|---------------|--------------------------------------|-----|-----|-----|-----|-----|
| S1            | Dammam - Saudi Arabia                 | 2.35| 1.23| 0   | 2.12| 0.23|
| S2            | Davao - Philippines                   | 2.45| 1.24| 0   | 2.24| 0.56|
| S3            | Phuket - Thailand                     | 6.33| 1.56| 0   | 3.21| 0.41|
| S4            | Duqm - Oman                           | 2.36| 0.87| 0   | 6.53| 0.26|
| S5            | Jawaharlal Nehru Port - India         | 3.56| 0.89| 0   | 2.35| 0.23|
| S6            | Kuwait - Kuwait                       | 6.58| 2.31| 0   | 4.29| 0.34|
| S7            | Jebel ali-Emirate                     | 2.39| 1.74| 0   | 4.36| 0.25|
| S8            | Mumbai - India                        | 2.47| 1.68| 0   | 5.14| 1.01|
| S9            | Shuwaikh - Kuwait                     | 3.64| 1.88| 0   | 3.23| 0.64|
| S10           | Hamriya - Emirate                     | 3.15| 2.05| 0   | 3.45| 0.33|
| S11           | Kandla port - India                   | 2.09| 0.74| 0   | 2.56| 0.64|
| S12           | Ajman port - Emirate                  | 3.47| 1.93| 0   | 2.87| 0.11|
| S13           | Mina rashid - Emirate                 | 4   | 1.45| 0   | 1.92| 0.75|
| S14           | Singapore - Singapore                 | 1.97| 1.68| 0   | 4.34| 0.64|
| S15           | Port said - Egypt                     | 2.36| 1.37| 0   | 3.17| 0.96|
| S16           | Antwerp- Belgium                      | 2.88| 0.96| 0   | 5.26| 1.09|
| S17           | Muscat- Oman                          | 1.23| 1.23| 0   | 3.31| 1.23|
| S18           | Portsmouth - U.K                      | 3.33| 1.29| 0   | 3.56| 1.23|
| S19           | Basra - Iraq                          | 2.35| 1.78| 0   | 4.56| 0.45|
| S20           | Aden - Yemen                          | 3.21| 1.56| 0   | 8.96| 0.56|
| S21           | Suez - Egypt                          | 5.12| 2.11| 0   | 8.69| 1.56|
| S22           | Navlaki - India                       | 6.35| 2.23| 0   | 12.3| 1.84|
| S23           | Bangkok - Thailand                    | 3.15| 3.11| 0   | 3.39| 0.34|
| S24           | Sohar - Oman                          | 2.94| 2.59| 0   | 3.15| 0.36|
| S25           | Shanghai - Chain                      | 3.47| 3.41| 0   | 2.49| 0.25|
| S26           | Salalah - Oman                        | 2.64| 1.97| 0   | 1.49| 0.19|
| S27           | Laem chabang - Thailand               | 3.35| 1.8  |0   | 4.11| 0.48|
| S28           | Hong kong - Chain                     | 3.16| 2.64| 0   | 3.94| 0.36|
| S29           | Busan - South Korea                   | 3.98| 1.39| 0   | 3.68| 0.27|
| S30           | Shenzhen - Chain                      | 4.15| 1.78| 0   | 2.58| 0.34|
| S31           | Kaohsiung - Taiwan                    | 3.27| 2.41| 0   | 3.47| 0.26|
| S32           | Manila - Philippines                  | 1.67| 2.31| 0   | 4.61| 0.34|
| S33           | Jeddah - Saudi Arabia                 | 3.74| 3.12| 0   | 4.39| 0.18|
| S34           | Nagoya - Japan                        | 3.31| 3.8 | 0   | 3.22| 0.47|

Fig. 1. The geographical location of all ports that their ships arriving in the Bushehr port.
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Transparency document. Supporting information

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Reference

[1] S. Dobaradan, I. Nabipour, R. Saeedi, A. Ostovar, M. Khorsand, N. Khajeahir, R. Hayati, M. Keshtkar, Association of metals (Cd, Fe, As, Ni, Cu, Zn and Mn) with cigarette butts in northern part of the Persian Gulf, Tob. Control (2016) 052931.