



Data Article

Time series data (2008–2023) of polychlorinated dibenzo-p-dioxins, dibenzofurans and polychlorinated biphenyls in bivalves from Shellfish Production Areas of the Basque coast (SE Bay of Biscay)



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ABSTRACT

The accumulation of contaminants in aquatic organisms is of concern to human health due to the potential for exposure through the consumption of seafood. This dataset presents the levels of 17 polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), and 12 dioxin-like polychlorinated biphenyls (DL-PCBs) (PCB-81, PCB-77, PCB-126, PCB-169, PCB-123, PCB-118, PCB-114, PCB-105, PCB-167, PCB-156, PCB-157 and PCB-189) in bivalves collected annually between 2008 and 2023 from the four Shellfish Production Areas of the Basque coast (southeastern Bay of Biscay). Additionally, data on 6 non-dioxin like polychlorinated biphenyls (NDL-PCBs) (PCB-28, PCB-52, PCB-101, PCB-153, PCB-138 and PCB-180) is provided for the 2012–2023 time period. Depending on the availability of bivalves at each Shellfish Production Area, different species, such as mussels (*Mytilus galloprovincialis*) and oysters (*Magallana gigas* and *Ostrea edulis*) were used for the evaluation. Bivalve samples were analyzed at the accredited Laboratory of Dioxins of the Institute of

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Environmental Assessment and Water Research - CSIC in Spain, following standardized methodologies according to the specific requirements established at the corresponding EU Regulation. Concentrations and the World Health Organization-Toxic Equivalents (WHO-TEQ) were calculated. Considering the data from the four Shellfish Production Areas and the study period, WHO-TEQ values ranged from 0.12 to 0.64 pg g^{-1} wet weight for PCDD/Fs and from 0.45 to 2.23 pg g^{-1} wet weight for DL-PCBs, whereas concentrations ranged from 7.45 to 51.10 ng g^{-1} wet weight for NDL-PCBs. This database is useful for (i) assessing the spatial and temporal trends of PCDD/Fs and various PCBs in bivalves from the Basque coast, (ii) determining the relative contribution of different congeners, (iii) comparison with levels for human consumption and environmental quality standards, as well as with levels of other biogeographical areas, and (iv) the management of Shellfish Production Areas on the Basque coast.

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Specifications Table

Subject	Environmental Science / Environmental Chemistry.
Specific subject area	Contaminant monitoring in bivalves from Shellfish Production Areas.
Data format	Raw data.
Type of data	Table.
Data collection	Depending on the Shellfish Production Area, 4 kg of mussels or 6 kg of oysters were collected annually at each station from 2008 to 2023. Bivalves were dissected and the soft tissues were pooled for the analysis of 17 PCDD/Fs, 12 DL-PCBs and 6 NDL-PCBs. PCDD/Fs analysis were performed using an Agilent Technologies 7890A gas chromatograph coupled to a Micromass AutoSpec Premier high resolution mass spectrometer controlled by a Masslynx data system. For DL-PCBs and NDL-PCBs an Agilent Technologies 6890N gas chromatograph coupled to a Micromass AutoSpec-Ultima high resolution mass spectrometer controlled by a Masslynx data system was used.
Data source location	Region: SE Bay of Biscay. Basque coast. Geographical coordinates of the position of the sampling stations of the Shellfish Production Areas in the Basque Country (UTM ETRS89 Zone 30N): <ul style="list-style-type: none"> • Plentzia in the Butroe estuary (UTM 504277, 4805529). • Mundaka-Arketas in the Oka estuary (UTM 525832, 4804747). • Hondarribia in the Bidasoa estuary (UTM 598313, 4801882). • Mendexa in offshore waters of the Basque coast (UTM 544650, 4800332).
Data accessibility [1]	Repository name: Solaun, Oihana; Zorita, Izaskun; Rodríguez, J German; Larreta, Joana; Abad, Esteban; Ábalos, Manuela (2023), "Database of polychlorinated dibenzo-p-dioxins, dibenzofurans and dioxin-like and non-dioxin like polychlorinated biphenyls in bivalves from Shellfish Production Areas in the Basque coast (southeastern Bay of Biscay)", Mendeley Data, V1. Data identification number: 10.17632/dr7y44vrzy.1 Direct URL to data: https://data.mendeley.com/datasets/dr7y44vrzy/1

1. Value of the Data

- Mussels and oysters are used as target species to assess coastal pollution [2]. Thus, long-term data using bivalves as sentinel organisms are essential to define spatial and temporal trends

of contaminants, as well as the relative contribution of different congeners of PCDD/Fs and various PCBs in bivalves from the Basque coast.

- Furthermore, these data can be compared with values obtained in other biogeographical areas, and the distribution of different congeners in different locations can be studied.
- The data presented in this article are important for understanding long-term changes in dioxins and various PCBs concentrations at the base of the food web.
- Environmental pollution researchers, shellfish producers and administrations will benefit from long-term data, as information on contaminant levels is key to assessing the effectiveness of measures taken to reduce human pressure and to ensure food safety in Shellfish Production Areas.
- These data can be compared with maximum levels of certain contaminants in food and elucidate whether bivalves are fit for human consumption or not [3]. In addition, these contaminant levels can be compared with the Environmental Quality Standards set out in the European Directive regarding priority substances in the field of water policy [4].

2. Data Description

Here we provide a dataset of PCDD/Fs and DL-PCBs in bivalves collected annually from 2008 to 2023 in four Shellfish Production Areas on the Basque coast (SE Bay of Biscay). Additionally, NDL-PCBs data are given for the period 2012-2023. The raw data is available at <https://data.mendeley.com/datasets/dr7y44vrzy/1> [1].

The raw data consists of two tables.

- Table PCDD/Fs and DL-PCBs data_2008-2023: Concentrations and WHO-TEQs of 17 PCDD/Fs and 12 DL-PCBs (pg g^{-1} wet weight) determined in bivalves collected annually between 2008 to 2023 in the four Shellfish Production Areas of the Basque coast.
- Table NDL-PCBs data_2012-2023: Concentrations of 6 NDL-PCBs (ng g^{-1} wet weight) determined in bivalves collected annually between 2012 and 2023 in the four Shellfish Production Areas of the Basque coast.

The PCDD/Fs and DL-PCBs expressed in WHO-TEQs were determined using World Health Organization Toxicity Equivalency Factors (WHO-TEFs) revised in 2005 according to [5].

The full name and abbreviations of each substance are given on a separate sheet in each table.

3. Experimental Design, Materials and Methods

3.1. Sampling

The study was conducted annually in spring between 2008 and 2023 in the three estuarine Shellfish Production Areas of the Basque coast (Fig. 1), while in the offshore Shellfish Production Area, samples were also collected in spring, but the survey ran from 2013 to 2023, as monitoring started later. In the estuarine areas (Plentzia, Mundaka-Arketas and Hondarribia) bivalves were sampled at low tide, while in the offshore zone (Mendexa) bivalves were collected by scuba divers.

Depending on the availability of bivalves, different species were collected each year in each Shellfish Production Area (Table 1).

At each station, 4 kg of mussels (*Mytilus galloprovincialis*) or 6 kg of oysters (*Magallana gigas* or *Ostrea edulis*) were obtained and shipped refrigerated without purification to the accredited Laboratory of Dioxins of the Institute of Environmental Assessment and Water Research - CSIC for the analysis of 35 substances. It should be noted that PCDD/Fs and DL-PCBs started to be measured from 2008, whereas NDL-PCBs started to be determined from 2012 (Table 2).

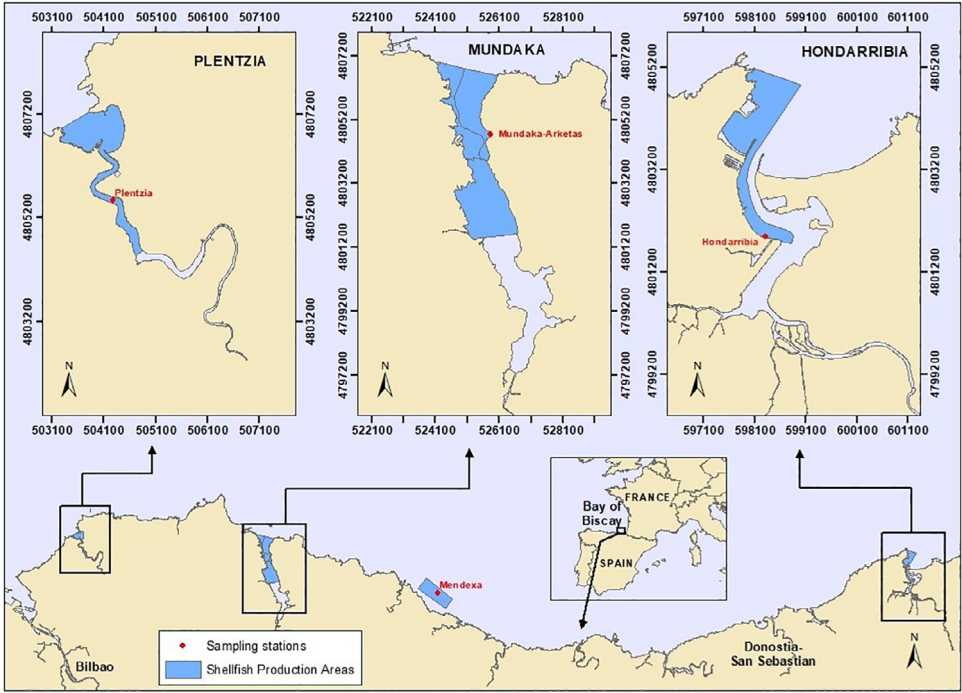


Fig. 1. Location of Shellfish Production Areas of the Basque Country and sampling stations in each of them.

Table 1

Bivalve type used each year at each sampling station for dioxins and PCBs chemical analysis.

Year	Sampling stations			
	Plentzia	Mundaka-Arketas	Hondarrabia	Mendexa
2008	Mussel	Pacific oyster	Mussel	No data
2009	Pacific oyster	Pacific oyster	Mussel	No data
2010	Mussel	Pacific oyster	Mussel	No data
2011	Mussel	Pacific oyster	Mussel	No data
2012	Mussel	Pacific oyster	Mussel	No data
2013	Mussel	Pacific oyster	Mussel	Mussel
2014	Mussel	Pacific oyster	Mussel	No data
2015	Mussel	Pacific oyster	Mussel	European oyster
2016	Mussel	Pacific oyster	Mussel	Mussel
2017	Mussel	Pacific oyster	Mussel	Mussel
2018	Mussel	Pacific oyster	Mussel	Mussel
2019	Mussel	Pacific oyster	Mussel	Mussel
2020	Mussel	Pacific oyster	Mussel	Mussel
2021	Mussel	Pacific oyster	Pacific oyster	Mussel
2022	Mussel	Pacific oyster	Pacific oyster	Mussel
2023	Pacific oyster	Pacific oyster	Pacific oyster	Mussel

3.2. Sample preparation

Prior to the analyses individual specimens were thawed and carefully opened with a scalpel. The soft tissue was removed and placed in an aluminium foil tray. One pool sample was prepared for each station and year. Tissues were frozen and freeze dried. Afterwards dry samples were ground and homogenized.

Table 2

List of substances measured in bivalve's fresh tissue and study period.

Group of contaminant and study period	Isomer abbreviation	Isomer name	
PCDDs (2008-2023)	2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin	
	1,2,3,7,8-PeCDD	1,2,3,7,8-pentachlorodibenzo-p-dioxin	
	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	
	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	
	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	
	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	
	OCDD	octachlorodibenzo-p-dioxin	
	PCDFs (2008-2023)	2,3,7,8-TCDF	2,3,7,8-tetrachlorodibenzofuran
		1,2,3,7,8-PeCDF	1,2,3,7,8-pentachlorodibenzofuran
		2,3,4,7,8-PeCDF	2,3,4,7,8-pentachlorodibenzofuran
1,2,3,4,7,8-HxCDF		1,2,3,4,7,8-hexachlorodibenzofuran	
1,2,3,6,7,8-HxCDF		1,2,3,6,7,8-hexachlorodibenzofuran	
2,3,4,6,7,8-HxCDF		2,3,4,6,7,8-hexachlorodibenzofuran	
1,2,3,7,8,9-HxCDF		1,2,3,7,8,9-hexachlorodibenzofuran	
1,2,3,4,6,7,8-HpCDF		1,2,3,4,6,7,8-heptachlorodibenzofuran	
1,2,3,4,7,8,9-HpCDF		1,2,3,4,7,8,9-heptachlorodibenzofuran	
OCDF		octachlorodibenzofuran	
DL-PCBs (2008-2023)	PCB-81	3,4,4',5'-tetrachlorobiphenyl	
	PCB-77	3,3',4,4'-tetrachlorobiphenyl	
	PCB-126	3,3',4,4',5'-pentachlorobiphenyl	
	PCB-169	3,3',4,4',5,5'-hexachlorobiphenyl	
	PCB-123	2,3',4,4',5'-pentachlorobiphenyl	
	PCB-118	2,3',4,4',5'-pentachlorobiphenyl	
	PCB-114	2,3,4,4',5'-pentachlorobiphenyl	
	PCB-105	2,3,3',4,4'-pentachlorobiphenyl	
	PCB-167	2,3',4,4',5,5'-hexachlorobiphenyl	
	PCB-156	2,3,3',4,4',5'-hexachlorobiphenyl	
	PCB-157	2,3,3',4,4',5'-hexachlorobiphenyl	
	PCB-189	2,3,3',4,4',5,5'-heptachlorobiphenyl	
	NDL-PCBs (2012-2023)	PCB-28	2,4,4'-trichlorobiphenyl
		PCB-52	2,2',5,5'-tetrachlorobiphenyl
PCB-101		2,2',4,5,5'-pentachlorobiphenyl	
PCB-153		2,2',4,4',5,5'-hexachlorobiphenyl	
PCB-138		2,2',3,4,4',5'-hexachlorobiphenyl	
PCB-180		2,2',3,4,4',5,5'-heptachlorobiphenyl	

3.3. PCDD/Fs, DL-PCBs and NDL-PCBs analysis

For the analysis of PCDD/Fs and DL-PCBs 10-15 g of dry sample were used, while for the analysis of NDL-PCBs 3-5 g of dry sample were used. The analysis of PCDD/Fs, DL-PCBs and NDL-PCBs was carried out following standardized methodologies laid down in the corresponding EU Regulation [6] and described in detail in [7]. Results were expressed in pg WHO-TEQ g⁻¹ ww for PCDD/Fs and DL-PCBs, and in ng g⁻¹ ww for NDL-PCBs. Values were calculated in upperbound, i.e., assuming that all values lower than the detection limit are equal to this limit.

Limitations

It has not been possible to find the same type of bivalve in all Shellfish Production Areas, so for the comparison of contaminants between areas, it is necessary to take into account the type of bivalve used. On the other hand, in recent years it has been difficult to obtain indigenous mussels, so the study has shifted almost exclusively to Pacific oysters. This phenomenon is becoming increasingly frequent on the Basque coast.

Ethics Statement

The authors state that our survey on aquatic invertebrates do not refer to the objectives of the “EU Directive 2010/63/EU on the protection of animals used for scientific purposes”, based on Article 1(3).

Data Availability

[Long-term data of dioxins and PCBs in the Basque coast in \(Original data\)](#) (Mendeley Data).

CRediT Author Statement

Izaskun Zorita: Conceptualization, Data curation, Visualization, Writing – original draft; **Oihana Solaun:** Conceptualization, Formal analysis, Project administration, Supervision, Writing – review & editing, Funding acquisition; **José Germán Rodríguez:** Conceptualization, Methodology, Writing – review & editing; **Joana Larreta:** Investigation, Validation, Methodology, Writing – review & editing; **Esteban Abad:** Methodology, Data curation, Writing – review & editing; **Manuela Ábalos:** Methodology, Data curation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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