

Table S1. Columns of the database [modified from [1]. Yellow rows were added in this study].

Name of the column	Description of the parameter
id	Unique identifier
country	The jurisdictional water where sampling took place
location	The specific location of sampling
fao_division	Code of FAO fishing division
sea	Sea where sampling took place
lat	Latitude (decimal degrees) of the site
lon	Longitude (decimal degrees) of the site
geog_prec	The accuracy of geographical coordinates (<i>see Table: geog_prec</i>)
class	Taxonomic class
order	Taxonomic order
family	Taxonomic family
spec_name_s	Scientific name of the species
spec_name_c	Common name of the species
spec_code	Code of the species: three first letters of genus and species
mar_habit	Habitat of the species
troph_lev	Decimal number of position that an individual occupies compared to the basic trophic level represented by autotrophs
troph_lev_r	Source of trophic level (<i>see Table: troph_lev_r</i>)
depth_m	Depth of sampling in meters
length_cm	Length of sample in centimetres
weight_g	Weight of sample in grammes
age_y	Age of the organism in years
sex	Sex of the organism
tissue_code	Code of the studied tissue (<i>see Table: tissue_code</i>)
pah	PAH analysed (<i>see Table: PAH</i>)
pah_molecular_weight	Molecular weight of analysed PAHs (<i>see Table: Molecular weight</i>)
pah_origin	Origin of analysed PAHs
DW_FW_WW	Water content of the sample as reference to PAHs (<i>see Table: DW_FW_WW</i>).
LOQ_mg_kg	Limit of quantification in mg/kg
LOD_mg_kg	Limit of detection in mg/kg
mea_mg_kg_orig	Mean PAH concentration in mg/kg
mea_mg_kg_derived	Mean PAH concentration in mg/kg converted in WW (wet weight)
min_mg_kg	Minimum PAH concentration in mg/kg
max_mg_kg	Maximum PAH concentration in mg/kg
sample_size	Number of samples
period	When samples were collected
samp_date	Date of sampling
season	Season in which sampling took place (seasons were defined based on water temperature).
wild_farmed_transplanted	State of the organism
ref_source	Reference to the original document reporting the data
yr_ref	Publication year
yr_samp	Year in which sampling was carried out
ref_num	Progressive number of the reference
THQ_mean_orig	Target hazard quotient (calculated from mea_mg_kg_orig) (<i>see Table: indices and formulas</i>)
THQ_mean_derived	Target hazard quotient (calculated from mea_mg_kg_derived) (<i>see Table: indices and formulas</i>)
THQ_min	Target hazard quotient (calculated from min_mg_kg) (<i>see Table: indices and formulas</i>)

THQ_max	Target hazard quotient (calculated from max_mg_kg) (<i>see Table: indices and formulas</i>)
ELCR	Cancer risk (<i>see Table: indices and formulas</i>)
species_IR_kg/day	Food ingestion rate in kg/day (FAOSTAT, 2018)
RFD_mg/kg/day	Oral reference dose for PAH (https://cfpub.epa.gov/ncea/iris/search/index.cfm - accessed on 01 December 2021)
CSF_mg/kg-day	Cancer slope factor for PAH (https://oehha.ca.gov/chemicals - accessed on 01 December 2021)
remarks	Optional remarks on the record
EF_day/yr	Frequency of exposure to PAH in day per year
ED_yr	Duration of exposure to PAH in year (average life expectancy in Italy – ISTAT, 2019)
BW_kg	Body weight in kg (average body weight in Italy – ANSA, 2013)
AT	Average exposure time for non-carcinogens

Table S2. Geographic precision code used in the database [from [1]].

Location precision	Provided location info	Description
1	Specific latitude/longitude	Exact latitude/longitude provided in literature.
2	Specific description	Able to approximate latitude/longitude with specific site location information; match geographic features on provided map with Google Earth, or name of small area is given (e.g. city, small bay, cove) in literature.
3	Less Specific: <250 km	No latitude/longitude, or specific site location information as described above. Provided with a water body title (i.e. sound, bay, gulf, etc.) or description of region with a distance across of <250 km.
4A	Specific: <500 km	Latitude/longitude or specific site location information given for multiple sites, with single mean PAH value reported across all sites. Furthest sampling locations are <500 km apart.
4B	Vague: <500 km	No latitude/longitude, or specific site location information. Estimated sampling area based on literature description is <500 km across.
5A	Specific: <1,000 km	Latitude/longitude or specific site location information given for multiple sites, with single mean PAH value reported across all sites. Furthest sampling locations are 500–1,000 km apart.
5B	Vague: <1,000 km	No latitude/longitude, or specific site location information. Estimated sampling area based on literature description is 500–1,000 km across.
6A	Specific: >1,000 km	Latitude/longitude or specific site location information given for multiple sites, with single mean PAH value reported across all sites. Furthest sampling locations are >1,000 km apart.

Table S3. Sources of the trophic levels of the organisms included in the database.

Code	Source of trophic level
FB	FishBase (https://www.fishbase.se/search.php)
SLB	SeaLifeBase (https://sealifebase.ca/)

Table S4. Tissues codes used in the database (modified from [1]).

Code	Tissue
APP	Appendages (Crustaceans)
FI	Fillet (fish)
FL	Flesh
GI	Gills
GO	Gonads (sex indeterminate)
LI	Liver
MU	Muscle (mixed, undetermined)
SK	Skin
SO	Soft part (whole body without carapace or shell)
WH	Whole body

Table S5. PAHs included in the database.

Code	PAH species
1MeNap	1-MeNaphthalene
2MeNap	2-MeNaphthalene
5MC	5-Methylchrysene
Ace	Acenaphthene
Acy	Acenaphthylene
Ant	Anthracene
BaA	Benzo(a)anthracene
BaP	Benzo(a)pyrene
BF	Benzo(b)fluoranthene+Benzo(j)fluoranthene+Benzo(k)fluoranthene
BaF	Benzo(a)fluoranthene
BbF	Benzo(b)fluoranthene
BeP	Benzo(e)pyrene
BghiFlu	Benzo[ghi]fluoranthene
BghiP	Benzo(g,h,i)perylene
BkF	Benzo(k)fluoranthene
C1Nap	C1-Naphthalene
C2Nap	C2-Naphthalene
C3Nap	C3-Naphthalene
C1Phe	C1-Phenanthrene
C2Phe	C2-Phenanthrene
CcdPyr	Cyclopenta(cd)pyrene
Chr	Chrysene
Da	Dibenzo(a,h)anthracene+Dibenzo(a,c)anthracene
DaeP	Dibenzo(a,e)pyrene
DahA	Dibenzo(a,h)anthracene
DahP	Dibenzo(a,h)pyrene
DaiP	Dibenzo(a,i)pyrene
DalP	Dibenzo(a,l)pyrene
Fl	Fluorene
Flu	Fluoranthene
InP	Indeno(1,2,3-cd)pyrene
Nap	Naphthalene
Per	Perylene
Phe	Phenanthrene
Pyr	Pyrene
Try	Triphenylene

HMW-PAHs	BaA+BaP+BbF+BghiP+BkF+Chr+DahA+InP
LMW-PAHs	Ace+Acy+Ant+Fl+Nap+Phe
MMW-PAHs	Flu+Pyr
PAH16	Ace+Acy+Ant+Fl+Nap+Phe+Flu+Pyr+BaA+BaP+BbF+BghiP+BkF+Chr+DahA+InP
PAH4	BaA+BaP+BbF+Chr
PAH5	BaA+5MC+BbF+BkF+DahA+InP
PAH6	Chr+DalP+DaeP+DaiP+DahP

Table S6. PAHs molecular weight abbreviations used in the database.

Code	Molecular weight
LMW	Low molecular weight (Ace+Acy+Ant+Fl+Nap+Phe)
MMW	Medium molecular weight (Flu+Pyr)
HMW	High molecular weight (BaA+BaP+BbF+BghiP+BkF+Chr+DahA+InP)

Table S7. water content abbreviations used in the database.

Code	Water content
DW	Dry weight
FW	Fresh weight
WW	Wet weight

Table S8. Indices and formulas included in the database.

Parameter	Description	Formula
THQ	Target hazard quotient; it indicates the ratio between exposure and the reference dose. When THQ risk is above 1, it means that THQ is higher than the reference dose, and systemic effects may occur [2].	$\text{THQ} = \text{EF (day/yr)} \times \text{ED (yr)} \times \text{IR (kg/day)} \times \text{C (mg/kg)} \div \text{RFD (mg kg}^{-1} \text{ day)} \times \text{BW (kg)} \times \text{AT}$ <p>Where EF is frequency of exposure to PAH in day per year, ED the duration of exposure to PAH in year, IR the food ingestion rate in kg/day, C the PAH concentration, RFD the oral reference dose for PAH, BW the body weight, and AT the average exposure time for non-carcinogens</p>
ELCR	Excess Lifetime Cancer risk; if ELCR is above the acceptable lifetime risk (ALR) of 10^{-5} , threshold value considered by the US-EPA [3], it indicates a probability greater than 1 chance over 100,000 of an individual of developing cancer [2].	$\text{ELCR} = \text{EF (day/yr)} \times \text{ED (yr)} \times \text{IR (kg/day)} \times \text{CSF (mg kg}^{-1} \text{ day)} \div \text{BW (kg)} \times \text{AT}$ <p>Where EF is frequency of exposure to PAH in day per year, ED the duration of exposure to PAH in year, IR the food ingestion rate in kg/day, CSF the cancer slope factor for PAH, BW the body weight, and AT the average exposure time for non-carcinogens</p>

Table S9. Pairwise comparisons between the three PAHs classes in Mediterranean mussel, using Wilcoxon rank sum test. P-value adjustment method: Benjamini-Hochberg.

	HMW	LMW
LMW	0.024	-
MMW	2.00E-16	2.00E-16

Table S10. Pairwise comparisons between the three PAHs classes in Manila clam, using Wilcoxon rank sum test. P-value adjustment method: Benjamini-Hochberg.

	HMW	LMW
LMW	0.0058	-
MMW	2.00E-16	2.00E-16

Table S11. Pairwise comparisons between the three PAHs classes in common sole, using Wilcoxon rank sum test. P-value adjustment method: Benjamini-Hochberg.

	HMW	LMW
LMW	4.4E-12	-
MMW	3.90E-15	7.40E-06

Table S12. Pairwise comparisons between the three PAHs classes in red mullet, using Wilcoxon rank sum test. P-value adjustment method: Benjamini-Hochberg.

	HMW	LMW
LMW	0.0000087	-
MMW	2.20E-05	8.70E-01

Table S13. Comparison between mean concentrations measured in cold and warm months in Mediterranean mussel, using Wilcoxon rank sum test with continuity correction.

	W	p-value
LMW	466928	0.6573
MMW	116590	0.02062
HMW	1966608	0.001802

Table S14. Comparison between mean concentrations measured in cold and warm months in Mediterranean mussel, controlling for the effect of sampling depth and sampling year with ANCOVA.

	h	p-value
LMW	61.9416	0.1644
MMW	61.7926	0.0187
HMW	61.1097	0.0288

Table S15. Comparison between mean concentrations measured in cold and warm months in Manila clam, using Wilcoxon rank sum test with continuity correction.

	W	p-value
LMW	14460	0.04262
MMW	3338	7.379e-08
HMW	39859	0.0001512

Table S16. Comparison between mean concentrations measured in cold and warm months in Manila clam, controlling for the effect of sampling year with ANCOVA.

	h	p-value
LMW	0.72895	0.0409
MMW	0.745463	0
HMW	0.73026	0.2377

Table S17. Comparison between mean concentrations measured in cold and warm months in red mullet, using Wilcoxon rank sum test with continuity correction.

	W	p-value
LMW	69	0.2488
MMW	34	0.7172
HMW	201	0.4702

Table S18. Comparison between mean concentrations measured in cold and warm months in red mullet, controlling for the effect of sampling year with ANCOVA.

	h	p-value
LMW	0.623478	0.9996
MMW	0.654525	0.9783
HMW	1.16508	0.9969

Table S19. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and LMW PAHs concentrations in Mediterranean mussel caught along the Italian coast of the Adriatic Sea in warm months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.2214401 (1.99E-08)	-0.1067694 (6.81E-03)	-0.2075656 (1.43E-07)
Depth	0.2214401 (1.99E-08)	1	-0.1468864 (1.97E-04)	-0.1673262 (2.22E-05)
Concentration	-0.1067694 (6.81E-03)	-0.1468864 (1.97E-04)	1	0.2517786 (1.75E-10)
Sampling year	-0.2075656 (1.43E-07)	-0.1673262 (2.22E-05)	0.2517786 (1.75E-10)	1

Table S20. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and LMW PAHs concentrations in Mediterranean mussel caught along the Italian coast of the Adriatic Sea in cold months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.2099184 (2.87E-05)	0.1953428 (9.89E-05)	-0.053704 (2.84E-01)
Depth	0.20991836 (2.87E-05)	1	-0.116066 (2.07E-02)	0.2860409 (1.19E-08)
Concentration	0.19534281 (9.89E-05)	-0.116066 (2.07E-02)	1	-0.1415952 (4.77E-03)
Sampling year	-0.05370396 (2.84E-01)	0.2860409 (1.19E-08)	-0.1415952 (4.77E-03)	1

Table S21. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and MMW PAHs concentrations in Mediterranean mussel caught along the Italian coast of the Adriatic Sea in warm months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.4098711 (3.81E-12)	-0.12992433 (2.77E-02)	-0.3046016 (2.46E-07)
Depth	0.4098711 (3.81E-12)	1	-0.09531347 (1.06E-01)	0.1020633 (8.38E-02)
Concentration	-0.1299243 (2.77E-02)	-0.0953135 (1.06E-01)	1	0.3661233 (5.55E-10)
Sampling year	-0.3046016 (2.46E-07)	0.1020633 (8.38E-02)	0.36612335 (5.55E-10)	1

Table S22. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and MMW PAHs concentrations in Mediterranean mussel caught along the Italian coast of the Adriatic Sea in cold months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.2395307 (9.79E-05)	0.10764629 (8.00E-02)	0.0331474 (5.90E-01)
Depth	0.23953068 (9.79E-05)	1	-0.16939674 (5.87E-03)	0.2114675 (5.83E-04)
Concentration	0.10764629 (8.00E-02)	-0.1693967 (5.87E-03)	1	-0.0949106 (1.23E-01)
Sampling year	0.03314738 (5.90E-01)	0.2114675 (5.83E-04)	-0.09491059 (1.23E-01)	1

Table S23. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and HMW PAHs concentrations in Mediterranean mussel caught along the Italian coast of the Adriatic Sea in warm months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.1933501 (1.77E-09)	-0.3103082 (4.55E-22)	-0.3611953 (2.55E-29)
Depth	0.1933501 (1.77E-09)	1	-0.3632558 (1.23E-29)	-0.002299 (9.43E-01)
Concentration	-0.3103082 (4.55E-22)	-0.3632558 (1.23E-29)	1	0.1852465 (8.14E-09)
Sampling year	-0.3611953 (2.55E-29)	-0.002299 (9.43E-01)	0.1852465 (8.14E-09)	1

Table S24. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and HMW PAHs concentrations in Mediterranean mussel caught along the Italian coast of the Adriatic Sea in cold months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.2734209 (1.05E-14)	0.1531073 (1.49E-05)	0.0376332 (2.87E-01)
Depth	0.27342088 (1.05E-14)	1	-0.1228886 (5.10E-04)	0.3005424 (1.89E-17)
Concentration	0.1531073 (1.49E-05)	-0.1228886 (5.10E-04)	1	-0.2381534 (1.63E-11)
Sampling year	0.03763318 (2.87E-01)	0.3005424 (1.89E-17)	-0.2381534 (1.89E-17)	1

Table S25. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and LMW PAHs concentrations in Mediterranean mussel caught in the Tyrrhenian Sea in warm months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	-0.0116240 (6.47E-01)	0.1371445 (6.31E-08)	0.1379185 (5.32E-08)
Depth	-0.0116240 (6.47E-01)	1	-0.0714831 (4.81E-03)	0.4558116 (2.82E-72)
Concentration	0.1371445 (6.31E-08)	-0.0714831 (4.81E-03)	1	0.3715108 (1.27E-48)
Sampling year	0.1379185 (5.32E-08)	0.4558116 (2.82E-72)	0.3715108 (1.27E-48)	1

Table S26. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and LMW PAHs concentrations in Mediterranean mussel caught in the Tyrrhenian Sea in cold months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.1472713 (8.62E-04)	0.16273394 (2.31E-04)	-0.0651628 (1.40E-01)
Depth	0.14727134 (8.62E-04)	1	0.23318093 (1.32E-07)	0.6546738 (1.21E-49)
Concentration	0.16273394 (2.31E-04)	0.2331809 (1.32E-07)	1	0.0800257 (7.02E-02)
Sampling year	-0.06516283 (1.40E-01)	0.6546738 (1.21E-49)	0.08002572 (7.02E-02)	1

Table S27. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and MMW PAHs concentrations in Mediterranean mussel caught in the Tyrrhenian Sea in warm months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	-0.0296697 (4.52E-01)	0.01640707 (6.78E-01)	0.2234357 (1.48E-08)
Depth	-0.02966968 (4.52E-01)	1	-0.10472471 (7.94E-03)	0.4848167 (1.05E-34)
Concentration	0.01640707 (6.78E-01)	-0.1047247 (7.94E-03)	1	0.4008783 (2.97E-24)
Sampling year	0.22343568 (1.48E-08)	0.4848167 (1.05E-34)	0.40087834 (2.97E-24)	1

Table S28. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and MMW PAHs concentrations in Mediterranean mussel caught in the Tyrrhenian Sea in cold months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.161335 (1.63E-02)	0.05308233 (4.29E-01)	-0.0457437 (4.96E-01)
Depth	0.16133503 (1.63E-02)	1	-0.05844194 (3.84E-01)	0.5788286 (6.65E-18)
Concentration	0.05308233 (4.29E-01)	-0.0584419 (3.84E-01)	1	0.4838851 (5.73E-13)
Sampling year	-0.0457437 (4.96E-01)	0.5788286 (6.65E-18)	0.48388511 (5.73E-13)	1

Table S29. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and HMW PAHs concentrations in Mediterranean mussel caught in the Tyrrhenian Sea in warm months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	-0.0867506 (3.25E-06)	0.16533876 (7.23E-19)	0.2181361 (1.21E-31)
Depth	-0.08675057 (3.25E-06)	1	0.02674539 (1.51E-01)	0.4469051 (4.63E-127)
Concentration	0.16533876 (7.23E-19)	0.0267454 (1.51E-01)	1	0.3557125 (3.31E-81)
Sampling year	0.21813614 (1.21E-31)	0.4469051 (4.63E-127)	0.35571249 (3.31E-81)	1

Table S30. Pairwise correlation coefficients with p-values (among brackets) between latitude, sampling depth and sampling year and HMW PAHs concentrations in Mediterranean mussel caught in the Tyrrhenian Sea in cold months.

	Latitude	Depth	Concentration	Sampling year
Latitude	1	0.2924779 (5.40E-20)	0.09727089 (2.33E-03)	-0.1382466 (1.51E-05)
Depth	0.29247791 (5.40E-20)	1	0.11188986 (4.61E-04)	0.6133932 (3.60E-82)
Concentration	0.09727089 (2.33E-03)	0.1118899 (4.61E-04)	1	0.2618919 (2.44E-16)
Sampling year	-0.1382466 (1.51E-05)	0.6133932 (3.60E-82)	0.2618919 (2.44E-16)	1

Figure S1. Geographical distributions of sampling sites of Mediterranean mussel caught along the Italian coast of the Adriatic Sea in warm months.



Figure S2. Geographical distributions of sampling sites of Mediterranean mussel caught along the Italian coast of the Adriatic Sea in cold months.



Figure S3. Geographical distributions of sampling sites of Mediterranean mussel caught in the Tyrrhenian Sea in warm months.

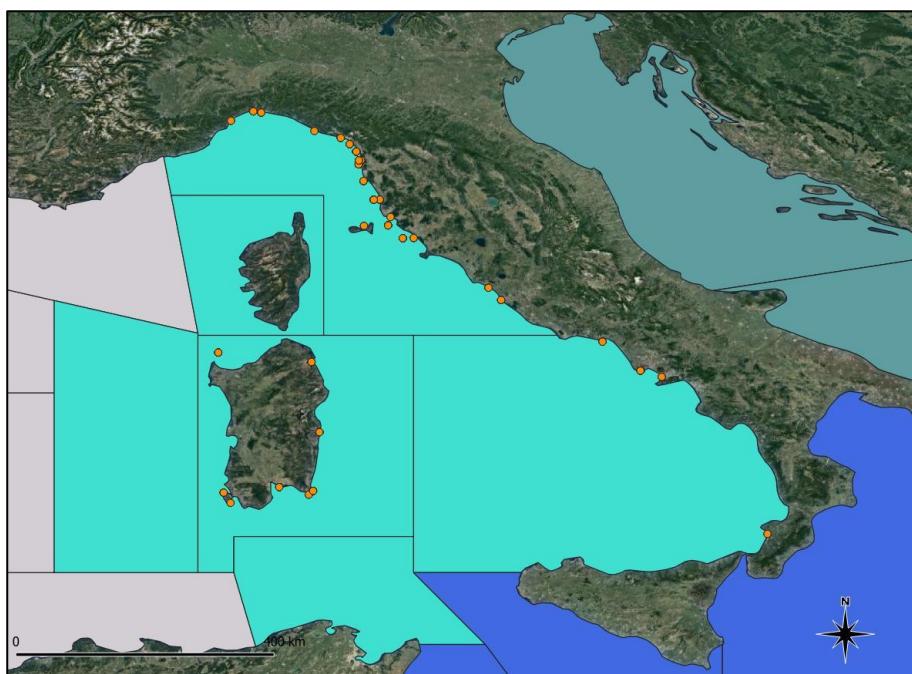


Figure S4. Geographical distributions of sampling sites of Mediterranean mussel caught in the Tyrrhenian Sea in cold months.

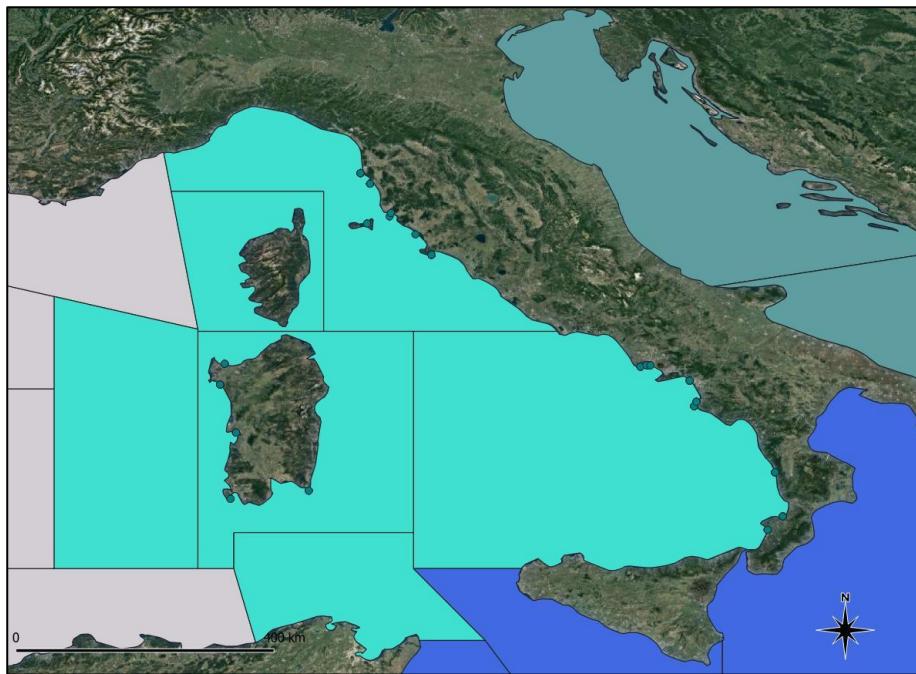


Figure S5. Boxplots of the concentration of single PAHs in Mediterranean mussel. The color of the boxes indicates the molecular weight of the given PAH. Boxplots are arranged in ascending order by median.

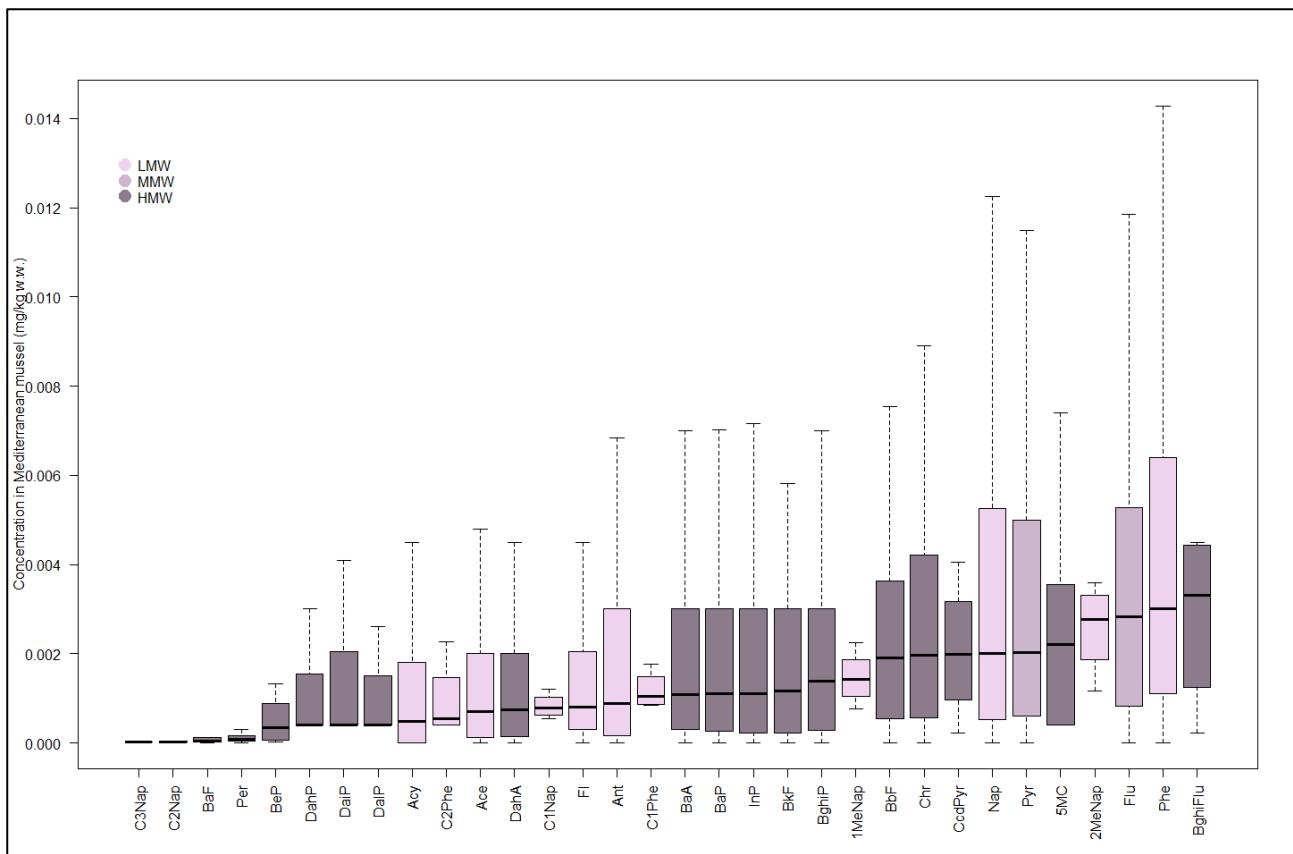
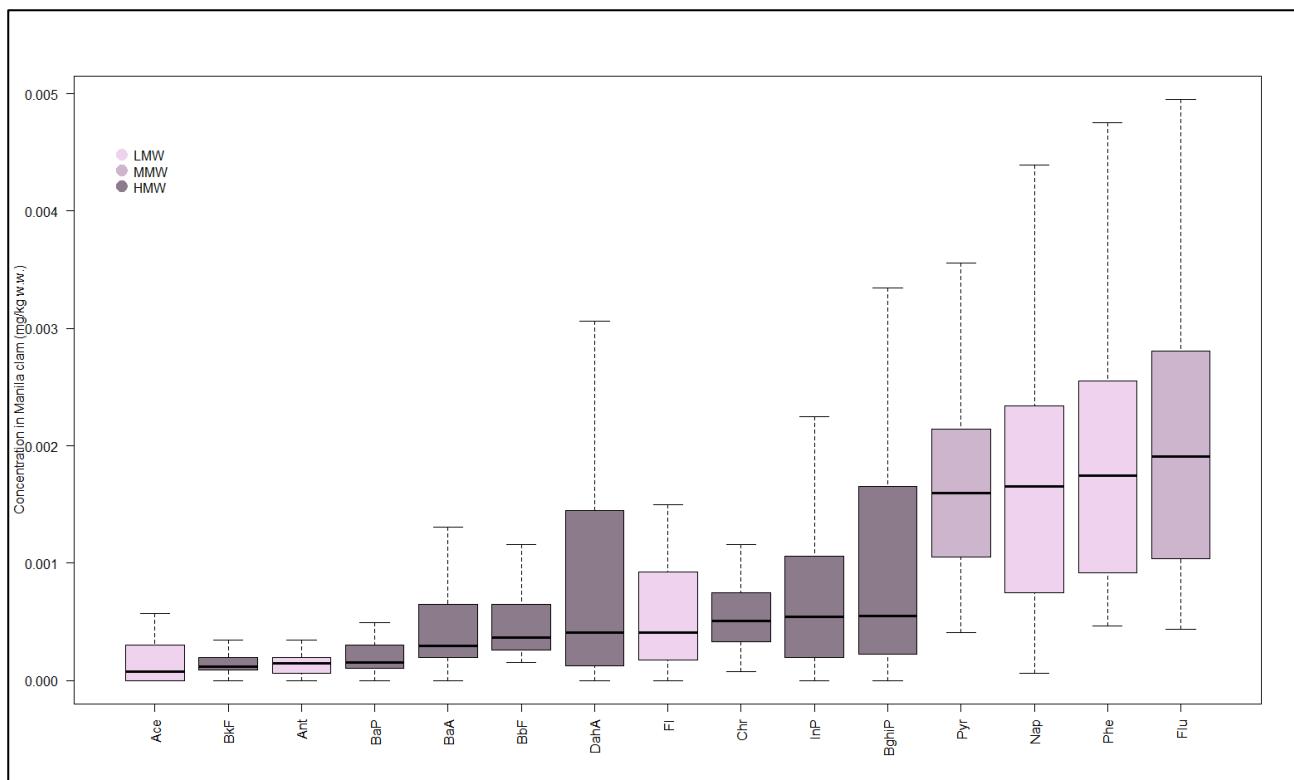


Figure S6: Boxplots of the concentration of single PAHs in Manila clam. The color of the boxes indicates the molecular weight of the given PAH. Boxplots are arranged in ascending order by median.



References:

1. Cinnirella, S.; Bruno, D.E.; Pirrone, N.; Horvat, M.; Živković, I.; Evers, D.C.; Johnson, S.; Sunderland, E.M. Mercury Concentrations in Biota in the Mediterranean Sea, a Compilation of 40 Years of Surveys. *Sci. Data* **2019**, *6*, 205, doi:10.1038/s41597-019-0219-y.
2. Ferrante, M.; Zanghì, G.; Cristaldi, A.; Copat, C.; Grasso, A.; Fiore, M.; Signorelli, S.S.; Zuccarello, P.; Oliveri Conti, G. PAHs in Seafood from the Mediterranean Sea: An Exposure Risk Assessment. *Food Chem. Toxicol.* **2018**, *115*, 385–390, doi:10.1016/j.fct.2018.03.024.
3. US-EPA Guidance for Assessing Chemical Contamination Data for Use in Fish Advisories, Vol. II. Risk Assessment and Fish Consumption Limits EPA/823-B94-004 2000.