ISTRAŽIVANJE OKOLIŠNIH UVJETA UNUTAR DVA VAŽNA PODRUČJA UZGOJA ŠKOLJKAŠA NA ISTOČNOJ OBALI JADRANA

A SURVEY OF ENVIRONMENTAL CONDITIONS AT TWO DISTINCT EASTERN ADRIATIC BIVALVE AQUACULTURE SITES

Perić Lorena*[1], Kapetanović Damir[1], Orlić Karla[1], Bolotin Jakša[2], Kožul Valter[2], Nerlović Vedrana[3], Bobanović-Ćolić Svjetlana[2], Barac Fran[1], Burić Petra[4], Marinac-Pupavac Sandra[5], Linšak Željko[5], Antunović Sanda[5] i Žurga Paula[5]

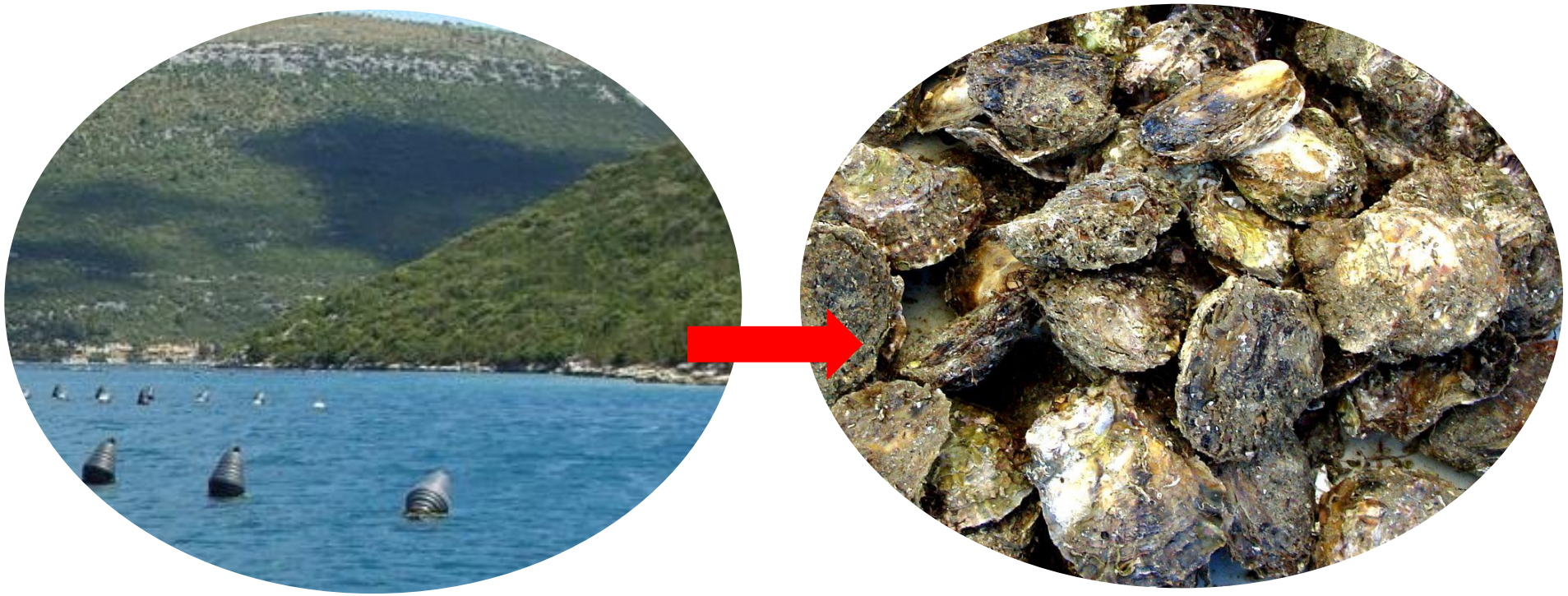
[1]Institut Ruđer Bošković, Bijenička cesta 54, 10000 Zagreb, Lorena.Peric@irb.hr
[2]Institut za more i priobalje, Sveučilište u Dubrovniku
[3]Sveučilišni odjel za Studije mora, Sveučilište u Splitu
[4]Fakultet prirodnih znanosti, Sveučilište Jurja Dobrile u Puli
[5]Nastavni zavod za javno zdravstvo Primorsko-goranske županije

riba Hrvatske
Jedi što vrijedi
29. - 31. 3. 2023.
Hotel Lav, Vukovar

14. Međunarodna konferencija o akvakulturi Vukovar 29-31.03.2023.

Introduction

Research objective



1. Microbiological quality of seawater and sediment at two important farming sites
2. Level of common chemical pollutants in the sediment and tissues of farmed bivalves

=> Seasonality and spatial patterns

Methods

Sampling sites, experimental setup

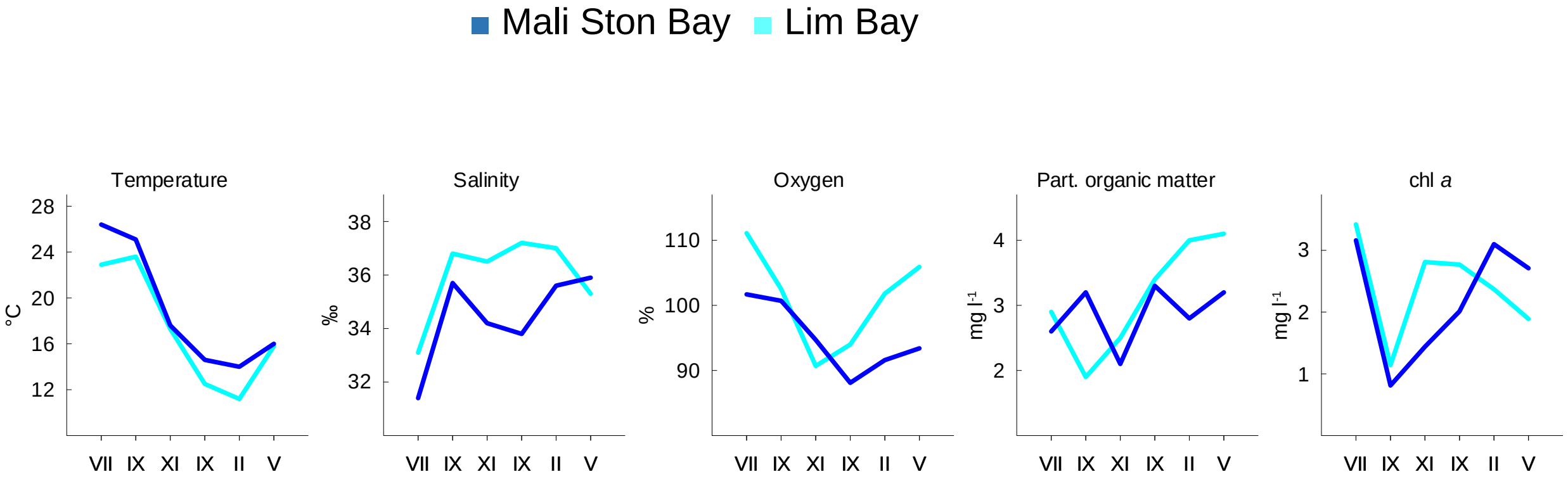
- ❑ Lim Bay (LB) & Mali Ston Bay (MSB) - protected marine reserves
- ❑ Farmed mussel *Mytilus galloprovincialis* & flat oyster *Ostrea edulis*
- ❑ Bimonthly sampling 07/2020 – 05/2021 (bivalves, sediment & seawater)

Methods

- Physico-chemical seawater parameters
  - T, O_2, sal, chl *a*, POM
- Fecal indicators of seawater and sediment
  - Total coliforms, *E. coli* (Colilert®) i enterococci (Enterolert®) – substrate technology (IDEXX)
- Chemical analyses: tissue & sediment samples (ICP MS, AAS, GC MS)
  - Metals (Cu, Zn, Pb, Cd, Hg) & As
  - Polycyclic aromatic hydrocarbons (PAHs; Σ Naphtalene, Acenaphtene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Dibenz[a,h]anthracene, Benzo[ghi]perylene, Indeno[1,2,3-cd]pyrene, Acenaphthylene)
  - Polychlorinated biphenyls (PCBs: Σ PCB 28, 52, 101, 118, 153, 105, 138, 156, 180 i 194)
  - Pesticides (p,p' – DDTs: Σ p,p'-DDE, p,p'-DDD, p,p'-DDT)

Results & discussion

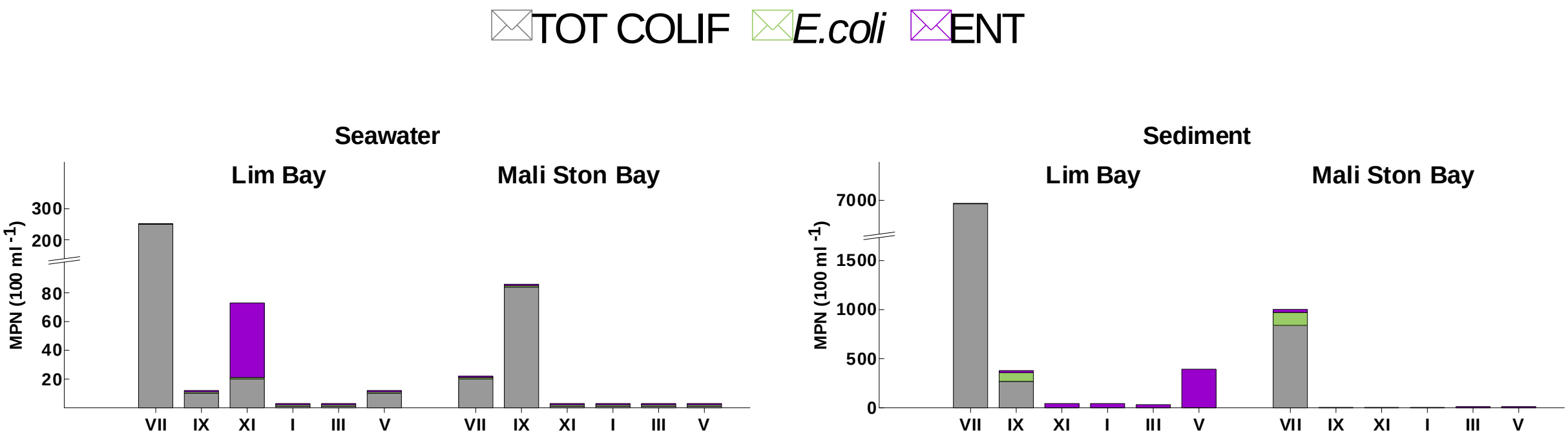
Physico-chemical parameters



Seawater parameters -> within range typical for Adriatic Sea

Results & discussion

Microbiological quality of seawater and sediment



- Transient (seasonal) increase, slightly higher at LB in summer
- Comparable to previous reports for Adriatic Sea aquaculture

Results & discussion

SEDIMENT: Concentrations of metals, As i PAHs (avg 07/2020 – 05/2021)

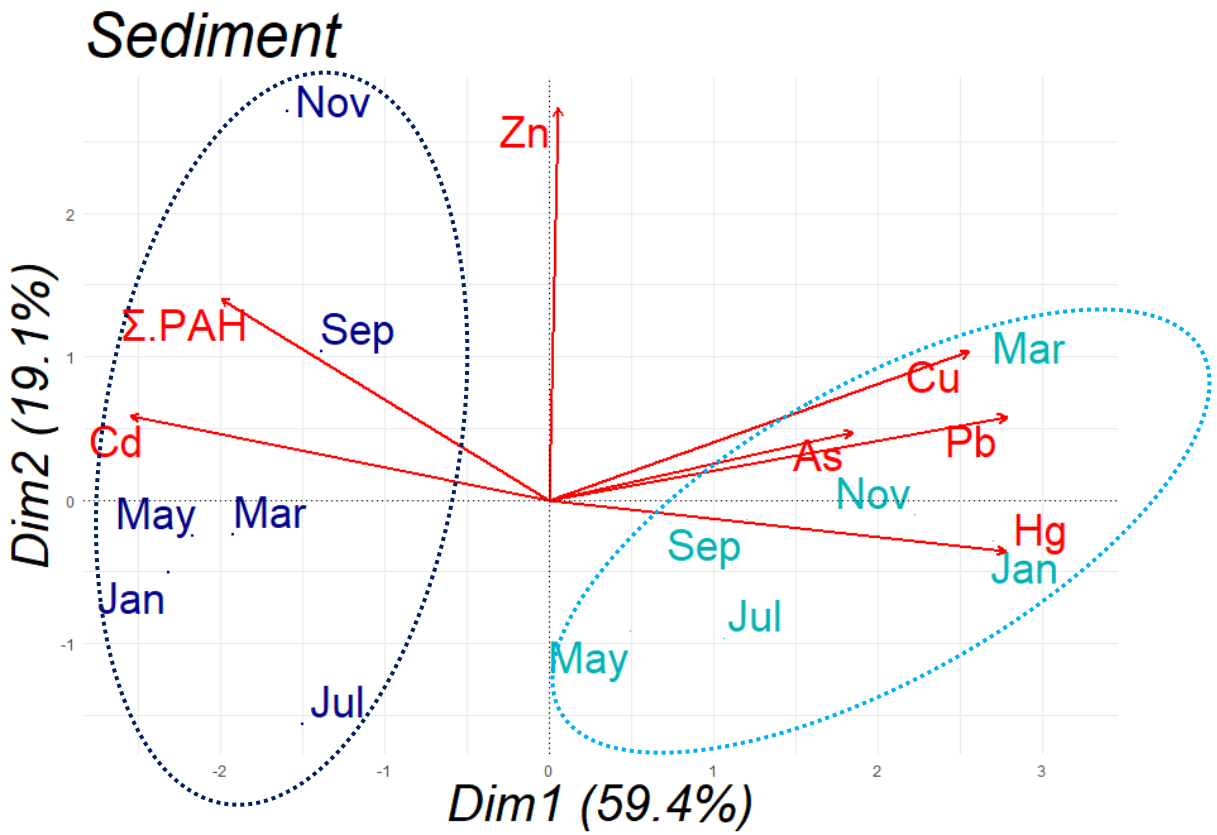
Sediment type:
Lim Bay: slightly gravelly mud
Mali Ston Bay: gravelly mud

	Mali Ston Bay			Lim Bay	
	Median	Min - Max		**Median**	Min - Max
Cu (µg/g d.w.)	**17.93**	10.75 - 23.46	*	**28.88**	13.89 - 63.18
Zn	**106.22**	64.31 - 521.59		**122.49**	91.72 - 213.20
Pb	**26.71**	19.06 - 35.82	*	**38.54**	24.18 - 41.87
Cd	**0.206**	0.16 - 0.60	*	**0.11**	0.09 - 0.20
As	**15.11**	12.16 - 18.90		**17.65**	7.92 - 20.22
Hg	**0.043**	0.03 - 0.08	*	**0.14**	0.09 - 0.19
ΣPAHs (ng/g d.w.)	**300.24**	110.63 - 580.23	*	**125.86**	6.06 - 938.10

LB *vs* MSB *p<0.05

Results & discussion

SEDIMENT SAMPLES PCA: metals, As, ΣPAHs + Jun, Sep, Nov Jan, Mar & May



- Mali Ston Bay
- Lim Bay

- LB ≠ MSB
- Seasonality
- MSB – PAHs & Cd; LB – Cu, Pb& Hg

Results & discussion

TISSUES : Concentrations of metals, As, ΣPAH, ΣPCB & ΣDDT (avg 07/2020 – 05/2021)

	Mytilus galloprovincialis				*Ostrea edulis*			
	■ Mali Ston Bay		■ Lim Bay		■ Mali Ston Bay		■ Lim Bay	
µg/g d.w.	Median	Min - Max	Median	Min - Max	Median	Min - Max	Median	Min - Max
Cu	4.94	3.21 - 13.60	4.89	3.06 - 7.34	173.16	80.33 - 301.62	134.71	67.91 - 211.04
Zn	118.22	89.12 - 194.59	103.78	76.22 - 167.52	2210.70	1253.24 - 2875.04	* 2725.13	2006.64 - 3978.38
Pb	1.09	0.73 - 1.57	1.00	0.69 - 1.85	0.48	0.30 - 0.64	0.62	0.28 - 1.61
Cd	1.2	0.83 - 1.88	* 0.75	0.55 - 1.28	3.69	2.49 - 4.51	3.86	2.56 - 5.99
As	37.19	31.99 - 54.73	* 20.68	18.19 - 43.20	34.42	25.03 - 45.79	* 22.89	16.56 - 29.16
Hg	0.16	0.10 - 0.23	0.09	0.07 - 0.16	0.14	0.09 - 0.17	0.15	0.09 - 0.20
ΣPCB	4.3	1.00 - 24.20	* 23.30	2.00 - 35.00	12.20	4.40 - 23.20	18.95	5.90 - 44.10
Σp,p' DDTs	1.65	1.20 - 5.60	* 1.85	1.00 - 7.20	1.85	1.00 - 4.70	1.70	1.00 - 5.40
ΣPAHs	20.69	8.97 - 86.75	* 12.66	1.21 - 52.87	19.09	6.99 - 80.95	21.22	6.63 - 45.67

LB *vs* MSB *p<0.05

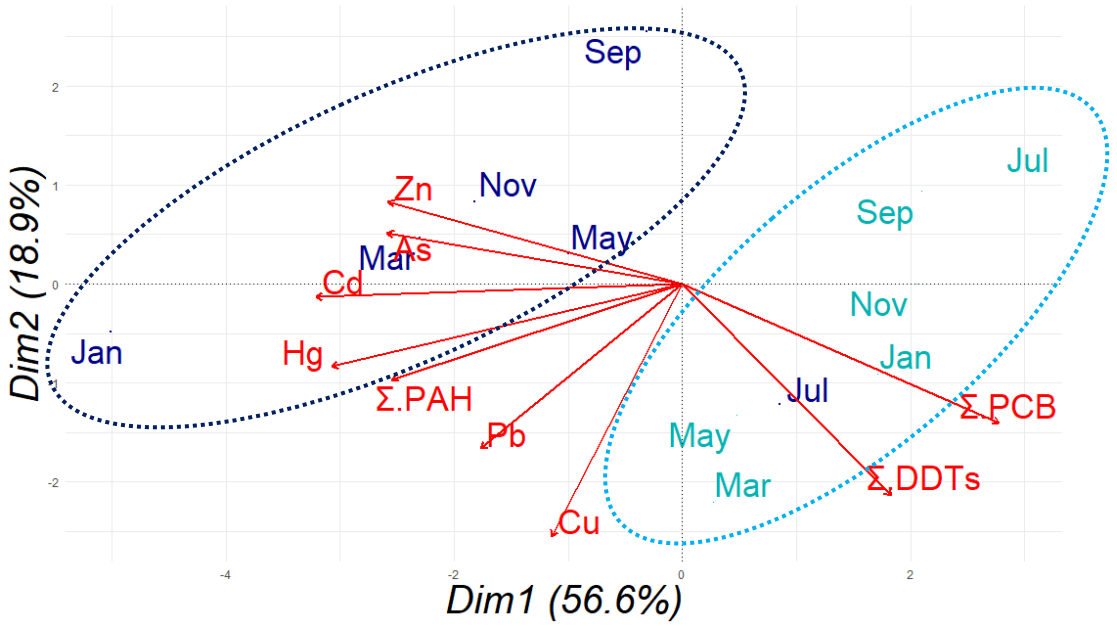
- values *generally* comparable to previous reports for eastern Adriatic farmed bivalves
- As: ↑ MSB *vs* LB

Results & discussion

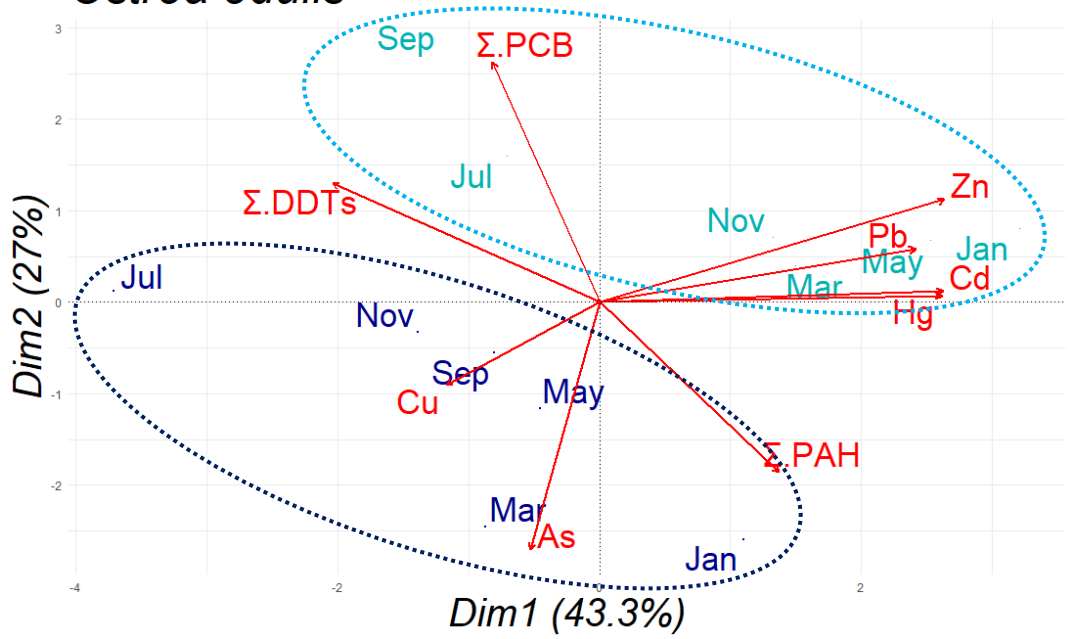
TISSUE SAMPLES PCA: metals, As, ΣPCBs, ΣDDTs & ΣPAHs + Jun, Sep, Nov Jan, Mar & May

■ Mali Ston Bay ■ Lim Bay

Mytilus galloprovincialis



Ostrea edulis



- LB ≠ MSB
- Seasonality

CONCLUSIONS

- Lim Bay *vs* Mali Ston Bay: Season & site specific patterns of antropogenic pressure intensity and type

- Concentrations of potentially toxic pollutants in line with previous reports for eastern Adriatic farmed bivalves =>generally below the levels of concern for moderate seafood consumption (e.g. Bilandžić et al, 2016; Gavrilović et al, 2007; Herceg-Romanić et al, 2014; Milun et al, 2016, 2020)

- What about farmed bivalves?

=> In progress: evaluation of stress response (standard biochemical indicators) with respect to the level of chemical pollutants

Osjetljivost komercijalno važnih školjkaša u akvakulturi istočnog Jadrana na promjene okolišnih uvjeta

Sensitivity of commercially important bivalves from eastern Adriatic aquaculture to variations in environmental conditions

BEST ADRIA (HRZZ IP-2019-04-1956; 2020 - 2023)

Sveučilište u Dubrovniku – University of Dubrovnik, Department of Applied Ecology

Istrida d.o.o. Poreč