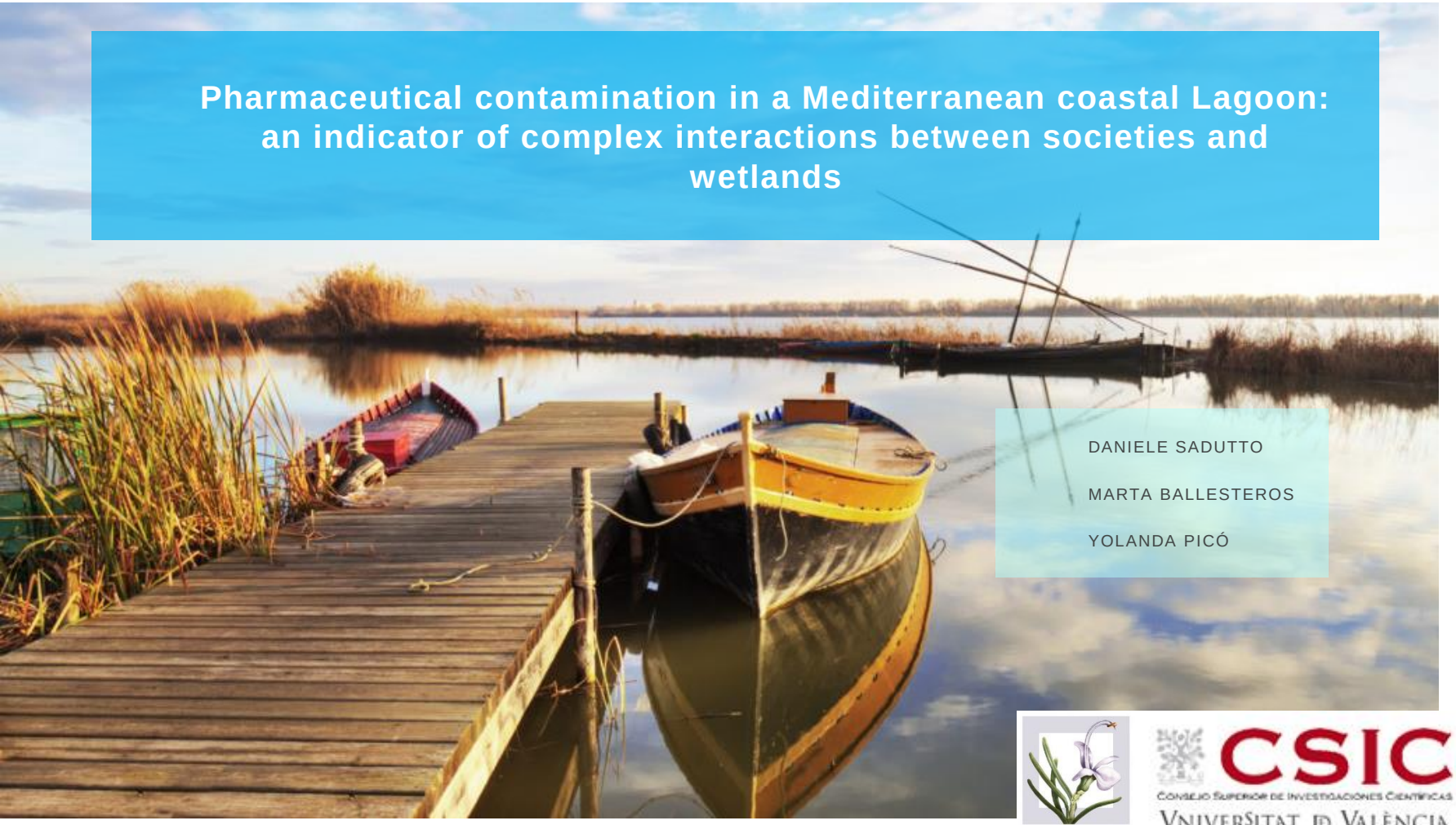
I Jornadas ANTROPOCEN@

Los Contaminantes Emergentes en el Parque Natural de L'Albufera



Pharmaceutical contamination in a Mediterranean coastal Lagoon: an indicator of complex interactions between societies and wetlands

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CIDE Centro de Investigaciones Sobre Desertificación

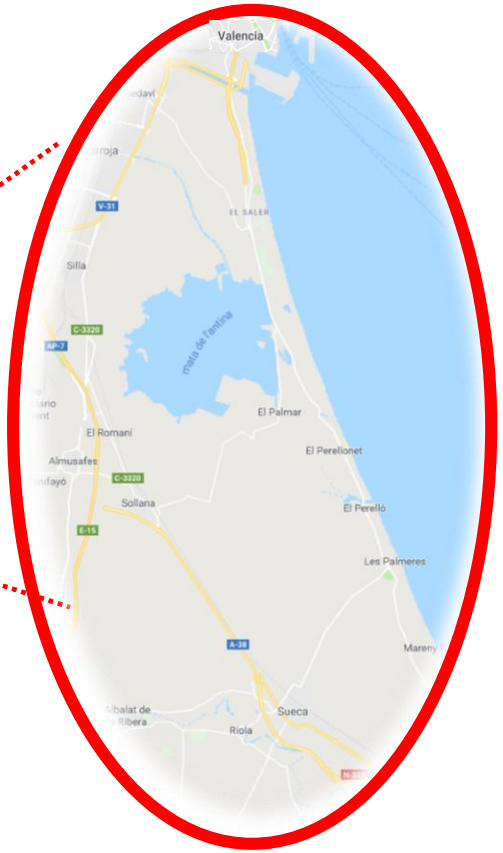
CSIC Consejo Superior de Investigaciones Científicas

Universitat de València

OBJECTIVE

To establish the occurrence and spatial distribution of Pharmaceuticals and Personal Care Products (PPCPs) in the Albufera Natural Park (Valencia, Spain) and their relation to population.

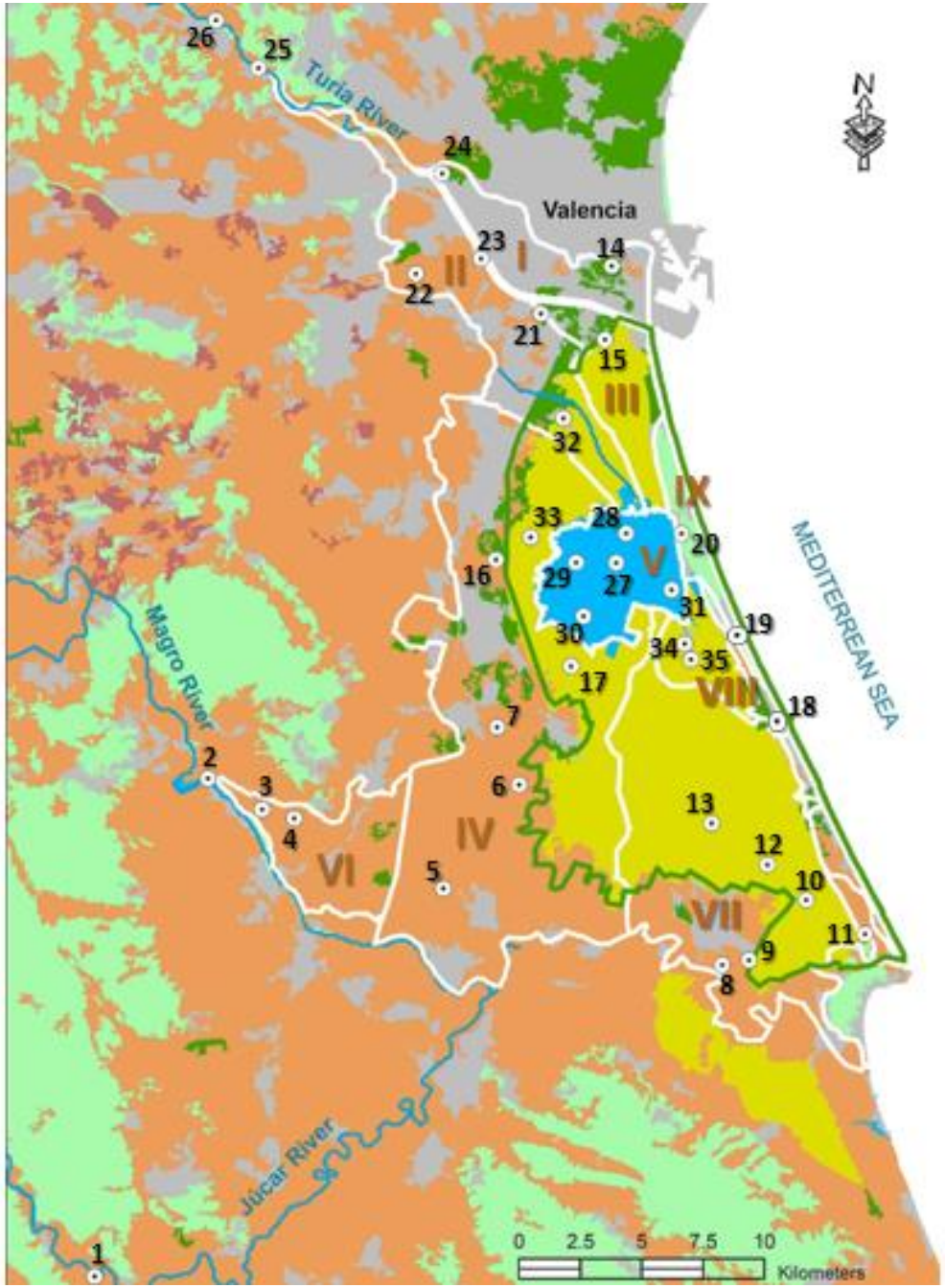
Studied area: Albufera Natural Park



- Surface: 21,000 ha

Sourronded by towns, industry, agriculture and leisure zones

- Crossed by roads
- Water input:
  - –Fresh water : 64 spots
  - –Undepurated urban sewage waters
  - –Water from WWTP


Turia River
Valencia
MEDITERREAN SEA
Magro River
Júcar River
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II
III
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VII
VIII
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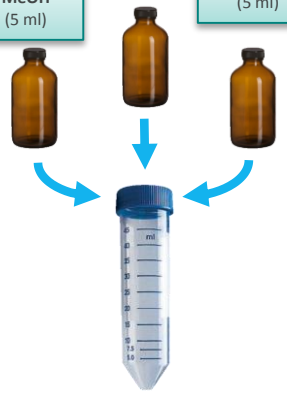
29
30
31
32
33
34
35
0 2.5 5 7.5 10
Kilometers

EXTRACTION

Mc Ilvaine EDTA Buffer (5 ml)

MeOH (5 ml)

H_2O MiliQ (5 ml)



Vortex (5min)

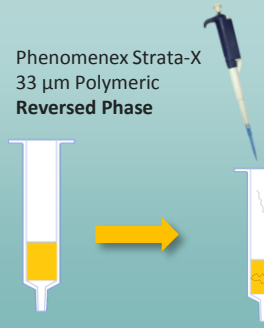
Sonicated (10 min)

Centrifugated 3000rpm (6 min)

CLEAN-UP

Supernatant + H_2O MiliQ

Phenomenex Strata-X 33 µm Polymeric **Reversed Phase**



6 ml MeOH

6 ml H_2O

6 ml SDS 2 mM (Sodium Dodecyl Sulfate)

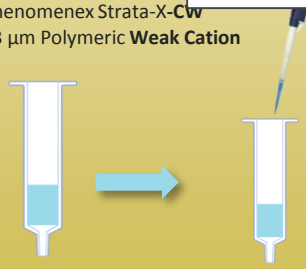
CONDITIONING

6 ml MeOH

3 ml MeOH / DCM (50:50)

ELUTION

Phenomenex Strata-X-**CW** 33 µm Polymeric **Weak Cation**



6 ml MeOH

6 ml H_2O

6 ml MeOH / NH_4OH (95:5)

1 ml Vial

ANALYTES AND HPLC- MS/MS ANALYSIS

Compound	Therapeutic category	Ionization mode	Compound	Therapeutic category	Ionization mode
Acetylsalicylic Acid	Analgesic/Anticoagulant	-	**Ibuprofen**	Analgesic	-
Alprazolam	Anxiolytic	+	**Indomethacin**	Antibiotic	-
Amoxicillin	Antibiotic	+	**Lorazepam**	Anxiolytic	+
Atenolol	Antihypertensive	+	**Metformin**	Antidiabetic	+
Atorvastatin	Lipid regulator	+	**Metylparaben**	Preservative	-
Bezafibrate	Lipid regulator	-	**Naproxen**	Analgesic	-
Bisphenol A	Plastic additive	-	**Norfloxacin**	Antibiotic	+
Butylparaben	Preservative	-	**Ofloxacin**	Antibiotic	+
Caffeine	CNS stimulant	+	**Omeprazol**	Gastrointestinal	+
Cloramphenicol	Antibiotic	-	**Paracetamol**	Analgesic	+
Clofibric Acid	Lipid regulator	-	**Propylparaben**	Preservative	-
Codeine	Analgesic	+	**Simvastatin**	Lipid regulator	+
Diclofenac	Analgesic	-	**Thiamphenicol**	Antibiotic	-
Enalapril	Antihypertensive	+	**Tramadol**	Analgesic	+
Etoricoxib	Analgesic	+	**Triclocarban**	Antibacterial	-
Etylparaben	Preservative	-	**Triclosan**	Antibacterial	-
Flufenamic Acid	Analgesic	-	**Warfarin**	Anticoagulant	-
Furosemide	Antihypertensive	-			

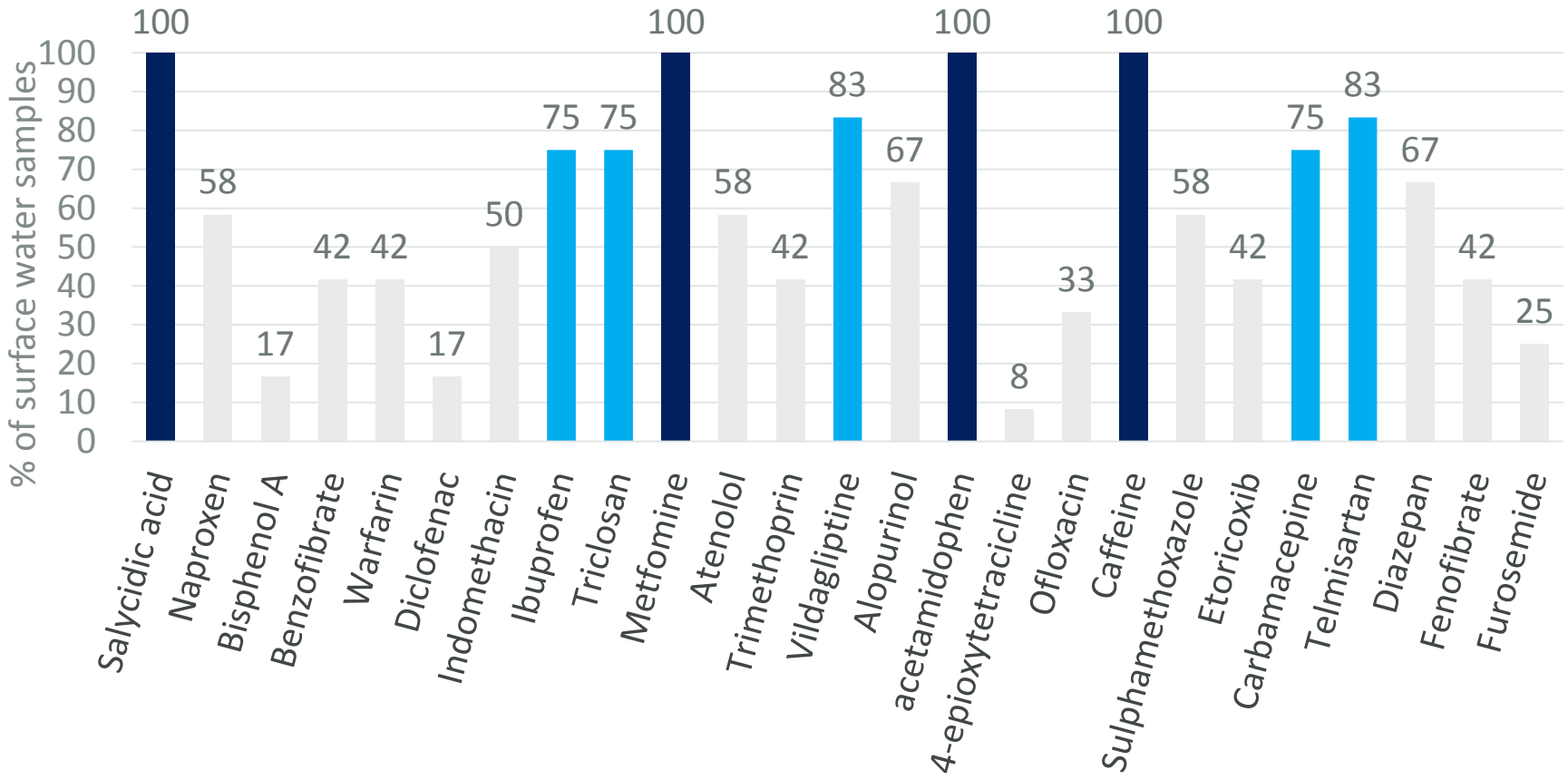
Samples

Agilent 1260 Infinity

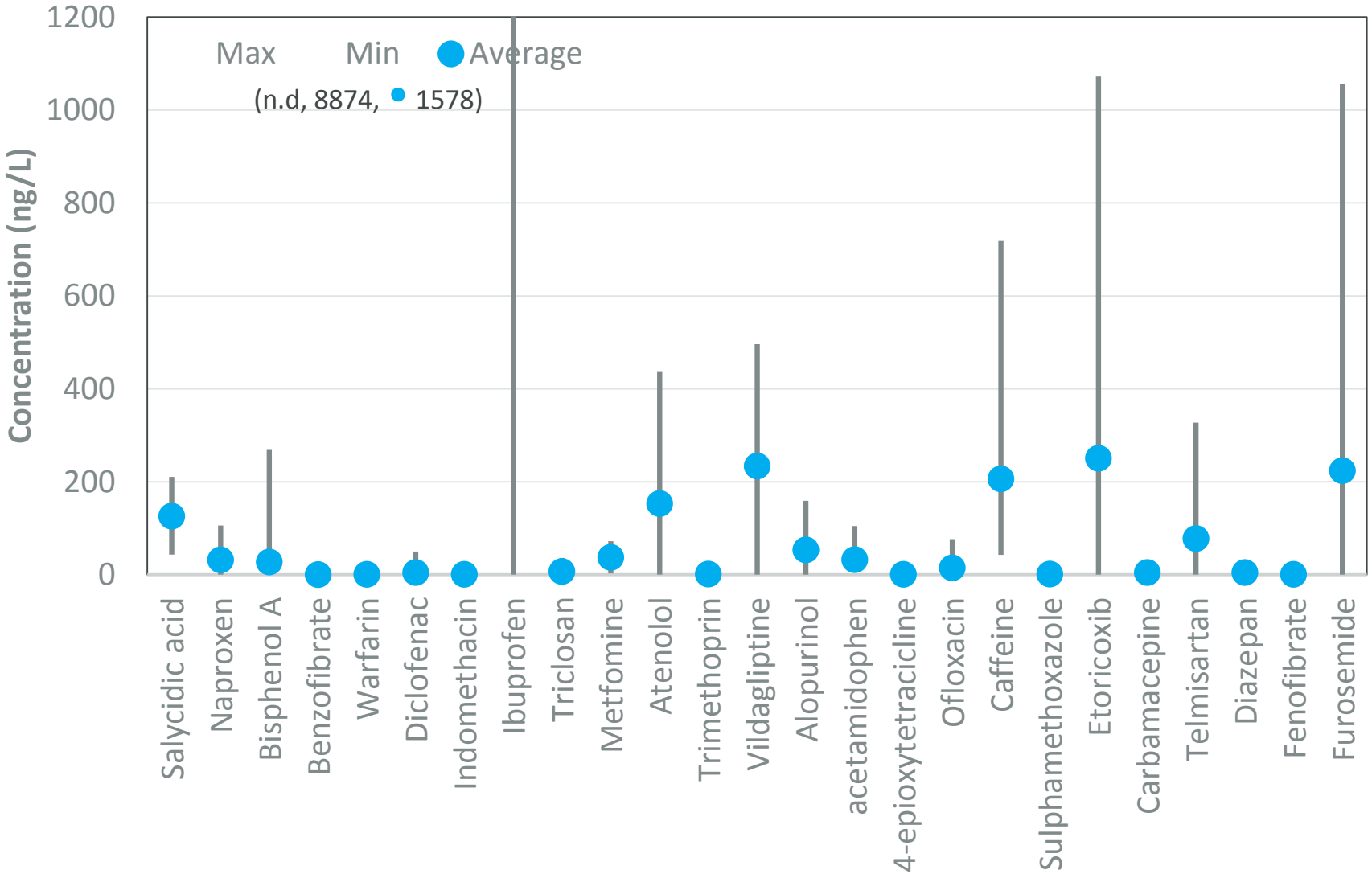
Agilent 6410
Triple Quad LC/MS

RESULTS AND DISCUSSION

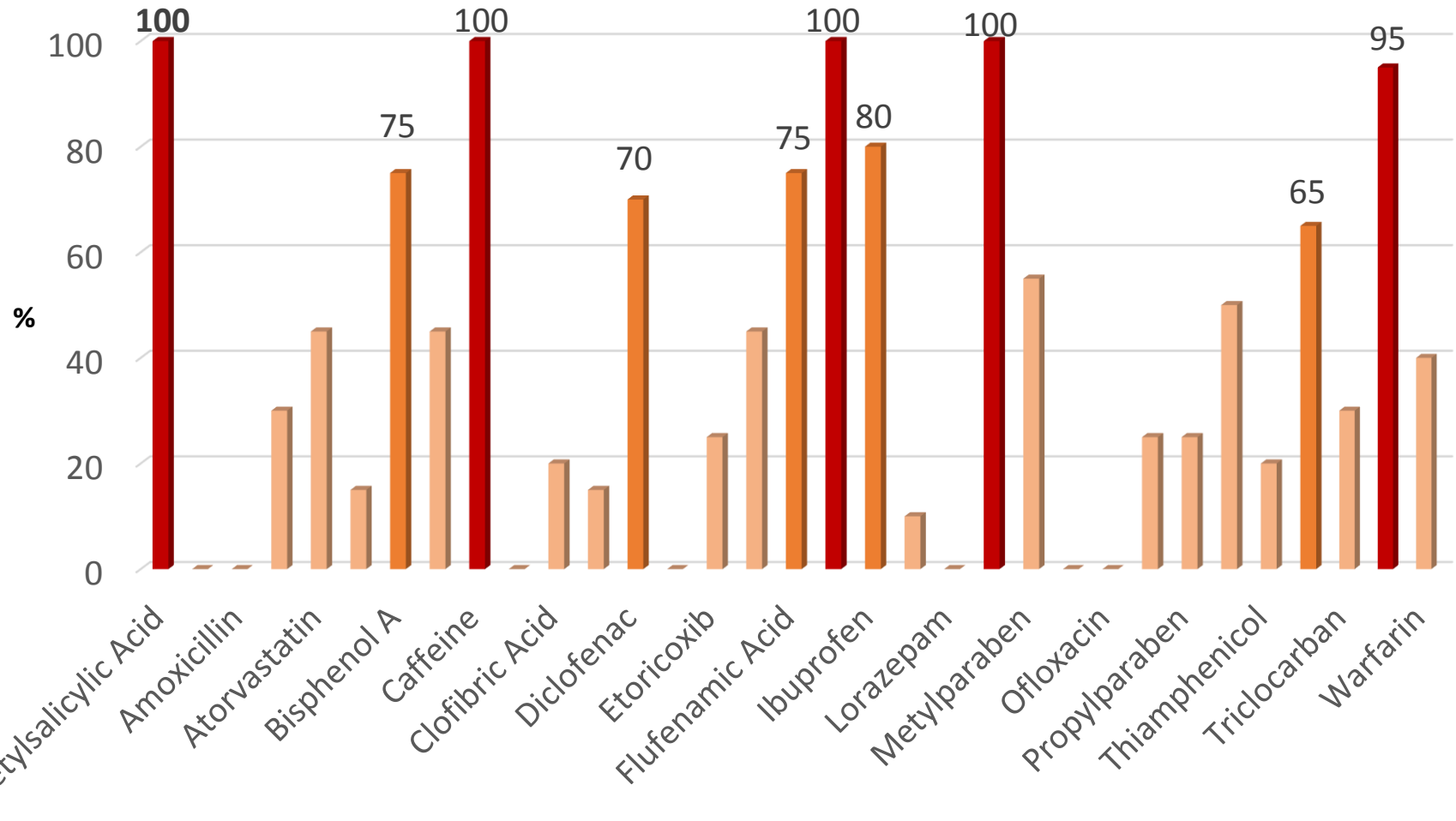
% OCCURENCE IN SURFACE WATER



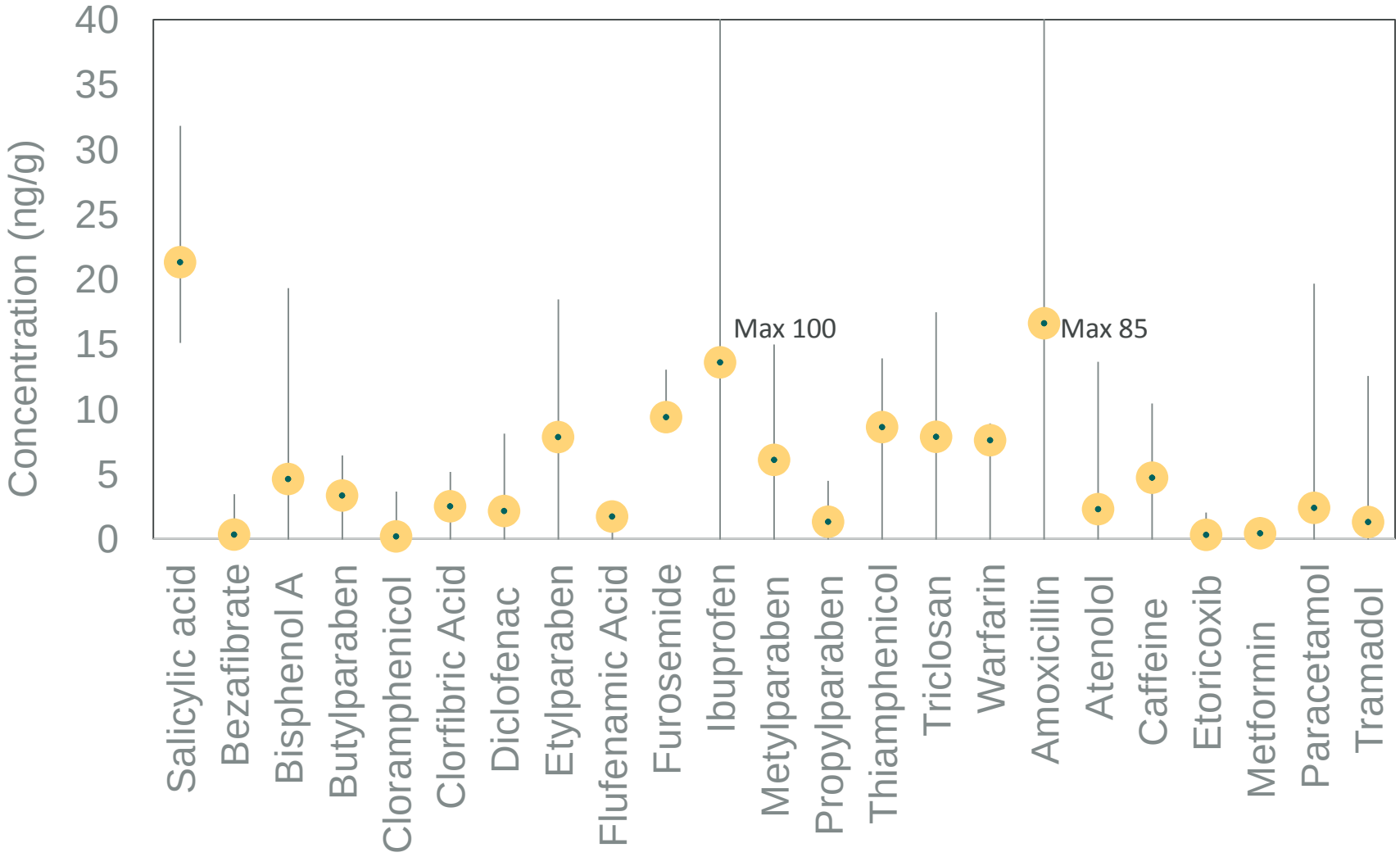
CONCENTRATIONS OF 25 PPCPs IN WATER



% OCCURENCE IN SEDIMENT

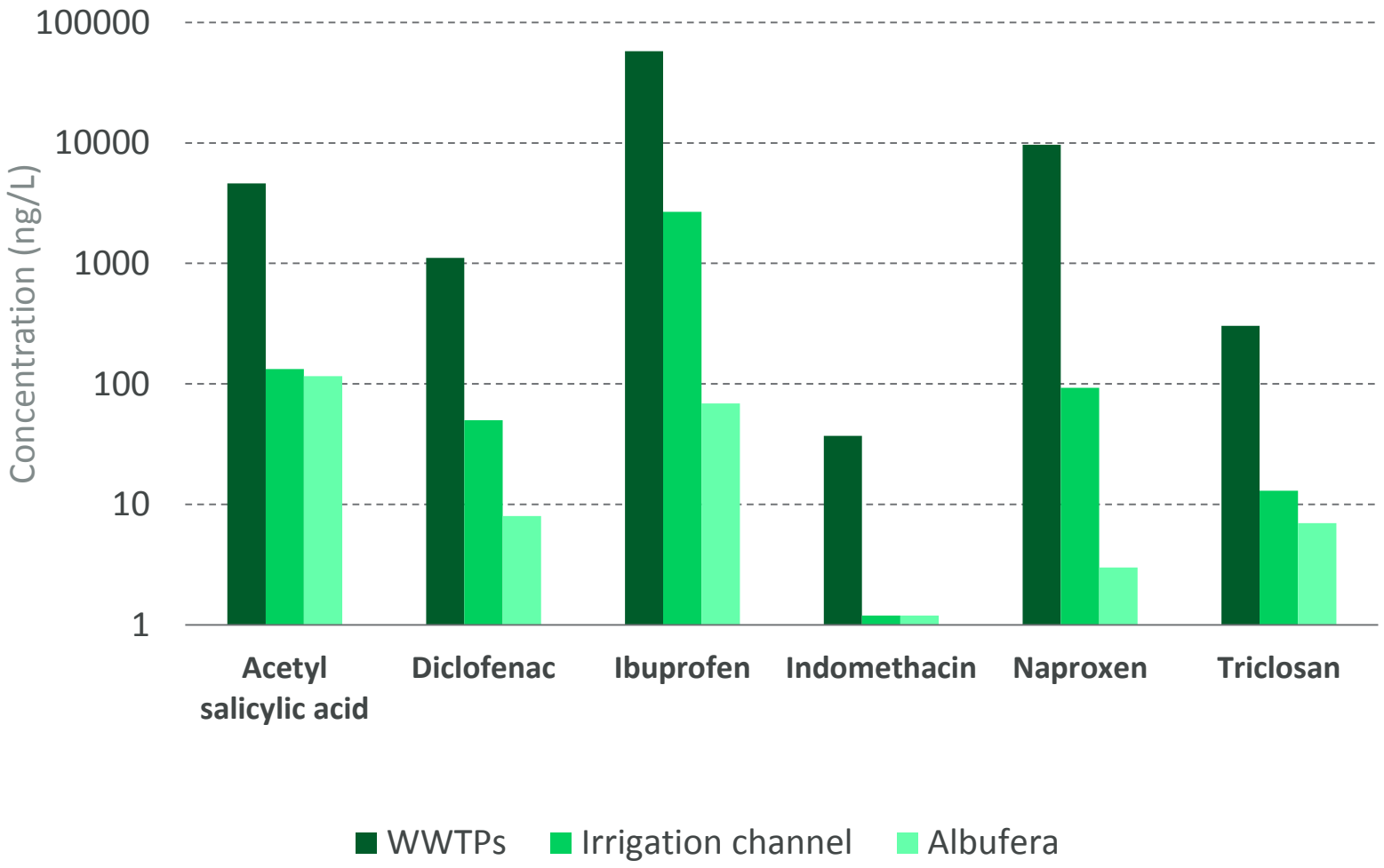


CONCENTRATION OF 23 PPCPs IN SEDIMENTS



COMPARISON OF THE CONCENTRATIONS IN DIFFERENT SAMPLES

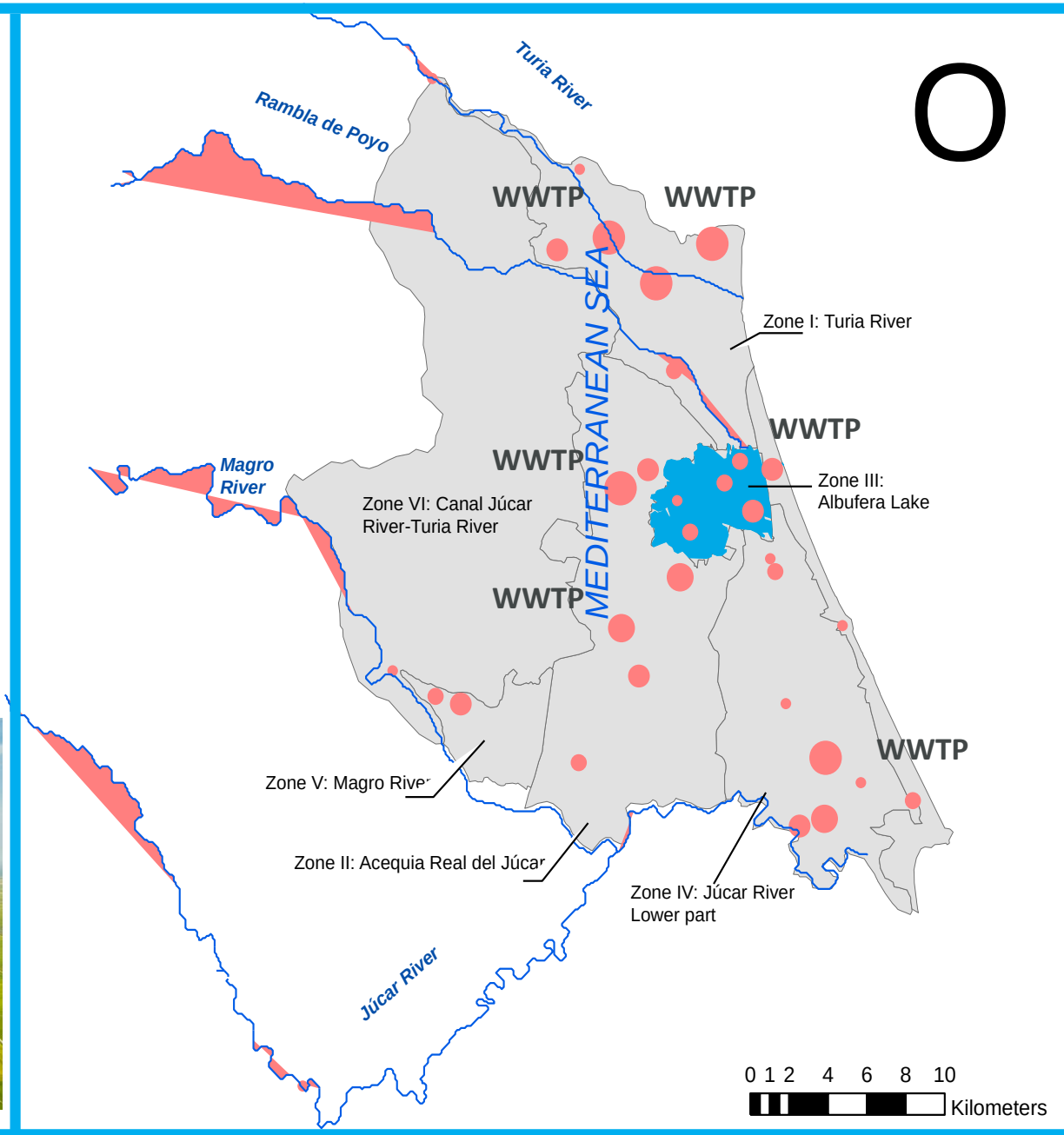
Acid compounds



SPATIAL DISTRIBUTION OF PHARMACEUTICALS

Average Concentration

- 44.50 - 53.00
- 53.01 - 62.00
- 62.01 - 72.00
- 72.01 - 79.00
- 79.01 - 105.97



SPATIAL DISTRIBUTION OF PHARMACEUTICALS

Maximum Concentration

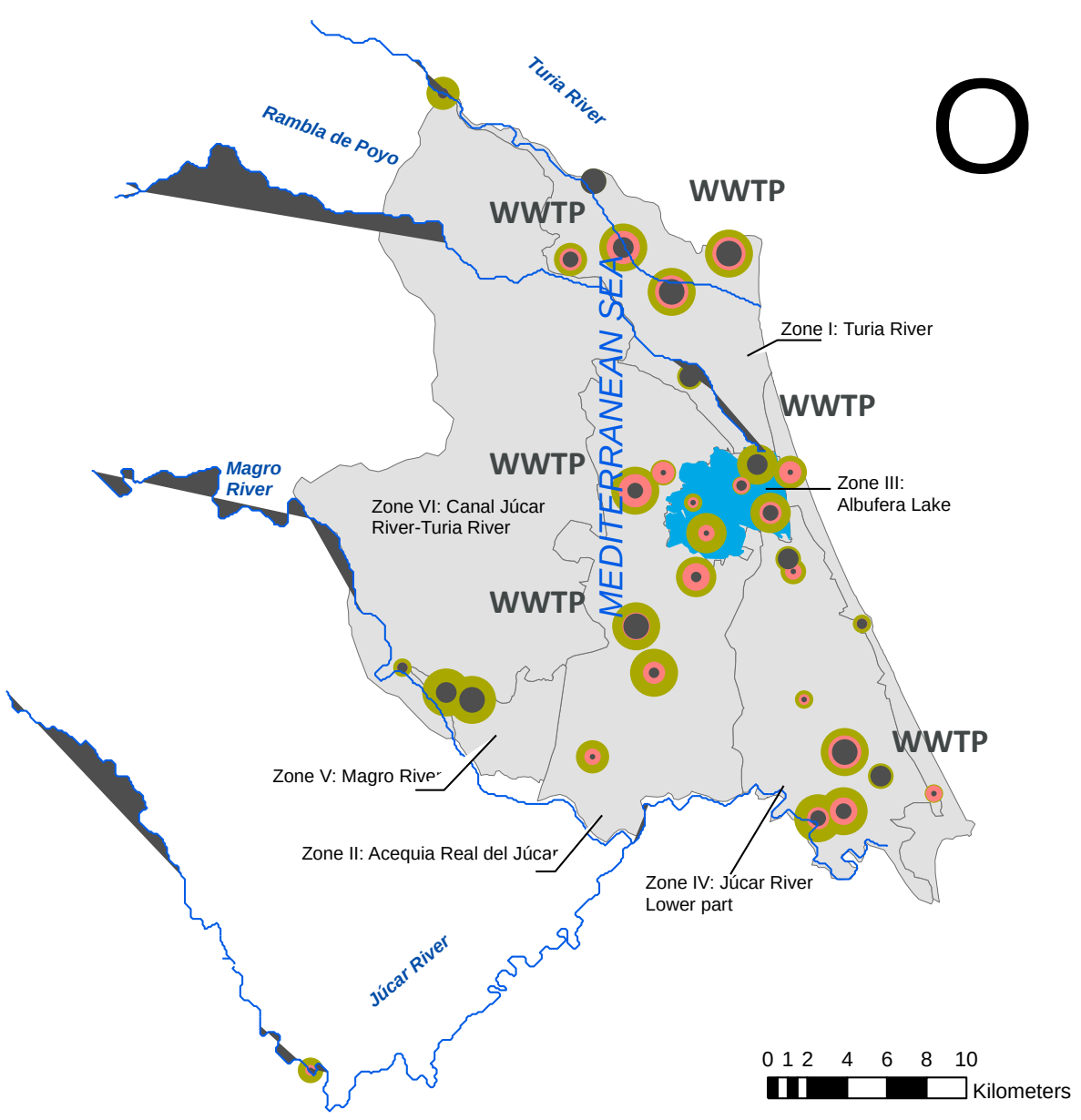
- 95.00 - 120.00
- 120.01 - 151.00
- 151.01 - 213.05
- 213.06 - 288.00
- 288.001 - 628.00

Average Concentration

- 44.50 - 53.00
- 53.01 - 62.00
- 62.01 - 72.00
- 72.01 - 79.00
- 79.01 - 105.97

Number of Components

- 17 - 19
- 20 - 21
- 22 - 23
- 24 - 26
- 27 - 29



CONCLUSIONS

- The results of the 20 sediment and 35 water samples evidenced the presence of many of the selected EC in these environmental compartments.
- The WWTPs are considered an important source of contamination, but not the only one.
- The presence of these contaminants is related to sourronding populations as demonstrated this study.
- In sediments, *furosemide* and *amoxicilin* were those at the highest concentration: > 15 ng/g dry weight (d.w.)
- In water, *ibuprofen, salicydic acid, atenolol and caffeine* and *metylparaben* were those at the highest concentration (up to 8000 ng/L for ibuprofen
- These data pointed out the importance to optimize removal treatments and the development of new barriers to avoid the discharges of EC to these sensitive environments.
- This methodology produced an accurate outlook of a basal state for the Albufera Natural Park and could be developed in the context of a chronic monitoring of this site.

ACKNOWLEDGEMENTS

The contamination of the Anthropocene in the Albufera Natural Park: Smart tolos for an efficient use of resources taken into account the genere perespective Proyecto financiado por el programa Prometeo **PROMETEO/2018/155**

GENERALITAT VALENCIANA

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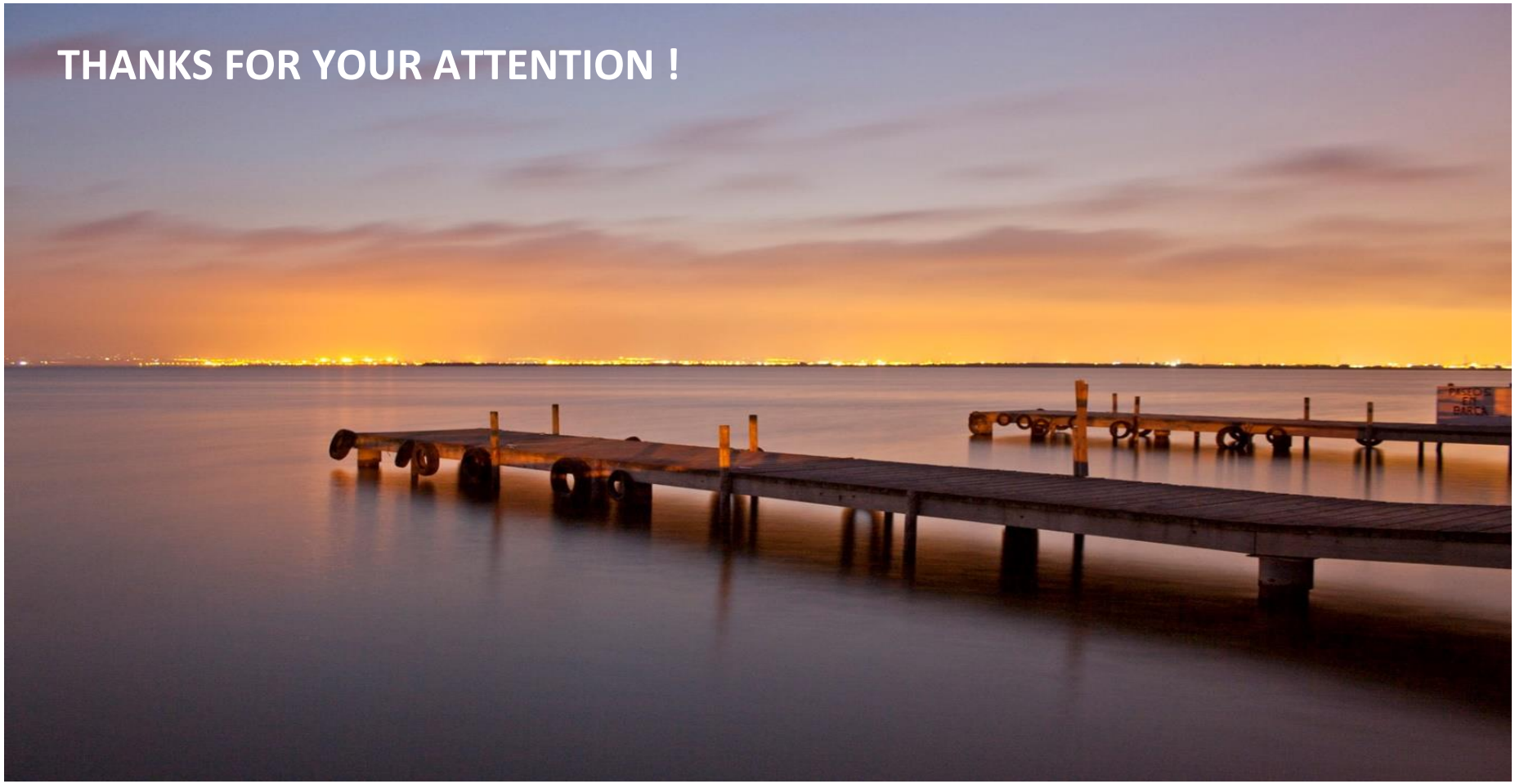
THANKS FOR YOUR ATTENTION !