

distributions with actual salinity levels. The species distribution data will allow us to investigate the extent of amphibian occupancy of coastal water bodies in the UK as well as the tolerance of individual species to salinity in the wild.

#### **1.08.P-Tu017 Investigating the Relationship Between Bioaccumulated POPs and Biomarker Response in Spinner Dolphins, *Stenella longirostris***

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In the Brazilian coast, the spinner dolphin, *S. longirostris*, occurs predominantly at oceanic waters, concentrating at the upper continental slope, with occasional sightings at higher depths or along the continental shelf. Due to the overlap of its distribution with oil and gas extraction and production (E&P), *S. longirostris* was included as a priority sentinel species to be used in the ongoing Cetacean Monitoring Project (PMC-BS) carried out by Petrobras at the Santos Basin pre-salt province (25005'S 42035'W, 25055'S 43034'W). This study investigated the relationship between blubber burdens of polycyclic aromatic hydrocarbons (PAHs) and persistent organic pollutants (POPs) and biomarker response measured in the tegument of *S. longirostris*, sampled within the Santos Basin pre-salt province. Skin and blubber samples (n=16) were obtained opportunistically through remote biopsy, during telemetry or visual survey efforts. Blubber samples were analyzed for PAHs and POPs (PCBs, PBDEs and organochlorines). Skin samples were used to quantify glutathione S-transferase (GST) activity, cytochrome P450 1A (CYP1A) protein content and transcript levels of aryl hydrocarbon receptor (AhR), cytochrome P450 1B (CYP1B), estrogen receptor beta (ESR2), heat shock protein (HSP70) and UDP-glucuronosyltransferase (UGT1). To investigate the relationship between bioaccumulated PAHs and POPs and biomarker response, generalized linear models (GLMs) were constructed. Best fitted models indicated that PAHs levels contributed significantly to the observed variance of biomarker data. In particular, PAHs levels were negatively associated to CYP1B, ESR2, HSP70 and UGT1 transcript levels. Apart from PAHs, only mirex was negatively associated with AhR transcript levels and PBDEs were positively associated with UGT1 transcript levels. Regarding to PAHs, the predominance of negative associations may be due to the prevalence of two and three ring compounds, which have been shown to inhibit biomarker response, such as EROD and GST activity in other species. The negative relationship between PAHs and ESR2 also suggests a potential inhibitory effect over reproductive signaling. Taken together, our results suggest that the levels of bioaccumulated contaminants found in these samples, especially PAHs, may be of concern to *S. longirostris* local population and reinforce the need to continually monitor this species in the Brazilian coast.

#### **1.08.P-Tu018 Polycyclic Aromatic Hydrocarbons (PAHs) in Cetacean From Western Mediterranean Coast**

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Polycyclic aromatic hydrocarbons (PAHs) are persistent organic pollutants derived from the combustion of organic matter, highly lipophilic and present in all the world's seas and oceans, as well as in the atmosphere and soils. However, the analysis and impact of these compounds on cetaceans are scarce. Cetaceans, which are considered as oceanic sentinels of human and wildlife health, have been suggested to be especially susceptible to the toxic effects of PAHs. The aim of this work was to detect and quantify 16 PAHs in blubber samples from 58 individuals of various endemic cetacean species stranded on the Murcia coastline (Western Mediterranean) between 2011 and 2018. Only six of the 16 studied compounds were detected with detection frequencies ranging from 17.24% (anthracene) to 98.28% (phenanthrene). The concentrations detected are in line with those obtained by other authors in marine mammals from areas with high anthropogenic pressure. Phenanthrene was the PAH showing the highest concentrations (maximum 205.14 µg/kg lw.), followed by naphthalene, acenaphthene, fluoranthene, fluorine and anthracene. Our results in striped dolphin (the species with the largest number of samples, n=40) followed the same distribution pattern than others striped dolphins elsewhere, dominated by naphthalene (46.86 ± 27.48 µg/kg). This compound is used as a precursor in many industrial processes, as well as a component of pesticides and fuels, so high levels in the study area, characterized by its intensive agriculture (up to 10.9% of the total pesticides used in all of Spain), were expected. On the other hand, the profile of PAHs detected in the study area is mainly composed of low molecular weight compounds, which have the lowest carcinogenic and mutagenic potential. However, some studies have demonstrated the greater genetic susceptibility of Mediterranean cetaceans to the adverse effects of PAHs. Therefore, toxic effects affecting the status of studied populations should be addressed. This is the first work assessing PAHs concentrations in cetaceans from the Region of Murcia, so the data presented in this work could serve as a reference for future research.

#### **1.08.P-Tu019 Organochlorine Pesticides, Polychlorinated Byphenils (PCBs) and Polybrominated Dyphenil Ethers (PBDEs) in Seven Mediterranean Endemic Cetacean Species**

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Mediterranean Sea is considered as a hotspot for several persistent organic pollutants (POPs), whose potential health end-points include the reproductive, immune and endocrine systems, and are able to cause cancer. Status of most populations of Mediterranean cetacean species is not generally considered to be favorable and chemical pollution is commonly suggested as a probable cause. Long-term biomonitoring of these cetacean populations provide useful information on the POPs-pollution status of western Mediterranean Sea, which might have direct impact in wildlife and human health. We used blubber from 7 different species of cetaceans (n=57) stranded along the Murcia coastline (SE Spain) between 2011 and 2018 to study 16 different

organochlorine pesticides (OCPs), 18 polychlorinated biphenyl (PCB) congeners and 8 polybrominated biphenyl ethers (PBDE) congeners. DDE and methoxychlor accounted for more than 80% of the OCPs in all species. Mean DDE/tDDT ratio was over 0.9 for all the studied species, which indicates the absence of recent exposures to DDT in these individuals. PCB pattern was dominated by PCBs 180, 153 and 138 and was homogeneous between species. On the other hand, PBDE pattern was dominated by BDE 47, although the rest of the composition was highly variable among species. Striped dolphin was the species showing the highest concentrations of most OCPs (tDDT  $4752 \pm 7415 \text{ mg} \cdot \text{kg}^{-1} \text{ lw.}$ ; methoxychlor  $2263 \pm 2920 \text{ mg} \cdot \text{kg}^{-1} \text{ lw.}$ ), PCBs ( $6490 \pm 9550 \text{ mg} \cdot \text{kg}^{-1} \text{ lw}$ ) and PBDEs ( $73 \pm 103 \text{ mg} \cdot \text{kg}^{-1} \text{ lw}$ ), generally followed by bottlenose dolphins and common dolphin, which could be explained by their feeding behavior in shallower waters closer to the coast. No significant differences were found among sexes and length was generally not significantly correlated with any compound, although higher concentrations were obvious for older individuals. We lacked enough samples to assess temporal trends. The magnitude of the pollutant concentrations reported in this work was generally lower than those reported for cetacean species in the western Mediterranean. This fact could be explained either by a temporal decrease of these pollutants or different analytical procedures. Although all of these compounds have been banned from decades ago, they are still found at detectable concentrations in cetacean tissues. However, the concentrations found in this study are below those toxicity thresholds reported for marine mammals by different works.

#### **1.08.P-Tu020 Release of Nickel Particles From Mining ACTivity in New Caledonia: Organs Disruption on Eels, *Anguilla marmorata***

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Anthropic activities such as open pit mining amplifies the natural erosion of soils leading to atmospheric emission of metal particles including nickel (Ni). New Caledonia is particularly affected by Ni mining activities because of the presence of ultramafic soils (30% of its surface), which are highly concentrated in Ni. These particles produced during extraction, by atmospheric transport and soil erosion will end up by deposition or leaching in aquatic ecosystems. These deposits can directly impact living organisms in the rivers downstream the mines, such as eels. Despite alarming freshwater Ni concentrations, no study explained so far the consequences of metals contamination on eels living under mining influence, fish known to be sensitive to this kind of pollution. The aim of this study was thus to determine by different approaches how eels, *Anguilla marmorata*, are impacted by Ni contamination and other associated metals by measuring: (i) morphometric parameters; (ii) expression level of genes encoding proteins implicated in lipid metabolism, oxidative stress, detoxification and apoptosis in liver, kidneys, brain, gills, spleen and muscle and (iii) metal concentrations in liver, kidneys, gills and muscle. The results showed that for eels living in rivers downstream mines, liver seems to be the main affected organ with an oxidative stress, lipid metabolism disruption, mitochondrial dysfunction and carcinogenic markers activated. The organ in which Ni was the most accumulated was the kidney. These results underlined the potential toxic impact of metal contamination from mining activity on eels. This study should allow us to define in an integrated way (i) to what extent the contributions of metals related to the mining activities impact the aquatic organisms and (ii) what would be the levels in natural environment tolerable to preserve the wild fauna.

#### **1.08.P-Tu022 Searching for Novel Biomarkers of Effect of Neuroactive Compounds: A Study on Caged Carp (*Cyprinus carpio*) Exposed to Municipal Wastewaters In Situ**

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Contamination of the aquatic ecosystems by neuroactive compounds (NCs), such as neuroactive pharmaceuticals, illicit drugs, stimulants and pesticides with neuroactive action, lately emerged as an important environmental issue. However, assessment and identification of ecological impacts of NCs in aquatic ecosystems still faces challenges and limitations [1]. One of them is the lack of sensitive and reliable biomarkers of effect of NCs, which could be considered as valuable early warning signals of environmental contamination by NCs. In our study, we searched for novel biomarkers of effect of NCs by measurement of expression of selected genes (RQ-PCR analysis), encoding proteins involved in neurotransmitter pathways and exocytosis, myelination, neuroendocrine regulation of reproduction and changes in membrane potential, in brain tissue of caged common carp (*Cyprinus carpio*) exposed *in situ* to untreated municipal wastewater and industrial effluents. Among the tested genes, inhibition of serotonin receptor 1aa (*htr1aa*) and myelin basic protein (*mbp*), and stimulation of tachykinine 3a (*tac3a*) and voltage-gated  $\text{Ca}^{++}$  P/Q channel  $\alpha 1a$  (*cacna1a*) was detected. These elements can be considered as promising novel biomarkers of effect of NCs, whose sensitivity and specificity should be also tested *in vitro* and *in vivo*. To link the observed responses to possible adverse outcomes, they were integrated in the Adverse Outcome Pathways (AOPs) available in AOPwiki database. The corresponding Key Event (KE) was identified only for the inhibition of the serotonin receptor gene expression (serotonin receptor inactivation; AOPs 221, 222, 224, 225) implying to depression and agitation as resulting adverse outcomes. We also stress the importance of synchronisation of biomarker research with further development of the AOP framework database, which should include additional events related to disturbance of neural function, as crucial for development of improved biomarker-based strategy for impact assessment of NCs in the aquatic environment. [1] Kaisarevic S, Vulin I, Tenji D, Tomic T, Teodorovic I (2021) *Environ Sci Eur* 33:115 **Acknowledgements:** The research was supported by the EU FP 7 project SOLUTIONS (Grant No. 603437) and The Science Fund of the Republic of Serbia, PROMIS (Grant No. 6061817), BIANCO. The abstract content is the responsibility of the Faculty of Sciences University of Novi Sad, and it does not reflect the opinion of the Science Fund of the Republic of Serbia.