
Evaluation of the emission potential (microplastics & organic additives) by conventional or biodegradable mussel nets

Fleurine Akoueson*^{†1}, Therese Nitschke², Mathias Bossaer³, Bayan Almasri⁴, Christian Rolando⁴, Ana Catarino⁵, Guillaume Duflos⁶, Alexandre Dehaut⁷, Rachid Amara⁸, and P erine Doyen⁹

¹Universite du littoral cote d'opale (ULCO) – UMRt 1158 BioEAgro – 62200 Boulogne-sur-Mer, France, France

²Flanders Marine Institute (VLIZ) – InnovOcean Campus, Jacobsenstraat 1, 8400 Ostend, Belgium

³Flanders Marine Institute (VLIZ) – Research Department, Ocean Human Health Division, 8400 Oostende, Belgium

⁴Universite de Lille (Univ. Lille) – Miniaturisation pour la Synth ese, l'Analyse et la Prot eomique (MSAP) - USR 3290, Villeneuve d'Ascq cedex, France – 59655 Villeneuve d'Ascq, France

⁵Flanders Marine Institute (VLIZ) – Innovocean Site, Wandelaarkaai 7, B-8400 Oostende, Belgium

⁶Anses - Laboratoire de S ecurit e des Aliments - Site de Boulogne-sur-Mer (Anses - LSA1 - Site de Boulogne-sur-Mer) – Agence nationale de s ecurit e sanitaire de l'alimentation, de l'environnement et du travail, Agence nationale de s ecurit e sanitaire de l'alimentation, de l'environnement et du travail – Anses - LSA1 - Site de Boulogne-sur-Mer 6 Boulevard du Bassin Napol eon 62200 BOULOGNE-SUR-MER, France

⁷Laboratoire de s ecurit e des aliments de Boulogne-sur-Mer (ANSES-LSAL) – Agence nationale de s ecurit e sanitaire de l'alimentation, de l'environnement et du travail, Agence nationale de s ecurit e sanitaire de l'alimentation, de l'environnement et du travail – Boulevard du Bassin Napol eon, 62200 Boulogne-sur-Mer, France

⁸Laboratoire d'Oc eanologie et de G eosciences (LOG) – Universit e Littoral C ote d'Opale – 62930 Wimereux, France, France

⁹Universit e du Littoral C ote d'Opale (ULCO) – Universit e du Littoral C ote d'Opale, Universit e du Littoral C ote d'Opale – Univ. Littoral C ote d'Opale, UMRt 1158 BioEcoAgro, USC ANSES, INRAe, Univ. Artois, Univ. Lille, Univ. Picardie Jules Verne, Univ. Li ege, Junia, 62200 Boulogne-sur-Mer, France, France

Abstract

In mussel farming, the use of tapping nets is essential for preventing product loss and protecting mussels from predators. Plastic nets are exposed to various biotic and abiotic mechanisms, potentially resulting in their degradation and the subsequent release of microplastics into the aquatic environment.

To address this issue, professionals of the aquaculture industry are developing alternatives

*Speaker

[†]Corresponding author: fleurine.akoueson@univ-littoral.fr

to conventional (petro-based) plastics, introducing nets made from biodegradable and recyclable materials, which appear to be promising alternatives. Despite the challenges associated with the complete degradation of most bioplastics in the environment, these materials are supposed to be more durable and have less impact on the environment. However, the current information on the fragmentation and the release of microplastics (MPs) from these materials is not documented.

In this context, this study aimed to compare the chemical signature and the release of MPs and organic plastic additives (OPAs) from both biodegradable and conventional mussel nets. This assessment was carried out on pristine materials and after artificial aging under ultraviolet (UV) radiation in seawater.

Nets were immersed in 1.6 μm filtered natural seawater and exposed to UV radiations for 35 and 57 days, respectively simulating 12 and 18 months of average natural solar irradiance in Europe. After characterizing the chemical composition of the two plastic materials using FTIR, the presence of OPAs was highlighted for each condition using TD(Py)-GC-HRMS. The quantity of MPs and OPAs released into seawater for each condition was also studied. The results will provide us with a better understanding of the degradation pattern of these plastic materials to assess their fate and potential impact(s) on the environment. This will provide valuable information to mussel farmers and stakeholders at a time when changes in practices are required.

Keywords: microplastics, additives, biodegradable plastics, mussel farming, nets