Les Journées Régionales Drones et Véhicules Autonomes (JRDVA), 24,25 avril 2025

Integration of UAV and AI for the monitoring of lugworm abundances

Alfredo Fernández-Alías[1,*], Olivier Losson[2], Nicolas Bur[3], Sylvie Marylène Gaudron[1,4], Sébastien Lefebvre[1,2]

[1]*Laboratoire d'Océanologie et de Géosciences, station marine de Wimereux. Univ. Lille, Univ. Littoral Côte d'Opale, CNRS, IRD, UMR 8187, 42 Rue Paul Duez, 59000 Lille, France*
[2] *CRIStAL. Centre de Recherche en Informatique, Signal et Automatique de Lille. Univ. Lille, CNRS, Centrale Lille, UMR 9189, 59000 Lille, France*
[3]*LaMCube, Laboratoire de Mécanique, Multi-physique, Multi-échelle. Univ. Lille, CNRS Centrale Lille, UMR CNRS 9013, 59000 Lille, France 4 Sorbonne Université, UFR 927, F-75005 Paris, France*

** alfredo.fernandez-alias@univ-lille.fr*

The lugworms from the genus *Arenicola* provide important ecosystem services as coastal engineers contributing to nutrients recycling through sediment reworking as well as being used as bait by anglers. These organisms have been exploited over the years by recreational fishermen given their shoreline availability and the relatively capture easiness. However, the development of professional exploitation techniques can severely compromise the viability of the lugworm populations in some overexploited ecosystems, thus arising the need to monitor the populations and developing regulation measurements for their extraction. Traditional monitoring system for these organisms involves the use of extensive time in digging the worms, which live between 5 to 70 cm depth, or counting the faecal casts that they produce as a *proxy* for the real population abundance. In this work, we have developed a new methodological approach by combining the deployment of an unmanned aerial vehicle (UAV) with image analysis by means of self-trained artificial intelligence (AI) providing near real-time data on the abundance and distribution of feacal casts over the beach. This approach reduces the personnel requirement, allowing higher area coverage and an increased resolution. The implementation of this technique across the Opale coast in the French coastal area of the Eastern English Channel will allow the development of effective management measurements, ensuring the maintenance of the ecosystem services.