Prospection for bioactive compounds in the North Sea: creating a knowledge base for blue biotech innovation in Flanders

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The potential of bioactive compounds from marine bioresources is currently hugely underexplored in our seas and oceans, and will offer a 'sea of opportunities' in several sectors. Primary and secondary metabolites in marine organisms are of particular interest because they have unique properties and a broad valorisation potential in e.g. pharma, cosmetics, agriculture, nutraceuticals, chemicals and functional bio-based materials. Nevertheless, the biodiscovery of new bioactive compounds has so far been limited in the North Sea region. The PROBIO project aims at the discovery and characterisation of bioactive compounds derived from local North Sea species. Therefore, a reproducible and scalable high-throughput workflow was established for the analytic screening of extracts regarding multitarget bioactivity and toxicity. In a first step, 50 North Sea species possibly containing bioactive compounds with a commercial potential have been identified and collected. Existing information of these species on bioactive compounds, cultivation opportunities and spatial/seasonal distribution are summarized in "Bioprospection Index cards". Next, the sampled species are analytically screened using a high-throughput method and will result in a fingerprint of metabolites for each species (including alkaloids, terpenes, ether/ketal, steroides, lactones, hydroxybenzene/quinones and peptides). The extracts are further tested on their electrophysiological activity based on a set of pharmacological targets and on their antimicrobial activity based on biofilm-inhibitory and -eradicating activity. Structures of the hit compounds and mechanisms of action are further characterized if relevant. All data on structural, (analytical) mass spectral and biological activity of these compounds and other metadata dedicated to marine organisms will be combined in an open-source comprehensive database, as a tool for industry and knowledge institutions to identify promising applications of marine compounds for biorefinery, aquaculture and biotechnology. Careful considerations will be made in collaboration with industrial partners to file a patent on a single isolated bioactive compound or define a strategy to delay patent filing until structure analogues have been tested and found sufficiently active to claim a class of compounds. Opportunities to couple blue biotechnology with (offshore) aquaculture to produce tailor-made biomass will be explored.

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