Job Title : Source and production of 20:5n-3 and 22:6n-3 at the basis of marine food webs
Main Research Field : Environment and Geosciences (ENV)
Sub Research Field : Life Sciences (LIF)
Key words : Trophic ecology, lipids, biochemistry, physiology, plankton
Job Description : The steadily increase in human consumption of seafood is partly related to the beneficial health effects of long chain n-3 (Omega 3) polyunsaturated fatty acids, 20:5n-3 and 22:6n-3, on cardiovascular disease, hypertension, autoimmune disorders, neural development, and mental disorders. The majority of 20:5n-3 and 22:6n-3 originates from marine phytoplankton, but their quantity varies significantly with phylogeny and physiology. Their availability is one of the key factors influencing the growth and reproduction of zooplankton and organisms at higher ranks of the trophic hierarchy. There is concern for a potential shortage of 20:5n-3 and 22:6n-3 due not only to stock reduction and overfishing, but also to climate changes which may affect their production and upward transfer. To address this issue burdened with economical, ecological and public health consequences, **the specific objectives of the Marie-Curie project** are: i) identify the source and quantify the production of 20:5n-3 and 22:6n-3 at the basis of marine food webs, ii) evaluate the trophic transfer efficiency of 20:5n-3 and 22:6n-3 in trophic webs, iii) hierarchize and quantify the influence of the climate related shifts on both production and transfer. Using deuterated, ^{13}C and ^{18}O labeled carbon sources, and LC n-3 PUFA precursors, he/she will characterize the influence taxonomic specific synthetic pathways and nutritional mode (autotrophic vs heterotrophic) on the isotope fractionation of 20:5 n-3 and 22:6n-3. The influence of growth rate on isotope fractionation will be determined by measuring the 20:5n-3 and 22:6n-3 isotope composition at different culture stages (exponential, early stationary and stationary phases). Altogether, **experimental and biochemical approaches** will help to distinguish the metabolic origin of 20:5n-3 and 22:6n-3 primary production and estimate the respective parts of de novo synthesis and bioconversion of dietary precursors within the food webs. Additionally, he/she could use stable isotope labelled cultures to fed dominant zooplankton species in order to measure trophic transfer efficiency (TTE) of 20:5n-3 and 22:6n-3. He/she will test different realistic nutrient scenarios (limitation, replete, unbalanced) in large mesocosms on i) LC n-3 PUFA primary production at the taxonomic/functional level ; ii) their transfer and potential upgrading through heterotrophic protists. The risks associated with such logistically demanding and technically complex approach will be limited, with the recognized experiences and expertise of the involved researchers of the host lab (LEMAR), who had participated and/or organized, previously, large scale mesocosm experiments. In parallel, he/she could explore how realistic the rise of temperature and its interaction with nutrient availability modulate the LC n-3 PUFA synthesis by protists and their upward transfer and accumulation efficiencies by zooplankton. A 30L sub-sample of the mesocosm species assemblages exposed to different nutrient conditions will be collected every week. The collected samples will be then exposed few days in microcosms to three different temperatures (mesocosm temperature + 0°C, +1.5°C and 2.5°C). In addition to the biological parameters, the impact of the experimental temperature changes will be assessed by measuring “homovisquous adaptation” parameters, such as polar lipid class

composition, polar lipid - phytosterol ratio, fatty acid composition of polar lipids, and phytosterol composition.

Supervisor(s) :
Philippe Soudant is a marine biologist with more than 20 years of experience on marine lipid biochemistry and 15 years' experience in developing new flow cytometry assays, both applied to his fields of research, which include marine parasitology, protist and metazoan physiology, harmful algae bloom ecology and impacts, as well as fate and impacts of microplastics. He managed several challenging interdisciplinary projects.
http://orcid.org/0000-0003-3090-5612
Point H : 34 (Web of Knowledge, Aout 2017).
Researchgate score (RG) is 40.92, higher than 97.5% of ResearchGate members.
https://www.researchgate.net/profile/Philippe_Soudant/contributions
In total, Philippe Soudant has 137 publications since 1995 and 94 publications between 2007 and 2017 in peer-reviewed scientific journals

Department/Research:
The project is hosted by LEMAR (UMR6539), an inter-disciplinary laboratory with more than 120 permanent people aiming to understand the functioning of marine ecosystems. The research team has extensive (and free) access to the needed functioning instruments.
https://www-iuem.univ-brest.fr/LEMAR/LemarLab

Suggestion for interdisciplinary / intersectoral secondments
In addition to those available at LEMAR, the fellow could have access to field and cruise facilities through key partnerships (LIENSs UMR7266 and EPOC 5805).

Skills Requirements (optional) :
Expert technical skills in chromatography (GC-FID, GC-MS, TLC, HPLC) requested; ideally on lipids or related compounds.
Knowledge in trophic ecology will be appreciated.
Publications : at least one paper per year since PhD defense.