

Curriculum Vitae (January 2020)

Stéphane PESCE

40 years old

Senior Scientist/Director of Research in Microbial Ecotoxicology
Leader of the Group "Aquatic Microbial Ecotoxicology"

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Degrees/Education

2013 HDR (French habilitation for research direction) in Microbial Ecotoxicology

University Blaise Pascal, Clermont-Ferrand II

« Structural and functional response and adaptation of microbial communities to organic and inorganic pesticides in lotic systems »

2006 PhD in Microbial Ecology

University Blaise Pascal, Clermont-Ferrand II (France)

« A combined microcosm and field approach to evaluate the effects of pesticides on the activity and diversity of stream microbial communities »

2002 MS - Master degree in Environmental Toxicology

University of Metz (France)

Research positions

Irstea, RiverLy Research Unit, Lyon-Villeurbanne, France

2019-present

Director of Research

2009- 2018

Normal Class Researcher

2017 (7 months)

Guest Researcher @ Ecotox Centre – EPFL (Lausanne, Switzerland)

2007-2009

Post-doctoral position

Main research topic

Aquatic microbial ecotoxicology: Study of structural and functional responses and adaptation of benthic microbial communities to organic and inorganic toxicants in the context of global change

Teaching and supervision of students and post-doctoral scientists

2008-present Supervision of students and post-doctoral scientists

Post-doctoral scientists (3), PhD students (3), Master theses (7), Engineer thesis (1)

2015-present Lecturer in Ecotoxicology (~15 hours/year)

University Savoie Mont Blanc, Chambéry (France), Master Level

2003-2006 Lecturer in Ecology, Ecotoxicology and Microbiology

University Blaise Pascal, Clermont-Ferrand II (France), License and Master levels

2002-2003 Private teaching in Molecular Biology and Cellular Biology

EFESUP postgraduate private school, Clermont-Ferrand (France)

Scientific expertise and responsibilities

Member of 6 PhD-Thesis committees

2019 Anne Vicente (16/10/2019; University of Lorraine, France) – Reviewer

2017 Brice Reoyo-Prats (06/12/2017; University of Perpignan, France) - Reviewer

2016 Veronika Storck (05/12/2016; University of Burgundy, France) - Examiner

2015 Elodie Billard (17/07/2015; Grenoble-Alpes University, France) - Reviewer

2011 Frédérique Changey (16/12/2011; University of Burgundy, France) - Examiner

2010 Sabir Hussain (14/09/2010; University of Burgundy, France) - Examiner

Member of 8 PhD-Thesis steering committees

2010-present Aline Ballot (2018-2021; UMR 5557 -University of Lyon, France)
Chevelie Cinea (2018-2021; UMR 5023 -University of Lyon, France)
Mégane Noyer (2017-2020; UMR 5110 -University of Perpignan, France)
Brice Reoyo Prats (2014-2017; UMR 5110 -University of Perpignan, France)
Veronika Storck (2013-2016; INRA UMR Agroecology, Dijon, France)
Armelle Autret (2013-2016; Irstea UR HBAN, Antony, France)
Floriane Larras (2010-2013; INRA UMR CARTELE, Thonon-les-bains, France)
Sandra Kim-Tiam (2010-2013; IRSTEA UR REBX, Bordeaux, France)

2017-present Co-creator and co-responsible of the international network on microbial ecotoxicology (Ecotoxicomic; <https://ecotoxicomic.org/>)

2013-2018 Co-creator and Member of advisory board of the French pluridisciplinary thematic network (RTP) on microbial ecotoxicology

Organization of Scientific Events

2020 Co-organizer of the « 2nd International Conference on Microbial Ecotoxicology ». *Montpellier, France*

2017 Co-organizer and member of the scientific committee of the « 1st International Conference on Microbial Ecotoxicology ». *Lyon, France*

2017 Co-organizer and member of the scientific committee of the French-Swiss Workshop « Study of sediment communities for ecotoxicological risk assessment and environmental pollutants monitoring studies ». *Villié-Morgon, France*

2016 Co-organizer and member of the scientific committee of the French « 3rd Congress on Microbial Ecotoxicology ». *Rovaltain, France*

2014 Co-organizer of the European Workshop « The use of environmental biofilms in ecotoxicological evaluation and risk assessment: towards a structured European network? ». *Lyon, France*

2014 Co-organizer and member of the scientific committee of the French congress « Microbial Ecotoxicology ». *Banyuls-sur-mer, France*

2013 Co-organizer of the French Workshop « Place of microbial ecotoxicology in the national context: Progress and prospects ». *Lyon, France*

2010 Co-organizer and chairman of the session « The use of aquatic biofilms in microbial ecology » in the French congress « Ecology 2010 ». *Montpellier, France*

Editorial Activity

Guest Editor of the Research Topic « Microbial Ecotoxicology » in « *Frontiers in Microbiology* » and « *Frontiers in Environmental Science* » (in progress)

Guest Editor of a Special Issue « Microbial Ecotoxicology » in « *Environmental Science and Pollution Research* » (March 2016)

Participation in national and international scientific expertise:

2020-2023 Co-coordinator (together with L. Mamy, INRAE and W. Sanchez, IFREMER) of the national expertise on the effects of pesticides and biocontrols on biodiversity and ecosystem services requested by 3 French Ministries (Agriculture, Ecological Transition, and Research & Innovation).

2017-present Member of the Scientific Strategic Committee of the technical Platform Biochem-Env (*AnaEE-France, UMR ECOSYS, Versailles*).

2015-present Member of the Directory Board of the Rovaltain Scientific Foundation for research in Health and Environment (<http://www.fcsrovaltain.org/>).

2015-present Member of the Scientific Committee of the Doctorate School « Ecology-Evolution-Microbiology-Modelling ». *University of Lyon, France*

2007-present Peer-review of more than 55 scientific articles for 20 international journals (*Aquat. Toxicol., Chemosphere, Ecol. Indic., Environ. Sci. Pollut. Res., Environ. Pollut., Ecotoxicology, Environ. Sci. Technol., Frontiers Microbiol., Water Research, etc...*)

2011-present Evaluation of scientific projects
French Research Agency ANR, EFPA department of INRA, ECOS-Sud Committee, etc...

2010 Member of the international scientific expert committee within the French framework of the "Plan National Chlordecone": « Remediation to Chlordecone pollution in the French West Indies », *French West Indies, 17-22 May 2010*

Participation in multi-partner research programmes

Current and recent Projects

- 2018-22** ANTIBIOTOX: *Fate of antibiotics and associated resistance genes in agroecosystems: ecotoxicological risk for functional microbial communities of receiving river systems.* Funding: French Research Agency ANR ; **Project Partner (responsible for workpackage 3)**
- 2018-20** PERSORESTO : *Efficiency and social perception of the restoration of the Tillet River and of the water quality of the Bourget Lake.* Funding: Rhône Méditerranée Corse Water Agency; **Project Leader**
- 2018-20** ANTIBIOTOOLS : *A set of tools to monitor antibiotic and antibiotic resistances in aquatic ecosystems.* Funding: French Agency for Food, Environmental and Occupational Health & Safety (ANSES); **Project Partner**
- 2017-19** COMMUSED: *Structural and functional assessment of benthic microbial and invertebrate communities to evaluate the ecological quality of polluted rivers.* Funding: Rhône Méditerranée Corse Water Agency; **Project Leader**
- 2017-18** SANO-FILMS: *Molecular and functional study of microbial biofilms to assess ecotoxicological effects of pharmaceutical industry effluents.* Funding: SANOFI; **Project Leader**
- 2017-18** SEDIPICT: *Validation and application of Pollution Induced Community Tolerance (PICT) measurement to evaluate in situ effects of pollutants on sediment microbial communities.* Funding: French Agency for Biodiversity (AFB) ; **Project Leader**
- 2017-18** TRACES : *Transfer and ecotoxicological effects of metals in alpine streams surrounding disused mines.* Funding: EC2CO Program ; **Project Partner**
- 2016-18** COOPERA: *French-Swiss project to develop ecotoxicological tools at community level to assess the ecological quality of contaminated sediments.* Funding: French Auvergne-Rhône-Alpes Region ; **Project Leader**
- 2016-19** IMPACT-CE: *Development and transfer of chemical and biological tools to monitor the impact of agricultural practices on lotic ecosystems.* Funding: French Agency for Biodiversity (AFB) and the French Ministry of the Environment– ECOPHTYO Plan ; **Project Partner**
- 2016-18** ECOBIOPEST: *Effects of pesticides on lotic ecosystems in the Auvergne territory: functional response and adaptation of leaf litter microbial communities.* Funding: Loire-Bretagne Water Agency; **Project Partner**

Other Projects

2010-2015 Participation in three programmes funded by the French Research Agency ANR

- ANR CESA POTOMAC (2012-2015) – **Responsible for workpackage 3**
- ANR BIOADAPT SEQADAPT (2012-2015)
- ANR CES SENDEFO (2010-2013) - **Responsible for workpackage 1**

2005-2015 Participation in more than ten multi-partner research programmes

Main sources of funding: French Ministry of Ecology (Pesticides Programme), French National Agency for Water and Aquatic Environments (ONEMA), EDF, etc...

Scientific valorisation

Peer-reviewed international publications

48 published articles

3 book chapters

Scopus H index (01/01/2020; without self-citations) = 15 (948 citations, 114 co-authors)

National publications

3 published articles

2 book chapter

Conference and workshop contributions

- 11 guest conferences/keynotes in international and national seminars and congresses
- 30 conferences and 32 posters in international seminar/congresses/workshop
- 31 conferences and 5 posters in national congresses/workshop

Peer-reviewed international publications

- PESCE S., CAMPICHE S., CASADO-MARTINEZ C., MAHAMOUD AHMED A., BONNINEAU C., DABRIN A., LYAUTEY E., FERRARI B.J.D., 2020. Towards simple tools to assess functional effects of contaminants on natural microbial and invertebrate sediment communities. *Environ. Sci. Pollut. Res. In press* (doi: 10.1007/s11356-019-07331-z)
- BONNINEAU C., ARTIGAS J., CHAUMET B., DABRIN A., FABURE J., FERRARI B.J.D., LEBRUN J.D., MARGOUM C., MAZZELLA N., MIEGE C., MORIN S., UHER E., BABUT M., PESCE S., 2020. Role of biofilms in contaminant bioaccumulation and trophic transfer in aquatic ecosystems: current state of knowledge and future challenges. *Rev. Environ. Contam. Toxicol. In press*
- MAHAMOUD AHMED A., TARDY V., BONNINEAU C., BILLARD P., PESCE S., LYAUTEY E., 2020. Changes in sediment microbial diversity following chronic copper exposure induce community copper-tolerance without increasing sensitivity to arsenic. *J. Haz. Mat. In press*
- MARTIN-LAURENT F., TOPP E., BILLET L., BATHISSON I., MALANDAIN C., BESSE-HOGGAN P., MORIN S., ARTIGAS J., BONNINEAU C., KERGOAT L., DEVERS-LAMRANI M., PESCE S., 2019. Environmental risk assessment of antibiotics in agroecosystems: ecotoxicological effects on aquatic microbial communities and dissemination of antimicrobial resistances and antibiotic biodegradation potential along the soil-water continuum. *Environ. Sci. Pollut. Res.* 26, 18930-18937
- PESCE S., LAMBERT A.S., MORIN S., FOULQUIER A., COQUERY M., DABRIN A., 2018. Experimental warming differentially influences the vulnerability of phototrophic and heterotrophic periphytic communities to copper toxicity. *Front. Microbiol.* 9, 1424
- MAHAMOUD AHMED A., LYAUTEY E., BONNINEAU C., DABRIN A., PESCE S., 2018. Environmental concentrations of copper, alone or in mixture with arsenic, can impact river sediment microbial community structure and functions. *Front. Microbiol.* 9, 1852
- ROSSI F., PESCE S., MALLET C., MARGOUM C., CHAUMOT A., MASSON M., ARTIGAS J., 2018. Interactive effects of pesticides and nutrients on microbial communities responsible of litter decomposition in streams. *Front. Microbiol.* 9, 2437
- PESCE S., PERCEVAL O., BONNINEAU C., CASADO- MARTINEZ C., DABRIN A., LYAUTEY E., NAFFRECHOUX E., FERRARI B.J.F., 2017. Looking at biological community level to improve ecotoxicological assessment of freshwater sediments: Report on a First French-Swiss Workshop. *Environ. Sci. Pollut. Res.* 607-608, 1018-1025.
- LAMBERT A.S., DABRIN A., FOULQUIER A., MORIN S., ROSY C., COQUERY M., PESCE S., 2017. Influence of temperature in pollution-induced community tolerance approaches used to assess effects of copper on freshwater phototrophic periphyton. *Sci. Total. Environ.* 607-608, 1018-1025
- MORIN S., LAMBERT A.S., PLANES RODRIGUEZ E., DABRIN A., COQUERY M., PESCE S., 2017. Changes in copper toxicity towards diatom communities with experimental warming. *J. Haz. Mat.* 334, 223-232
- BRUGGERMANN M., HAYECK N., BONNINEAU C., PESCE S., ALPERT P.A., PERRIER S., ZUTH C., HOFFMANN T., CHEN JM., GEORGE C., 2017. Interfacial photochemistry of biogenic surfactants: a major source of abiotic volatile organic compounds. *Faraday discuss.* 200, 59-74
- PESCE S., ZOGHLAMI O., MARGOUM C., ARTIGAS J., CHAUMOT A., FOULQUIER A., 2016. Combined effects of drought and the fungicide tebuconazole on aquatic leaf litter decomposition. *Aquat. Toxicol.* 173, 120-131
- PESCE S., MARGOUM C., FOULQUIER A., 2016. Pollution-induced community tolerance for in situ assessment of recovery in river microbial communities following the ban of the herbicide diuron. *Agr. Eco. Environ.* 221, 79-86
- GHIGLIONE J.F., MARTIN-LAURENT F., PESCE S., 2016. Microbial ecotoxicology: an emerging discipline facing contemporary environmental threats. *Environ. Sci. Pollut. Res.* 23, 3981-3983.
- LAMBERT A.S., DABRIN A., MORIN S., GAHOU J., FOULQUIER A., COQUERY M., PESCE S., 2016. Temperature modulates phototrophic periphyton response to chronic copper exposure. *Environ. Pollut.* 208, 821-829
- TLILI A., BERARD A., BLANCK H., BOUCHEZ A., CASSIO F., ERIKSSON M., MORIN S., MONTUELLE B., NAVARRO E., PASCOAL C., PESCE S., SCHMITT-JANSEN M., BEHRA R., 2016. Pollution Induced Community Tolerance (PICT): Towards an ecologically relevant risk assessment of chemicals in aquatic systems. *Freshwater Biol.* 61, 2141-2151
- FOULQUIER A., ARTIGAS J., PESCE S., DATRY T., 2015. Drying responses of microbial litter decomposition and associated fungal and bacterial communities are not affected by emersion frequency. *Freshwater Sci* 34, 1233-1244.

- FOULQUIER A., MORIN S., DABRIN A., MARGOUM C., MAZZELLA C., PESCE S., 2015. Effects of mixtures of dissolved and particulate contaminants on phototrophic biofilms: new insights from a PICT approach combining toxicity tests with passive samplers and model substances. *Environ. Sci. Pollut. Res.* 22, 4025-4036
- LAMBERT A.S., PESCE S., FOULQUIER A., GAHOU J., COQUERY M., DABRIN A., 2015. Improved short-term toxicity test protocol to assess metal tolerance in phototrophic biofilms: Toward standardization of PICT approaches. *Environ. Sci. Pollut. Res.* 22, 4037-4045.
- PASCAULT N., ROUX S., ARTIGAS J., PESCE S., LELOUP J., DEBROAS D., BOUCHEZ A., HUMBERT J.F., 2014. A high-throughput sequencing ecotoxicology study of freshwater bacterial communities and their responses to tebuconazole. *FEMS Microbiol. Ecol.* 90, 563-574
- GHIGLIONE J.F., MARTIN-LAURENT F., STACHOWSKI-HABERKORN S., PESCE S., VUILLEUMIER S., 2014. The coming of age of microbial ecotoxicology: report on the first two meetings in France. *Environ. Sci. Pollut. Res.* 21, 14241-14245.
- DEVERS-LAMRANI M., PESCE S., ROUARD N., MARTIN-LAURENT F., 2014. Evidence for cooperative mineralization of diuron by *Arthrobacter sp. BS2* and *Achromobacter sp. SPI* isolated from a mixed culture enriched from diuron exposed environments. *Chemosphere* 117, 208-215.
- KIM TIAM S., MORIN S., PESCE S., FEURTET-MAZEL A., MOREIRA A., GONZALEZ P., MAZZELLA N., 2014. Environmental effects of realistic pesticide mixtures on natural biofilm communities with different exposure histories. *Sci. Total Environ.* 473-474, 496-506.
- ARTIGAS J., PASCAULT N., BOUCHEZ A., CHASTAIN J., DEBROAS D., HUMBERT J.F., LELOUP J., TADONLEKE R., TER HALLE A., PESCE S., 2014. Comparative sensitivity to the fungicide tebuconazole of biofilm and planktonic microbial communities in freshwater ecosystems. *Sci. Total Environ.* 468-469, 326-336.
- BABUT M., ARTS G., BARRA CARACCILO A., CARLUER N., DOMANGE N., FRIBERG N., GOUY V., GRUNG M., LAGADIC L., MARTIN-LAURENT F., PESCE S., REAL B., REICHENBERGER S., ROEX E.W.M., ROMIJN K., RÖTTELE M., STENRØD M., TOURNEBIZE J., VERNIER F., VINDIMIAN E., 2013. Pesticide risk assessment and management in a globally changing world – Report from a European interdisciplinary workshop. *Environ. Sci. Pollut. Res.* 20, 8298-8312.
- LARRAS F., LAMBERT A.S., PESCE S., RIMET F., BOUCHEZ A., MONTUELLE B., 2013. The effect of temperature and a herbicide mixture on freshwater periphytic algae. *Ecotox. Environ. Saf.* 98, 162-170.
- PESCE S., BEGUET J., ROUARD N., DEVERS-LAMRANI M., MARTIN-LAURENT F., 2013. Response of a diuron-degrading community to diuron exposure assessed by real-time quantitative PCR monitoring of phenylurea hydrolase A and B encoding genes. *Appl. Microbiol. Biotechnol.* 97, 1661-1668.
- PESCE S., MARGOUM C., ROUARD N., FOULQUIER A., MARTIN-LAURENT F., 2013. Freshwater sediment pesticide biodegradation potential as an ecological indicator of microbial recovery following a decrease in chronic pesticide exposure: A case study with the herbicide diuron. *Ecol. Indic.* 29, 18-25.
- MORIN S., ROUBEIX V., BATHISSON I., WINTERTON P., PESCE S., 2012. Characterization of freshwater diatom communities: comparing taxonomic and genetic-fingerprint approaches. *J. Phycol.* 48, 1458-1464.
- ROUBEIX V., PESCE S., MAZZELLA N., COSTE M., DELMAS F., 2012. Variations in periphytic diatom tolerance to agricultural pesticides in a contaminated river: An analysis at different diversity levels. *Fresen. Environ. Bull.* 21, 2090-2094.
- ARTIGAS J., MAJERHOLC J., MARGOUM C., VOLAT B., NEYRA M., PESCE S., 2012. Effects of the fungicide tebuconazole on microbial capacities for litter breakdown in streams. *Aquat. Toxicol.* 122-123, 197-205
- MORIN S., LAMBERT A.S., ARTIGAS J., COQUERY M., PESCE S., 2012. Diatom immigration drives biofilm recovery after chronic copper exposure. *Freshwat. Biol.* 57, 1658-1666.
- MORIN S., PESCE S., KIM-TIAM S., LIBERT X., COQUERY M., MAZZELLA N., 2012. Periphyton tolerance following chronic exposure to low doses of pesticides in mixtures. *Ecotoxicology* 21, 1570-1580.
- LAMBERT A.S., MORIN S., ARTIGAS J., VOLAT B., COQUERY M., NEYRA M., PESCE S., 2012. Structural and functional recovery of microbial biofilms after a decrease in copper exposure: Influence of the presence of pristine communities. *Aquat. Toxicol.* 109, 118-126.
- PESCE S., BOUCHEZ A., MONTUELLE B., 2011. Effects of organic herbicides on phototrophic microbial communities in freshwater ecosystems. *Rev. Environ. Contam. Toxicol.* 214, 87-124.
- PESCE S., MORIN S., LISSALDE S., MONTUELLE B., MAZZELLA N., 2011. Combining polar organic chemical integrative samplers (POCIS) with toxicity testing to evaluate pesticide mixture effects on natural phototrophic biofilms. *Environ. Pollut.* 159, 735-741.
- PESCE S., LISSALDE S., LAVIEILLE D., MARGOUM C., MAZZELLA N., ROUBEIX V., MONTUELLE B., 2010. Evaluation of single and joint toxic effects of diuron and its main metabolites on natural phototrophic biofilms using a pollution-induced community tolerance (PICT) approach. *Aquat. Toxicol.* 99, 492-499.
- PESCE S., MARTIN-LAURENT F., ROUARD N., ROBIN A., MONTUELLE B., 2010 Evidence for adaptation of riverine sediment microbial communities to diuron mineralization: incidence of run-off and soil erosion. *J. Soil. Sed.* 10, 698-707.

- MONTUELLE B., DORIGO U., BERARD A., VOLAT B., BOUCHEZ A., TLILI A., GOUY V., PESCE S., 2010. The periphyton as a multimetric bioindicator for assessing the impact of land use on rivers: an overview of the Ardières-Morcille experimental watershed, *Hydrobiologia*, 657, 123-141.
- PESCE S., MARGOUM C., MONTUELLE B., 2010. In situ relationships between spatio-temporal variations in diuron concentrations and phototrophic biofilm tolerance in a contaminated river. *Water Res.* 44, 1941-1949.
- MORIN S., PESCE S., TLILI A., COSTE M., MONTUELLE B., 2010. Recovery potential of periphytic communities in a river impacted by a vineyard watershed. *Ecol. Indic.* 10, 429-426.
- PESCE S., BATISSION I., BARDOT C., FAJON C., PORTELLI C., MONTUELLE B., BOHATIER J., 2009. Response of spring and summer riverine microbial communities following glyphosate exposure. *Ecotox. Environ. Saf.* 72, 1905-1912.
- PESCE S., MARTIN-LAURENT F., ROUARD N., MONTUELLE B., 2009. Potential for microbial diuron mineralisation in a small wine-growing watershed: from treated plots to lotic receiver hydrosystem.. *Pest Manag. Sci.* 65, 651-657.
- LEHOURS A.C., BARDOT C., PELISSON P.F., GUEDON A., PESCE S., DEMEURE G., SARGOS D., FONTY G., 2009. Successional changes in bacterial community assemblages following anoxia in the hypolimnion of an eutrophic lake. *Aquat. Microb. Ecol.* 54, 71-82.
- PESCE S., BARDOT C., LEHOURS A.C., BATISSION I., BOHATIER J., FAJON C., 2008. Effects of diuron in microcosms on natural riverine bacterial community composition: new insight into phylogenetic approach using PCR-TTGE analysis. *Aquat. Sci.* 70, 410-418.
- PESCE S., FAJON C., BARDOT C., BONNEMOY F., PORTELLI C., BOHATIER J., 2008. Longitudinal changes in microbial planktonic communities of a French river in relation to pesticide and nutrient inputs. *Aquat. Toxicol.* 86, 352-360.
- BATISSION I., PESCE S., BESSE-HOGGAN P., SANCELME M., BOHATIER J., 2007. Isolation and characterization of diuron-degrading bacteria from lotic surface water. *Microb. Ecol.* 54, 761-770.
- PESCE S., FAJON C., BARDOT C., BONNEMOY F., PORTELLI C., BOHATIER J., 2006. Effects of the phenylurea herbicide diuron on natural riverine microbial communities in an experimental study. *Aquat. Toxicol.* 78, 303-314.

International book chapters

- PESCE S., GHIGLIONE J.F., MARTIN-LAURENT F., 2017. Microbial communities as ecological indicators of ecosystem recovery following chemical pollution. In *Microbial Ecotoxicology*. Cravo-Laureau C., Duran R., Cagnon C., Lauga B., Eds. Springer
- GUASCH H., ARTIGAS J., BONET B., BONNINEAU C., CANALS O., CORCOLL N., FOULQUIER A., LÓPEZ-DOVAL J., KIM-TIAM S., MORIN S., NAVARRO E., PESCE S., PROIA L., SALVADÓ H., SERRA A., 2016. Environmental river biofilms as biological indicators of the impact of chemical contaminants. In *Aquatic Biofilms: Ecology, Water Quality and Wastewater Treatment*. Romani, A.M., Guasch, H. and Balaguer, D., Eds. Caister Academic Press
- VILLENEUVE A., MONTUELLE B., PESCE S., BOUCHEZ A., 2013. Environmental river biofilms as biological indicators of the impact of chemical contaminants. In *Encyclopedia of aquatic ecotoxicology*. Férard, J.F. and Blaise, C., Eds. (DOI 10.1007/978-94-007-5704-2), p. 443-456