Competency Standard for Aquatic Invertebrates Survey, Mitigation and Management

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Draft Competency Framework for Aquatic Macroinvertebrates (Freshwater)

All practitioners should have knowledge and understanding of:	
The importance of aquatic macroinvertebrates as ecological indicators and for ecological assessment. An understanding of the habitat drivers for aquatic macroinvertebrate assessment.	
Aquatic macroinvertebrate survey, identification, ecology, and as indicators of biological water quality	Understanding of: 1) Basic habitat requirements and environmental preferences, including distribution 2) Community structure and dynamics and how this may vary in different habitats 3) Sensitivity to natural and anthropogenic environmental pressures 4) Life history, e.g. variability between seasonal presence/abundance, emergence of adults 5) Feeding relationships and functional groups, e.g. shredders, grazers 6) Conservation status and Invasive Non-Native Species (INNS) 7) The interaction of aquatic macroinvertebrate survey with other assessments of aquatic habitats, e.g. aquatic macrophytes, physico-chemical water quality, River Habitat Survey etc.
Health and safety	Knowledge and understanding of best practice and organisational health and safety procedures, and issues associated with aquatic macroinvertebrate surveys; identifying safe survey techniques such as using ranging pole, waders, auto-inflating lifejackets, boats etc. Able to recognise other safety issues associated with working in or near water - e.g. river level, flow, soft silt, risk of leptospirosis etc. Able to plan and undertake survey and laboratory work in a safe manner incorporating appropriate personal hygiene measures, Personal Protective Equipment (PPE) and due regard for COSHH (Control of Substances Hazardous to Health).
Biosecurity	When undertaking surveys and fieldwork, awareness of appropriate biosecurity measures for self and other surveyors including cleaning and disinfecting equipment before deploying, making sure that sampling equipment is disinfected (where appropriate), washed, cleaned and/or dried before moving to another area, surveying from upstream to downstream, etc. Awareness of aquatic and riparian non-native species and the risks associated with their spread. Undertake as standard appropriate biosecurity measures (use DEFRA-approved disinfectants) and personal hygiene precautions relating to working near water (both still and flowing) and working with animals. Able to implement the 'check, clean, dry' methodology: https://secure.fera.defra.gov.uk/nonnativespecies/checkcleandry/documents/check-clean-dry-england.pdf

Competency Standards			
Activity	**Basic**	**Capable**	**Accomplished**
Policy, Legislation and Standards			
Advising on requirements of environmental (and relevant other) policy, legislation and standards (P3)	Awareness of key environmental policy and legislation and the level of protection afforded to habitats and species. Awareness of UK or local Biodiversity Action Plans. Awareness of the importance of preventing the spread of INNS through appropriate biosecurity protocols.	Knowledge and experience of compliance with relevant legislation, for example in relation to the spread of INNS, or impacts to water quality or WFD status. Can confidently interpret legislation in regard to specific scenarios (e.g. habitat restoration) and experience of providing accurate advice appropriate to role. Able to suggest appropriate mitigation in relation to compliance with legislation.	Provides in-depth advice to clients and stakeholders on compliance with legislation and policy, and provides guidance and training to others. In-depth knowledge and experience of the relevance of legislation and policy in relation to macroinvertebrates, their habitats and mitigation in complex scenarios. May have experience of holding protected species licences for relevant aquatic invertebrates.
Surveying			
Habitat/species survey design, planning and fieldwork (S1)	Awareness of sources of information on known occurrence and distribution of aquatic macroinvertebrates (including Environment Agency (EA) open-source data). Able to check site and weather conditions prior to survey. Knowledge of when macroinvertebrate surveys can be carried out (seasonal restrictions and weather conditions, water levels etc.). Awareness of the main survey methods to survey macroinvertebrates in different habitats, the appropriate collection of samples, and proportionate sampling of habitats, and sample preservation.	Experience of understanding sources of desk study data and using this data to inform survey approach (e.g. records of notable habitats or protected species). Experience of how adverse site or weather conditions may affect survey results. Tailoring survey effort according the availability of data. Experience of designing, planning and leading a variety of macroinvertebrate surveys, under standard scenarios e.g. routine monitoring, appropriate to their role. Able to decide what additional data to collect on site to inform survey design. Experience of adapting survey design on	Significant experience of considering information for complex or difficult sites to design appropriate survey methodology, e.g. targeted species surveys, quantitative surveys, catchment-scale projects. Provides training and guidance to surveyors, including specific site constraints, e.g. designated sites, protected species, legal constraints. Quality assures field data/samples and recognises errors in data.

	Has assisted on surveys under supervision. Awareness of the importance of supporting habitat and physico-chemical data. Appreciate the confidentiality of particular survey methods, e.g. pollution investigation.	site according to changing conditions or requirements. Fully conversant with different sampling methods, including how to avoid bias.	
Species identification, handling and population assessment (S2) (Including laboratory processing)	Has a basic awareness of taxonomy and classification and can identify some common taxa to family level in the field or lab and know how to estimate abundance. Awareness of the use of taxonomic key and eDNA techniques for identification purposes. . Awareness of the procedure of sorting and processing macroinvertebrate samples in the laboratory, including the importance of quality assurance. Is developing a knowledge of species handling by working with/shadowing others. Is aware of legal and biosecurity issues, standard biosecurity protocols, laboratory safe working procedures and COSHH. Aware of population assessment techniques for macroinvertebrates. Aware of species recording schemes and the importance of reporting	Experience of identifying taxa at mixed-taxon level within accepted margins of error according to best practice guidance and estimate abundance. Competent in the use of microscopes and laboratory equipment. Identifies some species in the field as required (e.g. removing protected species, identifying INNS). Reliably uses dichotomous keys to key out species accurately. Reliably identifies most commonly encountered family groups in the field, e.g. for pollution response surveys. Implements effective biosecurity protocols. Distinguishes between qualitative and quantitative data and assesses the significance of invertebrate populations, e.g. for habitat assessment or assessment of conservation status.	Routinely and accurately quality assures the field or laboratory identification work of others, at family or mixed-taxon level. May specialise in one or more taxonomic groups to provide additional guidance and expertise in that area. Confident in species identification outside their natural range, and understands the significance of this, e.g. protected/notable species or INNS. Designs and implements population assessments, for example to obtain semi-quantitative data for habitats or species, in complex or non-standard scenarios.

	notable species and INNS using resources such as INNS Mapper.		
Habitat identification and evaluation (S3)	Appreciates that different macroinvertebrate communities may indicate different habitats, potential impacts to habitats or regional variability. Recognises the range of representative habitats to be sampled. Is developing an understanding of the use of biotic indices under different scenarios.	Experience of applying habitat assessment methods to different scenarios, and adjusting these methods as required in the field, including the importance of adjacent habitats and ecological connectivity. Applies representative sampling methods reliably across habitats. Applies and interprets different biotic indices under standard assessment scenarios, and interprets results according to standard methods, e.g. Pond PSYM (Predictive System of Multimetrics).	Designs and implements surveys to identify and establish a broad range of habitats, including complex or uncommon habitats. Designs bespoke surveys for non-standard assessments for complex or protected sites. Experience of applying habitat assessment metrics accurately in complex scenarios, e.g. RIVPACS (River Invertebrate Prediction and Classification System), CSM (Common Standards Monitoring).
Physical environment survey and assessment (S4)	Appreciates the need for supporting physical-chemical parameters to support habitat assessment, e.g. water quality, substrate types, flow, pollution indicators. Collects such data under guidance.	Experience of collecting accurate physical-chemical site data relevant to the assessment being undertaken. Obtains representative site data according to habitat variability, according to industry standards.	Understands the importance of the physical environment in determining habitat and species distribution, and how this may change, e.g. through climate change. Recognises when physical-chemical data may be erroneous. Experience in the multi-disciplinary application of physical-chemical parameters, e.g. for WFD assessment.
Environmental Assessment			
Impact assessment (A4)	Appreciates that aquatic macroinvertebrates can be used to inform baseline conditions for	Experience of using aquatic macroinvertebrate baseline data to inform habitat condition and/or impact	Identifies assessment requirements (scoping) and assesses the accuracy and validity of complex submissions.

	Ecological Impact Assessment (EcIA) and habitat condition monitoring. Knowledge of simple EcIAs for aquatic macroinvertebrates and/or their habitats and may contribute to assessment and/or under supervision.	assessment and make appropriate mitigation recommendations of limited scope and/or complexity. Experience of simple or standard EcIAs for aquatic macroinvertebrates and their habitats.	Leads on the assessment of aquatic macroinvertebrates and their habitats for EcIA, including for more complex or non-standard projects or sites. Able to advise and train others.
Environmental Management			
Providing specialist advice on habitat/species management and/or habitat creation or rehabilitation plans or projects (M1)	Awareness of simple techniques for habitat/species management that can be used to manage and/or create habitats suitable for macroinvertebrates, e.g. pond creation.	Experience of standard habitat/species management projects or habitat creation techniques for macroinvertebrates, including those designed to adapt to/mitigate climate change effects, e.g. river restoration.	Provides specialist technical advice on a wide range of complex or non-standard habitat/species management and/or habitat creation and/or climate change adaptation techniques for macroinvertebrates, e.g. catchment management.
Designing and preparing (M2), and implementing (M3) habitat/species management, mitigation, compensation and/or enhancement plans or projects.	Knowledge of the design and/or implementation of simple habitat/species management, mitigation, compensation and enhancement projects for macroinvertebrates, e.g. pond creation. Awareness of the considerations that might present opportunities and constraints (e.g. land ownership, planning, and feasibility) in the design, preparation and implementation of plans or projects.	Experience of [the design of] simple or standard habitat and/or species management, mitigation, compensation and enhancement projects for macroinvertebrates, including the timing of development works. Experience of appropriate management monitoring schemes and remedial actions, e.g. river restoration. Experience of selecting appropriate design options in standard scenarios, e.g. according to flow or sedimentation impacts.	Leads on the design of medium to large-scale habitat/species management, mitigation, compensation and enhancement plans or projects, particularly those that are complex, including catchment management, or habitats for certain species. Designs effective monitoring schemes appropriate to the scale/impact of the project. Considers the potential impacts of INNS macroinvertebrates to inform mitigation design.
Strategic outcome monitoring, data	Knowledge of strategic monitoring activities, e.g. Riverfly monitoring, WFD surveillance monitoring.	Experience of strategic monitoring projects, producing monitoring reports and evidence-based recommendations.	Leads on the design and implementation of complex monitoring strategies. Reviews evidence and

management and reporting (M5)	Awareness of the importance of valid and accurate data, and potential limitations of data errors.	Contributes to the management of standard data sets to inform strategy.	identifies evidence-based recommendations for further action.
Risk management during project implementation (M6)	Awareness of the risks commonly associated with project implementation and how to manage them, e.g. transfer of INNS; maintenance of water quality standards (e.g. by monitoring macroinvertebrates or water quality). Complies with site-based risk management protocols, e.g. by liaising with the Ecological Clerk of Works (ECoW).	Experience of best practice guidance to identify and successfully manage risks for small and medium scale [standard] projects. Acts as the Ecological Clerk of Works, liaising with other professionals and contractors as appropriate, for example to mitigate biosecurity risks, the spread of INNS, or to prevent impacts to water quality.	Provides comprehensive advice and implements best practice guidance for complex or challenging [non-standard] projects, for example by coordinating or performing the ECoW role for large-scale or high-risk projects. Designs effective multi-species/habitat strategies or biosecurity measures for complex and large-scale projects.
Scientific Method			
Scientific method design and implementation (SM1)	Awareness of a range of methodologies that can be used to investigate scientific questions, e.g. pollution investigation (upstream v downstream). Awareness of a range of types of data, and their appropriateness. Aware of simple hypotheses and methodologies to test these under guidance.	Able to design scientific questions, and methodologies to test these. Implements standard scientific methodology independently and more complex methodologies under guidance, e.g. pollution investigation including Before/After/Control/Impact (BACI). Considers the appropriateness of data when designing an investigation, i.e. scale and extent of sampling data.	Formulates complex scientific questions, designs investigative methodologies to test these, and supervises investigative design by others. Implements all aspects of a complex or non-standard scientific methodology.
Analysis of environmental data and modelling (SM2)	Awareness of different approaches to modelling using macroinvertebrate data. Awareness of appropriate analyses of straightforward data sets, able to	Experience of choosing appropriate analyses to use; carries out straightforward analyses of a range of standard data independently, including	Carries out complex data analyses and interpretation. Makes sound use of ecological and/or bespoke environmental modelling.

	prepare data for and calculate biotic indices using calculator tools (e.g. the RICT (River Invertebrate Classification Tool) analysis. Awareness of the potential limitations of data and the importance of minimising errors.	evidence from modelling, e.g. using RICT and interpreting the output. Analyses standard data independently, and more complex data under guidance, including steps to minimise errors.	Able to contribute sound statistical advice to the design of a scientific methodology, e.g. multivariate analyses, or appropriate statistical test.
Interpretation and evidence-based reporting (SM3)	Awareness of the importance of, and techniques for, interpreting data, using appropriate presentation tools, e.g. graphs or mapping. Awareness of report structure to present data in a logical way, including a non-technical summary.	Experience of interpreting data and evidence, acknowledging limitations and uncertainties, and draws and presents valid conclusions. Interprets standard data independently, and more complex data and evidence under guidance. Interprets results to form a sound judgement or hypothesis, e.g. of habitat use by macroinvertebrates, or indicating water quality.	Independently interprets complex data and produces accurate, factual and well written conclusions for a range of audiences as appropriate. Able to interpret macroinvertebrate community and environmental information as part of a non-standard, complex assessment.
Organisational Management			
Managing Quality (OM1)	Awareness of the importance of quality assurance, e.g. for laboratory analysis or reporting – Ring Tests, audits, data entry, laboratory procedures, audit trails etc. Aware of internal or external systems and standards for quality management.	Experience of the implementation of quality standards to check the work of others and contributes to quality assurance, for example by checking the work of others.	Develops and manages quality management protocols. Defines required quality standards and carries out audits to check these are implemented.

Note: 'capable' level requires achievement of all criteria for both 'basic' as well as 'capable'; 'accomplished' requires achievement of all criteria for all levels