# BIOTIC – Biological Traits Information Catalogue

MarLIN

**Harvey Tyler-Walters, Dan Lear.** Marine Biological Association of the United Kingdom,
The Laboratory, Citadel Hill, Plymouth PL1 2PB, UK

## Biological Traits Information Catalogue

BIOTIC provides biological traits information on benthic species – to download and link to survey data. This allows benthic data to be analyzed on a functional level. BIOTIC contains information on up to 42 biological traits on selected benthic species and genera, plus supporting information including a bibliography of source literature. The emphasis is on benthic invertebrates and plants. Users can browse the species list, search by biological trait and download traits by species.

## Aims

- To provide easy access to biological traits information in a standardised format
- To circumvent the prolonged literature reviews required to collate traits information
- To provide a platform for users to share and exchange traits information
- To create a 'single' repository that the benthic science community itself can develop

## Trait schema

The BIOTIC schema includes 42 separate traits (Table 1), based on clearly defined terms. Where needed, the traits use a one to three level hierarchy of terms of increasing specificity (Table 2). It is based on the traits developed by MarLIN[1,2], itself based on standard terms and rationale developed for the UK's Marine Nature Conservation Review[3] and Habitat Classification[4], with additional traits[5,6] to support UK Biodiversity Action Plans, OSPAR reporting, and studies of benthic sensitivity to, and recovery from, human activities[7,8].

**Table 1. List of benthic invertebrate traits compiled in the biological traits information catalogue (BIOTIC). Where more than one category of traits applies, all relevant categories are recorded.**

| Subject area | *Traits* (categories) |
|---|---|
| Biology | *Growth form* - 44 categories e.g. Algal gravel, Bivalved, Foliose, Turbinate, Encrusting |
| | *Growth rate* (expressed as µm, mm, cm per day/month/year) |
| | *Size (max.)* - 6 categories from Very small(<1cm) to Large(>50cm) |
| | *Environmental position* - 14 categories e.g. Epibenthic, Infaunal, Interstitial, Pelagic, Demersal |
| | *Habit* - 10 categories e.g. Attached, Bed forming, Burrow dwelling, Erect Encrusting |
| | *Height (above substratum)* – (mm/cm/m) |
| | *Flexibility* - High (>45°) / Low (10 – 45°) / None (<10°) |
| | *Fragility* - Fragile, Intermediary, Robust |
| | *Mobility/movement* - Swimmer, Crawler, Burrower, Drifter, Attached (permanent, temporary) |
| | *Dispersal potential (adult)* - 7 categories from None, Very limited (<1m) to >10km |
| | *Feeding method* - 19 categories e.g. Autotroph, Detritivore, Grazer, Predator |
| | *Typical food type* - (descriptive text) |
| | *Bioturbator* - 4 categories e.g. Diffusive mixing, Conveyor belt transport, |
| | *Sociability* - Free living, Gregarious, Colonial |
| | *Dependency* - Independent, Parasitic, Mutualist, Inquilinist, Commensal, Host |
| | *Toxicity* - (Yes/No) |
| | *Host (for another species)* - (Yes/No) |
| Habitat | *Distribution (UK & Global)* - ( descriptive text) |
| | *Biogeographic range* - ( descriptive text) |
| | *Migratory* - Resident, Passive, Active (Diel, Seasonal) |
| | *Depth range* (expressed as metres below chart datum) |
| | *Substratum preferences* - 38 categories e.g. Bedrock, Boulders, Mud, Gravel, Mixed, Other |
| | *Physiography* - 9 categories e.g. Open coast, Strait / sound, Sea loch, Ria / Voe, Estuary |
| | *Biological zone* – Benthic (15 categories), Pelagic (8 categories) |
| | *Wave exposure* - 8 categories from Extremely Exposed to Ultra Sheltered |
| | *Tidal strength* - Very Strong, Strong, Moderately Strong, Weak, Very Weak (negligible) |
| | *Salinity (range)* - Full (30-40 psu), Variable (18-40 psu), Reduced (18-30 psu), Low (<18 psu) |
| Life history | *Reproductive type* - 17 categories e.g. Budding, Fission, Gonochoristic, Hermaphrodite |
| | *Regeneration potential* – (Yes/No) |
| | *Reproductive frequency* - 7 categories e.g. Semelparous, Annual episodic, Biannual protracted |
| | *Reproductive season* - (range of months or seasons) |
| | *Reproductive location* - As adult, Adult burrow, Brooding, Sediment surface, Water column |
| | *Life span (max.)* - 8 categories from <1 year to 100+ years |
| | *Generation time* - 8 categories from <1 year to 100+ years |
| | *Age at maturity* - 8 categories from <1 year to 100+ years |
| | *Fecundity* – number of eggs |
| | *Egg/propagule size* – value (µm, mm, cm) |
| | *Fertilization type* - External, Internal, Self-fertile, None (asexual) |
| | *Developmental mechanism* – 10 categories e.g. Planktotrophic, Oviparous, Viviparous |
| Larval/Juvenile | *Larval/juvenile dispersal potential* - 7 categories from None, Very limited (<1m) to >10km |
| | *Larval settlement period* - (range of months or seasons) |
| | *Duration of larval stage* - <1 day, 1 day, 2-10 days, 11-30 days, 1-2 months, 1-6 months, >6 months |

**Table 2. Example of the hierarchical structure used in some traits and their categories.**

| | Level 1 | Level 2 |
|---|---|---|
| **Trait** | **Categories** | |
| Feeding method | | |
| | Autotroph | Photoautotroph |
| | | Chemoautotroph |
| | Detritivore | |
| | Deposit feeder | Surface deposit feeder |
| | | Sub-surface deposit feeder |
| | Suspension feeder | Passive |
| | | Active |
| | Grazer | Grazer (fronds /blades) |
| | | Grazer (grains / particles) |
| | | Grazer (surface /substratum) |
| | Herbivore | |
| | Omnivore | |
| | Scavenger | |
| | Predator | |
| | Symbiont contribution | |

Developed with funds from:

Developed with contributions from:

Advancing marine science through research, communication and education

www.mba.ac.uk

## Information on:

- 685 benthic species or genera, including 538 species from 16 major groups (Figure 1)
- plus another 146 entries as genera from 13 major groups, for up to 42 traits (Figure 2),
- supported by ca 4,600 referenced sources.

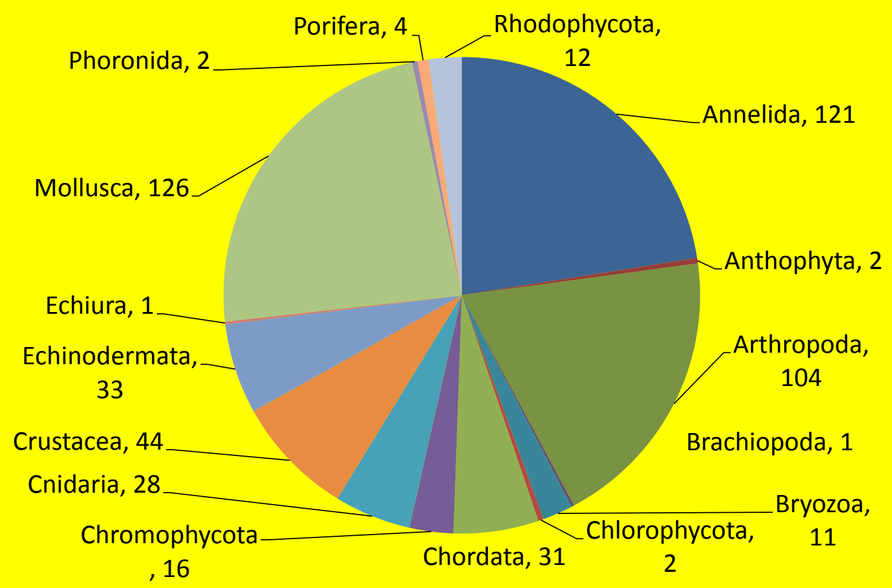


**Figure 1. Range of species information held (2012)**

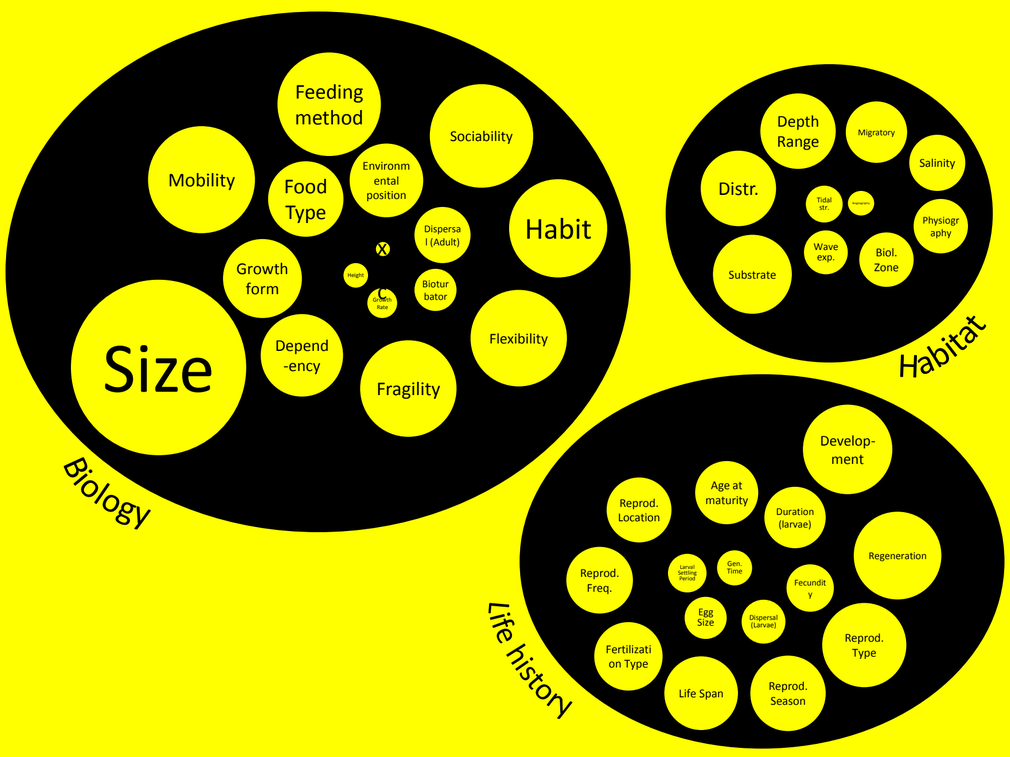


**Figure 2. Relative proportion of traits within the BIOTIC database (2012)**

## Lessons learned

MarLIN/BIOTIC was developed over a period of ten years. Collating traits information is time-consuming and labour intensive, and requires access to historical and grey literature.

**There is a surprising lack of basic biology on many marine species:**

- Life history traits variable (often only available a family level)
- Larval /juvenile traits, and rare/scarce species, are especially difficult.

**Trait catalogues need:**

- Fully referenced traits - so that users can refer to source.
- Peer review of content - ideal but difficult to organise.
- Internationally accepted set of terms - at present the definition of function groups varies from study to study, and yet clearly defined terms essential to the use of traits
- Standards - MNCR /UK Habitat Classification /EUNIS are good examples of standardisation but not agreed or used globally.
- Raw data - although but most studies use categorized traits.

The **entire marine community** needs to work together due to the range of expertise and information required.

## Future work

MarLIN's BIOTIC will be further developed as part of the EMODnet Biology 2 project (DG-Mare) 2013-2016; which aims to develop an standard trait vocabulary and database to enable the exchange, and hence use, of traits information across Europe.

## Acknowledgments

BIOTIC was developed by Drs Harvey Tyler-Walters, Charlotte Marshall, Emma Jackson, Olivia Langmead and Dan Lear (MBA), with advice and support from Drs Paul Somerfield (PML) , Stuart Jenkins and Hilmar Hinz (MBA). Funding was provided by the MBA, Plymouth Marine Laboratory (PML), Scottish Natural Heritage, the Crown Estate, and through collaboration with Marine Ecology Surveys Ltd (MES). Additional traits information was supplied by Drs Julie Bremner, Heidi Tillin, Lizzie Tyler, and others.

## References

1. Marine Life Information Network (www.marlin.ac.uk)
2. Tyler-Walters, H., Hiscock, K., Lear, D.B. & Jackson, A. 2001. Identifying species and ecosystem sensitivities. *Report to the Department for Environment, Food and Rural Affairs from the Marine Life Information Network (MarLIN).* Marine Biological Association of the United Kingdom, Plymouth. Contract CW0826
3. Hiscock, K. (ed.), 1996. *Marine Nature Conservation Review: rationale and methods*. Peterborough: Joint Nature Conservation Committee. [Coasts and seas of the United Kingdom. MNCR series.]
4. Connor, D.W., Allen, J.H., Golding, N., Howell, K.L., Lieberknecht, L.M., Northen, K.O. & Reker, J.B., (2004). The Marine Habitat Classification for Britain and Ireland. Version 04.05. *Joint Nature Conservation Committee, Peterborough*. www.jncc.gov.uk/MarineHabitatClassification
5. McLeod, C.R., 1996. Glossary of marine ecological terms, acronyms and abbreviations used in MNCR work. In *Marine Nature Conservation Review: rationale and methods*, (ed. K. Hiscock), Appendix 1, pp. 93-110. Peterborough: Joint Nature Conservation Committee. [Coasts and seas of the United Kingdom, MNCR Series].
6. Lincoln, R., Boxshall, G. & Clark, P., 1998. *A dictionary of ecology, evolution and systematics* (2nd ed.). Cambridge: Cambridge University of Press.
7. Marine Ecological Surveys Limited. 2008. Marine *Macrofauna Genus Trait Handbook*. Marine Ecological Surveys Limited, 24a Monmouth Place, BATH, BA1 2AY. 184pp. ISBN 978-0-9506920-2-9. http://www.genustraithandbook.org.uk/
8. Tyler-Walters, H., Rogers, S.I., Marshall, C.E. & Hiscock, K. 2009. A method to assess the sensitivity of sedimentary communities to fishing activities. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **19**, 285-300, DOI: 10.1002/aqc.965. http://dx.doi.org/10.1002/aqc.965