National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Guidance for the derivation of environmental risk limits

Taxonomic classification of species used for ERL derivation

version 1.1

Colophon

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Contents

1 Taxonomic division of species used in ecotoxicity tests

One of the prerequisites for deriving risk limits is that sensitive species groups are included in the dataset. Knowledge about the taxonomic position is important to understand and evaluate similarities and differences in sensitivities, and is indispensable to decide on assessment factors and whether or not a species sensitivity distribution can be constructed. Therefore, results of ecotoxicity tests are clustered in taxonomic groups according to the guidance presented here.

Since taxonomy of species is a field of discipline which is in continuous development and various classification systems exist within biology, we do not aim for completeness here. We have followed the taxonomy as outlined in Lawrence [1]. Listed in the rightmost column are the taxon names that are used to group species within the framework of environmental risk limit derivation in the Netherlands. Two tables are presented on the following pages that show a further division of the presented phyla and the taxonomic groups discerned for use within Dutch framework. The taxonomic classification outlined in this section is in accordance with REACH guidance.

Table 1 shows the major taxonomic division in kingdoms and phyla for those organisms regularly encountered in ecotoxicological tests.

Table 2 shows a more detailed taxonomic classification for those taxa that are further subdivided for purposes of ERL derivation. Listed in the rightmost column are the taxon names that are used to group species within the framework of standard setting.

Table 1 Taxonomic position of test organisms I: kingdoms and phyla and classification within the Dutch framework of ERL derivation.

REGNUM	**Common name**	**PHYLUM/DIVISION**	**Common name**	**Taxon name NL framework**
MONERA	Prokaryotes			
		GRACILICUTES (EUBACTERIA)		see Table 2
		MENDOSICUTES (ARCHAEBACTERIA)		see Table 2
PROTISTA	Protists			
		EUGLENOPHYTA	Euglenoids	Algae
		HETEROKONTOPHYTA		Algae
		CHLOROPHYTA	green algae	Algae
		MASTIGOPHORA	Flagellates	Protozoa
		SARCODINA (AMOEBAE)	Amoebas	Protozoa
		CILIOPHORA	Ciliates	Protozoa
PLANTAE	Plants			
		HEPATOPHYTA	Liverworts	
		ANTHOCEROPHYTA	Hornworts	
		BRYOPHYTA	Mosses	Bryophyta
		ANTOPHYTA (MAGNOLIOPHYTA)	flowering plants	Macrophyta
MYCETAE	Fungi			
		ZYGOMYCOTA		Fungi
		ASCOMYCOTA		Fungi
		BASIDIOMYCOTA		Fungi
		DEUTEROMYCOTA		Fungi
ANIMALIA	Animals			
		PORIFERA	Sponges	Porifera
		CNIDARIA (COELENTERATA)	corals, sea anemones…	Cnidaria
		CTENOPHORA (COELENTERATA)		Ctenophora
		PLATYHELMINTES	Flatworms	Platyhelminthes
		GASTROTRICHA		Gastrotricha
		ROTIFERA	Rotifers (wheel animals)	Rotifera
		NEMATODA	nematodes, roundworms	Nematoda
		MOLLUSCA	Molluscs	Mollusca
		ANNELIDA	ringed worms	Annelida
		ARTHROPODA	Arthropods	see Table 2
		ECHINODERMATA	Echinoderms	Echinodermata
		HEMICHORDATA		Hemichordata
		CHORDATA	vertebrates	see Table 2

Table 2 Taxonomic position of test organisms II: from kingdom to order and classification within the Dutch framework of ERL derivation.

REGNUM	**PHYLUM**	**common name**	**subphylum**	**super class**	**class**	**common name**	**subclass**	**order**	**common name**	**Taxon name NL framework**
MONERA										
	EUBACTERIA									
					Scotophobia					Bacteria
					Oxyophotobacteria	cyanobacteria				Cyanobacteria
	ARCHAEBACTERIA									Archaebacteria
PROTISTA										
	DINOFLAGELLATA									Algae
	EUGLENOPHYTA	euglenoids								Algae
	HETEROKONTOPHYTA									
					Chrysophycae	golden algae				Algae
					Bacillariophycae	diatoms				Algae
	CHLOROPHYTA	green algae								Algae
	PROTOZOA									
			Sarcomastighophora							
				Mastigophora		flagellates				Protozoa
			Ciliophora			cilates				Protozoa
			Sarcodina			amoebas				Protozoa
PLANTAE		macrophytes								
	HEPATOPHYTA	liverworts								
	ANTHOCEROPHYTA	hornworts								
	BRYOPHYTA	mosses								
	ANTOPHYTA (MAGNOLIOPHYTA)	flowering plants								
					Dicotelydones					Macrophyta
					Monocotyledones					Macrophyta
MYCETAE		fungi								
	ZYGOMYCOTA									Fungi
	ASCOMYCOTA	e.g. yeasts, moulds								Fungi
	BASIDIOMYCOTA									Fungi
	DEUTEROMYCOTA	e.g. penicillum								Fungi
	MYCOPHYCOPHYTA	lichens								

Table 2 (cont.)

REGNUM	PHYLUM	common name	subphylum	super class	class	common name	subclass	order	common name	Taxon name NL framework
ANIMALIA										
	PORIFERA	sponges								
	CNIDARIA (COELENTERATA)									
					Anthozoa	corals and sea anemones				Cnidaria
					Hydrozoa	milliporine corals, hydroids, siphonophores				Cnidaria
					Scyphozoa	true jellyfishes				Cnidaria
	CTENOPHORA (COELERTERATA)									
					Tentacula					Ctenophora
					Nuda					Ctenophora
	PLATYHELMINTHES	flatworms								
					Turbellaria					Platyhelminthes
	GASTROTRICHA									Gastrostricha
	ROTIFERA	rotifers (wheel animals)								Rotifera
	NEMATODA	nematodes, roundworms								Nematoda
	MOLLUSCA	molluscs								
					Pelecypoda (Bivalvia)	Clams etc.				Mollusca
					Gastropoda					Mollusca
							Pulmonata		whelks, land and water snails, slugs etc.	Mollusca
					Scaphopoda	tusk shells				Mollusca
					Cephalopoda					Mollusca
	ANNELIDA	ringed worms								
					Oligochaeta	e.g. earthworms, enchytraeids				Annelida
					Polychaeta	e.g. ragworms, lugworms				Annelida
					Hirudinae	leeches				Annelida

Table 2 (cont.)

REGNUM	PHYLUM	common name	subphylum	super class	class	common name	subclass	order	common name	Taxon name NL framework
ANIMALIA (cont.)										
	ARTHROPODA	arthropods								
			Chelicerata		Arachnida					
								Araneida	spiders	Arachnida
								Acarina	ticks and mites	Arachnida
					Pycnogonida	sea spiders				Pycnogonida
			Crustacea							
					Branchiopoda	water fleas, etc.				Crustacea
					Ostracoda	ostracods				Crustacea
					Copepoda	copepods				Crustacea
					Mystacocarida					Crustacea
					Branchiura	fish lice				Crustacea
					Cirripedia	barnacles				Crustacea
					Malocostraca	crabs, lobsters, shrimps, woodlice				Crustacea
			Atelocerata							
					Diplopoda	millipedes				Myriapoda
					Chilopoda	centipedes				Myriapoda
					Insecta	insects				
							Apterygota			
								Collembola	springtails	Insecta
							Pterygota			
								Odonata	dragonflies	Insecta
								Ephemeroptera	mayflies	Insecta
								Plecoptera	stoneflies	Insecta
								Trichoptera	caddis-flies	Insecta
								Coleoptera	beetles	Insecta
								Diptera	house flies, mosquitos, etc.	Insecta
								Hymenoptera	ants, wasps, bees	Insecta
	ECHINODERMATA	echinoderms								
			Pelmatozoa		Crinoidea	sea lillies, feather stars				Echinodermata
			Eleutherozoa		Stelleroidea	star fish, brittle stars				Echinodermata
					Echinoidea	sea urchins				Echinodermata

Table 2 (cont.)

REGNUM	PHYLUM	common name	subphylum	super class	class	common name	subclass	order	common name	Taxon name NL framework
ANIMALIA (cont.)										
	HEMICHORDATA									
	CHORDATA									
			Urochordata (=Tunicata)		Ascidiacea	sea squirts		Enterogona		Ascidiacea
			Cephalochordata			lancelets				
			Agnatha			jawless vertebrates				
			Gnatostomata			jawed vertebrates				
				Pisces		fishes				Pisces
					Chondrichthyes	sharks and rays				Pisces
					Osteichthyes	bony fishes				Pisces
				Tetrapoda						
					Amphibia	frogs, toads, salamanders, newts				Amphibia
					Reptilia					Reptilia
					Aves					Aves
					Mammalia					Mammalia

2 Trophic levels

2.1 Aquatic ecosystem

The following scheme may be consulted when the position of a taxonomic group in a trophic level of the aquatic ecosystem is needed. Three trophic levels are discerned: primary producers, primary consumers and secondary consumers.
This section is cited from part II, Appendix IV of the former technical guidance document (TGD) for new and existing substances and biocides [2], which is no longer in use. The list has been updated with respect to the original citation.

Primary producers
Primary producers photo-/chemo-autotrophically synthesise organic compounds using inorganic precursors. They include:

- chlorophyll-containing species of vascular plants
- algae, (e.g. green algae: *Pseudokircherniella (*previously: *Selenastrum*), *Scenedesmus*, *Chlorella, Skeletonema, Dunaliella*; blue-green algae: e.g. *Microcystis, Anabaena, Synechococcus;* diatoms: e.g. *Navicula*, *Nitzschia, Thalassiosira*)
- purple sulphur bacteria, chlorobacteria
- aquatic fungi
- chemo-autotrophic bacteria (nitrifying bacteria, sulphur bacteria).

Primary consumers
They live mainly on living or dead autotrophic organisms or on microorganisms. Representatives of this trophic level are especially plant-eating animals (i.e. species that are not carnivorous of the following taxonomic groups):

- protozoa (e.g. *Uronema*, *Entosiphon*, *Tetrahymena*)
- annelida (e.g. *Tubifex*, *Lumbriculus*, *Enchytraeus, Neanthes*)
- crustacea (e.g. *Artemia*, *Daphnia* sp., *Ceriodapnnia* sp., *Copepoda*, *Gammarus*, *Asellus, Mysidopsis, Palaemonetes, Cancer*)
- molluscs (e.g. *Dreissena*, *Mytilus*, *Ostrea*; several gastropods: *Lymnaea*, *Patella*, *Viviparus,* *Nucella*)
- insects[1] (some insect larvae that are not carnivorous, like e.g. *Chironomus* sp.)
- nematoda (those species which are living in water)
- ascidiacea (sea squirts, e.g. *Ciona* sp. or *Ascidia* sp.)

Secondary consumers
They live mainly on primary consumers. Among them are:

- predatory insects and larvae of insects (e.g. *Chaoborus*)
- carnivorous protozoa
- rotifers (*Brachyonus*)
- cnidarians (formerly Coelenterata; e.g. *Hydra, Cordylophora, Eirene*)

[1] Most insect species spend a substantial part of their life cycle in or on the sediment. Depending on the type of test and the life stage tested, these species may be used in ERL derivation for sediment rather than the water compartment.

- predatory copepods
- fish (Teleostei: e.g. *Cyprinus carpio*, *Danio rerio* (previously: *Brachydanio rerio*), *Poecilia reticulata*, *Oryzias latipes*, *Pimephales promelas*, *Lepomis macrochirus*, *Oncorhynchus mykiss* (previously: *Salmo gairdneri*), *Leuciscus idus*, *Cyprinodon* sp., *Carassius* sp.)
- amphibians (e.g. *Rana*, *Xenopus*)

Decomposers
Organisms of this trophic level break down dead organic material to inorganic constituents.

2.2 Terrestrial ecosystem

The trophic levels used within REACH for the terrestrial ecosystem are primary producers, decomposers and consumers. Since little additional information is given on how to classify terrestrial organisms in these trophic levels, a more detailed classification in the following sections.

Primary producers
According to the REACH guidance, the primary producers are plants (Macrophyta), producing food for heterotrophic organisms. We have extended this trophic level with Algae and Cyanobacteria, since there are many terrestrial, photoautotrophic species in both taxa that are also primary producers.

Decomposers
Decomposers contribute to the breakdown of organic matter (detritus, humus, litter) rather than predating on other organisms. REACH guidance mentions only Bacteria as 'taxon' in this trophic level. We have divided the level of decomposers in two separate classes: micro-organisms and higher organisms. The micro-organism decomposers operate at the molecular level: organic molecules are broken down into smaller fragments and/or eventually into inorganic nutrients. The higher organism decomposers fragment organic matter, (litter, humus) or plants into smaller pieces.

Bacteria belong to the micro-organism decomposers. We have added the Fungi to this trophic level. Additionally, we discern the groups 'Enzymatic reactions' and 'Microbial processes' within the micro-organism decomposers. Ecotoxicological information for both groups is regularly encountered.
A few taxa are placed in the group of higher organism decomposers. The feeding strategy of these organisms can be characterised by breaking down organic material into smaller fragments. The food of these organisms is organic matter in various forms, or plant material, rather than other organisms (predation). The distinction between decomposers (higher organism) and consumers (next section) can not be made fully, since by consuming organic matter, the decomposers also eat bacteria and fungi and possibly other smaller organisms.

Consumers
The organisms at this level should be those that predominantly predate on other organisms. Species in this class will, to some extent, also digest organic matter.

Note that the classification given below is indicative. Especially the distinction between the decomposing higher organisms and the consumers may not be very sharp for some species. A species may be placed in a different category than indicated in the scheme when information on its feeding behaviour is available.
The indicative list of taxa below is divided over trophic levels for terrestrial organisms. Species listed are examples for which ecotoxicological data have been encountered.

Primary producers
- Algae (e.g. *Achnanthes* sp., *Ankistrodesmus* sp., *Chlamydomonas* sp., *Chlorella* sp., *Chlorococcum* sp., *Navicula* sp., *Nitzschia* sp., *Scenedesmus* sp., *Synedra* sp., *Ulothrix* sp.)
- Cyanobacteria (e.g. *Anabaena* sp., *Microcoleus* sp., *Nostoc* sp., *Oscillatoria* sp.)
- Macrophyta (all photosynthesising plant species)

Decomposers – micro-organisms
- Bacteria
- Enzymatic reactions[2] (e.g. amylase, dehydrogenase, glucosidase, invertase, phosphatase, sulphatase, urease)
- Microbial processes (e.g. denitrification, 'substrate'-mineralisation, nitrification, respiration, sulphur oxidation)
- Fungi
- Protozoa – saprobic feeders[3]

Decomposers – higher organisms
- Annelida (*Allolobophora* sp., *Aporrecrodea* sp., *Dendrobaena* sp., *Eisenia* sp., *Enchytraeus* sp[4]., *Lumbricus* sp.)
- Crustacea[5] (e.g. *Porcellio* sp., *Oniscus* sp.)
- Mollusca[6] (e.g. *Arianta* sp., *Arion* sp., *Helix* sp.)

Consumers
- Araneae (e.g. *Lycosa* sp., *Oedothorax* sp., *Paradosa* sp.)
- Acari (e.g. *Phytoseiulus* sp., *Platynothrus* sp., *Typhlodromus* sp.)
- Insecta (e.g. *Folsomia* sp., *Gryllus* sp., *Onychiurus* sp., *Orchesella* sp., *Poecilus* sp., *Tomocerus* sp.)
- Nematoda (e.g. *Aphelenchus* sp., *Caenorhabditis* sp., *Panagrellus* sp.)

[2] Soil enzymatic reactions are important in the ecological functioning of the soil. If toxicity data for these processes are available, they are taken into consideration in ERL derivation for the soil compartment.
[3] Although the dominant mode of protozoan nutrition in soil is considered to be phagotrophy [3], sapbrobic feeding might be the most important route for some species. Check the feeding strategy for a given test organism in order to classify
[4] Other species of enchytraeids may be encountered. Although several Enchytraeid species consume high amounts of fungal mycelium, they primarily decompose organic (plant) material [3].
[5] Most terrestrial crustaceans are isopods (order Isopoda, suborder Oniscoideia). Although omnivores, the majority of their food consists of dead material [3].
[6] Most terrestrial molluscs (Gastropoda) are generalist herbivores and many consume fungi [3]. They are placed in the comminutors by Römbke *et al*. [4].

- Protozoa – phagotrophic feeders

References

1. Lawrence E, Dictionary of Biological Terms. 11th ed. 1996, Harlow, United Kingdom: Longman. 693.
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