Supporting Information

Comparison of the trait aggregation methods with each other

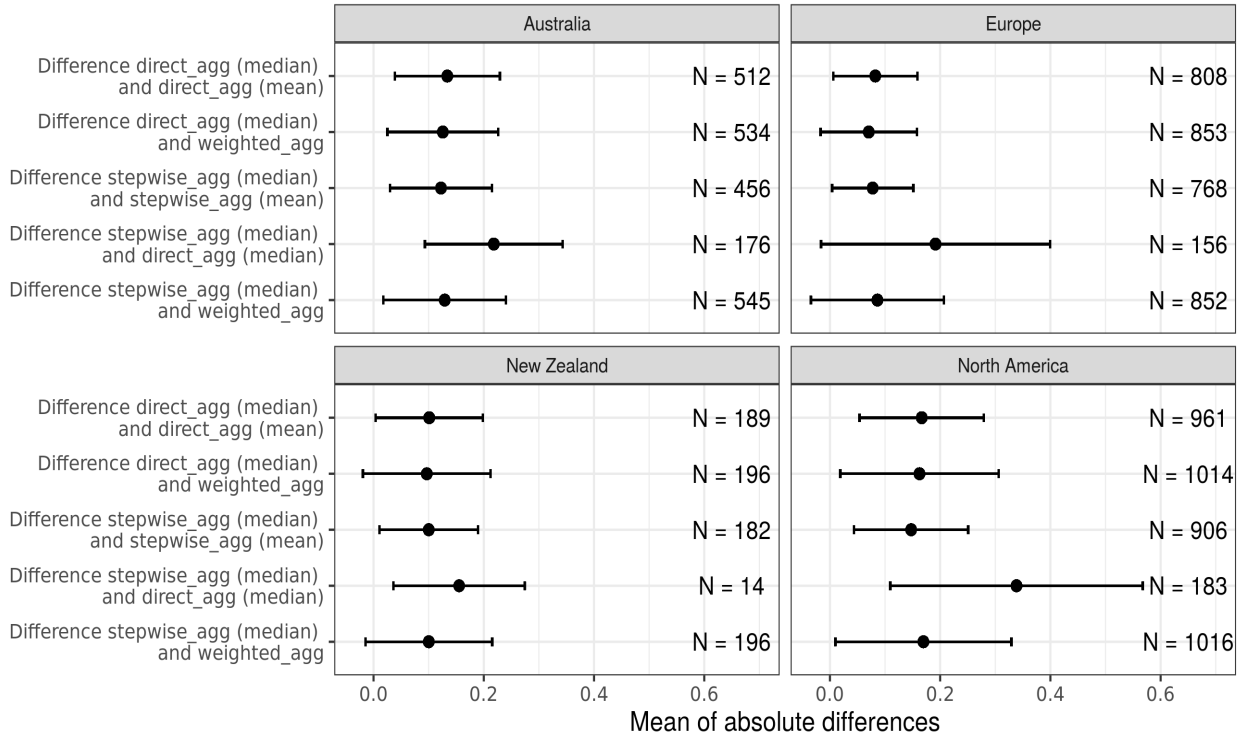

Figure 1: Means of absolute differences in trait affinities with standard deviations per region for all grouping features. Compared aggregation methods are displayed on the y-axis. N indicates the number of cases where differences occurred.

Re-analysis of Szöcs et al. 2014 using harmonized and aggregated grouping features.

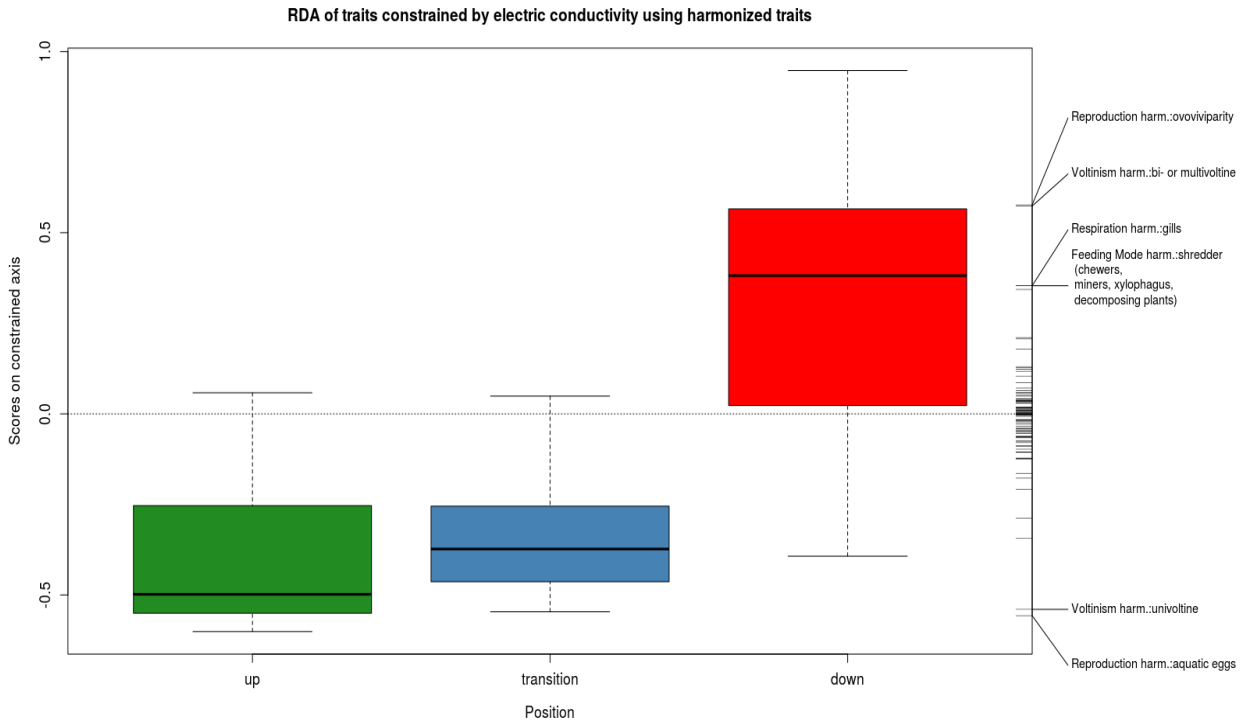

Figure 2: RDA of traits constrained by electric conductivity using harmonized grouping features. Boxplot of site scores along the conductivity axis (31.44% explained variance, p = 0.001, 1000 permutations). Rug on the left indicates trait scores on the conductivity axis. Only traits with a mahalanobis distance greater than 5.02 were labeled in accordance to the procedure in Szöcs et al. 2014.

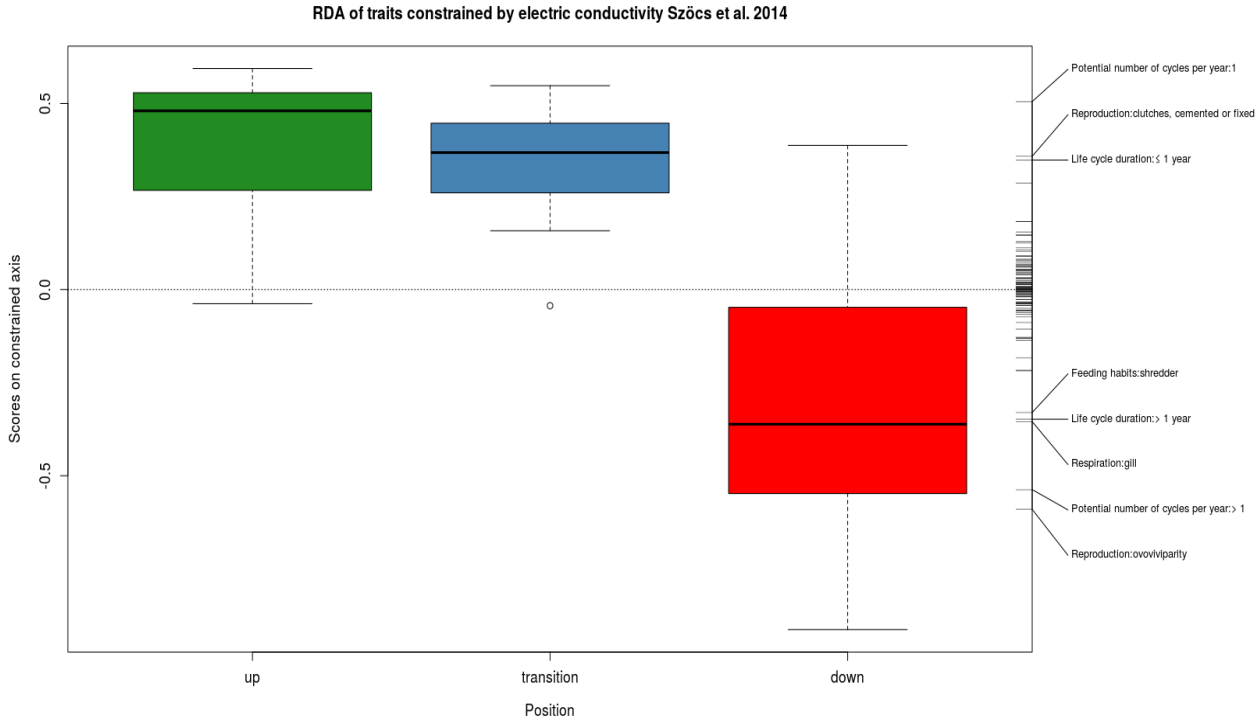

Figure 3: RDA of traits constrained by electric conductivity. Boxplot of site scores along the conductivity axis (30.09% explained variance, p = 0.001, 1000 permutations). Rug on the left indicates trait scores on the conductivity axis. Only traits with a mahalanobis distance greater than 5.02 were labeled.

Trait distribution along first RDA axis

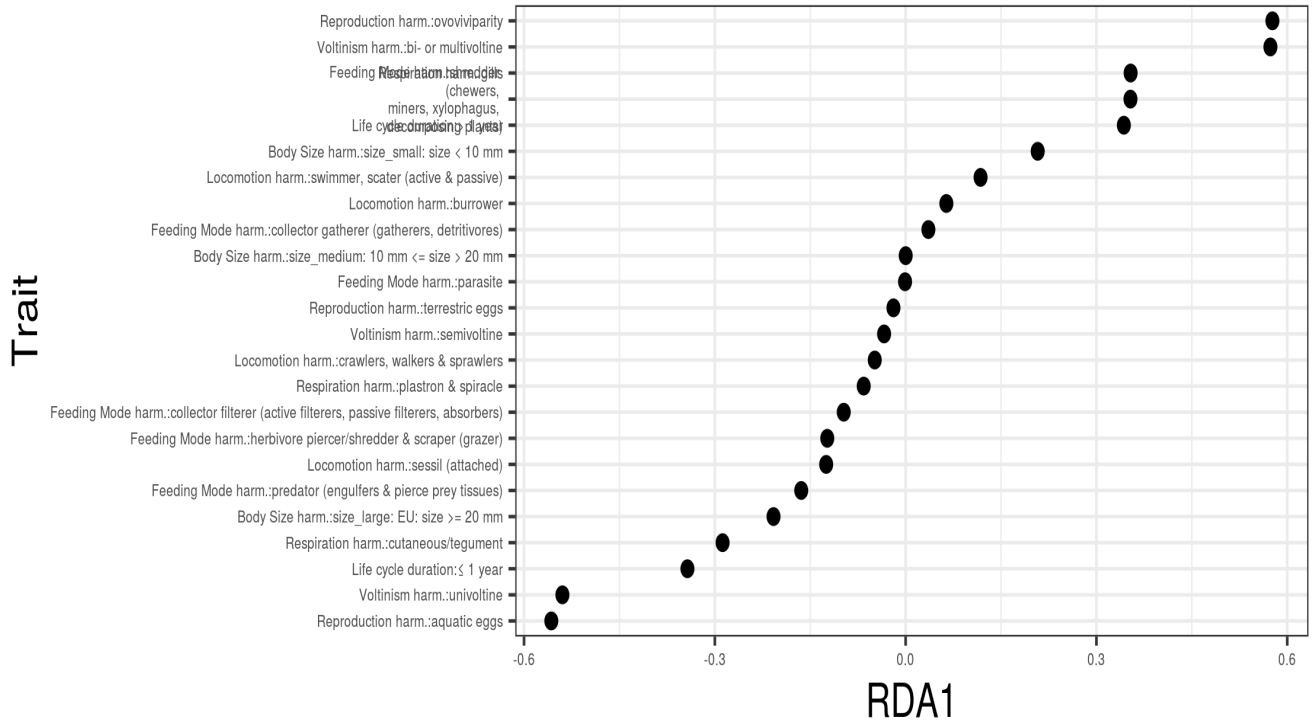

Figure 4: Trait scores on the first RDA axis for harmonized traits and traits of the grouping feature *life cycle duration*.

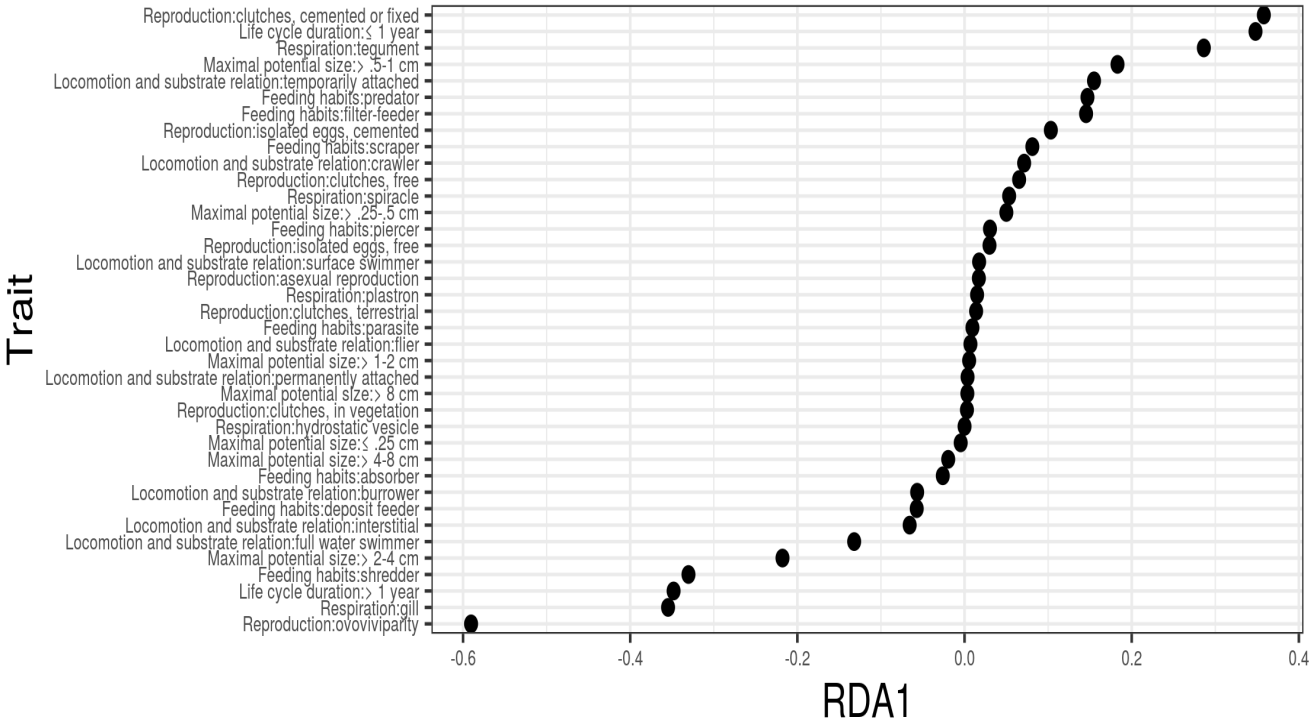

Figure 5: Trait scores on the first RDA axis for the traits responding to high salinity in Szöcs et al. 2014 .

Linear models of trait proportions

Linear models of trait proportions with harmonized traits:

Table 1: Results of linear models for the four selected harmonized traits and life cycle duration > 1 year. Trait proportions were logit transformed prior model building, estimates are on the logit scale. Although years were statistically not significant we kept this factor in the model to avoid temporal autocorrelation. Bold values indicate statistically significant effects ($p < 0.05$).

	Feeding mode: shredder	Life cycle duration: > 1 year	Voltinism: bi- or multivoltine	Reproduction: ovoviviparity	Respiration: gills
Intercept (= upstream)	**-1.041**	**-0.486**	0.375*	**-0.823**	0.092
Downstream	**0.926**	**0.605**	**1.376**	**1.684**	**0.854**
Downstream x 2008	-0.117	0.106	-0.235	-0.088	-0.317
Downstream x 2009	0.030	-0.056	0.001	0.245	0.180
Year 2008	-0.167	-0.115	0.033	-0.182	-0.151
Year 2009	0.175	0.086	-0.088	0.246	0.141

** p.value = 0.055*

Linear models of trait proportions Szöcs et al. 2014:

Table 2: Results of linear models for the five selected traits for Szöcs et al. 2014. Trait proportions were logit transformed prior model building, estimates are on the logit scale. Although years were statistically not significant we kept this factor in the model to avoid temporal autocorrelation. Bold values indicate statistically significant effects ($p < 0.05$).

	Feeding habits: shredder	Life cycle duration: > 1 year	Cycles per year: > 1	Reproduction: ovoviviparity	Respiration: gills
Intercept (= upstream)	**-0.853**	**-0.478**	**0.603**	**-0.838**	0.111
Downstream	**0.819**	**0.594**	**1.297**	**1.679**	**0.839**
Downstream x 2008	-0.155	0.102	-0.227	-0.070	-0.314
Downstream x 2009	0.073	-0.053	-0.020	0.248	0.176
Year 2008	-0.122	-0.112	0.026	-0.192	-0.154
Year 2009	0.167	0.084	-0.104	0.250	0.139

Trait proportions over time

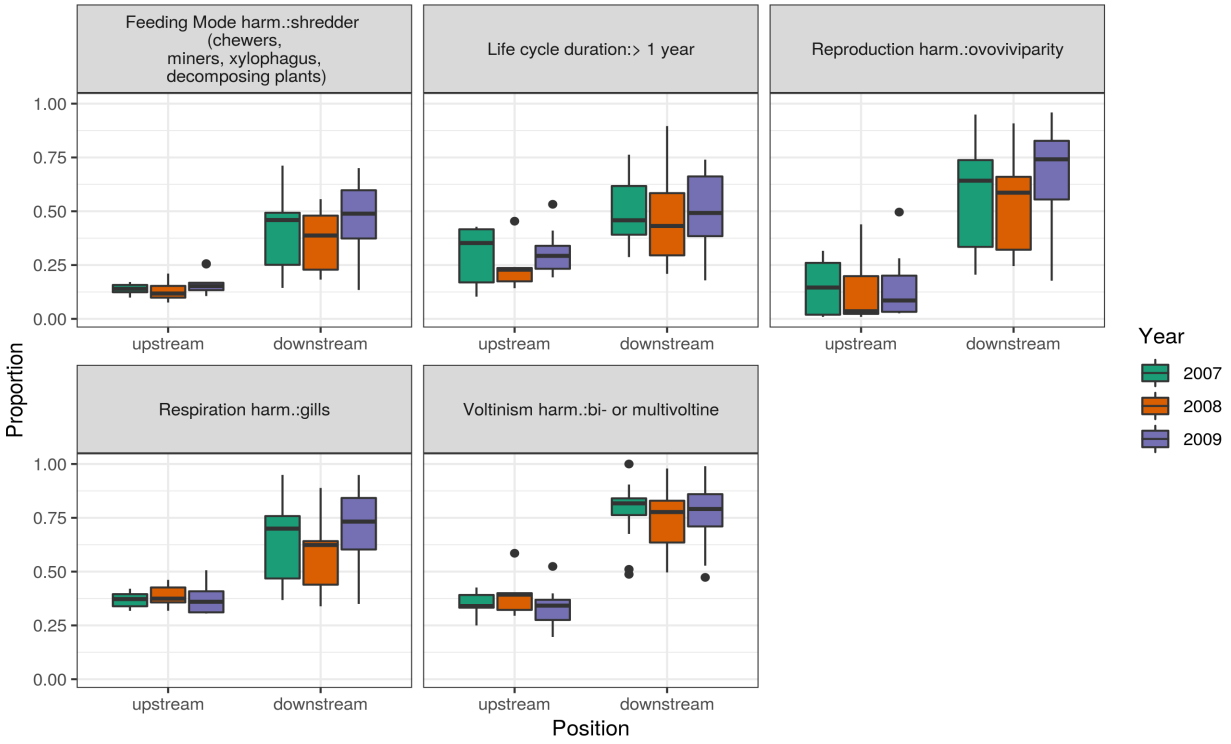

Figure 6: Proportions for the four harmonized traits that have been promoted by salinization and life cycle duration > 1 year for down- and upstream sites.

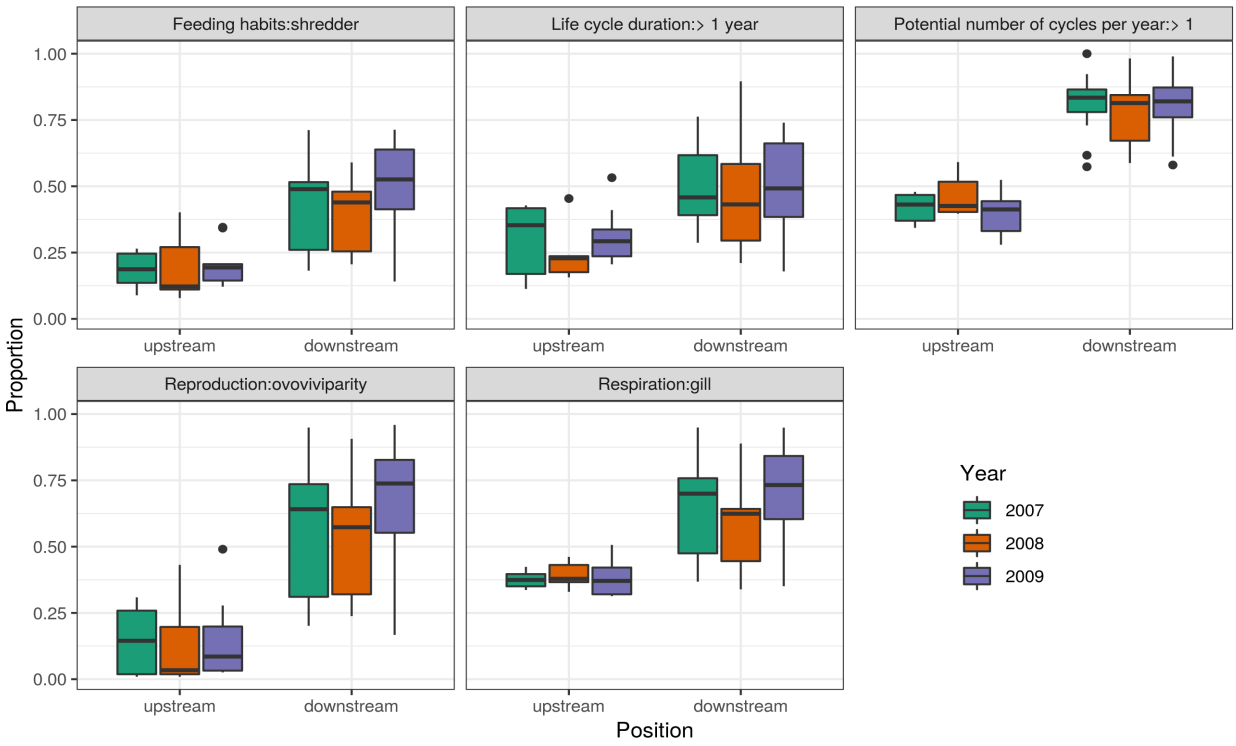

Figure 7: Proportions for five selected traits for down- and upstream sites (traits that have been promoted by salinization) from Szöcs et al. 2014.

Harmonization of the European trait databases

Table 3: Representation of traits per grouping feature and their harmonization for the European trait databases. The color coding indicates traits that have been harmonized. Cyan colored traits have not been used because they either represented ambiguous traits or traits that were not compatible with the traits of the other databases. Harmonization was done by assigning the maximum affinity of the allocated traits for the respective taxa to the harmonized trait.

Grouping feature	Freshwater ecology	Tachet	Harmonized traits
Voltinism	Semivoltine	Semivoltine	Semivoltine
Voltinism	Univoltine	Univoltine	Univoltine
Voltinism	Bivoltine	Polyvoltine	Bi/Multivoltine
Voltinism	Trivoltine		
Voltinism	Multivoltine		
Voltinism	Flexible		
Feeding Mode	Shredder	Shredder	Shredder
Feeding Mode	Miner	Deposit-feeder	Gatherer
Feeding Mode	Xylophagus	Absorber	Filterer
Feeding Mode	Gatherer	Filter-feeder	Herbivore
Feeding Mode	Active filterer	Scraper	Predator
Feeding Mode	Passive filterer	Predator	Parasite
Feeding Mode	Grazer	Parasite	
Feeding Mode	Predator	*Piercer (plants or animals)* [a]	
Feeding Mode	Parasite		
Feeding Mode	Other		
Locomotion	Swimming/scating	Surface swimmer	Swimmer
Locomotion	Swimming/diving	Full water swimmer	Burrower
Locomotion	Burrowing/boring	Burrower	Crawler
Locomotion		Interstitial	Sessil
Locomotion	Sprawling/walking	Crawler	
Locomotion	(semi) sessil	Temporarily attachted	
Locomotion	Other	Permanently attached	
Locomotion		Flier	
Respiration	Tegument	Tegument	Tegument
Respiration	Gill	Gill	Gills
Respiration	Plastron	Plastron	Plastron, spiracle
Respiration	Spiracle (aerial)	Spiracle (aerial)	
Respiration	Hydrostatic vesicle	Hydrostatic vesicle (aerial)	
Respiration	Tapping (air stores of aq. plants)		
Respiration	Excursion/Extension (to surface)		
Body size		<= 0.25cm	Small (< 1 cm)
Body size		> 0.25 - 0.5cm	Medium (>= 1cm - 2 cm)
Body size		> 0.5- 1cm	Large (>= 2 cm)

Body size		$> 1 - 2$ cm	
Body size		$2 - 4$ cm	
Body size		$4 - 8$ cm	
Body size		> 8 cm	
Reproduction	ovovivipar	ovoviviparity	ovoviviparity
Reproduction	free isolated eggs	isolated eggs, free	aquatic eggs
Reproduction	cemented isolated eggs	isolated eggs, cemented	terrestrial eggs
Reproduction	fixed clutches	clutches, cemented or fixed	
Reproduction	free clutches	clutches, free	
Reproduction	clutches in vegetation	clutches, in vegetation	
Reproduction	terrestrial clutches	clutches, terrestrial	
Reproduction	asexual	asexual reproduction	
Reproduction	parasitic		

a Taxa exhibiting this trait have been assigned to predators or herbivores based on a classification by Philippe Usseglio-Polatera.