

Supplement S2. Morphological diversity (MD) of test characters in the family test.

Test Groups	MD of Ponotum	MD of Elytron
Pleocomidae	0.0063	0.0032
Geotrupidae	0.0071	0.0079
Passalidae	0.0031	0.0013
Trogidae	0.0076	0.0018
Glaresidae	0.0067	0.0014
Ochodaeidae	0.0041	0.0065
Hybosoridae	0.0094	0.0047
Glaphyridae	0.0074	0.0040
Scarabaeidae	0.0167	0.0110
Lucanidae	0.0122	0.0026

Supplement S3. Morphological diversity (MD) of test characters in the subfamily test.

Test Groups	MD of Ponotum	MD of Elytron
Pleocominae	0.0063	0.0032
Taurocerastinae	0.0012	0.0021
Bolboceratinae	0.0087	0.0068
Geotrupinae	0.0054	0.0022
Aulacocyclusinae	0.0090	0.0015
Passalinae	0.0026	0.0012
Troginae	0.0067	0.0018
Omorginae	0.0078	0.0016
Glaresidae	0.0067	0.0014
Ochodaeinae	0.0038	0.0063
Anaidinae	0.0080	0.0017
Ceratocanthinae	0.0088	0.0031
Hybosorinae	0.0043	0.0017
Liparochninae	0.0057	0.0043
Pachyplectrinae	0.0040	0.0002
Glaphyrinae	0.0074	0.0040
Chironinae	0.0025	0.0011
Aegialiinae	0.0086	0.0017
Eremazinae	0.0130	0.0023
Aulonocneminae	0.0056	0.0047
Termitotroginae	0.0015	0.0045
Dynamopodinae	0.0014	0.0039

Orphninae	0.0030	0.0035
Aclopinae	0.0165	0.0154
Aphodiinae	0.0055	0.0046
Cetoniinae	0.0124	0.0060
Dynastinae	0.0067	0.0026
Melolonthinae	0.0156	0.0033
Rutelinae	0.0103	0.0077
Scarabaeinae	0.0077	0.0068
Aesalinae	0.0152	0.0042
Lucaninae	0.0111	0.0025
Lampriminae	0.0030	0.0007
Syndesinae	0.0123	0.0008
