Supplementary Table 1 Names recovered at all taxonomic levels (phylum, order, family, genus, species) by each gene region with Sanger sequencing of individuals as well as NGS of mixed tissue. Sequence assignments were generated through a BLASTn similarity search against the GenBank public database followed by lowest common ancestor parsing of results.

Prokaryotes					**Sanger**	**NGS**					
Phylum	**Order**	**Family**	**Genus**	**Species**	**COI**	**COI**	**16Sv3**	**16Sv4**	**16Sv6**	**18S**
Acidobacteria											
	Acidobacteriales										
		Acidobacteriaceae									
Actinobacteria											
	Actinomycetales										
		Actinomycetaceae									
			Actinomyces								
		Corynebacteriaceae									
			Corynebacterium								
				C. singulare							
		Microbacteriaceae									
		Micrococcaceae									
		Mycobacteriaceae									
			Mycobacterium								
		Nocardiaceae									
			Nocardia								
		Nocardioidaceae									
		Propionibacteriaceae									
			Propionibacterium								
		Pseudonocardiaceae									
			Pseudonocardia								
		Streptomycetaceae									
			Streptomyces								
	Bifidobacteriales										
		Bifidobacteriaceae									
			Bifidobacterium								
	Coriobacteriales										
		Coriobacteriaceae									
			Collinsella								
				C. aerofaciens							
Bacteroidetes											
	Bacteroidales										
		Bacteroidaceae									
			Bacteroides								
				B. acidifaciens							
				B. ovatus							

B. stercorirosoris						
Marinilabiaceae						
Porphyromonadaceae						
Dysgonomonas						
D. capnocytophagoides						
Parabacteroides						
Proteiniphilum						
Tannerella						
T. forsythia						
Rikenellaceae						
Alistipes						
A. shahii						
A. finegoldii						
Rikenella						
R. microfusus						
Flavobacteriales						
Blattabacteriaceae						
Blattabacterium						
B. punctulatus						
Flavobacteriaceae						
Riemerella						
Sphingobacteriales						
Sphingobacteriaceae						
Sphingobacterium						
Chloroflexi						
Cyanobacteria						
Deferribacteres						
Deferribacterales						
Deferribacteraceae						
Elusimicrobia						
Firmicutes						
Bacillales						
Bacillaceae						
Bacillus						
Listeriaceae						
Listeria						
Staphylococcaceae						
Staphylococcus						
S. kloosii						
Clostridiales						
Clostridiaceae						
Clostridium						
Eubacteriaceae						

Eubacterium						
E. siraeum						
Lachnospiraceae						
Blautia						
B. stercoris						
Robinsoniella						
R. peoriensis						
Roseburia						
R. hominis						
Ruminococcaceae						
Anaerotruncus						
A. colihominis						
Hydrogenoanaerobacterium						
H. saccharovorans						
Ruminococcus						
Erysipelotrichales						
Erysipelotrichaceae						
Coprobacillus						
C. cateniformis						
Lactobacillales						
Enterococcaceae						
Enterococcus						
E. faecalis						
Lactobacillaceae						
Lactobacillus						
L. acetotolerans						
L. casei						
L. sanfranciscensis						
L. vaginalis						
Leuconostocaceae						
Fructobacillus						
F. fructosus						
Leuconostoc						
L. fallax						
Streptococcaceae						
Lactococcus						
L. lactis						
Fusobacteria						
Fusobacteriales						
Fusobacteriaceae						
Fusobacterium						
F. varium						
Planctomycetes						

Planctomycetales							
Planctomycetaceae							
Proteobacteria							
Aeromonadales							
Aeromonadaceae							
Aeromonas							
Burkholderiales							
Alcaligenaceae							
Burkholderiaceae							
Burkholderia							
Comamonadaceae							
Campylobacterales							
Campylobacteraceae							
Campylobacter							
Chromatiales							
Chromatiaceae							
Desulfobacterales							
Desulfobacteraceae							
Desulfovibrionales							
Desulfovibrionaceae							
Desulfovibrio							
Enterobacteriales							
Enterobacteriaceae							
Cronobacter							
Enterobacter							
E. cloacae							
Klebsiella							
K. oxytoca							
Pantoea							
P. stewartii							
Proteus							
Providencia							
Legionellales							
Coxiellaceae							
Myxococcales							
Neisseriales							
Neisseriaceae							
Aquaspirillum							
A. putridiconchylium							
Kingella							
K. oralis							
Neisseria							
N. cinerea							

N. shayeganii						
Stenoxybacter						
S. acetivorans						
Vitreoscilla						
V. stercoraria						
Oceanospirillales						
Halomonadaceae						
Carnimonas						
C. nigrificans						
Zymobacter						
Z. palmae						
Oceanospirillaceae						
Pasteurellales						
Pasteurellaceae						
Pseudomonadales						
Moraxellaceae						
Acinetobacter						
Pseudomonadaceae						
Pseudomonas						
Rhizobiales						
Bartonellaceae						
Bartonella						
Brucellaceae						
Methylobacteriaceae						
Methylobacterium						
Phyllobacteriaceae						
Mesorhizobium						
Rhizobiaceae						
Rhodobacterales						
Rhodobacteraceae						
Rhodospirillales						
Acetobacteraceae						
Acetobacter						
Asaia						
Commensalibacter						
C. intestini						
Gluconobacter						
Saccharibacter						
S. floricola						
Rhodospirillaceae						
Rickettsiales						
Anaplasmataceae						
Wolbachia						

					W. pipientis							
				Rickettsiaceae								
					Rickettsia							
					R. bellii							
			Sphingomonadales									
				Sphingomonadaceae								
			Vibrionales									
				Vibrionaceae								
			Xanthomonadales									
				Xanthomonadaceae								
					Stenotrophomonas							
		Spirochaetes										
			Spirochaetales									
				Spirochaetaceae								
					Borrelia							
		Tenericutes										
			Entomoplasmatales									
				Spiroplasmataceae								
					Spiroplasma							
		Verrucomicrobia										
			Verrucomicrobiales									
				Verrucomicrobiaceae								
					Akkermansia							
					A. muciniphila							

Eukaryotes					**Sanger**	**NGS**					
Phylum	**Order**	**Family**	**Genus**	**Species**	**COI**	**COI**	**16Sv3**	**16Sv4**	**16Sv6**	**18S**
Annelida										
	Haplotaxida									
		Glossoscolecidae								
			Pontoscolex							
				P. corethrurus						
Apicomplexa										
Arthropoda										
	Araneae									
	Blattodea									
		Blattidae								
			Periplaneta							
				P. americana						
	Coleoptera									
		Brentidae								
			Lepidapion							
		Buprestidae								

Chrysobothris						
C. femorata						
Carabidae						
Carabus						
Cerambycidae						
Monochamus						
Nortia						
N. carinicollis						
Phaea						
Chrysomelidae						
Diabrotica						
D. cristata						
Monoleptites						
Curculionidae						
Cryptorhynchus						
C. lapathi						
Euplatypus						
E. parallelus						
Hylobius						
Porthetes						
Sampsonius						
S. dampfi						
Trigonopterus						
Elateridae						
Conoderus						
C. lividus						
Melanotus						
Lampyridae						
Melyridae						
Collops						
Staphylinidae						
Atheta						
Tenebrionidae						
Collembola						
Hypogastruridae						
Ceratophysella						
Decapoda						
Ocypodidae						
Uca						
Diptera						
Cecidomyiidae						
Ceratopogonidae						
Culicoides						

Chironomidae						
Acricotopus						
A. lucens						
Orthocladius						
O. dorenus						
Polypedilum						
Dolichopodidae						
Dolichopus						
Drosophilidae						
Drosophila						
D. grimshawi						
Phoridae						
Megaselia						
M. scalaris						
Psychodidae						
Berdeniella						
Phlebotomus						
P. perniciosus						
Sarcophagidae						
Parasarcophaga						
Sarcophaga						
S. taenionota						
Simuliidae						
Stratiomyidae						
Hermetia						
H. illucens						
Syrphidae						
Toxomerus						
Tabanidae						
Chrysops						
Haematopota						
H. pluvialis						
Hybomitra						
H. rhombica						
Tachinidae						
Zelia						
Z. vertebrata						
Xylophagidae						
Exeretonevra						
E. angustifrons						
Hemiptera						
Aleyrodidae						
Cicadellidae						

	Cicadella		■				
	C. viridis		■				
	Deltocephalus	■	■				
	Delphacidae					■	
	Nilaparvata					■	
	N. lugens					■	
	Flatidae		■				
	Issidae	■	■				
	Eusarima		■				
	Gelastyrella		■				
	G. litaoensis		■				
	Miridae	■	■				■
	Phytocoris	■	■				
	Triozidae			■			
	Trioza			■			
Hymenoptera		■	■	■	■	■	■
	Apidae	■	■				
	Diadasia		■				
	D. bituberculata		■				
	Paratetrapedia		■				
	Braconidae	■	■				
	Ecphylus	■	■				
	Chrysididae		■				
	Chrysis		■				
	Crabronidae	■	■				
	Trypoxylon	■	■				
	T. figulus	■	■				
	Diapriidae	■	■				
	Formicidae	■	■	■	■		■
	Anochetus	■	■				
	Camponotus	■	■				
	Cyphomyrmex	■	■		■		
	Pachycondyla		■				
	P. javana		■				
	Pseudomyrmex	■	■		■		
	P. salvini	■	■				
	P. satanicus	■	■				
	Halictidae	■	■				■
	Lasioglossum	■	■				
	Ichneumonidae	■	■		■		
	Pimpla		■				
	P. molesta		■				
	Mymaridae	■	■				

Pompilidae							
	Aporus						
		A. niger					
Scelionidae							
	Baeus						
	Macroteleia						
Vespidae							
	Agelaia						
	Apoica						
		A. thoracica					
	Mischocyttarus						
		M. mexicanus					
	Polybia						
	Protopolybia						
	Synoeca						
		S. septentrionalis					
Lepidoptera							
Crambidae							
	Chilo						
		C. suppressalis					
Elachistidae							
	Antaeotricha						
Epipyropidae							
	Heteropsyche						
Hesperiidae							
	Parphorus						
		P. decora					
Noctuidae							
	Spodoptera						
		S. exigua					
Riodinidae							
	Detritivora						
Megaloptera							
Mesostigmata							
Neuroptera							
Chrysopidae							
Orthoptera							
Gryllidae							
	Agnotecous						
Tettigoniidae							
Psocoptera							
Pachytroctidae							
Peripsocidae							

Psocidae							
	Blastopsocus						
		B. lithinus					
	Longivalvus						
Thysanoptera							
	Phlaeothripidae						
		Haplothrips					
	Thripidae						
		Scirtothrips					
			S. bounites				
			S. citri				
Trombidiformes							
	Lebertiidae						
		Lebertia					
Foraminifera							
Fungi							
	Eurotiales						
		Trichocomaceae					
	Wallemiales						
		Wallemiaceae					
			Wallemia				
				W. sebi			
Nematoda							
	Tylenchida						
Viridiplantae							
	Caryophyllales						
		Amaranthaceae					
			Beta				

Supplementary Table 2. Summary of taxonomic data recovered from one Malaise trap sample using three different data sources. Important taxonomic recoveries have been highlighted. Full taxonomic details are in Supplementary Table 1.

Data Source	Prokaryotes	Plants & Fungi	Non-Arthropods	Arthropoda				
				Coleoptera	Diptera	Hymenoptera	Lepidoptera	Other Orders
Morph-ology	None	None	None	Present	Present	Present	Present	Araneae, Blattodea, Collembola, Hemiptera, Neuroptera, Orthoptera, Psocoptera, Thysanoptera, Trichoptera, Trombidiformes
Sanger COI	None	None	None	7 families, 8 genera, 4 species	8 families, 2 genera	10 families, 12 genera, 5 species	2 families, 2 genera	Araneae, Blattodea, Collembola, Hemiptera, Neuroptera, Psocoptera, Thysanoptera, Trombidiformes
NGS COI	*Rickettsia*, *Wolbachia*	None	None	**12 families, 17 genera, 7 species**	**13 families, 14 genera, 7 species**	**12 families, 20 genera, 9 species**	**5 families, 4 genera, 1 species**	**Araneae, Blattodea, Collembola, Decapoda, Hemiptera, Megaloptera, Neuroptera, Orthoptera, Psocoptera, Thysanoptera, Trombidiformes**
NGS 16S	**14 phyla, 37 orders, 67 families, 70 genera, 43 species**	**Amaranthaceae, Trichocomaceae, Wallemiaceae**	**Annelida, Foraminifera**	2 families, 1 genus	Chironomidae, Phoridae	3 families, 2 genera	1 species	Hemiptera
NGS 18S	2 phyla, 2 orders, 2 families, 1 genus, 1 species	Present	**Apicomplexa, Nematoda**	Present	6 families, 4 genera, 4 species	4 families, 1 genera, 1 species	1 species	Blattodea, Collembola, Hemiptera, Mesostigmata, Orthoptera, Psocoptera, Thysanoptera, Trombidiformes

Supplementary Table 3. Number of sequences and family-level diversity represented in COI primer design, including amplification primers designed.

Order	#sequences	#families	Primer set
Araneae	14639	68	ArF5 X ArR6
Blattodea (incl. Isoptera)	854	11	ArF4 X ArR6 **or** ArF3 X ArR7
Coleoptera	15632	80	ArF1 X ArR2
"Collembola"	5437	16	ArF5 X ArR6
Dermaptera	47	1	ArF5 X ArR6
Diptera	44778	62	ArF1 X ArR3
Ephemeroptera	5924	15	ArF2 X ArR5
Hemiptera	8703	60	ArF10 X ArR3
Hymenoptera	2000	36	ArF10 X ArR5
Isopoda	1840	28	ArF2 X ArR5
Lepidoptera	3000	39	ArF1 X ArR6
Mantodea	169	12	ArF2 X ArR5
Mecoptera	51	4	ArF1 X ArR6
Megaloptera	417	2	ArF2 X ArR5
Neuroptera	682	18	ArF1 X ArR3
Odonata	1691	14	ArF1 X ArR5
Orthoptera	2464	14	ArF1 X ArR5
Phasmida	78	2	ArF1 X ArR5
Plecoptera	2578	11	ArF1 X ArR5
Psocoptera	82	2	ArF5 X ArR9
Thysanoptera	879	4	ArF5 X ArR9
Trichoptera	14502	43	ArF5 X ArR9
Trombidiformes	1822	17	ArF10 X ArR5
Total	**128269**	**559**	

Primers

ArF1 GCI CCW GAY ATR GCI TTY CCI CG
ArF2 GCI CCI GAY ATR GCI TTY CCI CG
ArF3 GCI CCR GAY ATR GCI TTY CCA CG
ArF4 GCI CCC GAT ATR GCI TTY CCY CG
ArF5 GCI CCI GAY ATR KCI TTY CCI CG
ArF10 CCW GAT ATA KCI TWY CCI CG
ArR2 CCW GTW YTI GCI GGI GCI ATY AC
ArR3 CCW GTW YTA GCI GGI GCW ATY AC
ArR5 CCI GTI YTI GCI GGI GCI ATY AC
ArR6 CCI GTI TTR GCI GGI GCI ATY AC
ArR7 CCI GTI YTI GCI GGR GCA ATY AC
ArR9 CCW GTI YTW GCI GGI GCI ATY AC