Supplementary Materials

for

Automated Insect Detection and Biomass Monitoring via AI and Electrical Field Sensor Technology

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S1: Data processing algorithm

Input: 1-minute audio signals from cloud storage
Output: Estimated insect biomass
Step 1: Load Audio
Load raw audio data
Step 2: Power line Noise Cancellation
if power line noise is detected **then**
    Apply filtering to remove it
end if
Step 3: Signal Segmentation
Divide the signal into $N = 60$ segments
for $i = 1$ to N **do**
    Step 4.1: CNN-based Insect Presence Prediction
    Pass segment i to the CNN to compute a prediction score
    if insect presence is indicated **then**
        Step 4.2: F_0 Estimation
        Estimate F_0 and compute its mean ($\mu^i_{f_0}$) and standard deviation ($\sigma^i_{f_0}$)
        if $\mu^i_{f_0}$ and $\sigma^i_{f_0}$ meet threshold criteria **then**
            Mark segment i as a valid insect event
        else
            Discard segment i
        end if
    else
        Discard segment i
    end if
end for
Step 5: Event Aggregation
Group adjacent valid events
Step 6: Data Collection
Aggregate data from valid events
Step 7: Biomass Estimation
Apply biomass model to compute the final estimate
    return Estimated insect biomass

S2: Reference table for WBF and body mass

Reference table containing insect body mass (g), state of specimens when weighed (dry/wet/fresh), and their wing beat frequency (WBF) for various species, genera, families, and orders of insects. The † sign denotes internal FaunaPhotonics measurements. The table is ordered by increasing WBF.

Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Lepidoptera	*Pieridae*	*Pieris napi*	0.037[36]		6[36]	Yes
Lepidoptera					6[37]	Yes
Lepidoptera	*Saturniidae*	*Saturnia pyri*	1.89[36]		8[36]	Yes
Lepidoptera	*Saturniidae*	*Philosamia cynthia*	0.605[36]		8[36]	Yes
Lepidoptera	*Papilionidae*	*Papilio podalirius*	0.3[36]		10[36]	Yes
Lepidoptera	*Nymphalidae*	*Argynnis pandora*	0.278[36]		10[36]	Yes
Lepidoptera	*Pieridae*	*Pieris brassicae*	0.144[36]		10[36]	Yes
Lepidoptera	*Nymphalidae*	*Vanessa atalanta*	0.134[36]		10[36]	Yes
Lepidoptera	*Pieridae*	*Pieris brassicae*	0.127[36]		12[36]	Yes
Lepidoptera	*Pieridae*	*Pieris brassicae*	0.0691[38]		12[38]	Yes
Lepidoptera	*Saturniidae*	*Automeris belti*	0.665[36]		14[36]	No
Lepidoptera	*Nymphalidae*	*Aphantopus hyperantus*	0.0374[38]		16[38]	Yes
Lepidoptera	*Saturniidae*	*Automeris jaciinda*	0.298[36]		17[36]	No
Lepidoptera	*Saturniidae*	*Eacles imperialis*	1.105[36]		17[36]	No
Lepidoptera	*Saturniidae*	*Automeris fieldi*	0.394[36]		17[36]	No
Odonata	*Calopterygidae*	*Calopteryx virgo*	0.1457[38]		17[38]	Yes
Lepidoptera	*Nymphalidae*	*Vanessa io*	0.195[36]		18[36]	Yes
Lepidoptera	*Bombycidae*	*Bombyx mori*	0.595[36]		18[36]	No
Odonata					18[37]	Yes
Lepidoptera	*Saturniidae*	*Automeris zugana*	0.428[36]		19[36]	No
Neuroptera			0.009[39]	Wet	19[37]	Yes
Odonata	*Calopterygidae*	*Calopteryx splendens*	0.1092[38]		19[38]	Yes
Lepidoptera	*Nymphalidae*	*Vanessa cardui*	0.173[36]		20[36]	Yes
Lepidoptera	*Sphingidae*	*Chelonia villica*	0.165[36]		20[36]	Yes
Odonata	*Aeshnidae*	*Anax junius*	0.82[36]		20[36]	No
Odonata	*Libellulidae*	*Libellula depressa*	0.245[36]		20[36]	Yes
Odonata	*Libellulidae*	*Orthetrum coerulescens*	0.248[36]		20[36]	Yes
Odonata	*Aeshnidae*	*Aeshna sp.*	0.611[36]		20[36]	Yes
Lepidoptera	*Lepedoptera*	*Rhodocera rhamni*	0.107[36]		21[36]	Yes
Odonata	*Libellulidae*	*Libellula quadrimaculata*	0.307[36]		21[36]	Yes
Odonata	*Libellulidae*	*Sympetrum meridionale*	0.281[36]		21[36]	Yes

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Table continued from previous page

Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Odonata	*Aeshnidae*	*Nasiaeschna pentacantha*	0.43[36]		21[36]	No
Lepidoptera	*Saturniidae*	*Hyperchiria nausica*	0.2[36]		21[36]	No
Odonata	*Libellulidae*	*Pantala flavescens*	0.308[36]		22[36]	Yes
Lepidoptera	*Notodontidae*	*Notodonta dictaea*	0.201[36]		22[36]	Yes
Lepidoptera	*Satyridae*	*Coenonympha pamphilus*	0.046[36]		22[36]	Yes
Lepidoptera	*Saturniidae*	*Syssphinx molina*	1.63[36]		22[36]	No
Lepidoptera	*Sphingidae*	*Manduca corallina*	1.6[36]		22[36]	No
Odonata	*Aeshnidae*	*Anax formosus*	1.2[36]		22[36]	No
Lepidoptera	*Geometridae*	*Geometra papilionaria*	0.1071[38]		22[38]	Yes
Lepidoptera	*Saturniidae*	*Automerina auletes*	0.72[36]		23[36]	No
Odonata	*Libellulidae*	*Tramea Carolina*	0.358[36]		23[36]	No
Lepidoptera	*Sphingidae*	*Erinnyis ello*	1.21[36]		23[36]	No
Lepidoptera	*Saturniidae*	*Automeris hamata*	0.564[36]		23[36]	No
Lepidoptera	*Saturniidae*	*Adeloneivaia boisduvalii*	0.839[36]		24[36]	No
Odonata	*Libellulidae*	*Pachydiplax longipenms*	0.178[36]		24[36]	No
Lepidoptera	*Noctuidae*	*Triphaena pronuba*	0.485[36]		24[36]	Yes
Neuroptera			0.009[39]	Wet	24[37]	Yes
Lepidoptera	*Noctuidae*	*Venilia macularia*	0.021[36]		25[36]	Yes
Odonata	*Macromiidae*	*Macromia taeniolata*	0.93[36]		25[36]	No
Odonata	*Corduliidae*	*Somatochlora tenebrosa*	0.352[36]		25[36]	No
Neuroptera	*Chrysopidae*	*Chrysoperla carnea*	0.0065[38]		25[38]	Yes
Blattodea	*Blattidae*	*Periplanela americana*	1.555[36]		26[36]	Yes
Odonata	*Libellulidae*	*Tramea lacerata*	0.382[36]		26[36]	No
Odonata	*Libellulidae*	*Libellula pulchella*	0.508[36]		26[36]	No
Odonata	*Corduliidae*	*Tetragoneuria cynosura*	0.165[36]		27[36]	No
Lepidoptera	*Lymantriidae*	*Lymantria clispar*	0.101[36]		27[36]	Yes
Lepidoptera	*Nymphalidae*	*Polygonia c-album*	0.1145[38]		27[38]	Yes
Trichoptera	*Phryganeidae*	*Phryganea grandis*	0.159[38]		27[38]	Yes
Trichoptera			0.159[38]		27[38]	Yes
Lepidoptera	*Lymantriidae*	*Calliteara pudibunda*	0.237[36]		28[36]	Yes
Lepidoptera	*Sphingidae*	*Manduca corallina*	1.618[36]		28[36]	No
Odonata	*Libellulidae*	*Erythemis simplicicollis*	0.176[36]		28[36]	No
Mecoptera	*Panorpidae*	*Panorpa communis*	0.03[36]		28[36]	Yes
Odonata					28[37]	Yes
Lepidoptera	*Sphingidae*	*Manduca nistica*	2.704[36]		29[36]	No
Lepidoptera	*Sphingidae*	*Acherontia atropos*	2.2403[38]		29[38]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Lepidoptera	*Geometridae*	*Xanthorhoe montanata*	0.0133[38]		29[38]	Yes
Lepidoptera	*Sphingidae*	*Laothoe populi*	0.8449[38]		29[38]	Yes
Odonata	*Macromiidae*	*Macromia georgina*	0.545[36]		30[36]	No
Neuroptera			0.009[39]	Wet	30[37]	Yes
Lepidoptera	*Noctuidae*	*Hypena proboscidalis*	0.0565[38]		30[38]	Yes
Odonata	*Libellulidae*	*Plathemis lydia*	0.365[36]		31[36]	No
Odonata	*Aeshnidae*	*Aeshna grandis*	1.2296[38]		31[38]	Yes
Lepidoptera	*Saturniidae*	*Hylesia spp.*	0.168[36]		32[36]	
Lepidoptera	*Geometridae*	*Idaea aversata*	0.0303[38]		32[38]	Yes
Odonata			0.27[38]		32[38]	Yes
Lepidoptera	*Pterophoridae*	*Pterophorus pentadactyla*	0.0114[38]		32[38]	Yes
Odonata	*Aeshnidae*	*Brachytron pratense*	0.557[36]		33[36]	Yes
Coleoptera	*Lucanidae*	*Ljicanus cervus*	2.6[36]		33[36]	No
Lepidoptera	*Sphingidae*	*Manduca lefeburei*	0.571[36]		33[36]	No
Lepidoptera	*Erebidae*	*Eilema lurideola*	0.0258[38]		33[38]	Yes
Lepidoptera	*Plutellidae*	*Plutella xylostella*	0.0019[40]	Fresh	35†	Yes
Odonata	*Coenagrionidae*	*Coenagrion puella*	0.0316[38]		36[38]	Yes
Odonata	*Coenagrionidae*	*Coenagrion puella*	0.0374[38]		36[38]	Yes
Odonata	*Coenagrionidae*	*Coenagrion puella*	0.0277[38]		37[38]	Yes
Odonata	*Aeshnidae*	*Aeshna mixta*	0.53[36]		38[36]	Yes
Odonata					38[37]	Yes
Odonata	*Libellulidae*	*Orthetrum cancellatum*	0.4176[38]		38[38]	Yes
Lepidoptera	*Sphingidae*	*Oryba achemenides*	2.809[36]		39[36]	No
Lepidoptera			0.203[38]		39[38]	Yes
Lepidoptera	*Crambidae*	*Chrysoteuchia culmella*	0.109[38]		40[38]	Yes
Odonata	*Libellulidae*	*Sympetrum striolatum*	0.1595[38]		40[38]	Yes
Lepidoptera	*Crambidae*	*Anania hortulata*	0.0293[38]		40[38]	Yes
Lepidoptera	*Noctuidae*	*Agrostis exclaniationis*	0.133[36]		41[36]	Yes
Lepidoptera	*Sphingidae*	*Madoryx oeclus*	1.699[36]		41[36]	No
Lepidoptera	*Saturniidae*	*Adeloneivaia subangulata*	0.487[36]		41[36]	No
Lepidoptera	*Geometridae*	*Pasiphila rectangulata*	0.0107[38]		41[38]	Yes
Odonata	*Gomphidae*	*Ophiogomphus serpentiniis*	0.312[36]		42[36]	Yes
Hemiptera	*Cicadidae*	*Cicada sp.*	0.752[36]		42[36]	Yes
Lepidoptera	*Tortricidae*	*Adoxophyes orana*	0.01532[41]	Fresh	43†	Yes
Lepidoptera					43[37]	Yes
Lepidoptera	*Sphingidae*	*Xylophones pluto*	0.829[36]		45[36]	No

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Neuroptera	*Hemerobiidae*	*Wesmaelius subnebulosis*	0.0026[38]		45[38]	Yes
Coleoptera	*Melolonthidae*	*Melolontha vulgaris*	0.961[36]		46[36]	Yes
Neuroptera	*Hemerobiidae*	*Hemerobius humulinus*	0.0021[38]		46[38]	Yes
Lepidoptera	*Noctuidae*	*Orthosia gothica*	0.1253[38]		47[38]	Yes
Diptera	*Tipulidae*	*Tipula gigantea*	0.069[36]		48[36]	Yes
Lepidoptera	*Noctuidae*	*Plusia gamma*	0.144[36]		48[36]	Yes
Lepidoptera	*Zygaenidae*	*Zygaena filipendulae*	0.127[36]		48[36]	Yes
Lepidoptera	*Sphingidae*	*Xylophanes libya*	0.559[36]		48[36]	No
Lepidoptera	*Sphingidae*	*Pachygonidia drucei*	0.702[36]		48[36]	No
Diptera	*Tipulidae*				48[42]	Yes
Mecoptera	*Panorpidae*	*Panorpa communis*	0.0398[38]		48[38]	Yes
Mecoptera			0.0398[38]		48[38]	Yes
Lepidoptera	*Yponomeutidae*	*Yponomeuta spp.*			50†	Yes
Neuroptera	*Hemerobiidae*	*Micromus angulatus*	0.0059[38]		50[38]	Yes
Lepidoptera	*Tortricidae*	*Plodia interpunctella*	0.004305[43]	Fresh	50†	Yes
Lepidoptera	*Noctuidae*	*Helicoverpa armigera*	0.13505[44]	Fresh	52†	Yes
Diptera	*Tipulidae*	*Tipula sp.*	0.03[36]		52[36]	Yes
Lepidoptera	*Tortricidae*		0.0055[38]		52[38]	Yes
Neuroptera			0.0035[38]		52[38]	Yes
Lepidoptera	*Sphingidae*	*Deilephila elpenor*	0.5281[38]		53[38]	Yes
Lepidoptera	*Tortricidae*	*Pandemis cerasana*	0.0124[38]		54[38]	Yes
Neuroptera	*Hemerobiidae*	*Wesmaelius sp.*	0.0033[38]		54[38]	Yes
Lepidoptera	*Lasiocampidae*	*Poecilocampa populi*	0.112[36]		55[36]	Yes
Lepidoptera	*Sphingidae*	*Enyo ocypete*	0.388[36]		56[36]	No
Diptera	*Tipulidae*				57[42]	Yes
Lepidoptera	*Crambidae*		0.0059[38]		57[38]	Yes
Lepidoptera	*Lasiocampidae*	*Malacosoma americanum*	0.088[36]		58[36]	No
Diptera	*Tipulidae*	*Tipula oleracea*			59†	Yes
Diptera	*Tipulidae*	*Tipula sp.*	0.0676[38]		59[38]	Yes
Lepidoptera	*Zygaenidae*	*Zygaena sp.*	0.0804[38]		60[38]	
Lepidoptera	*Sphingidae*	*Perigonia lusca*	0.638[36]		62[36]	No
Hymenoptera	*Ichneumonidae*	*Ophion luteus*	0.033[36]		62[36]	Yes
Coleoptera	*Melolonthidae*	*Melolontha vulgaris*	0.597[36]		62[36]	Yes
Lepidoptera	*Tortricidae*	*Cydia pomonella*	0.0265[45]	Fresh	62†	Yes
Lepidoptera	*Tortricidae*	*Pseudargyrotoza conwagana*	0.0044[38]		64[38]	Yes
Lepidoptera	*Tortricidae*	*Lobesia abscisana*	0.0076[38]		64[38]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Odonata	*Coenagrionidae*	*Ischnura elegans*	0.033[46]	Fresh	65†	Yes
Lepidoptera	*Tortricidae*	*Lobesia botrana*	0.00655[47]	Fresh	66†	Yes
Hemiptera	*Tessaratomidae*	*Tessaratoma javanica*	0.926[36]		66[36]	
Diptera	*Tipulidae*	*Nephrotoma quadrifaria*	0.0181[38]		67[38]	Yes
Coleoptera	*Cantharidae*	*Telephorus fuscipes*	0.109[36]		72[36]	Yes
Lepidoptera	*Sphingidae*	*Macroglossa stellatarum*	0.282[36]		73[36]	Yes
Diptera	*Trichoceridae*	*Trichocera sp.*	0.0012[36]		74[36]	Yes
Coleoptera	*Chrysomelidae*	*Agelastica alni*	0.03115[48]		75†	Yes
Coleoptera	*Cantharidae*	*Rhagonycha fulva*	0.0183[38]		75†	Yes
Ephemeroptera	*Baetidae*	*Centroptilum luteolum*	0.0027[38]		75[38]	Yes
Ephemeroptera			0.0027[38]		75[38]	Yes
Coleoptera	*Scarabaeidae*	*Amphimallon solstitiale*	0.291[36]		78[36]	Yes
Coleoptera	*Coccinellidae*	*Harmonia axyridis*	0.0283[38]		79[38]	Yes
Diptera	*Tipulidae*	*Nephrotoma flavescens*	0.0118[38]		79[38]	Yes
Coleoptera	*Cantharidae*	*Rhagonycha fulva*	0.0183[38]		79[38]	Yes
Hymenoptera	*Ichneumonidae*	*Amblyteles armatorius*	0.0569[49]		80[49]	No
Coleoptera	*Cerambycidae*		0.142[36]		80[36]	Yes
Lepidoptera	*Sphingidae*	*Macroglossa bombyliformis*	0.189[36]		80[36]	Yes
Hemiptera	*Aphididae*	*Acyrthosiphon kondoi*	0.000702[36]		81[36]	Yes
Lepidoptera					81[37]	Yes
Lepidoptera	*Sphingidae*	*Macroglossa stellatarum*	0.345[36]		85[36]	No
Coleoptera	*Chrysomelidae*	*Psylliodes chrysocephala*			85†	Yes
Hymenoptera	*Apidae*	*Exaerete frontalis*	0.699[50]		86[50]	No
Coleoptera	*Cetoniidae*	*Cetonia aurata*	0.537[36]		86[36]	Yes
Coleoptera	*Cerambycidae*	*Rutpela maculata*	0.1026[38]		86[38]	Yes
Hymenoptera	*Apidae*	*Exaerete frontalis*	0.644[36]		87[36]	No
Hymenoptera	*Tenthredinidae*	*Athalia scutelariae*	0.0132[38]		87[38]	Yes
Hemiptera	*Aphrophoridae*	*Neophilaenus sp.*			89†	Yes
Hymenoptera	*Apidae*	*Bombus lapidarius*	0.495[36]		90[36]	Yes
Hymenoptera	*Tenthredinidae*	*Athalia rosae*	0.0104[51]	Fresh	90†	Yes
Diptera	*Phoridae*		0.0005†	Wet	90[42]	Yes
Hemiptera	*Aphididae*	*Mysus persicae*	0.000334[36]		90[36]	Yes
Hemiptera	*Aleyrodidae*	*Aleyrodes proletella*	6.3e-05[52]		92†	No
Hemiptera	*Pentatomidae*	*Halyomorpha halys*	0.09843[53]	Fresh	92†	Yes
Diptera	*Heleomyzidae*				92[42]	Yes
Coleoptera	*Scarabaeidae*	*Aphodius sp.*	0.0327[38]		93[38]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Coleoptera	*Cerambycidae*	*Leptura quadrifasciata*	0.1173[38]		93[38]	Yes
Neuroptera	*Hemerobiidae*	*Micromus sp.*	0.0003[38]		94[38]	Yes
Diptera	*Tipulidae*		0.002[38]		94[38]	Yes
Coleoptera	*Curculionidae*	*Hypera meles*			95†	Yes
Diptera	*Tabanidae*	*Tabanus bovinus*	0.276[36]		96[36]	Yes
Hemiptera	*Pentatomidae*	*Pentatoma rufipes*	0.1397[38]		96[38]	Yes
Coleoptera			0.0539[38]		97[38]	Yes
Hymenoptera	*Apidae*	*Eulaema meriana*	0.94[36]		98[36]	No
Hymenoptera	*Cimbicidae*	*Cimbex sp.*			99†	Yes
Hemiptera	*Aphididae*	*Uroleucon cirsii*	0.0015[38]		99[38]	Yes
Hemiptera	*Scutelleridae*	*Chrysocoris purpureus*	0.264[36]		100[36]	No
Diptera	*Tabanidae*	*Dasyramphis atra*	0.233[36]		100[36]	Yes
Hemiptera	*Aphididae*	*Brevicoryne brassicae*	0.00084[54]	Fresh	100†	Yes
Hymenoptera	*Vespidae*	*Vespa crabro*	0.567[36]		100[36]	Yes
Coleoptera	*Scarabaeidae*	*Aphodius sp.*	0.1095[38]		101[38]	Yes
Diptera	*Lonchopteridae*				102[42]	Yes
Coleoptera	*Coccinellidae*	*Propylea 14-punctata*	0.0105[38]		102[38]	Yes
Diptera	*Tabanidae*				102[42]	Yes
Coleoptera	*Scarabaeidae*	*Aphodius sp.*	0.0929[38]		103[38]	Yes
Coleoptera	*Rutelidae*	*Popillia japonica*	0.0501[55]		104[37]	No
Hymenoptera	*Vespidae*	*Vespa crabro*	0.597[36]		104[36]	Yes
Hemiptera	*Aphididae*	*Aphis fabae*	0.000641[56]		104†	Yes
Diptera	*Scathophagidae*	*Scathophaga stercoraria*	0.0224[38]		104[38]	Yes
Hemiptera	*Aphididae*	*Myzus persicae*	0.0004[57]	Fresh	104†	Yes
Hemiptera	*Aphididae*	*Aphis fabae*	0.000411[36]		104[36]	Yes
Hymenoptera	*Vespidae*	*Polistes dominula*	0.0898[58]	Fresh	105†	Yes
Hymenoptera	*Apidae*	*Eulaema meriana*	0.875[50]		105[50]	No
Diptera	*Therevidae*				106[42]	Yes
Coleoptera	*Rutelidae*	*Popillia japonica*	0.1504[59]		107†	Yes
Hemiptera	*Miridae*		0.0119[38]		108[38]	Yes
Hymenoptera	*Apidae*	*Eulaema bombiformis*	0.983[50]		109[50]	No
Diptera	*Stratiomyidae*				109[42]	Yes
Hymenoptera	*Vespidae*	*Vespa germanica*	0.187[36]		110[36]	Yes
Hymenoptera	*Ichneumonidae*		0.0233[38]		110[38]	Yes
Hymenoptera	*Andrenidae*	*Andrena vaga*	0.0957[60]	Fresh	112†	Yes
Coleoptera	*Oedemeridae*	*Oedemera nobilis*	0.021[38]		112[38]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Hymenoptera	*Vespidae*	*Vespa crabro*	0.4775[61]		113†	Yes
Diptera	*Syrphidae*	*Syrphus grossulariae*	0.02[36]		114[36]	Yes
Diptera	*Psychodidae*				114[42]	Yes
Hemiptera	*Miridae*	*Lygus rugulipennis*	0.014[38]		115[38]	Yes
Coleoptera	*Nitidulidae*	*Brassicogethes aeneus*	0.0014[62]		115†	Yes
Hemiptera			0.0226[38]		116[38]	Yes
Hymenoptera	*Braconidae*				117†	Yes
Hymenoptera	*Tenthredinidae*	*Cladius pectinicornis*			117†	Yes
Orthoptera	*Acrididae*	*Chorthippus brunneus*	0.16[63]	Fresh	118†	Yes
Hemiptera	*Aphididae*	*Aphis nerii*	0.000467[36]		118[36]	Yes
Diptera	*Syrphidae*	*Volucella plumata*	0.124[36]		120[36]	Yes
Diptera	*Syrphidae*	*Volucella pellucens*	0.073[36]		120[36]	Yes
Diptera	*Syrphidae*	*Chrysotoxum bicincta*	0.075[36]		120[36]	Yes
Hemiptera	*Miridae*	*Lygocoris pabulinus*	0.00556[64]	Fresh	120†	Yes
Hymenoptera	*Sphecidae*	*Ammophila sabulosa*	0.045[36]		120[36]	No
Hemiptera	*Miridae*		0.0048[38]		120[38]	Yes
Coleoptera	*Tenthredinidae*	*Ceutorhynchus obstrictus*			122†	Yes
Hemiptera	*Cicadellidae*	*Scaphoideus titanus*	0.00345[65]	Fresh	123†	Yes
Coleoptera	*Chrysomelidae*	*Oulema melanopus*	0.0061[38]		123[38]	Yes
Hemiptera	*Aphididae*	*Aphis gossypii*	0.000114[36]		123[36]	Yes
Coleoptera	*Rutelidae*	*Popillia japonica*	0.09453[55]		123[37]	Yes
Hymenoptera	*Apidae*	*Bombus sp.*	1.6[36]		125[36]	Yes
Hemiptera	*Aphididae*	*Aphis gossypii*	0.00228[66]	Fresh	125†	Yes
Hymenoptera	*Vespidae*	*Vespula vulgaris*	0.0841[61]		125†	Yes
Diptera	*Bibionidae*	*Bibio sp.*			125†	Yes
Diptera	*Tephritidae*	*Ceratitis capitata*	0.0049[67]		126†	Yes
Hymenoptera	*Braconidae*	*Cotesia glomerata*	0.001[49]		126[49]	Yes
Hemiptera	*Miridae*		0.0011[38]		127[38]	Yes
Hymenoptera	*Apidae*	*Bombus muscorum*	0.226[36]		128[36]	Yes
Hymenoptera	*Apidae*	*Eulaema cingulata*	0.547[36]		128[36]	No
Diptera	*Drosophilidae*				129†	Yes
Hymenoptera	*Apidae*	*Apis sp.*	0.0213[36]		130[36]	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.388[36]		130[36]	Yes
Hymenoptera	*Apidae*	*Xylocopa violacea*	0.614[36]		130[36]	Yes
Coleoptera	*Brentidae*	*Protapion fulvipes*			130†	Yes
Coleoptera	*Staphylinidae*	*Dalotia coriaria*			130†	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Hymenoptera	*Ichneumonidae*	*Orthopelma mediator*	0.000712[68]	Dry	130†	Yes
Diptera	*Stratiomyidae*				131[42]	Yes
Diptera	*Syrphidae*	*Volucella bombylans*	0.1624[38]		133[38]	Yes
Diptera	*Syrphidae*	*Volucella pellucens*	0.01613[38]		134[38]	Yes
Diptera	*Muscidae*	*Musca domestica*	0.01697[69]		134†	Yes
Hymenoptera	*Apidae*	*Bombus liortonim*	0.159[36]		135[36]	Yes
Hymenoptera	*Apidae*	*Eulaema cingulata*	0.544[50]		135[50]	No
Hymenoptera	*Vespidae*		0.0184[38]		135[38]	Yes
Hymenoptera	*Braconidae*		0.0029[38]		136[38]	Yes
Diptera	*Stratiomyidae*				136[42]	Yes
Diptera	*Asilidae*				137[42]	Yes
Diptera	*Syrphidae*	*Syrphus balteatus*	0.0232[36]		138[36]	Yes
Hemiptera	*Miridae*	*Macrolophus pygmaeus*	0.00084[70]	Fresh	139†	Yes
Hymenoptera	*Vespidae*	*Vespa germanica*	0.24[36]		139[36]	Yes
Hemiptera	*Miridae*	*Macrolophus sp.*	0.0076[38]		139[38]	Yes
Diptera	*Syrphidae*	*Episyrphus balteatus*	0.01507[71]		140†	Yes
Hymenoptera	*Cynipidae*	*Diplolepis rosae*	0.001077[68]	Dry	140†	Yes
Diptera	*Cecidomyiidae*	*Aphidoletes aphidimyza*			140†	Yes
Diptera	*Calliphoridae*	*Lucilia sericata*	0.00732[72]	Fresh	142†	Yes
Hymenoptera	*Vespidae*	*Vespula vulgaris*	0.09[36]		143[36]	Yes
Diptera	*Syrphidae*	*Chrysotoxum arcuatum*	0.073[36]		144[36]	Yes
Diptera	*Psychodidae*		0.0006[38]		144[38]	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.2081[38]		144[38]	Yes
Hymenoptera	*Vespidae*	*Vespula germanica*	0.0769[38]		145[38]	Yes
Hymenoptera	*Vespidae*	*Vespula germanica*	0.0833[38]		146[38]	Yes
Diptera	*Syrphidae*	*Platychirus pellatus*	0.0128[36]		147[36]	Yes
Diptera	*Dolichopodidae*	*Hydrophorus alboflorens*	0.0047[73]	Dry	148[73]	Yes
Coleoptera	*Rutelidae*	*Popillia japonica*	0.1955[55]		148[37]	Yes
Diptera	*Tabanidae*				148[42]	Yes
Hemiptera	*Pentatomidae*	*Graphosoma italicum*	0.045[74]	Dry	149†	Yes
Hymenoptera	*Apidae*	*Eulaema nigrita*	0.399[36]		149[36]	No
Hymenoptera	*Apidae*	*Bombus terrestris*	0.2227[38]		149[38]	Yes
Diptera	*Sarcophagidae*	*Sarcophaga sp.*	0.054[38]		149[38]	Yes
Hymenoptera	*Apidae*	*Eulaema nigrita*	0.441[50]		150[50]	No
Hymenoptera	*Ichneumonidae*	*Tersilochus heterocerus*			150†	Yes
Diptera	*Syrphidae*	*Chrysotoxum vernale*	0.064[36]		150[36]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Hemiptera	*Saldidae*		0.0021[75]		151†	Yes
Hemiptera	*Aleyrodidae*	*Trialeurodes vaporariorum*	3.5e-05[36]		151†	Yes
Diptera	*Empididae*		0.0193[38]		151[38]	Yes
Diptera	*Sciomyzidae*		0.011†	Wet	151[42]	Yes
Diptera	*Tabanidae*	*Haematopota pluvialis*	0.0183[38]		151[38]	Yes
Hymenoptera	*Apidae*	*Bombus lapidarus*	0.568[36]		152[36]	Yes
Hymenoptera	*Braconidae*	*Dacnusa sibirica*			152†	Yes
Hymenoptera	*Vespidae*	*Vespula germanica*	0.0818[38]		152[38]	Yes
Diptera	*Dolichopodidae*				152[42]	Yes
Hymenoptera	*Braconidae*	*Aphidius ervi*	0.0002[76]	Dry	152†	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.1854[38]		152[38]	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.88[36]		156[36]	Yes
Diptera	*Stratiomyidae*	*Chloromyia formosa*	0.0183[38]		156[38]	Yes
Diptera	*Tephritidae*	*Bactrocera oleae*			157†	Yes
Diptera	*Tephritidae*	*Rhagoletis spp.*	0.0045†	Wet	157[42]	Yes
Hymenoptera	*Braconidae*	*Aphidius colemani*	3.4e-05[77]	Dry	159†	Yes
Diptera	*Calliphoridae*	*Calliphora sp.*	0.023[36]		160[36]	Yes
Diptera	*Sarcophagidae*	*Sarcophaga carnaria*	0.045[36]		160[36]	Yes
Hymenoptera	*Torymidae*	*Torymus sp.*	0.0024[38]		160[38]	Yes
Diptera	*Calliphoridae*				160[42]	Yes
Diptera	*Sarcophagidae*	*Sarcophaga crassipalpis*	0.02268[78]		161[79]	Yes
Diptera	*Sciaridae*				161[42]	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.2125[38]		161[38]	Yes
Diptera	*Calliphoridae*	*Calliphora erythrocephala*	0.053[36]		162[36]	Yes
Hymenoptera	*Braconidae*	*Aphidius matricariae*			163†	Yes
Hymenoptera			0.103[38]		163[38]	Yes
Diptera	*Syrphidae*	*Eristalis tenax*	0.111[36]		164[36]	Yes
Hymenoptera	*Braconidae*		0.003[38]		164[38]	Yes
Hymenoptera	*Megachilidae*	*Megachile rotundata*	0.02437[80]		165[80]	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.2154[38]		165[38]	Yes
Hemiptera	*Alerodidae*	*Aleurothrixus floccosus*	6.5e-05[36]		165[36]	No
Diptera	*Syrphidae*	*Episyrphus balteatus*	0.0294[38]		166[38]	Yes
Diptera	*Drosophilidae*	*Drosophila melanogaster*	0.0009[81]	Dry	166†	Yes
Diptera	*Drosophilidae*	*Drosophila melanogaster*	0.0006[82]	Wet	166†	Yes
Diptera	*Dolichopodidae*				166[42]	Yes
Diptera	*Dolichopodidae*				167[42]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Hymenoptera	*Apidae*	*Bombus terrestris*	0.1381[83]	Fresh	168†	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.1493[83]	Fresh	168†	Yes
Coleoptera	*Staphylinidae*	*Aleochara bilineata*	0.003[84]		168†	Yes
Hemiptera	*Alerodidae*	*Bemisia tabaci*	3.3e-05[36]		168[36]	Yes
Diptera	*Sarcophagidae*				168[42]	Yes
Diptera	*Sarcophagidae*	*Sarcophaga crassipalpis*	0.02268[78]		169[79]	Yes
Hymenoptera	*Apidae*	*Eufriesia pulchra*	0.425[36]		170[36]	No
Thysanoptera	*Thripidae*	*Scirtothrips citri*	1.34e-05[85]	Fresh	170†	Yes
Diptera	*Lauxaniidae*				170[42]	Yes
Diptera	*Syrphidae*	*Syrphus nitens*	0.022[36]		172[36]	Yes
Hymenoptera	*Andrenidae*	*Andrena sp.*	0.0453[38]		172[38]	Yes
Hymenoptera	*Vespidae*	*Vespula vulgaris*	0.0874[38]		173[38]	Yes
Thysanoptera	*Thripidae*	*Frankliniella occidentalis*	1.5e-05[86]	Fresh	174†	Yes
Diptera	*Syrphidae*	*Syrphus corollae*	0.0213[36]		174[36]	Yes
Diptera	*Sarcophagidae*	*Sarcophaga crassipalpis*	0.02268[78]		177[79]	Yes
Diptera	*Muscidae*	*Mesembrina meridiana*	0.117†	Wet	177[42]	Yes
Hymenoptera	*Eulophidae*	*Diglyphus isaea*			177†	Yes
Diptera	*Drosophilidae*	*Scaptomyza flava*	0.00014[87]	Dry	177†	Yes
Diptera	*Syrphidae*	*Syrphus ribesii*	0.0273[38]		177[38]	Yes
Hymenoptera	*Apidae*	*Euglossa imperialis*	0.169[36]		179[36]	No
Diptera	*Tachinidae*		0.0055†	Wet	179[42]	Yes
Hemiptera	*Alerodidae*	*Trialeurodes vaporariorum*	3.5e-05[36]		180[36]	Yes
Diptera	*Chloropidae*		0.003[38]		180[38]	Yes
Hymenoptera	*Apidae*	*Eufriesea pulchra*	0.351[50]		181[50]	No
Hymenoptera	*Apidae*	*Euglossa imperialis*	0.176[50]		181[50]	No
Diptera	*Calliphoridae*	*Calliphora dubia*			181[79]	No
Diptera	*Syrphidae*	*Eristalis tenax*	0.129[36]		181[36]	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.1504[38]		183[38]	Yes
Hymenoptera	*Apidae*	*Euglossa cognata*	0.159[50]		184[50]	No
Diptera	*Syrphidae*				185[42]	Yes
Hymenoptera	*Pteromalidae*	*Pteromalus puparium*	0.001[49]		185[49]	Yes
Diptera	*Calliphoridae*				185[42]	Yes
Diptera	*Heleomyzidae*				185[42]	Yes
Diptera	*Calliphoridae*	*Calliphora dubia*			186[79]	No
Diptera	*Syrphidae*	*Syrphus ribesii*	0.0371[36]		186[36]	Yes
Hymenoptera	*Apidae*	*Bombus terrestris*	0.1641[38]		186[38]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Hymenoptera	*Pteromalidae*	*Spalangia cameroni*	0.025[88]	Dry	187†	Yes
Diptera	*Anthomyiidae*	*Delia antiqua*			187†	Yes
Diptera	*Syrphidae*	*Scaeva pyrastri*	0.034[36]		190[36]	Yes
Diptera	*Muscidae*	*Musca domestica*	0.012[36]		190[36]	Yes
Diptera	*Syrphidae*	*Syrphus sp.*	0.0005[38]		190[38]	Yes
Diptera	*Calliphoridae*	*Calliphora dubia*			191[79]	No
Hymenoptera	*Megachilidae*	*Osmia bicornis*	0.08345[89]	Fresh	194†	No
Diptera	*Drosophilidae*	*Drosophila virilis*	0.002[36]		195[36]	Yes
Diptera	*Syrphidae*	*Syrphus vitripennis*	0.0385[36]		196[36]	Yes
Hymenoptera	*Apidae*	*Apis mellifera*	0.1008[36]		197[36]	Yes
Hymenoptera	*Apidae*	*Bombus pascuorum*	0.1166[38]		198[38]	Yes
Diptera	*Syrphidae*		0.0044[38]		198[38]	Yes
Hymenoptera	*Figitidae*	*Leptopilina boulardi*	0.004[49]		198[49]	Yes
Diptera	*Calliphoridae*				199[42]	Yes
Hymenoptera	*Apidae*	*Bombus lapidarius*	0.1536[38]		199[38]	Yes
Hymenoptera	*Apidae*	*Euglossa championi*	0.136[50]		200[50]	No
Diptera	*Cecidomyiidae*	*Dasineura brassicae*			200†	Yes
Diptera	*Calliphoridae*				200[42]	Yes
Diptera	*Cecidomyiidae*	*Feltiella acarisuga*			201†	Yes
Diptera	*Calliphoridae*	*Lucilia sericata*	0.00732[72]	Fresh	201[79]	Yes
Diptera	*Chloropidae*		0.00075†	Wet	202[42]	Yes
Diptera	*Syrphidae*				202[42]	Yes
Hymenoptera	*Encyrtidae*	*Leptomastix dactylopii*	0.00045[90]	Fresh	203†	No
Hymenoptera	*Apidae*	*Euglossa crasipunctata*	0.067[50]		204[50]	No
Hymenoptera	*Apidae*	*Bombus pascuorum*	0.1166[38]		205†	No
Hymenoptera	*Apidae*	*Euglossa bursigera*	0.084[50]		207[50]	No
Diptera	*Drosophilidae*				207[42]	Yes
Diptera			0.0268[38]		208[38]	Yes
Diptera	*Syrphidae*		0.0385[38]		208[38]	Yes
Hymenoptera	*Apidae*	*Euglossa mandibularis*	0.09[36]		209[36]	No
Diptera	*Fanniidae*	*Fannia scalaris*	0.01[36]		210[36]	Yes
Diptera	*Syrphidae*	*Eristalis tenax*	0.073[36]		210[36]	Yes
Hymenoptera	*Crabonidae*	*Ectemnius cavifrons*	0.08[38]		210[38]	Yes
Diptera	*Syrphidae*	*Eristalis arbustorum*	0.0705[36]		211[36]	Yes
Diptera	*Syrphidae*	*Eupeodes corollae*	0.01095[71]		212†	Yes
Diptera	*Calliphoridae*	*Lucilia sericata*	0.00768[91]	Fresh	213[79]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Hymenoptera	*Andrenidae*	*Andrena sp.*	0.0376[38]		213[38]	Yes
Hymenoptera	*Apidae*	*Euglossa tridentata*	0.11[50]		214[50]	No
Diptera	*Calliphoridae*	*Calliphora vomitoria*	0.0549[38]		214[38]	Yes
Diptera	*Sepsidae*				215[42]	Yes
Hymenoptera	*Apidae*	*Apis mellifera*	0.089†		217†	Yes
Diptera	*Chironomidae*				218[42]	Yes
Hymenoptera	*Apidae*	*Apis mellifera*	0.089†		219†	Yes
Diptera	*Muscidae*	*Hydrotaea aenescens*	0.0121[92]		219†	Yes
Hymenoptera	*Vespidae*	*Polistes gallicus*	0.115[36]		220[36]	Yes
Hymenoptera	*Apidae*	*Euglossa dissimula*	0.104[36]		220[36]	No
Diptera	*Muscidae*	*Musca vetustissima*	0.01[93]	Fresh	221[79]	No
Hymenoptera	*Apidae*	*Euglossa mixta*	0.094[50]		223[50]	No
Diptera	*muscidae*	*Musca vetustissima*	0.01[93]	Fresh	224[79]	No
Hemiptera	*Alerodidae*	*Trialeurodes abutiloides*	5e-05[36]		224[36]	Yes
Diptera	*Calliphoridae*	*Lucilia sericata*	0.00768[91]	Fresh	225[79]	Yes
Diptera	*Sciaridae*		0.00022†	Wet	225†	Yes
Hymenoptera	*Apidae*	*Euglossa dissimula*	0.1[50]		227[50]	No
Hymenoptera	*Apidae*	*Apis mellifera*	0.089†		228†	Yes
Diptera	*Muscidae*	*Musca vetustissima*	0.01[93]	Fresh	229[79]	No
Diptera	*Drosophilidae*	*Drosophila suzukii*	0.0008[94]	Fresh	230†	Yes
Hymenoptera	*Apidae*	*Apis mellifera*	0.089†		230†	Yes
Hymenoptera	*Apidae*	*Apis mellifera*	0.0886[38]		230[38]	Yes
Hymenoptera	*Apidae*	*Euglossa hansoni*	0.082[50]		233[50]	No
Hymenoptera	*Apidae*	*Euglossa sapphirina*	0.055[50]		234[50]	No
Hymenoptera	*Megachilidae*	*Megachile rotundata*	0.02437[80]		234†	Yes
Hymenoptera	*Apidae*	*Euglossa despecta*	0.112[50]		238[50]	No
Hymenoptera	*Apidae*	*Apis mellifera*	0.085[36]		240[36]	Yes
Diptera	*Drosophilidae*	*Drosophila virilis*	0.002[36]		240[36]	Yes
Diptera	*Dolichopodidae*				244[42]	Yes
Hymenoptera	*Apidae*	*Euglossa heterosticta*	0.064[50]		250[50]	No
Hymenoptera	*Apidae*	*Apis mellifera*	0.078[36]		250[36]	Yes
Hymenoptera	*Aphelinidae*	*Encarsia formosa*			259†	Yes
Diptera	*Culicidae*	*Theobaldia anulata*	0.0099[36]		262[36]	Yes
Diptera	*Chamaemyidae*				262[42]	Yes
Hymenoptera	*Apidae*	*Euglossa saphirina*	0.071[36]		265[36]	No
Diptera	*Pipunculidae*		0.001†	Wet	269[42]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Diptera	*Chloropidae*	*Thaumatomyia notata*	0.0014[38]		269[38]	Yes
Hymenoptera	*Trichogrammatidae*	*Trichogramma*			272†	Yes
Diptera	*Culicidae*		0.0058[36]		277[36]	Yes
Diptera	*Culicidae*				286[42]	Yes
Diptera	*Culicidae*	*Aedes cantans*	0.0066[38]		286[38]	Yes
Diptera	*Culicidae*				298[42]	Yes
Diptera	*Syrphidae*	*Sphaerophoria scripta*	0.0193[36]		308[36]	Yes
Diptera	*Culicidae*		0.0018†	Wet	329†	Yes
Diptera	*Culicidae*	*Culiseta annulata*	0.0077[38]		331[38]	Yes
Diptera	*Culicidae*	*Culex pipiens*	0.0049[38]		334[38]	Yes
Diptera	*Culicidae*				339[42]	Yes
Diptera	*Culicidae*	*Culex restuans*	0.0018†	Wet	341[95]	No
Diptera	*Culicidae*	*Culiseta annulata*	0.007[38]		344[38]	Yes
Diptera	*Culicidae*	*Aedes dorsalis*	0.0018†	Wet	373[95]	Yes
Diptera	*Culicidae*	*Aedes vexans*	0.0024[96]	Dry	377[95]	Yes
Diptera	*Culicidae*	*Aedes infirmatus*	0.0018†	Wet	380[95]	Yes
Diptera	*Culicidae*	*Aedes japonicus*	0.0018†	Wet	383[95]	Yes
Diptera	*Culicidae*	*Culex coronator*	0.0018†	Wet	393[95]	No
Diptera	*Culicidae*	*Mansonia titillans*	0.0018†	Wet	395[95]	No
Diptera	*Culicidae*	*Aedes triseriatus*	0.0005[97]	Dry	395[95]	Yes
Diptera	*Culicidae*	*Culex tarsalis*	0.00187[98]	Dry	395[95]	No
Diptera	*Culicidae*	*Culex nigripalpus*	0.0018†	Wet	397[95]	No
Diptera	*Culicidae*	*Psorophora columbiae*	0.0018†	Wet	411[95]	No
Diptera	*Culicidae*	*Anopheles crucians*	0.0018†	Wet	411[95]	No
Diptera	*Culicidae*	*Aedes sierrensis*	0.0018†	Wet	425[95]	No
Diptera	*Culicidae*	*Culiseta incidens*	0.0018†	Wet	426[95]	No
Diptera	*Culicidae*	*Deinocerites cancer*	0.0018†	Wet	427[95]	No
Diptera	*Culicidae*	*Wyeomyia mitchellii*	0.0018†	Wet	438[95]	No
Diptera	*Culicidae*	*Culex interrogator*	0.0018†	Wet	441[95]	No
Diptera	*Chironomidae*				445[42]	Yes
Diptera	*Culicidae*	*Aedes taeniorhynchus*	0.0018†	Wet	447[95]	No
Diptera	*Culicidae*	*Wyeomyia vanduzeei*	0.0018†	Wet	454[95]	No
Diptera	*Culicidae*	*Culex quinquefasciatus*	0.0018†	Wet	456[95]	Yes
Diptera	*Culicidae*	*Anopheles albimanus*	0.0018†	Wet	460[95]	No
Diptera	*Culicidae*	*Culex iolambdis*	0.0018†	Wet	469[95]	No
Diptera	*Culicidae*	*Aedes aegypti*	0.0015[36]		480[36]	Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Diptera	*Culicidae*	*Aedes aegypti*	0.0023[99]		498[95]	Yes
Diptera	*Culicidae*	*Anopheles quadrimaculatus*	0.0018†	Wet	504[95]	No
Diptera	*Culicidae*	*Wyeomyia smithii*	0.0018†	Wet	525[95]	No
Diptera	*Culicidae*	*Aedes albopictus*	0.0004[100]	Dry	536[95]	No
Diptera	*Chironomidae*		0.0018[38]		544[38]	No
Diptera	*Chironomidae*		0.0011[38]		557[38]	Yes
Diptera	*Culicidae*	*Toxorhynchites rutilus*	0.0018†	Wet	600[95]	No
Diptera	*Culicidae*	*Uranotaenia lowii*	0.0018†	Wet	736[95]	No
Diptera	*Culicidae*	*Aedes aegypti*	0.0004[99]		852†	Yes
Hemiptera	*Dicytyopharidae*	*Engela minuta*	0.0057[101]			No
Hemiptera	*Dicytyopharidae*	*Thanatodictya praeferrata*	0.0081[101]			No
Hemiptera	*Dicytyopharidae*	*Raphiophora vitrea*	0.0196[101]			No
Hemiptera	*Dicytyopharidae*	*Dictyophara europaea*	0.0229[101]			Yes
Hemiptera	*Miridae*	*Plagiognathus sp.*	0.0022[102]			Yes
Hemiptera	*Miridae*	*Orthocephalus saltator*	0.0044[102]			Yes
Hemiptera	*Miridae*	*Phytocoris varipes*	0.01005[102]			Yes
Hemiptera	*Miridae*	*Psallus perrisi*	0.0133[102]			Yes
Coleoptera	*Oedemeridae*	*Oedemera nobilis*	0.0189[103]			Yes
Hemiptera	*Alerodidae*	*Dialeurodes citri (male)*	3.6e-05[36]			Yes
Hemiptera	*Alerodidae*	*Dialeurodes citri (female)*	8e-05[36]			Yes
Hymenoptera	*Braconidae*	*Aphidius ervi*	0.00017[104]			Yes
Coleoptera	*Staphylinidae*	*Aleochara lanuginosa*	0.0003[74]	Dry		No
Hemiptera	*Cixiidae*		0.0002[74]	Dry		Yes
Hymenoptera	*Formicidae*	*Lasius alienus*	0.0003[74]	Dry		Yes
Hymenoptera	*Formicidae*	*Ponera coarctata*	0.0003[74]	Dry		Yes
Hymenoptera	*Formicidae*	*Lasius niger*	0.0004[74]	Dry		Yes
Coleoptera	*Carabidae*	*Epaphius secalis*	0.0005[74]	Dry		Yes
Hymenoptera	*Formicidae*	*Lasius fuliginosus*	0.0005[74]	Dry		Yes
Coleoptera	*Staphylinidae*	*Oxytelus sculptus*	0.0006[74]	Dry		Yes
Hymenoptera	*Formicidae*	*Myrmica ruginodis*	0.0007[74]	Dry		Yes
Coleoptera	*Staphylinidae*	*Tachinus signatus*	0.0008[74]	Dry		Yes
Diptera	*Chironomidae*	*Chironomus plumosus*	0.001[74]	Dry		Yes
Coleoptera	*Staphylinidae*	*Philonthus rectangulus*	0.002[74]	Dry		Yes
Hemiptera	*Miridae*	*Lygus pratensis*	0.002[74]	Dry		Yes
Dermaptera	*Spongiphoridae*	*Labia minor*	0.003[74]	Dry		Yes
Hemiptera	*Rhyparochromidae*	*Rhyparochromus phoeniceus*	0.004[74]	Dry		Yes

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Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Coleoptera	*Histeridae*	*Hister fenestus*	0.006[74]	Dry		Yes
Coleoptera	*Carabidae*	*Leistus ferrugineus*	0.007[74]	Dry		Yes
Coleoptera	*Scarabaeidae*	*Aphodius foetens*	0.009[74]	Dry		Yes
Coleoptera	*Carabidae*	*Ophonus rufibarbis*	0.011[74]	Dry		Yes
Coleoptera	*Staphylinidae*	*Philonthus decorus*	0.012[74]	Dry		Yes
Coleoptera	*Carabidae*	*Limodromus assimilis*	0.015[74]	Dry		Yes
Hemiptera	*Coreidae*	*Coreus marginatus*	0.023[74]	Dry		Yes
Coleoptera	*Carabidae*	*Calathus ambiguus*	0.025[74]	Dry		Yes
Coleoptera	*Carabidae*	*Calathus fuscipes*	0.025[74]	Dry		Yes
Coleoptera	*Carabidae*	*Nebria brevicollis*	0.029[74]	Dry		Yes
Dermaptera	*Forficulidae*	*Forficula auricularia*	0.029[74]	Dry		Yes
Hemiptera	*Pyrrhocoridae*	*Pyrrhocoris apterus*	0.032[74]	Dry		Yes
Coleoptera	*Silphidae*	*Phosphuga atrata*	0.042[74]	Dry		Yes
Coleoptera	*Cetoniidae*	*Oxythyrea funesta*	0.045[74]	Dry		Yes
Coleoptera	*Carabidae*	*Pseudoophonus rufipes*	0.047[74]	Dry		Yes
Orthoptera	*Acrididae*	*Chorthippus spp.*	0.063[74]	Dry		Yes
Coleoptera	*Carabidae*	*Pterostichus melanarius*	0.071[74]	Dry		Yes
Orthoptera	*Acrididae*	*Chorthippus spp.*	0.072[74]	Dry		Yes
Coleoptera	*Carabidae*	*Pterostichus niger*	0.074[74]	Dry		Yes
Coleoptera	*Silphidae*	*Silpha carinata*	0.074[74]	Dry		Yes
Coleoptera	*Carabidae*	*Carabus granulatus*	0.106[74]	Dry		Yes
Coleoptera	*Carabidae*	*Carabus convexus*	0.12[74]	Dry		Yes
Coleoptera	*Carabidae*	*Carabus hortensis*	0.237[74]	Dry		Yes
Coleoptera	*Carabidae*	*Carabus coriaceus*	1.043[74]	Dry		Yes
Diptera	*Muscidae*	*Musca domestica*	0.0195[92]			Yes
Hymenoptera	*Pteromalidae*	*Trichilogaster signiventris*	0.00018[105]	Wet		No
Coleoptera	*Chrysomelidae*		0.0055[105]	Wet		Yes
Diptera	*Tephritidae*	*Ceratitis capitata*	0.007[105]	Wet		Yes
Hymenoptera	*Pteromalidae*	*Trichilogaster acaciaelongifoliae*	0.027[105]	Wet		Yes
Coleoptera	*Curculionidae*	*Gonipterus scutelatus*	0.03[105]	Wet		Yes
Lepidoptera	*Nymphalidae*	*Dira clytus*	0.062[105]	Wet		Yes
Hemiptera	*Aphididae*	*Aphis gossypii*	0.000183[66]	Fresh		Yes
Hymenoptera	*Vespidae*	*Polistes gallicus*	0.06324[106]			Yes
Hymenoptera	*Vespidae*	*Polistes dominula*	0.10044[106]			Yes
Coleoptera	*Chrysomelidae*	*Chaetocnema aridula*	0.0014[107]			Yes
Coleoptera	*Chrysomelidae*	*Longitarsus pratensis*	0.00175[107]			Yes

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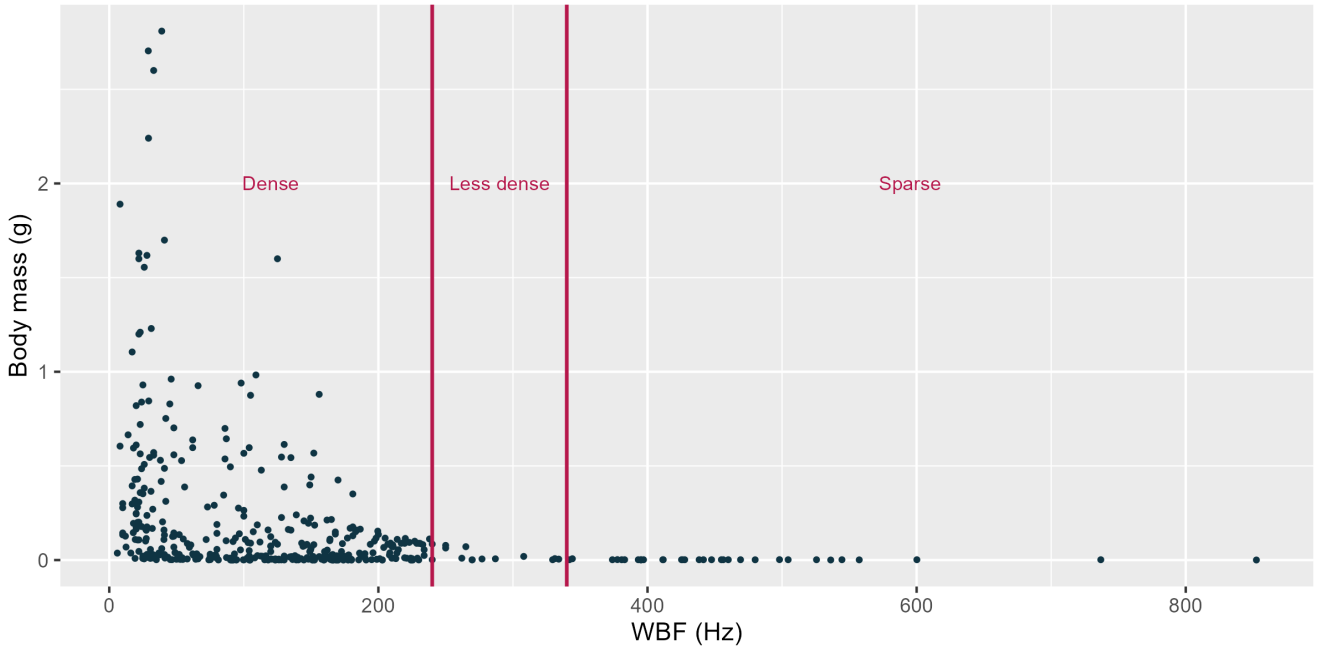
Order	Family	Species	Body Mass (g)	Wet/Dry/Fresh weight	WBF (Hz)	Europe (Yes/No)[35]
Coleoptera	*Chrysomelidae*	*Crepidodera aurata*	0.00265[107]			Yes
Coleoptera	*Chrysomelidae*	*Aphtona cyparissiae*	0.0044[107]			Yes
Coleoptera	*Chrysomelidae*	*Sphaeroderma testaceum*	0.00465[107]			Yes
Diptera	*Tephritidae*	*Ceratitis capitata*	0.00784[108]	Fresh		Yes
Diptera	*Hybotidae*		0.00063†	Wet		Yes
Diptera	*Limoniidae*		0.0018†	Wet		Yes
Diptera	*Ptychopteridae*	*Ptychoptera spp.*	0.0046†	Wet		Yes
Diptera	*Psilidae*		0.0058†	Wet		Yes
Diptera	*Dolichopodidae*		0.008†	Wet		Yes
Diptera	*Pallopteridae*					Yes
Diptera	*Dolichopodidae*		0.003†	Wet		

Concluded

S3: Biomass algorithm

Input: Set of N insect events, each with a WBF estimate $\mu_{f_0}^i$
Output: Estimated body mass B_i for each event
for $i \leftarrow 1$ to N **do**
    Retrieve candidate species from reference table
    Let C = number of retrieved candidates
    if $C = 0$ **then**
        if $240 < \mu_{f_0}^i \leq 340$ Hz **then**
            $B_i \leftarrow$ median mass for $(240 < \mu_{f_0}^i \leq 340$ Hz$)$
        else if $\mu_{f_0}^i > 340$ Hz **then**
            $B_i \leftarrow$ mass for $\mu_{f_0}^i = 480$ Hz (mosquito)
        else
            $B_i \leftarrow$ median mass for $\mu_{f_0}^i \leq 240$ Hz
        end if
    else if $C = 1$ **then**
        $B_i \leftarrow$ mass of the single candidate
    else ▷ $C > 1$
        Exclude non-region insects (e.g., non-European) to refine the candidate set
        Let C' = updated number of candidates
        if $C' = 0$ **then**
            $B_i \leftarrow 0$
        else if $C' = 1$ **then**
            $B_i \leftarrow$ mass of the single remaining candidate
        else
            $B_i \leftarrow$ weighted average of remaining candidate masses
        end if
    end if
end for

S4: Body mass and WBF distribution



S3: Body mass and WBF distribution categorized into three regions. From left to right: The dense region which includes WBFs less than 240 Hz. The less dense region which includes WBFs between 240 Hz and 340 Hz, and the sparse region which covers WBFs greater than 340 Hz.

S5: Descriptive statistics of reference table

Descriptive statistics for body mass and WBF from the reference table (S2), including number of values (N), mean, standard deviation (S.D.), minimum (Min), and maximum (Max) values.

Variable	N	Mean	S.D.	Min	Max
Body Mass (g)	480	0.17	0.36	0.000013	2.8
WBF (Hz)	473	143	117	6	852

S6: Overview of count and biomass samples

Start- and end date of count and biomass data collection for both sites 1 and 2 for both sensors and Malaise traps. The table is ordered by site and start date.

Start Date	End Date	Site	Sensor Count	Malaise Count	Sensor Biomass (g)	Malaise Biomass (g)
2024-06-17	2024-06-18	Site1	329	320	25.0	1.645
2024-06-18	2024-06-19	Site1	221	385	14.141136	1.593
2024-06-19	2024-06-20	Site1	97	103	12.674007	0.43
2024-06-20	2024-06-21	Site1	176	482	13.991867	1.368
2024-06-24	2024-06-25	Site1	503	463	16.8197	1.451
2024-06-25	2024-06-26	Site1	241	797	19.701242	2.16
2024-06-26	2024-06-27	Site1	313	380	31.594295	1.86
2024-06-27	2024-06-28	Site1	301	832	30.040947	3.271
2024-07-11	2024-07-15	Site1	2033	1091	113.545189	4.322
2024-07-15	2024-07-18	Site1	3602	916	195.0	3.033
2024-07-18	2024-07-22	Site1	8856	2799	350.0	10.757
2024-07-22	2024-07-25	Site1	2896	892	156.0	5.142
2024-07-25	2024-07-29	Site1	3243	996	163.0	4.69
2024-07-29	2024-08-01	Site1	6010	1560	205.0	5.122
2024-08-01	2024-08-05	Site1	7331	1498	237.33	5.65
2024-08-05	2024-08-08	Site1	8700	969	296.39	3.782
2024-08-08	2024-08-12	Site1	2582	682	152.13	2.073
2024-08-12	2024-08-15	Site1	4948	779	202.53	2.651
2024-08-15	2024-08-19	Site1	1006	1003	71.5	2.25
2024-08-19	2024-08-22	Site1	1442	426	88.13	0.848
2024-08-22	2024-08-26	Site1	2482	436	297.35	1.005
2024-08-26	2024-08-29	Site1	1081	650	145.36	4.683
2024-08-29	2024-09-02	Site1	1084	616	121.17	2.121
2024-09-02	2024-09-05	Site1	1055	547	118.404	1.82
2024-09-05	2024-09-09	Site1	747	716	95.13	1.454
2024-09-09	2024-09-12	Site1	103	137	28.23	0.801
2024-06-17	2024-06-18	Site2	944	948	51.311	4.38
2024-06-18	2024-06-19	Site2	1048	921	23.9105605	3.827
2024-06-19	2024-06-20	Site2	207	322	45.44451767	0.964
2024-06-20	2024-06-21	Site2	2361	1162	71.00112367	2.804
2024-06-24	2024-06-25	Site2	881	621	36.41	2.161
2024-06-25	2024-06-26	Site2	901	1071	33.29	3.067
2024-06-26	2024-06-27	Site2	864	1097	49.42	3.237

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Start Date	End Date	Location	Sensor Count	Malaise Count	Sensor Biomass (g)	Malaise Biomass (g)
2024-06-27	2024-06-28	Site2	1692	1551	34.56	5.437
2024-07-11	2024-07-15	Site2	1990	1702	152.41	3.111
2024-07-15	2024-07-18	Site2	1154	587	281.87	2.373
2024-07-18	2024-07-22	Site2	4735	2995	378.22	11.275
2024-07-22	2024-07-25	Site2	3574	1538	362.82	4.074
2024-07-25	2024-07-29	Site2	9897	2023	621.45	6.865
2024-07-29	2024-08-01	Site2	11343	733	425.06	2.811
2024-08-01	2024-08-05	Site2	15317	3057	601.0	8.162
2024-08-05	2024-08-08	Site2	10782	1745	519.63	5.97
2024-08-08	2024-08-12	Site2	2575	2115	393.24	4.762
2024-08-12	2024-08-15	Site2	2313	2095	340.06	6.45
2024-08-15	2024-08-19	Site2	1223	2476	291.71	4.313
2024-08-19	2024-08-22	Site2	982	973	256.96	2.238
2024-08-22	2024-08-26	Site2	2033	782	710.89	1.859
2024-08-26	2024-08-29	Site2	3034	1224	553.76	4.179
2024-08-29	2024-09-02	Site2	3529	1610	253.68	12.3
2024-09-02	2024-09-05	Site2	2777	845	111.39	7.11
2024-09-05	2024-09-09	Site2	2301	604	68.71	2.213
2024-09-09	2024-09-12	Site2	629	171	89.23	1.014

Concluded

S7: Descriptive statistics of count and biomass values for site 1

Descriptive statistics for count and biomass for site 1 from the sample overview table (S4), including number of values (N), mean, standard deviation (S.D.), minimum (Min), and maximum (Max) values.

Variable	N	Mean	S.D.	Min	Max
Sensor Count	26	2361	2685	97	8856
Malaise Count	26	788	544	103	2799
Sensor Biomass (g)	26	123	99	13	350
Malaise Biomass (g)	26	2.9	2.2	0.43	11

S8: Descriptive statistics of count and biomass values for site 2

Descriptive statistics for count and biomass for site 2 from the sample overview table (S4), including number of values (N), mean, standard deviation (S.D.), minimum (Min), and maximum (Max) values.

Variable	N	Mean	S.D.	Min	Max
Sensor Count	26	3426	3894	207	15317
Malaise Count	26	1345	766	171	3057
Sensor Biomass (g)	26	260	215	24	711
Malaise Biomass (g)	26	4.5	2.9	0.96	12

S9: Shapiro-Wilk's test for normality

Shapiro-Wilk's test results for all variables for both sites 1-2, including *P*-value and level of significance:

$P < 0.001$ ***
$P < 0.01$ **
$P < 0.05$ *
$P > 0.05$ NS

Variable	P-Value	Significance
Site 1 - Malaise Count	0.000341	***
Site 1 - Malaise Biomass	0.000429	***
Site 1 - Sensor Count	0.000133	***
Site 1 - Sensor Biomass	0.024360	*
Site 2 - Malaise Count	0.156467	NS
Site 2 - Malaise Biomass	0.006753	**
Site 2 - Sensor Count	0.000006	***
Site 2 - Sensor Biomass	0.010702	*

References

35. GBIF.org. GBIF home page. https://www.gbif.org (2025). Accessed: 28 January 2025.

36. Byrne, D. N., Buchmann, S. L. & Spangler, H. G. Relationship Between Wing Loading, Wingbeat Frequency and Body Mass in Homopterous Insects. *J. Exp. Biol.* **135**, 9–23, DOI: https://doi.org/10.1242/JEB.135.1.9 (1988).

37. Yu, W., Zhang, H., Xu, R., Sun, Y. & Wu, K. Characterization of Wingbeat Frequency of Different Taxa of Migratory Insects in Northeast Asia. *Insects* **13**, 520, DOI: https://doi.org/10.3390/INSECTS13060520 (2022).

38. Tercel, M. P., Veronesi, F. & Pope, T. W. Phylogenetic clustering of wingbeat frequency and flight-associated morphometrics across insect orders. *Physiol. Entomol.* **43**, 149–157, DOI: https://doi.org/10.1111/PHEN.12240 (2018).

39. Burrows, M. & Dorosenko, M. Jumping mechanisms in lacewings (Neuroptera, Chrysopidae and Hemerobiidae). *J. Exp. Biol.* **217**, 4252–4261, DOI: https://doi.org/10.1242/JEB.110841 (2014).

40. Sarfraz, M., Dosdall, L. M. & Keddie, B. A. Resistance of Some Cultivated Brassicaceae to Infestations by Plutella xylostella (Lepidoptera: Plutellidae). *J. Econ. Entomol.* **100**, 215–224, DOI: https://doi.org/10.1093/JEE/100.1.215 (2007).

41. Ankersmit, G. W., Rabbinge, R. & Dijkman, H. Studies on the sterile-male technique as a means of control of adoxophyes orana (Lepidoptera, Tortricidae) 4. technical and economic aspects of mass-rearing. *Neth. J. Plant Pathol.* **83**, 27–39, DOI: https://doi.org/10.1007/BF01976509 (1977).

42. Hall, J. M. *et al.* Kinematic diversity suggests expanded roles for fly halteres. *Biol. Lett.* **11**, 20150845, DOI: https://doi.org/10.1098/RSBL.2015.0845 (2015).

43. Sambaraju, K. R. & Phillips, T. W. Ovipositional preferences and larval performances of two populations of indianmeal moth, Plodia interpunctella. *Entomol. Exp. et Appl.* **128**, 283–293, DOI: https://doi.org/10.1111/J.1570-7458.2008.00723.X (2008).

44. Li, Z., Li, D., Xie, B., Ji, R. & Cui, J. Effect of body size and larval experience on mate preference in Helicoverpa armigera (Hübner) (Lep., Noctuidae). *J. Appl. Entomol.* **129**, 574–579, DOI: https://doi.org/10.1111/J.1439-0418.2005.01012.X (2005).

45. Gu, H., Hughes, J. & Dorn, S. Trade-off between mobility and fitness in Cydia pomonella L. (Lepidoptera: Tortricidae). *Ecol. Entomol.* **31**, 68–74, DOI: https://doi.org/10.1111/J.0307-6946.2006.00761.X (2006).

46. Grabow, K. & Rüppell, G. Wing loading in relation to size and flight characteristics of European Odonata. *Odonatologica* **24**, 175–186 (1995).

47. Torres-Vila, L. M., Rodríguez-Molina, M. C., Roehrich, R. & Stockel, J. Vine phenological stage during larval feeding affects male and female reproductive output of Lobesia botrana (Lepidoptera: Tortricidae). *Bull. Entomol. Res.* **89**, 549–556, DOI: https://doi.org/10.1017/S000748539900070X (1999).

48. Lehmann, P., Westberg, M., Tang, P., Lindström, L. & Käkelä, R. The Diapause Lipidomes of Three Closely Related Beetle Species Reveal Mechanisms for Tolerating Energetic and Cold Stress in High-Latitude Seasonal Environments. *Front. Physiol.* **11**, 576617, DOI: https://doi.org/10.3389/fphys.2020.576617 (2020).

49. Burrows, M. & Dorosenko, M. Take-off mechanisms in parasitoid wasps. *J. Exp. Biol.* **220**, 3812–3825, DOI: https://doi.org/10.1242/JEB.161463 (2017).

50. Darveau, C. A., Hochachka, P. W., Welch, K. C., Roubik, D. W. & Suarez, R. K. Allometric scaling of flight energetics in Panamanian orchid bees: a comparative phylogenetic approach. *J. Exp. Biol.* **208**, 3581–3591, DOI: https://doi.org/10.1242/JEB.01776 (2005).

51. Müller, C. Interactions between glucosinolate- and myrosinase-containing plants and the sawfly Athalia rosae. *Phytochem. Rev.* **8**, 121–134, DOI: https://doi.org/10.1007/s11101-008-9115-3 (2009).

52. Hondelmann, P., Paul, C., Schreiner, M. & Meyhöfer, R. Importance of Antixenosis and Antibiosis Resistance to the Cabbage Whitefly (Aleyrodes proletella) in Brussels Sprout Cultivars. *Insects* **11**, 56, DOI: https://doi.org/10.3390/INSECTS11010056 (2020).

53. Acebes-Doria, A. L., Leskey, T. C. & Bergh, J. C. Host Plant Effects on Halyomorpha halys (Hemiptera: Pentatomidae) Nymphal Development and Survivorship. *Environ. Entomol.* **45**, 663–670, DOI: https://doi.org/10.1093/EE/NVW018 (2016).

54. Raworth, D. A., McFarlane, S., Gilbert, N. & Frazer, B. D. Population dynamics of the cabbage aphid, Brevicoryne brassicae (Homoptera: Aphididae) at Vancouver, British Columbia: III. development, fecundity, and morph determination vs. aphid density and plant quality. *The Can. Entomol.* **116**, 879–888, DOI: https://doi.org/10.4039/ENT116879-6 (1984).

55. Oertli, J. J. & Oertli, M. Energetics and thermoregulation of Popillia japonica Newman (Scarabaeidae, Coleoptera) during flight and rest. *Physiol. Zool.* **63**, DOI: https://doi.org/10.1086/physzool.63.5.30152621 (1990).

56. Dixon, A. F. G., Chambers, R. J. & Dharma, T. R. Factors affecting size in aphids with particular reference to the black bean aphid, Aphis fabae. *Entomol. Exp. et Appl.* **32**, 123–128, DOI: https://doi.org/10.1111/j.1570-7458.1982.tb03192.x (1982).

57. Kempton, R. A., Lowe, H. J. B. & Bintcliffe, E. J. B. The Relationship between Fecundity and Adult Weight in Myzus persicae. *The J. Animal Ecol.* **49**, 917, DOI: https://doi.org/10.2307/4235 (1980).

58. Käfer, H., Kovac, H., Oswald, B. & Stabentheiner, A. Respiration and metabolism of the resting european paper wasp (Polistes dominulus). *J. Comp. Physiol. B: Biochem. Syst. Environ. Physiol.* **185**, 647–658, DOI: https://doi.org/10.1007/S00360-015-0915-7 (2015).

59. Ludwig, D. The Effect of Temperature on the Growth Curves of the Japanese Beetle (Popillia japonica Newman). *Physiol. Zool.* **5**, DOI: https://doi.org/10.1086/physzool.5.3.30151174 (1932).

60. Giovanetti, M. & Lasso, E. Body size, loading capacity and rate of reproduction in the communal bee Andrena agilissima (Hymenoptera; Andrenidae). *Apidologie* **36**, 439–447, DOI: https://doi.org/10.1051/APIDO:2005028 (2005).

61. Kovac, H. & Stabentheiner, A. Does size matter? – Thermoregulation of 'heavyweight' and 'lightweight' wasps (Vespa crabro and Vespula sp.). *Biol. Open* **1**, 848–856, DOI: https://doi.org/10.1242/BIO.20121156 (2012).

62. Willow, J. *et al.* Evaluating the effect of seven plant essential oils on pollen beetle (Brassicogethes aeneus) survival and mobility. *Crop. Prot.* **134**, 105181, DOI: https://doi.org/10.1016/J.CROPRO.2020.105181 (2020).

63. Grayson, F. W. L. & Hassall, M. Effects of Rabbit Grazing on Population Variables of Chorthippus brunneus (Orthoptera). *Oikos* **44**, 27, DOI: https://doi.org/10.2307/3544039 (1985).

64. Groot, A. T. & Smid, H. M. Polyandry in the mind bug Lygocoris pabulinus (L.)—effects on sexual communication and fecundity. *Invertebr. Reproduction & Dev.* **38**, 143–155, DOI: https://doi.org/10.1080/07924259.2000.9652449 (2000).

65. Chuche, J. & Thiéry, D. Egg incubation temperature differently affects female and male hatching dynamics and larval fitness in a leafhopper. *Ecol. Evol.* **2**, DOI: https://doi.org/10.1002/ece3.89 (2012).

66. Jiang, S. *et al.* Feeding behavioral response of cotton aphid, Aphis gossypii, to elevated CO2: EPG test with leaf microstructure and leaf chemistry. *Entomol. Exp. et Appl.* **160**, 219–228, DOI: https://doi.org/10.1111/EEA.12475 (2016).

67. Esterhuizen, N. *et al.* Effects of within-generation thermal history on the flight performance of Ceratitis capitata: Colder is better. *J. Exp. Biol.* **217**, 3545–3556, DOI: https://doi.org/10.1242/jeb.106526/257777/am/effects-of-within-generation-thermal-history-on (2014).

68. Visser, B., Dooremalen, C. V., Ruiz, A. V. & Ellers, J. Fatty acid composition remains stable across trophic levels in a gall wasp community. *Physiol. Entomol.* **38**, 306–312, DOI: https://doi.org/10.1111/PHEN.12035 (2013).

69. Neupane, S., White, K., Thomson, J. L., Zurek, L. & Nayduch, D. Environmental and Sex Effects on Bacterial Carriage by Adult House Flies (Musca domestica L.). *Insects* **11**, 401, DOI: https://doi.org/10.3390/INSECTS11070401 (2020).

70. Oliveira, L. . . *et al.* Contrasting Phenotypic Variability of Life-History Traits of Two Feral Populations of Macrolophus pygmaeus (Hemiptera: Miridae) under Two Alternative Diets. *Agronomy* **13**, 118, DOI: https://doi.org/10.3390/AGRONOMY13010118 (2022).

71. Putra, N. S. & Yasuda, H. Effects of prey species and its density on larval performance of two species of hoverfly larvae, Episyrphus balteatus de Geer and Eupeodes corollae Fabricius (Diptera: Syrphidae). *Appl. Entomol. Zool.* **41**, 389–397, DOI: https://doi.org/10.1303/AEZ.2006.389 (2006).

72. Kökdener, M. & Yllmaz, A. F. The Effects of Gunshot Residue Components (Pb, Ba, and Sb) on the Life History Traits of Lucilia sericata (Diptera: Calliphoridae). *J. Med. Entomol.* **58**, 2130–2137, DOI: https://doi.org/10.1093/JME/TJAB123 (2021).

73. Burrows, M. Jumping from the surface of water by the long-legged fly Hydrophorus (Diptera, Dolichopodidae). *J. Exp. Biol.* **216**, 1973–1981, DOI: https://doi.org/10.1242/JEB.083683 (2013).

74. Faly, L. I., Brygadyrenko, V. V., Orzekauskaite, A. & Paulauskas, A. Sensitivity of non-target groups of invertebrates to cypermethrin. *Biosyst. Divers.* **31**, 393–400, DOI: https://doi.org/10.15421/012347 (2023).

75. Burrows, M. Jumping strategies and performance in shore bugs (Hemiptera, Heteroptera,Saldidae). *J. Exp. Biol.* **212**, 106–115, DOI: https://doi.org/10.1242/JEB.024448 (2009).

76. Sequeira, R. & Mackauer, M. Covariance of adult size and development time in the parasitoid wasp Aphidius ervi in relation to the size of its host, Acyrthosiphon pisum. *Evol. Ecol.* **6**, 34–44, DOI: https://doi.org/10.1007/BF02285332/METRICS (1992).

77. Ode, P. J. & Crompton, D. S. Compatibility of aphid resistance in soybean and biological control by the parasitoid Aphidius colemani (Hymenoptera: Braconidae). *Biol. Control.* **64**, 255–262, DOI: https://doi.org/10.1016/J.BIOCONTROL.2012.12.001 (2013).

78. Bulut, M., Ünal Zeybekoğlu & Kökdener, M. Effects of Tissue Type and Temperature on Selected Life-History Traits of the Flesh Fly, Sarcophaga crassipalpis (Macquart, 1839) (Diptera: Sarcophagidae). *J. Med. Entomol.* **59**, 1921–1927, DOI: https://doi.org/10.1093/JME/TJAC149 (2022).

79. Pinto, J., Magni, P. A., O'Brien, R. C. & Dadour, I. R. Chasing Flies: The Use of Wingbeat Frequency as a Communication Cue in Calyptrate Flies (Diptera: Calyptratae). *Insects* **13**, 822, DOI: https://doi.org/10.3390/INSECTS13090822 (2022).

80. Grula, C. C., Rinehart, J. P., Greenlee, K. J. & Bowsher, J. H. Body size allometry impacts flight-related morphology and metabolic rates in the solitary bee Megachile rotundata. *J. Insect Physiol.* **133**, 104275, DOI: https://doi.org/10.1016/J.JINSPHYS.2021.104275 (2021).

81. Voorhies, W. A. V., Khazaeli, A. A. & Curtsinger, J. W. Lack of correlation between body mass and metabolic rate in Drosophila melanogaster. *J. Insect Physiol.* **50**, 445–453, DOI: https://doi.org/10.1016/J.JINSPHYS.2004.03.002 (2004).

82. Schilder, R. J. & Raynor, M. Molecular plasticity and functional enhancements of leg muscles in response to hypergravity in the fruit fly Drosophila melanogaster. *J. Exp. Biol.* **220**, 3508–3518, DOI: https://doi.org/10.1242/JEB.160523 (2017).

83. Spaethe, J. & Weidenmüller, A. Size variation and foraging rate in bumblebees (Bombus terrestris). *Insectes Sociaux* **49**, 142–146, DOI: https://doi.org/10.1007/S00040-002-8293-Z/METRICS (2002).

84. Green, K. Age-related variation in mean sperm length, in the rove beetle Aleochara bilineata. *J. Insect Physiol.* **49**, 993–998, DOI: https://doi.org/10.1016/S0022-1910(03)00164-1 (2003).

85. Wiesenborn, W. D. & Morse, J. G. Feeding rate of Scirtothrips citri (Moulton) (Thysanoptera: Thripidae) as Influenced by Life Stage and Temperature. *Environ. Entomol.* **15**, 763–766, DOI: https://doi.org/10.1093/EE/15.3.763 (1986).

86. Terry, L. I. & Dyreson, E. Behavior of Frankliniella occidentalis (Thysanoptera: Thripidae) within Aggregations, and Morphometric correlates of Fighting. *Annals Entomol. Soc. Am.* **89**, 589–602, DOI: https://doi.org/10.1093/AESA/89.4.589 (1996).

87. Whiteman, N. K. *et al.* Mining the plant–herbivore interface with a leafmining Drosophila of Arabidopsis. *Mol. Ecol.* **20**, 995–1014, DOI: https://doi.org/10.1111/J.1365-294X.2010.04901.X (2011).

88. King, B. H. Sex-ratio manipulation in response to host size by the parasitoid wasp Spalangia cameroni: a laboratory study. *Evolution* **42**, DOI: https://doi.org/10.1111/j.1558-5646.1988.tb04179.x (1988).

89. Seidelmann, K. Optimal resource allocation, maternal investment, and body size in a solitary bee, Osmia bicornis. *Entomol. Exp. et Appl.* **166**, 790–799, DOI: https://doi.org/10.1111/EEA.12711 (2018).

90. Dillon, N., Austin, A. D. & Bartowsky, E. Comparison of preservation techniques for DNA extraction from hymenopterous insects. *Insect Mol. Biol.* **5**, 21–24, DOI: https://doi.org/10.1111/J.1365-2583.1996.TB00036.X (1996).

91. Kökdener, M., Gündüz, N. E. A., Ünal Zeybekoğlu, Aykut, U. & Yllmaz, A. F. The Effect of Different Heavy Metals on the Development of Lucilia sericata (Diptera: Calliphoridae). *J. Med. Entomol.* **59**, 1928–1935, DOI: https://doi.org/10.1093/JME/TJAC134 (2022).

92. Farkas, R. & Pap, L. Susceptibility of Hydrotaea aenescens (Wiedemann) (Diptera: Muscidae) to selected insecticides and its importance in integrated fly management. *Parasitol. Res. 1996 82:2* **82**, 170–173, DOI: https://doi.org/10.1007/S004360050089 (1996).

93. Greenham, P. M. The Effects of the Variability of Cattle Dung on the Multiplication of the Bushfly (Musca vetustissima Walk.). *The J. Animal Ecol.* **41**, 153, DOI: https://doi.org/10.2307/3510 (1972).

94. Shu, R., Uy, L. & Wong, A. C. N. Nutritional phenotype underlines the performance trade-offs of Drosophila suzukii on different fruit diets. *Curr. Res. Insect Sci.* **2**, 100026, DOI: https://doi.org/10.1016/J.CRIS.2021.100026 (2022).

95. Kim, D., DeBriere, T. J., Cherukumalli, S., White, G. S. & Burkett-Cadena, N. D. Infrared light sensors permit rapid recording of wingbeat frequency and bioacoustic species identification of mosquitoes. *Sci. Reports* **11**, 1–9, DOI: https://doi.org/10.1038/s41598-021-89644-z (2021).

96. Brust, R. A. Weight and development time of different stadia of mosquitoes reared at various constant temperatures. *The Can. Entomol.* **99**, 986–993, DOI: https://doi.org/10.4039/ENT99986-9 (1967).

97. Juliano, S. A. & Stoffregen, T. L. Effects of habitat drying on size at and time to metamorphosis in the tree hole mosquito Aedes triseriatus. *Oecologia 1994 97:3* **97**, 369–376, DOI: https://doi.org/10.1007/BF00317327 (1994).

98. Gray, E. M. & Bradley, T. J. Metabolic Rate in Female Culex tarsalis (Diptera: Culicidae) : Age, Size, Activity, and Feeding Effects. *J. Med. Entomol.* **40**, 903–911, DOI: https://doi.org/10.1603/0022-2585-40.6.903 (2003).

99. Arrivillaga, J. & Barrera, R. Food as a limiting factor for Aedes aegypti in water-storage containers. *J. vector ecology : journal Soc. for Vector Ecol.* **29** (2004).

100. Reiskind, M. H. & Zarrabi, A. A. Is bigger really bigger? differential responses to temperature in measures of body size of the mosquito, Aedes albopictus. *J. Insect Physiol.* **58**, 911–917, DOI: https://doi.org/10.1016/J.JINSPHYS.2012.04.006 (2012).

101. Burrows, M. Jumping mechanisms in dictyopharid planthoppers (Hemiptera, Dicytyopharidae). *J. Exp. Biol.* **217**, 402–413, DOI: https://doi.org/10.1242/jeb.093476 (2014).

102. Burrows, M. & Dorosenko, M. Jumping performance of flea hoppers and other mirid bugs (Hemiptera, Miridae). *J. Exp. Biol.* **220**, 1606–1617, DOI: https://doi.org/10.1242/JEB.154153 (2017).

103. Burrows, M. Do the enlarged hind legs of male thick-legged flower beetles contribute to take-off or mating? *J. Exp. Biol.* **223**, DOI: https://doi.org/10.1242/JEB.212670 (2020).

104. Couty, A. *et al.* Effects of artificial diet containing GNA and GNA-expressing potatoes on the development of the aphid parasitoid Aphidius ervi Haliday (Hymenoptera: Aphidiidae). *J. Insect Physiol.* **47**, 1357–1366, DOI: https://doi.org/10.1016/S0022-1910(01)00111-1 (2001).

105. Gouws, E. J., Gaston, K. J. & Chown, S. L. Intraspecific Body Size Frequency Distributions of Insects. *PLOS ONE* **6**, e16606, DOI: https://doi.org/10.1371/JOURNAL.PONE.0016606 (2011).

106. Kovac, H., Kundegraber, B., Käfer, H., Petrocelli, I. & Stabentheiner, A. Relation between activity, endothermic performance and respiratory metabolism in two paper wasps: Polistes dominula and Polistes gallicus. *Comp. Biochem. Physiol. Part A: Mol. & Integr. Physiol.* **250**, 110804, DOI: https://doi.org/10.1016/J.CBPA.2020.110804 (2020).

107. Nadein, K. & Betz, O. Jumping mechanisms and performance in beetles. I. Flea beetles (Coleoptera: Chrysomelidae: Alticini). *J. Exp. Biol.* **219**, 2015–2027, DOI: https://doi.org/10.1242/JEB.140533 (2016).

108. Weldon, C. W., Nyamukondiwa, C., Karsten, M., Chown, S. L. & Terblanche, J. S. Geographic variation and plasticity in climate stress resistance among southern African populations of Ceratitis capitata (Wiedemann) (Diptera: Tephritidae). *Sci. Reports* **8**, 1–13, DOI: https://doi.org/10.1038/s41598-018-28259-3 (2018).