

Global drivers of historical true fruit fly (Diptera: Tephritidae) invasions

SUPPORTING INFORMATION

Appendix S1 Tephritidae species introduced as biological control agents of weeds

Table S1.1 List of Tephritidae species introduced as biological control agents of weeds

Species	Countries	Reference
<i>Acinia picturata</i>	Johnston Atoll, USA (Hawaii), Wake Island	Foote et al. (1993); Hardy & Delfinado (1980); Norrbom et al. (1999); Turner (1996)
<i>Cecidochares connexa</i>	Ghana, Guam, India, Indonesia, Ivory Coast, Palau, Papua New Guinea, Philippines, Thailand, Togo	Aigbedion-Atalor et al. (2018); Bea et al. (2019); Cruz et al. (2006); David & Ramani (2011); Winston et al. (2014)
<i>Chaetorellia acrolophi</i>	USA, Canada	Norrbom et al. (1999); Turner (1996)
<i>Chaetorellia australis</i>	USA	Balciunas & Villegas (1999); Turner (1996)
<i>Euaesta aequalis</i>	Australia	Foote et al. (1993); Hardy & Drew (1996); Norrbom et al. (1999); Turner (1996)
<i>Eutreta xanthochaeta</i>	Australia, USA (Hawaii)	Aldrich (1923); Hardy & Delfinado (1980); Norrbom et al. (1999); Turner (1996)
<i>Mesoclanis magnipalpis</i>	Australia	Edwards et al. (1999)
<i>Mesoclanis polana</i>	Australia	Edwards et al. (1999, 2008)
<i>Procecidochares alani</i>	Australia, New Zealand, USA (Hawaii)	Hardy & Delfinado (1980); Norrbom et al. (1999); Turner (1996)
<i>Procecidochares utilis</i>	Australia, China, India, Madeira, Nepal, New Zealand, South Africa, USA (Hawaii)	David & Ramani (2011); Freidberg & Mansell (1995); Hardy & Delfinado (1980); Hardy & Drew (1996); Kluge (1991); Norrbom et al. (1999); Turner (1996)
<i>Terellia virens</i>	USA	Turner (1996); Norrbom et al. (1999)
<i>Tetreuaresta obscuriventris</i>	Fiji, New Caledonia, Tonga, USA (Hawaii)	Hancock & Drew (1994); Hardy & Delfinado (1980); Norrbom et al. (1999); Norrbom & Hancock (2014); Turner (1996)
<i>Urophora affinis</i>	Canada, USA	Foote et al. (1993); Turner (1996); White & Korneyev (1989)
<i>Urophora cardui</i>	Canada, New Zealand, USA	Foote et al. (1993); Norrbom et al. (1999); Turner (1996)
<i>Urophora quadrifasciata quadrifasciata</i>	Australia, Canada, USA	Foote et al. (1993); Han & McPherson (1994); Turner (1996); White & Korneyev (1989)
<i>Urophora sirunaseva</i>	USA	Foote et al. (1993); Norrbom et al. (1999); Turner (1996)
<i>Urophora solstitialis</i>	Australia, New Zealand, USA, Canada	Foote et al. (1993); Norrbom et al. (1999); Turner (1996)
<i>Urophora stylata</i>	Australia, India, New Zealand, Pakistan, USA	Agarwal & Kapoor (1992); Foote et al. (1993); Freidberg & Kugler (1989); Norrbom et al. (1999); Turner (1996)
<i>Urophora terebrans</i>	Australia	Norrbom et al. (1999)

Appendix S2 Non-native Tephritidae species (excluding biological control agents)

Table S2.2 List of non-native Tephritidae species (excluding biological control agents)

Biogeographic regions are abbreviated: AT – Afrotropic, AU – Australasia, AP – Asian Palearctic, EP – European Palearctic, IM – Indo-Malaya, NA – Nearctic, NT – Neotropic, OC – Oceania

* insufficient records available in GBIF database to quantify climatic range; excluded from climatic analyses

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Anastrepha curvicauda</i>	NT	NA	Bahamas, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Virgin Islands (U.S.)	USA (1905)	3	1	Tropical wet	Tropical wet	Foote et al. (1993); Knab & Yothers (1914); Norrbom et al. (1999); White & Elson-Harris (1992)
<i>Anastrepha fraterculus</i> "Brazil-1 morph"	NT	NT	Brazil	Argentina (unk.), Bolivia (unk.), Paraguay (unk.), Peru (unk.)	39	15	Humid subtropical, Savanna, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet, Warm-summer Mediterranean	Hot desert, Humid subtropical, Temperate oceanic, Tropical wet	Hernández-Ortiz et al. (2012, 2015); Prezotto et al. (2019); Selivon & Perondini (2007); Sutton et al. (2015)
<i>Anastrepha fraterculus</i> "Peruvian morph"*	NT	NT	Colombia, Ecuador, Peru	Ecuador (Galapagos) (1979)	—	—	—	—	Harper et al. (1989); Hernández-Ortiz et al. (2012, 2015); Sutton et al. (2015)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Anastrepha grandis</i>	NT	NT	Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, Venezuela	Panama (2009)	13	—	Humid subtropical, Temperate oceanic, Tropical rainforest, Tropical wet	—	GBIF (2020); MIDA (2018); Norrbom (1991); White & Elson-Harris (1992)
<i>Anastrepha ludens</i>	NT	NT	Belize, El Salvador, Guatemala, Honduras, Mexico, Nicaragua	Costa Rica (1990), Panama (1996)	34	7	Cold semi-arid, Hot semi-arid, Hot-summer Mediterranean, Monsoon-influenced humid subtropical, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical wet	Tropical monsoon, Tropical rainforest	CABI (2020); EPPO (2014); EPPO (2020); GBIF (2020); Foote et al. (1993); Hernández-Ortiz (1992); IPPC (2020); Norrbom et al. (1999); Norrbom et al. (2005); Ruiz-Arce et al. (2015); White & Elson-Harris (1992)
<i>Anastrepha obliqua</i>	NT	NT	Bahamas, Belize, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Suriname, Trinidad and Tobago, Venezuela	Antigua and Barbuda (1935), Barbados (2001), Dominica (1930), Grenada (2002), Guadeloupe (1930), Martinique (1933), Montserrat (1930), Netherlands Antilles (1930), Saint Kitts and Nevis (1933), Saint Lucia (1990), Saint Vincent and the Grenadines (2002), Virgin Islands (British) (1930), Virgin Islands (U.S.) (1930)	71	3	Savanna, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet	Tropical rainforest	CABI (2020); EPPO (2014); EPPO (2020); GBIF (2020); Núñez Bueno (1981); Norrbom et al. (2005); Ruiz-Arce et al. (2012); White & Elson-Harris (1992)
<i>Anastrepha suspensa</i>	NT	NA	Bahamas, Cayman Islands, Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, Virgin Islands (British)	USA (1965)	6	4	Tropical monsoon, Tropical rainforest, Tropical wet	Humid subtropical, Tropical monsoon	CABI (2020); EPPO (2020); GBIF (2020); Norrbom et al. (1999); Stone (1942); Weems (1966); White & Elson-Harris (1992)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Bactrocera carambolae</i>	IM	NT	Bangladesh, Brunei Darussalam, Cambodia, India, Indonesia, Malaysia, Singapore, Thailand, Timor- Leste, Vietnam	Brazil (1994), French Guiana (1994), Guyana (unk.), Suriname (1975)	49	7	Tropical monsoon, Tropical rainforest, Tropical wet	Tropical rainforest	CAB International (1994); CABI (2020); Drew & Hancock (1994); Drew & Romig (2013); EPPO (2020); GBIF (2020); Sauers-Muller (1991)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Bactrocera dorsalis</i>	AP, IM	AU, AP, AT, EP, IM, OC	Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Christmas Island, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam	Angola (unk.), Benin (2004), Botswana (unk.), Burkina Faso (unk.), Burundi (unk.), Cabo Verde (unk.), Cameroon (2004), Central African Republic (unk.), Chad (unk.), Comoros (2005), Congo (unk.), Côte d'Ivoire (2005), Democratic Republic of Congo (unk.), Equatorial Guinea (unk.), Eritrea (unk.), Eswatini (unk.), Ethiopia (2005), French Polynesia (1996), Gabon (unk.), Gambia (unk.), Ghana (2005), Guam (unk.), Guinea (unk.), Guinea-Bissau (unk.), Indonesia (Papua) (1992), Kenya (2003), Liberia (unk.), Madagascar (unk.), Mali (unk.), Mauritania (unk.), Mauritius (1996), Mayotte (2007), Mozambique (unk.), Namibia (unk.), Niger (unk.), Nigeria (2005), Oman (unk.), Pakistan (unk.), Palau (1996), Papua New Guinea (1992), Rwanda (unk.), Senegal (2004), Sierra Leone (unk.), South Africa (unk.), Sudan (2004), Tanzania (2003), Togo (2004), Uganda (2004), United Arab Emirates (1992), USA (Hawaii only) (1945), Zambia (unk.), Zimbabwe (unk.)	243	63	Hot semi-arid, Humid subtropical, Monsoon-influenced hot-summer humid continental, Monsoon-influenced humid subtropical, Monsoon-influenced subarctic, Savanna, Subtropical highland, Tropical monsoon, Tropical rainforest, Tropical wet	Hot desert, Hot semi-arid, Humid subtropical, Monsoon-influenced humid subtropical, Savanna, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet	CABI (2020); Drew & Hancock (1994); Drew & Romig (2013); Drew et al. (2005); EPPO (2020); GBIF (2020); Goergen et al. (2011); Hardy & Delfinado (1980); San Jose et al. (2013); Schutze et al. (2014); Vargas et al. (2015); Wang (1998); White (2006)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Bactrocera frauenfeldi</i>	AU, OC	AU	Guam, Kiribati, Marshall Islands, Micronesia, Nauru, Northern Mariana Islands, Palau, Papua New Guinea, Solomon Islands	Australia (1974)	16	10	Tropical rainforest	Hot desert, Tropical monsoon, Tropical wet	CABI (2020); Drew (1989); Drew & Romig (2013); EPPO (2020); GBIF (2020); White & Elson-Harris (1992)
<i>Bactrocera latifrons</i>	IM	AP, AT, OC	Bangladesh, Brunei Darussalam, India, Indonesia, Laos, Malaysia, Pakistan, Singapore, Sri Lanka, Taiwan, Thailand, Timor-Leste, Vietnam	Japan (1984), Kenya (2007), Tanzania (2006), USA (Hawaii only) (1983)	17	23	Savanna, Tropical monsoon, Tropical rainforest, Tropical wet	Humid subtropical, Savanna, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical wet	Bellis et al. (2017); CABI (2020); Drew & Romig (2013); EPPO (2020); GBIF (2020); Hardy (1973); Mziray et al. (2010); Wang (1998); White & Elson-Harris (1992)
<i>Bactrocera ochrosiae</i>	OC	OC	Guam	USA (Hawaii only) (1995)	3	—	Tropical rainforest	—	GBIF (2020); Leblanc et al. (2012)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Bactrocera oleae</i>	AT	AP, AT, EP, IM, NA, NT, OC	Angola, Eritrea, Ethiopia, Kenya, Lesotho, Namibia, South Africa	Albania (unk.), Algeria (unk.), Croatia (unk.), Cyprus (unk.), Egypt (unk.), France (unk.), Georgia (unk.), Greece (unk.), India (unk.), Iran (unk.), Israel (unk.), Italy (unk.), Jordan (unk.), Lebanon (unk.), Libya (unk.), Malta (unk.), Mauritius (unk.), Mexico (2000), Montenegro (unk.), Morocco (unk.), Pakistan (unk.), Portugal (unk.), Réunion (unk.), Saudi Arabia (unk.), Serbia (unk.), Seychelles (unk.), Slovenia (unk.), Spain (unk.), Switzerland (unk.), Syria (unk.), Tunisia (unk.), Turkey (unk.), USA (1998), USA (Hawaii only) (2018)	68	134	Cold semi-arid Hot semi-arid, Hot-summer Mediterranean Humid subtropical, Monsoon-influenced humid subtropical, Savanna, Subtropical highland, Temperate oceanic, Tropical rainforest, Tropical wet, Warm-summer Mediterranean	Cold desert, Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer Mediterranean, Humid subtropica, ISavanna, Temperate oceanic, Warm-summer Mediterranean	CABI (2020); EPPO (2020); GBIF (2020); Nardi et al. (2005); White (2006); White & Elson-Harris (1992)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Bactrocera tryoni</i>	AU	AU, OC	Australia	French Polynesia (1970), New Caledonia (1969), Papua New Guinea (2001)	178	2	Cold semi-arid, Hot desert, Hot semi-arid, Humid subtropical, Monsoon-influenced humid subtropical, Temperate oceanic, Tropical monsoon, Tropical wet, Warm-summer Mediterranean	Tropical rainforest	Amice & Sales (1997); CABI (2020); Drew (1989); EPPO (2020); GBIF (2020); Parea et al. (1997)
<i>Bactrocera zonata</i>	IM	AP, AT, EP	Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam	Egypt (1993), Iran (2002), Iraq (2016), Israel (2000), Libya (2007), Mauritius (1942), Oman (1982), Réunion (1991), Saudi Arabia (1982), Sudan (2011), United Arab Emirates (1982), Yemen (1982)	122	49	Hot desert, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Monsoon-influenced humid subtropical, Tropical monsoon, Tropical rainforest, Tropical wet, Warm-summer humid continental	Hot desert, Hot semi-arid, Savanna, Temperate oceanic, Tropical monsoon	Abdulrazak et al. (2016); CABI (2020); Drew & Romig (2013); EPPO (2020); GBIF (2020); Hardy (1973); De Meyer et al. (2007); White (2006); White & Elson-Harris (1992)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Campiglossa producta</i>	AP, EP, IM	AP, IM	Afghanistan, Albania, Algeria, Austria, Belgium, Bulgaria, Cyprus, Czechia, Finland, France, Germany, Great Britain, Greece, Hungary, India, Iran, Iraq, Israel, Italy, Jordan, Kazakhstan, Malta, Moldova, Morocco, Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Switzerland, Syria, Tajikistan, Turkmenistan, Tunisia, Turkey, Ukraine, Uzbekistan	China (unk.), Japan (unk.), South Korea (unk.), Thailand (unk.), Vietnam (unk.)	173	—	Hot-summer Mediterranean, Temperate oceanic, Tropical wet, Warm- summer Mediterranean	—	El Harym & Belqat (2017); Korneyev (1990); Korneyev & Dirlbek (2001); Merz & Korneyev (2004)
<i>Campiglossa sororcula</i> *	AU, AP, AT, EP, IM, OC	AU, OC	Algeria, Australia, Botswana, Cook Islands, Egypt, Fiji, French Polynesia, China, India, Japan, Kenya, Laos, Malawi, Morocco, Namibia, Nepal, New Caledonia, Niue, Portugal, Samoa, Saudi Arabia, South Africa, South Korea, Spain, Sri Lanka, Taiwan, Thailand, Tunisia, Turkey, Uganda, Vietnam, Yemen, Zambia, Zimbabwe	New Zealand (1995), USA (Hawaii only) (1966)	—	—	—	—	El Harym & Belqat (2017); Hancock & McGuire (2010); Hardy (1973, 1974); Hardy & Delfinado (1980); Hardy & Drew (1996); Korneyev (1990); Merz & Korneyev (2004); Wang (1998)
<i>Carpomya incompleta</i> *	AT, EP	AT	Egypt, Eritrea, Ethiopia, France, Iraq, Israel, Italy, Libya, Morocco, Niger, Oman, Saudi Arabia, Sudan, United Arab Emirates, Yemen	Burkina Faso (unk.), Kenya (unk.)	—	—	—	—	El Harym & Belqat (2017); EPPO (2020); Korneyev et al. (2017); Merz & Korneyev (2004); Norrbom et al. (1999); Wu et al. (2009)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Carpomya pardalina</i> *	AP, EP, IM	AP, EP	Cyprus, India, Iran, Iraq, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Pakistan, Russian Federation (Asian part), Russian Federation (European part), Saudi Arabia, Syria, Tajikistan, Turkey	Afghanistan (unk.), Armenia (unk.), Azerbaijan (unk.), Georgia (unk.), Israel (unk.), Turkmenistan (unk.), Ukraine (unk.), Uzbekistan (unk.)	—	—	—	—	El Harym & Belqat (2017); Korneyev et al. (2017); Merz & Korneyev (2004); Norrbon et al. (1999); White & Elson- Harris (1992)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Carpomya vesuviana</i> *	AP, EP, IM	AP, AT, EP, IM, OC	Afghanistan, Bangladesh, China, India, Iran, Iraq, Israel, Pakistan	Azerbaijan (unk.), Bosnia and Herzegovina (unk.), Bulgaria (unk.), Cambodia (unk.), Cyprus (unk.), Georgia (unk.), Italy (unk.), Lebanon (unk.), Mauritius (1991), Moldova (unk.), Oman (unk.), Réunion (unk.), Russian Federation (European part) (unk.), Syria (unk.), Tajikistan (unk.), Thailand (unk.), Turkey (unk.), Turkmenistan (unk.), United Arab Emirates (unk.), USA (Hawaii only) (unk.), Uzbekistan (unk.)	—	—	—	—	Hardy (1973); Korneyev et al. (2017); Merz & Korneyev (2004); Norrbom et al. (1999); Vadivelu (2014); White & Elson-Harris (1992)

Species	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Ceratitis capitata</i>	AT	AU, AP, AT, EP, NT, OC	Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Eritrea, Eswatini, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe	Albania (2004), Algeria (1850), Argentina (1934), Australia (1896), Austria (2011), Bolivia (1928), Bosnia and Herzegovina (unk.), Brazil (1901), Bulgaria (1936), Cape Verde (unk.), Colombia (unk.), Comoros (unk.), Costa Rica (1955), Croatia (unk.), Cyprus (1914), Ecuador (unk.), Egypt (1920), El Salvador (1975), France (1885), Greece (1915), Guatemala (1975), Guernsey (unk.), Honduras (1975), Iran (1977), Iraq (1947), Israel (1900), Italy (1863), Jordan (1930), Lebanon (1930), Libya (1939), Madagascar (unk.), Malta (unk.), Mauritius (1942), Montenegro (1959), Morocco (unk.), Nicaragua (1960), Panama (1963), Paraguay (unk.), Peru (unk.), Portugal (Madeira) (1829) (mainland) (1898), Réunion (1939), Romania (unk.), Russian Federation (Asian part) (unk.), Russian Federation (European part) (unk.), Saint Helena, Ascension and Tristan da Cunha (unk.), Sao Tome and Principe (unk.), Saudi Arabia (1920), Serbia (unk.), Seychelles (unk.), Slovenia (1958), Spain (Azores) (1830) (mainland) (1842), Suriname (unk.), Switzerland (unk.), Syria (1920), Tunisia (1855), Turkey (1904), Ukraine (1964), Uruguay (unk.), USA (Hawaii only) (1907), Venezuela (unk.), Yemen (1920)	406	840	Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Monsoon-influenced humid subtropical, Savanna, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet, Warm-summer Mediterranean	Cold desert, Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Monsoon-influenced humid subtropical, Savanna, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet, Warm-summer humid continental, Warm-summer Mediterranean	Adaime et al. (2017); CABI (2020); Enkerlin et al. (1989); EPPO (2020); Gasparich et al. (1997); GBIF (2020); Fimiani (1989); White & Elson-Harris (1992)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Ceratitis quilicii</i>	AT	AT	Botswana, Eswatini, Kenya, Malawi, South Africa, Tanzania, Zimbabwe	Mauritius (1955), Réunion (1950)	222	10	Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Monsoon-influenced humid subtropical, Savanna, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet, Warm-summer Mediterranean	Hot-summer Mediterranean, Savanna, Temperate oceanic, Tropical monsoon	De Meyer et al. (2016); EPPO (2020); GBIF (2020); Virgilio et al. (2018); White et al. (2000)
<i>Chaetorellia succinea</i>	AP, EP	NA	Cyprus, Egypt, France, Germany, Greece, Iran, Israel, Italy, Jordan, Kazakhstan, Turkey	USA (1996)	4	4	Hot-summer Mediterranean, Temperate oceanic	Warm-summer Mediterranean	Balciunas & Villegas (1999, 2001); El Harym & Belqat (2017); GBIF (2020); Merz & Korneyev (2004); Norrbom et al. (1999); Villegas (1998); White & Marquardt (1989)

Species	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Dacus ciliatus</i>	AT	AP, AT, EP, IM	Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Democratic Republic of Congo, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mayotte, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe	Bangladesh (unk.), Comoros (unk.), Egypt (unk.), India (1939), Iran (unk.), Israel (unk.), Jordan (unk.), Mauritius (1964), Myanmar (unk.), Nepal (unk.), Oman (unk.), Pakistan (unk.), Réunion (1964), Saint Helena, Ascension and Tristan da Cunha (unk.), Saudi Arabia (unk.), Sri Lanka (unk.), Turkey (unk.), United Arab Emirates (unk.), Yemen (unk.)	507	55	Cold desert, Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Monsoon-influenced humid subtropical, Savanna, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet, Warm-summer Mediterranean	Cold desert, Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer Mediterranean, Monsoon-influenced humid subtropical, Savanna, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet	CABI (2020); EPPO (2020); GBIF (2020); Vayssières et al. (2008); White (2006); White & Elson-Harris (1992)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Dacus frontalis</i>	AT, EP	EP	Angola, Benin, Cabo Verde, Democratic Republic of Congo, Kenya, Lesotho, Namibia, Saudi Arabia, South Africa, Sudan, Tanzania, United Arab Emirates, Yemen, Zimbabwe	Algeria (unk.), Egypt (unk.), Libya (unk.), Morocco (unk.), Tunisia (unk.)	120	7	Cold desert, Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Monsoon-influenced humid subtropical, Savanna, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet, Warm-summer Mediterranean	Hot desert	El Harym & Belqat (2017); GBIF (2020); Virgilio et al. (2018); White (2006)
<i>Dicheniotes ternarius</i> *	AT	AU	Kenya, South Africa, Zimbabwe	Australia (2002)	—	—	—	—	Hancock & Drew (2003); Norrbom et al. (1999)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Dirioxa pornia</i>	AU	OC	Australia	New Caledonia (unk.)	101	—	Cold semi-arid, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Monsoon-influenced humid subtropical, Temperate oceanic, Tropical monsoon, Tropical wet, Warm-summer Mediterranean	—	GBIF (2020); Hancock & Drew (1994); Norrbom & Hancock (2004); Permkam & Hancock (1995)
<i>Ensina sonchi</i>	AP, EP, IM	AT, IM, OC	Albania, Algeria, Andorra, Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, India, Iran, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Malta, Moldova, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation (Asian part), Russian Federation (European part), Saudi Arabia, Serbia, Slovakia, South Korea, Spain, Sweden, Switzerland, Turkey, Ukraine	Ethiopia (unk.), Philippines (unk.), Taiwan (unk.), USA (Hawaii only) (1968)	193	—	Hot-summer Mediterranean, Monsoon-influenced warm-summer humid continental, Subarctic, Subpolar oceanic, Temperate oceanic, Warm-summer humid continental, Warm-summer Mediterranean	—	El Harym & Belqat (2017); GBIF (2020); Hardy (1974); Hardy & Delfinado (1980); Merz & Korneyev (2004); Norrbom et al. (1999); Wang (1998); Wu et al. (2009)

Species	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Euaesta bullans</i>	NT	AU, AP, AT, EP, NA, NT	Argentina, Bolivia, Brazil, Chile, Peru, Uruguay	Algeria (unk.), Algeria (unk.), Australia (1929), Bulgaria (unk.), France (2010), Greece (unk.), Hungary (unk.), Iran (unk.), Israel (unk.), Italy (unk.), Jordan (unk.), Mexico (unk.), Moldova (unk.), Morocco (unk.), Portugal (1930), Republic of North Macedonia (unk.), Romania (unk.), Russian Federation (Asian part) (unk.), Russian Federation (European part) (unk.), Serbia (unk.), Slovakia (unk.), South Africa (unk.), Spain (unk.), Tunisia (unk.), Turkey (2017), Ukraine (unk.), USA (1940)	—	111	—	Cold semi-arid, Hot semi-arid, Hot-summer Mediterranean, Humid subtropical, Temperate oceanic, Warm-summer Mediterranean	Coquillett (1904); El Harym & Belqat (2017); Foote et al. (1993); GBIF (2020); Hardy & Drew (1996); Merz & Korneyev (2004); Norrbom et al. (1999)
<i>Euaestoides acutangulus</i>	NA	NT	Canada, USA	Colombia (unk.), Cuba (unk.), Dominican Republic (unk.), Ecuador (unk.), Chile (unk.), Mexico (unk.), Peru (unk.), Puerto Rico (unk.), Trinidad and Tobago (unk.)	334	18	Cold desert, Cold semi-arid, Hot desert, Hot semi-arid, Hot-summer humid continental, Hot-summer Mediterranean, Subarctic, Temperate oceanic, Warm-summer humid continental, Warm-summer Mediterranean	Cold semi-arid, Hot desert, Humid subtropical, Subtropical highland, Tropical wet	Foote et al. (1993); GBIF (2020); Savaris et al. (2019)
<i>Myopites tenellus</i> *	EP	AP	Austria, Czechia, France, Hungary, Romania, Russian Federation (European part), Slovakia, Ukraine	Russian Federation (Asian part) (unk.)	—	—	—	—	Korneyev (1987); Merz & Korneyev (2004); Norrbom et al. (1999)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Neoceratitis cyanescens</i>	AT	AT	Madagascar	Mauritius (1958), Mayotte (1992), Réunion (1951)	14	15	Hot semi-arid, Humid subtropical, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet	Hot-summer Mediterranean, Savanna, Temperate oceanic, Tropical monsoon, Tropical wet	Bordat (1992); De Meyer & Freidberg (2012); EPPO (2020); GBIF (2020); Orian & Moutia (1960); White & Elson-Harris (1992)
<i>Rhagoletis batava</i>	AP, EP	EP	Armenia, Belgium, Czechia, Finland, Germany, Hungary, Italy, Kyrgyzstan, Netherlands, Poland, Russian Federation (European part, North Caucasus, Altai, Tuva, western Siberia), Spain, Sweden, Switzerland, Turkey	Belarus (2014), Estonia (2015), Latvia (2014), Lithuania (2014)	21	1	Temperate oceanic, Warm-summer humid continental	Warm-summer humid continental	GBIF (2020); Korneyev et al. (2017); Merz & Korneyev (2004); Norrbom et al. (1999); Stalažs & Balalaikins (2017)
<i>Rhagoletis cerasi</i>	AP, EP	NA	Andorra, Armenia, Austria, Azerbaijan, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Great Britain, Greece, Hungary, Iran, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation (Asian part), Russian Federation (European part), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan	Canada (2015), USA (2017)	271	7	Hot-summer Mediterranean, Monsoon-influenced warm-summer humid continental, Subarctic, Temperate oceanic, Warm-summer humid continental	Warm-summer humid continental	Barringer (2018); EPPO (2020); GBIF (2020); Korneyev et al. (2017); Merz & Korneyev (2004); Stalažs & Balalaikins (2017); White & Elson-Harris (1992); Wakie et al. (2018); Wu et al. (2009)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Rhagoletis cingulata</i>	NA, NT	EP	Canada, Mexico, USA	Austria (2007), Belgium (2004), Croatia (2005), Czechia (2014), France (2010), Germany (1999), Great Britain (2016), Hungary (2006), Netherlands (2004), Poland (unk.), Slovenia (2007), Switzerland (1983)	29	38	Hot-summer humid continental, Humid subtropical, Subarctic, Warm-summer humid continental, Warm-summer Mediterranean	Temperate oceanic	Bjeliš et al. (2016); Bowyer (2016); Bush (1966); CABI (2020); Egartner et al. (2010); EPPO (2020); Foote et al. (1993); GBIF (2020); Korneyev et al. (2017); Merz & Niehuis (2001); Rull et al. (2011); Stalažs & Balalaikins (2017)
<i>Rhagoletis completa</i>	NA, NT	NA, EP	Mexico, USA	Austria (2008), Belgium (2016), Bosnia and Herzegovina (2012), Croatia (2003), Czechia (2017), France (2007), Germany (2004), Hungary (2011), Italy (1991), Netherlands (2016), Slovakia (2018), Slovenia (1998), Spain (unk.), Switzerland (1986) [also invasive in western USA but that not included in analysis]	58	102	Cold semi-arid, Hot-summer humid continental, Hot-summer Mediterranean, Humid subtropical, Warm-summer humid continental, Warm-summer Mediterranean	Humid subtropical, Temperate oceanic	Bush (1966); CABI (2020); Ciampolini & Trematerra (1992); Duso (1991); EPPO (2020); Foote et al. (1993); GBIF (2020); Korneyev et al. (2017); Merz & Korneyev (2004); Rull et al. (2013); Seljak & Žežlina (1999); Smit & Schaareman (2015); Stalažs & Balalaikins (2017); Tuba et al. (2012); Verheggen et al. (2016)
<i>Rhagoletis meigenii</i>	EP	NA	Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russian Federation (European part), Slovakia, Spain, Sweden, Switzerland, Ukraine	Canada (1977), USA (1986)	141	14	Subarctic, Temperate oceanic, Warm-summer humid continental	Hot-summer humid continental, Humid subtropical, Warm-summer humid continental	Foote et al. (1993); GBIF (2020); Korneyev et al. (2017); Maier (2005); Merz & Korneyev (2004); Stalažs & Balalaikins (2017)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Rhagoletis pomonella</i> *	NA, NT	NA, NT	Canada (Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Quebec, Saskatchewan), Mexico (Coahuila, Distrito Federal, Guerrero, Hidalgo, Jalisco, México, Michoacán, Nuevo León, Puebla, Querétaro, San Luis Potosí, Tlaxcala, Veracruz), USA (eastern states, west to eastern Dakotas and eastern Texas)	Canada (Alberta, British Columbia), USA (California, Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming), Mexico (Chiapas)	—	—	—	—	Bush (1966); Foote et al. (1993); GBIF (2020); Rull et al. (2006); White & Elson-Harris (1992)
<i>Strauzia longipennis</i>	NA	EP	Canada, USA	Germany (2010)	76	—	Cold semi-arid, Hot-summer humid continental, Humid subtropical, Temperate oceanic, Warm-summer humid continental	—	Brückner & Korneyev (2010); EPPO (2020); Foote et al. (1993); GBIF (2020), Lerche et al. (2012)
<i>Terellia fuscicornis</i>	AP, EP	EP, NA	Cyprus, France, Greece, Iran, Israel, Italy, Lebanon, Malta, Morocco, Netherlands, Portugal, Spain, Turkey	Great Britain (unk.), USA (1994)	1	24	Hot-summer Mediterranean	Cold semi-arid, Hot-summer Mediterranean, Warm-summer Mediterranean	El Harym & Belqat (2017); GBIF (2020); Merz & Korneyev (2004); Norrbom et al. (1999);
<i>Terellia ruficauda</i>	AP, EP	NA	Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Great Britain, Hungary, China, Iran, Ireland, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Mongolia, Netherlands, Norway, Poland, Romania, Russian Federation (Asian part), Russian Federation (European part), Slovakia, Spain, Sweden, Switzerland, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan	Canada (1913), USA (1930)	498	49	Monsoon-influenced hot-summer humid continental, Subarctic, Temperate oceanic, Warm-summer humid continental	Hot-summer humid continental, Subarctic, Warm-summer humid continental, Warm-summer Mediterranean	Foote et al. (1993); GBIF (2020); Merz & Korneyev (2004); Norrbom et al. (1999); Wang (1998); White & Elson-Harris (1992)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non - native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Terellia tussilaginis</i>	AP, EP	AP	Austria, Belgium, Bulgaria, Czechia, Denmark, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, China, Iran, Ireland, Italy, Latvia, Lithuania, Montenegro, Netherlands, Norway, Poland, Romania, Russian Federation (European part), Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine	Russian Federation (Asian part) (2010)	581	—	Subarctic, Subpolar oceanic, Temperate oceanic, Warm-summer humid continental, Warm-summer Mediterranean	—	GBIF (2020); Merz & Korneyev (2004); Norrbom et al. (1999); Wang (1998)
<i>Urophora jaceana</i>	AP, EP	NA	Andorra, Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Great Britain, Hungary, Iran, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Republic of North Macedonia, Romania, Russian Federation (European part), Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine	Canada (1923)	746	2	Subarctic, Subpolar oceanic, Temperate oceanic, Warm-summer humid continental	Warm-summer humid continental	Foote et al. (1993); GBIF (2020); Merz & Korneyev (2004); Shewell (1961); White & Korneyev (1989)

<i>Species</i>	Native biogeographic region(s)	Invaded biogeographic region(s)	Native countries	Invaded countries (year of first discovery)	N. of GBIF records - native range	N. of GBIF records - non-native range	Koppen-Geiger climate subgroups distribution - native range	Koppen-Geiger climate subgroups distribution - non-native range	References
<i>Zeugodacus cucurbitae</i>	AP, IM	AU, AP, AT, EP, OC	Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Christmas Island, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Timor-Leste, Vietnam	Australia (1997), Benin (2004), Burkina Faso (2000), Cameroon (1993), Côte d'Ivoire (2000), Democratic Republic of Congo (unk.), Egypt (unk.), Gambia (2000), Ghana (unk.), Guam (1975), Guinea (2000), Indonesia (Papua) (1940s), Iran (unk.), Japan (1993), Kenya (1930s), Mali (2000), Mauritius (1992), Niger (2004), Nigeria (unk.), Northern Mariana Islands (1981), Oman (unk.), Papua New Guinea (1940s), Réunion (1972), Saudi Arabia (unk.), Senegal (2000), Seychelles (1999), Solomon Islands (1984), Somalia (unk.), Sudan (unk.), Tanzania (unk.), Togo (unk.), Uganda (unk.), United Arab Emirates (unk.), USA (Hawaii only) (1895)	94	27	Hot semi-arid, Humid subtropical, Monsoon-influenced humid subtropical, Subtropical highland, Temperate oceanic, Tropical monsoon, Tropical rainforest, Tropical wet	Humid subtropical, Savanna, Temperate oceanic, Tropical rainforest, Tropical wet	CABI (2020); Dhillon et al. (2005); De Meyer et al. (2015); EPPO (2020); GBIF (2020); Hardy (1973, 1974); Vargas et al. (2015); Hardy & Delfinado (1980); Vayssières et al. (2007); Wang (1998); White (2006); White & Elson-Harris (1992)

Appendix S3 Documented eradication attempts against non-native tephritids worldwide

Table S3.3 Eradication attempts against non-native tephritids worldwide taken from Global Eradication and Response Database (GERDA; Kean et al., 2021)

Species	Year	Country (region)
<i>Anastrepha ludens</i>	1990	San Diego, California, USA
<i>Anastrepha ludens</i>	1992	Southern tip of Baja California Sur, Mexico
<i>Anastrepha ludens</i>	1992	Southern tip of Sonora, Mexico
<i>Anastrepha ludens</i>	1993	Parras de la Fuente, Coahuila, Mexico
<i>Anastrepha ludens</i>	2007	Escondido, San Diego, California, USA
<i>Anastrepha ludens</i>	2008	Azusa, Los Angeles, California, USA
<i>Anastrepha ludens</i>	2008	Raymondville, Texas, USA
<i>Anastrepha ludens</i>	2011	Cameron County, Texas, USA
<i>Anastrepha ludens</i>	2013	Harlingen, Texas, USA
<i>Anastrepha obliqua</i>	1934	Key West, Florida, USA
<i>Anastrepha obliqua</i>	1992	Northern part of Sinaloa state, Mexico
<i>Anastrepha obliqua</i>	1992	Southern tip of Baja California Sur, Mexico
<i>Anastrepha obliqua</i>	2005	Nicoya Peninsula, Costa Rica
<i>Bactrocera albistrigata</i>	2009	Los Angeles, California, USA
<i>Bactrocera carambolae</i>	1988	Suriname
<i>Bactrocera carambolae</i>	1988	Guyana
<i>Bactrocera carambolae</i>	1988	French Guiana
<i>Bactrocera carambolae</i>	1998	Oiapoque, Brazil
<i>Bactrocera correcta</i>	2009	Thailand
<i>Bactrocera correcta</i>	2009	Grove, Orange County, California, USA
<i>Bactrocera correcta</i>	2009	Calabasas, Los Angeles, California, USA
<i>Bactrocera correcta</i>	2011	Windermere, Orange County, Florida, USA
<i>Bactrocera dorsalis</i>	1996	Guam
<i>Bactrocera dorsalis</i>	1912	Taiwan
<i>Bactrocera dorsalis</i>	1960	Rota Island, USA minor outlying islands
<i>Bactrocera dorsalis</i>	1962	Rota Island, USA minor outlying islands
<i>Bactrocera dorsalis</i>	1963	Ogasawa Islands, Japan
<i>Bactrocera dorsalis</i>	1964	Tinian, USA minor outlying islands
<i>Bactrocera dorsalis</i>	1968	Saipan, USA minor outlying islands
<i>Bactrocera dorsalis</i>	1974	Kikajima Island, Japan
<i>Bactrocera dorsalis</i>	1974	Yoron Island, Japan
<i>Bactrocera dorsalis</i>	1974	Okinoerabu Island, Japan
<i>Bactrocera dorsalis</i>	1974	Amami-Oshima Islands, Japan
<i>Bactrocera dorsalis</i>	1974	Tokunoshima Island, Japan
<i>Bactrocera dorsalis</i>	1974	San Diego, California, USA
<i>Bactrocera dorsalis</i>	1977	Okinawa Islands, Japan
<i>Bactrocera dorsalis</i>	1996	Mt Eden, Auckland, New Zealand
<i>Bactrocera dorsalis</i>	1996	Mauritius
<i>Bactrocera dorsalis</i>	1998	Nauru
<i>Bactrocera dorsalis</i>	1999	Florida, USA
<i>Bactrocera dorsalis</i>	2000	Hao, French Polynesia
<i>Bactrocera dorsalis</i>	2006	Rialto, San Bernadino, California, USA

<i>Bactrocera dorsalis</i>	2006	Hollywood, Los Angeles, California, USA
<i>Bactrocera dorsalis</i>	2006	Northridge, Los Angeles, California, USA
<i>Bactrocera dorsalis</i>	2006	Santa Ana, California, USA
<i>Bactrocera dorsalis</i>	2007	Valrico, Hillsborough County, Florida, USA
<i>Bactrocera dorsalis</i>	2009	Lakewood, Los Angeles, California, USA
<i>Bactrocera dorsalis</i>	2009	Elk Grove, Sacramento, California, USA
<i>Bactrocera dorsalis</i>	2009	La Verne, Los Angeles, California, USA
<i>Bactrocera dorsalis</i>	2009	North Highlands, Sacramento, California, USA
<i>Bactrocera dorsalis</i>	2010	Pasadena, California, USA
<i>Bactrocera dorsalis</i>	2010	Safety Harbor, Florida, USA
<i>Bactrocera dorsalis</i>	2010	Milpitas, California, USA
<i>Bactrocera dorsalis</i>	2010	Easter Island, Chile
<i>Bactrocera dorsalis</i>	2011	Alhambra, Los Angeles County, California, USA
<i>Bactrocera dorsalis</i>	2011	Baldwin Park, Los Angeles County, California, USA
<i>Bactrocera dorsalis</i>	2011	Pleasanton, Alameda County, USA
<i>Bactrocera dorsalis</i>	2011	Yorba Linda, Orange County, California, USA
<i>Bactrocera dorsalis</i>	2011	Westminster, Orange County, California, USA
<i>Bactrocera dorsalis</i>	2011	North Hollywood/Burbank, Los Angeles County, California, USA
<i>Bactrocera dorsalis</i>	2013	Rarotonga, Cook Islands
<i>Bactrocera dorsalis</i>	2013	Aitutaki, Cook Islands
<i>Bactrocera dorsalis</i>	2013	Orange/Los Angeles Counties, California, USA
<i>Bactrocera dorsalis</i>	2013	Reseda, Los Angeles County, California, USA
<i>Bactrocera dorsalis</i> (as <i>invadens</i>)	2010	Limpopo province, South Africa
<i>Bactrocera dorsalis</i> (as <i>invadens</i>)	2010	Groblersbrug, South Africa
<i>Bactrocera dorsalis</i> (as <i>invadens</i>)	2011	Weipe, Limpopo, South Africa
<i>Bactrocera dorsalis</i> (as <i>invadens</i>)	2011	Groblersbrug, Limpopo, South Africa
<i>Bactrocera dorsalis</i> (as <i>papayae</i>)	1993	Torres Strait Islands, Queensland, Australia
<i>Bactrocera dorsalis</i> (as <i>papayae</i>)	1995	Cairns, Queensland, Australia
<i>Bactrocera dorsalis</i> (as <i>papayae</i>)	1997	Mount Isa, Queensland, Australia
<i>Bactrocera dorsalis</i> (as <i>papayae</i>)	1997	Cloncurry, Queensland, Australia
<i>Bactrocera dorsalis</i> (as <i>papayae</i>)	1997	Humpty Doo, Northern Territory, Australia
<i>Bactrocera dorsalis</i> (as <i>philippinensis</i>)	1997	Darwin, Northern Territory, Australia
<i>Bactrocera dorsalis</i> (as <i>philippinensis</i>)	2001	Darwin, Northern Territory, Australia
<i>Bactrocera facialis</i>	2019	Otara, Auckland, New Zealand
<i>Bactrocera frauenfeldi</i>	1998	Nauru
<i>Bactrocera passiflorae</i>	1990	Auckland, New Zealand

<i>Bactrocera tryoni</i>	1968	Adelaide, South Australia, Australia
<i>Bactrocera tryoni</i>	1972	Easter Island, Chile
<i>Bactrocera tryoni</i>	1987	Banksia Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1988	Torrensville, South Australia, Australia
<i>Bactrocera tryoni</i>	1989	Kensington, South Australia, Australia
<i>Bactrocera tryoni</i>	1989	Glynde, South Australia, Australia
<i>Bactrocera tryoni</i>	1989	Perth, Western Australia, Australia
<i>Bactrocera tryoni</i>	1989	Mitchel Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1989	Holden Hill, South Australia, Australia
<i>Bactrocera tryoni</i>	1990	Somerton Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1990	Mannigham, South Australia, Australia
<i>Bactrocera tryoni</i>	1990	Glandore, South Australia, Australia
<i>Bactrocera tryoni</i>	1990	Windsor Gardens, South Australia, Australia
<i>Bactrocera tryoni</i>	1990	Beulah Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1991	Strathalbyn, South Australia, Australia
<i>Bactrocera tryoni</i>	1991	Gilles Plains, South Australia, Australia
<i>Bactrocera tryoni</i>	1991	Loxton North, South Australia, Australia
<i>Bactrocera tryoni</i>	1991	Croydon Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1991	Royston Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1992	West Hindmarsh, South Australia, Australia
<i>Bactrocera tryoni</i>	1993	Willaston, South Australia, Australia
<i>Bactrocera tryoni</i>	1993	Ferryden Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1993	Elizabeth West, South Australia, Australia
<i>Bactrocera tryoni</i>	1993	Ingle Farm, South Australia, Australia
<i>Bactrocera tryoni</i>	1993	Northfield, South Australia, Australia
<i>Bactrocera tryoni</i>	1994	Aldinga Beach, South Australia, Australia
<i>Bactrocera tryoni</i>	1994	Fairview Park, South Australia, Australia
<i>Bactrocera tryoni</i>	1994	Unley, South Australia, Australia
<i>Bactrocera tryoni</i>	1995	Victoria Park, Perth, Western Australia, Australia
<i>Bactrocera tryoni</i>	1995	Whangarei, New Zealand
<i>Bactrocera tryoni</i>	1996	North Shore, Auckland, New Zealand
<i>Bactrocera tryoni</i>	1998	Prospect, South Australia, Australia
<i>Bactrocera tryoni</i>	1999	Nuku Hiva, French Polynesia
<i>Bactrocera tryoni</i>	2000	Ti Tree, Northern Territory, Australia
<i>Bactrocera tryoni</i>	2001	Avarua, Rarotonga, Cook Islands
<i>Bactrocera tryoni</i>	2002	Magill, South Australia, Australia
<i>Bactrocera tryoni</i>	2002	Thebarton, South Australia, Australia
<i>Bactrocera tryoni</i>	2003	Plympton Park, South Australia, Australia
<i>Bactrocera tryoni</i>	2003	Norton Summit, South Australia, Australia
<i>Bactrocera tryoni</i>	2006	Ti Tree, Northern Territory, Australia
<i>Bactrocera tryoni</i>	2007	Ti Tree, Northern Territory, Australia
<i>Bactrocera tryoni</i>	2007	Sunraysia, Victoria, Australia
<i>Bactrocera tryoni</i>	2008	aw Park, Adelaide, South Australia, Australia
<i>Bactrocera tryoni</i>	2008	Melbourne, Victoria, Australia
<i>Bactrocera tryoni</i>	2009	Ti Tree, Northern Territory, Australia
<i>Bactrocera tryoni</i>	2009	Goulburn Valley, Victoria, Australia
<i>Bactrocera tryoni</i>	2010	Leeton, New South Wales, Australia

<i>Bactrocera tryoni</i>	2011	Broken Hill, New South Wales, Australia
<i>Bactrocera tryoni</i>	2011	Highgate, Perth, Western Australia, Australia
<i>Bactrocera tryoni</i>	2012	Avondale, Auckland, New Zealand
<i>Bactrocera tryoni</i>	2014	Loxton, South Australia, Australia
<i>Bactrocera tryoni</i>	2014	Whangarei, New Zealand
<i>Bactrocera tryoni</i>	2015	Grey Lynn, Auckland, New Zealand
<i>Bactrocera tryoni</i>	2018	Flinders Island, Tasmania, Australia
<i>Bactrocera tryoni</i>	2019	Devonport, Auckland, New Zealand
<i>Bactrocera tryoni</i>	2019	Northcote, New Zealand
<i>Bactrocera xanthodes</i>	1998	Nauru
<i>Bactrocera xanthodes</i>	1998	Raivavae, French Polynesia
<i>Bactrocera xanthodes</i>	2000	Rurutu, French Polynesia
<i>Bactrocera xanthodes</i>	2002	Rimatara, French Polynesia
<i>Bactrocera zonata</i>	2000	Israel
<i>Bactrocera zonata</i>	2006	Fresno, California, USA
<i>Bactrocera zonata</i>	2010	Miami-Dade County, Florida, USA
<i>Ceratitis capitata</i>	1906	Napier, New Zealand
<i>Ceratitis capitata</i>	1906	Blenheim, New Zealand
<i>Ceratitis capitata</i>	1907	Bermuda
<i>Ceratitis capitata</i>	1907	Ponsonby, Auckland, New Zealand
<i>Ceratitis capitata</i>	1907	Devonport, Auckland, New Zealand
<i>Ceratitis capitata</i>	1929	Florida, USA
<i>Ceratitis capitata</i>	1956	Florida, USA
<i>Ceratitis capitata</i>	1962	Dade County, Florida, USA
<i>Ceratitis capitata</i>	1963	Dade County, Florida, USA
<i>Ceratitis capitata</i>	1966	Texas, USA
<i>Ceratitis capitata</i>	1968	Adelaide, South Australia, Australia
<i>Ceratitis capitata</i>	1975	Los Angeles, California, USA
<i>Ceratitis capitata</i>	1976	Alice Springs, Northern Territory, Australia
<i>Ceratitis capitata</i>	1977	Mexico
<i>Ceratitis capitata</i>	1977	Peten, Guatemala
<i>Ceratitis capitata</i>	1977	Los Huista, Guatemala
<i>Ceratitis capitata</i>	1980	Carnarvon, Western Australia, Australia
<i>Ceratitis capitata</i>	1980	Los Angeles, California, USA
<i>Ceratitis capitata</i>	1980	San Jose, California, USA
<i>Ceratitis capitata</i>	1981	Alice Springs, Northern Territory, Australia
<i>Ceratitis capitata</i>	1981	Tampa, Florida, USA
<i>Ceratitis capitata</i>	1984	Miami, Florida, USA
<i>Ceratitis capitata</i>	1985	Miami, Florida, USA
<i>Ceratitis capitata</i>	1986	Alice Springs, Northern Territory, Australia
<i>Ceratitis capitata</i>	1987	Kadina, South Australia, Australia
<i>Ceratitis capitata</i>	1987	Cleve, South Australia, Australia
<i>Ceratitis capitata</i>	1987	Dade County, Florida, USA
<i>Ceratitis capitata</i>	1988	Miami, Florida, USA
<i>Ceratitis capitata</i>	1988	Port Augusta, South Australia, Australia
<i>Ceratitis capitata</i>	1988	Port Augusta West, South Australia, Australia
<i>Ceratitis capitata</i>	1988	Largs North, South Australia, Australia

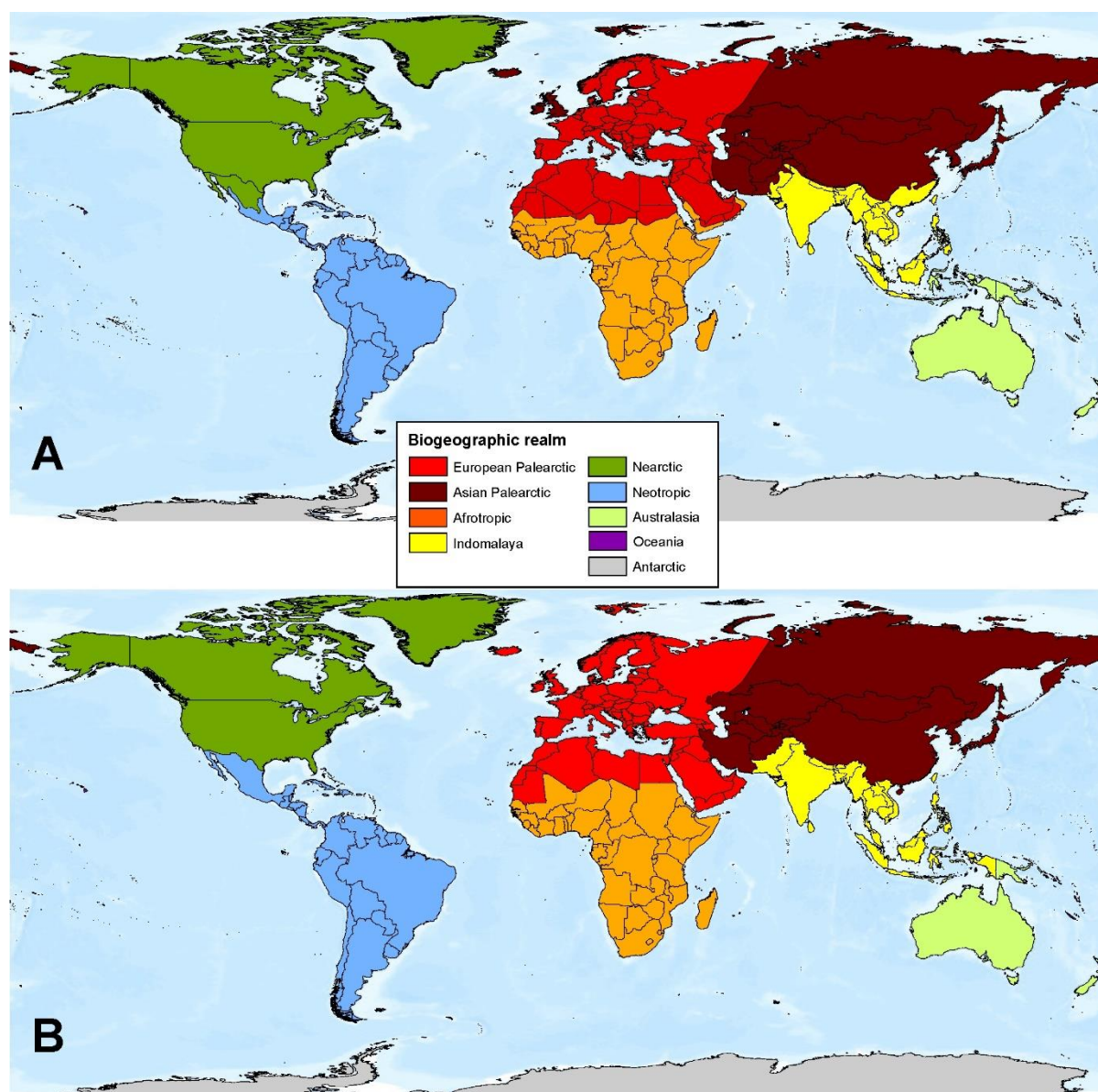
<i>Ceratitis capitata</i>	1989	Mountain View, California, USA
<i>Ceratitis capitata</i>	1989	Croydon Park, South Australia, Australia
<i>Ceratitis capitata</i>	1989	Collinswood, South Australia, Australia
<i>Ceratitis capitata</i>	1989	Payneham, South Australia, Australia
<i>Ceratitis capitata</i>	1989	Payneham, South Australia, Australia
<i>Ceratitis capitata</i>	1989	Christies Beach, South Australia, Australia
<i>Ceratitis capitata</i>	1989	Vale Park, South Australia, Australia
<i>Ceratitis capitata</i>	1990	Arica, Chile
<i>Ceratitis capitata</i>	1990	Tacna, Peru
<i>Ceratitis capitata</i>	1991	Port Pirie, South Australia, Australia
<i>Ceratitis capitata</i>	1991	Netley, South Australia, Australia
<i>Ceratitis capitata</i>	1992	Oasis Sur de Mendoza, Argentina
<i>Ceratitis capitata</i>	1992	General Alvear, Mendoza, Argentina
<i>Ceratitis capitata</i>	1992	Oasis Centro de Mendoza, Argentina
<i>Ceratitis capitata</i>	1992	Valle de Uco, Dept de Tunuyan, Tupunngato, San Carlos, Argentina
<i>Ceratitis capitata</i>	1992	Los Angeles basin, California, USA
<i>Ceratitis capitata</i>	1992	Malargue y El Sosneado en San Rafael, Mendoza, Argentina
<i>Ceratitis capitata</i>	1992	San Jose, California, USA
<i>Ceratitis capitata</i>	1992	Orroroo, South Australia, Australia
<i>Ceratitis capitata</i>	1995	Kununurra, Western Australia, Australia
<i>Ceratitis capitata</i>	1996	Mount Roskill, Auckland, New Zealand
<i>Ceratitis capitata</i>	1997	Belize
<i>Ceratitis capitata</i>	1997	Patagonia, Argentina
<i>Ceratitis capitata</i>	1997	Arava Valley, Jordan
<i>Ceratitis capitata</i>	1997	Arava Valley, Israel
<i>Ceratitis capitata</i>	1997	Florida, USA
<i>Ceratitis capitata</i>	1997	Kununurra, Western Australia, Australia
<i>Ceratitis capitata</i>	1998	Dade County, Florida, USA
<i>Ceratitis capitata</i>	1998	Gawler West, South Australia, Australia
<i>Ceratitis capitata</i>	2000	Arica, Chile
<i>Ceratitis capitata</i>	2000	Millswood, South Australia, Australia
<i>Ceratitis capitata</i>	2000	Walkerville, South Australia, Australia
<i>Ceratitis capitata</i>	2001	Hyde Park, Los Angeles, California, USA
<i>Ceratitis capitata</i>	2001	Daw Park, South Australia, Australia
<i>Ceratitis capitata</i>	2001	Torrens Park, South Australia, Australia
<i>Ceratitis capitata</i>	2001	Highgate, South Australia, Australia
<i>Ceratitis capitata</i>	2001	Parkside, South Australia, Australia
<i>Ceratitis capitata</i>	2001	Davoren Park, South Australia, Australia
<i>Ceratitis capitata</i>	2002	Salisbury Downs, South Australia, Australia
<i>Ceratitis capitata</i>	2002	Salisbury East, South Australia, Australia
<i>Ceratitis capitata</i>	2004	Trujillo, Honduras
<i>Ceratitis capitata</i>	2004	Northern area of Lake Xolotlan (Managua), Nicaragua
<i>Ceratitis capitata</i>	2005	Rancagua, Region VI, Chile
<i>Ceratitis capitata</i>	2005	Los Andes, Chile
<i>Ceratitis capitata</i>	2005	Rancho Cucamonga/Pomona, California, USA
<i>Ceratitis capitata</i>	2005	San Jose, Santa Clara, California, USA
<i>Ceratitis capitata</i>	2005	Estación Central, Metropolitan Region, Chile

<i>Ceratitis capitata</i>	2006	Wingfield, South Australia, Australia
<i>Ceratitis capitata</i>	2007	San Jose, Santa Clara, California, USA
<i>Ceratitis capitata</i>	2007	Dixon, Solano, California, USA
<i>Ceratitis capitata</i>	2007	Rolling Hills, Los Angeles, California, USA
<i>Ceratitis capitata</i>	2007	Ceduna, South Australia, Australia
<i>Ceratitis capitata</i>	2008	Spring Valley, San Diego, California, USA
<i>Ceratitis capitata</i>	2009	Santa Monica, Los Angeles, California, USA
<i>Ceratitis capitata</i>	2009	Imperial Beach, San Diego, California, USA
<i>Ceratitis capitata</i>	2009	Escondido, San Diego, California, USA
<i>Ceratitis capitata</i>	2009	Fallbrook, San Diego, California, USA
<i>Ceratitis capitata</i>	2010	Wingfield, South Australia, Australia
<i>Ceratitis capitata</i>	2010	South Brighton, South Australia, Australia
<i>Ceratitis capitata</i>	2010	Woodville North, South Australia, Australia
<i>Ceratitis capitata</i>	2010	Seaton, South Australia, Australia
<i>Ceratitis capitata</i>	2010	Boca Raton, Florida, USA
<i>Ceratitis capitata</i>	2010	Kununurra, Western Australia, Australia
<i>Ceratitis capitata</i>	2011	Pompano Beach, Broward County, Florida, USA
<i>Ceratitis capitata</i>	2011	San Pedro de Atacama, Chile
<i>Ceratitis capitata</i>	2011	Port Augusta, South Australia, Australia
<i>Ceratitis capitata</i>	2011	Iquique, Chile
<i>Ceratitis capitata</i>	2011	Independencia, Chile
<i>Ceratitis capitata</i>	2012	Iquique, Chile
<i>Ceratitis capitata</i>	2012	Ethelton, South Australia, Australia
<i>Ceratitis capitata</i>	2012	Ottoway, South Australia, Australia
<i>Ceratitis capitata</i>	2012	Pudahuel, Chile
<i>Ceratitis capitata</i>	2012	Vina del Mar, Chile
<i>Ceratitis capitata</i>	2012	Lampa, Chile
<i>Ceratitis capitata</i>	2012	Arica, Chile
<i>Ceratitis capitata</i>	2012	Rancho Cucamonga, San Bernadino County, California, USA
<i>Ceratitis capitata</i>	2013	Southern Belize, Belize
<i>Ceratitis capitata</i>	2013	Valparaíso, Chile
<i>Ceratitis capitata</i>	2013	Los Andes, Chile
<i>Ceratitis capitata</i>	2013	Kilburn, South Australia, Australia
<i>Ceratitis capitata</i>	2013	Woodville Gardens, South Australia, Australia
<i>Ceratitis capitata</i>	2013	Royal Park, Adelaide, South Australia, Australia
<i>Ceratitis capitata</i>	2013	Peterhead, South Australia, Australia
<i>Ceratitis capitata</i>	2015	Dominican Republic, Dominican Republic
<i>Ceratitis capitata</i>	2019	Thevenard, South Australia, Australia
<i>Rhagoletis cingulata</i>	2012	Provence-Alpes-Côte d'Azur, France
<i>Rhagoletis pomonella</i>	2000	Arlington, Oregon, USA
<i>Rhagoletis pomonella</i>	2000	Echo, Oregon, USA
<i>Rhagoletis pomonella</i>	2001	Pendleton, Oregon, USA
<i>Zeugodacus cucurbitae</i>	1913	Darwin, Northern Territory, Australia
<i>Zeugodacus cucurbitae</i>	1962	Rota Island, USA minor outlying islands
<i>Zeugodacus cucurbitae</i>	1976	Kume Island, Japan
<i>Zeugodacus cucurbitae</i>	1986	Okinawa islands, Japan
<i>Zeugodacus cucurbitae</i>	1992	Nauru

<i>Zeugodacus cucurbitae</i>	2001	Nauru
<i>Zeugodacus cucurbitae</i>	2004	Seychelles
<i>Zeugodacus cucurbitae</i>	2011	Arvin, Kern County, California, USA
<i>Zeugodacus tau</i> (as <i>Bactrocera tau</i>)	2016	Auckland, New Zealand

Appendix S4 Biogeographic regions used in this study

Figure S4.1 Maps of global biogeographic regions according to Wallace (A) and after adjustment of regional boundaries to match national boundaries (B).



Appendix S5 Generalized linear mixed-effects model framework variables fit and collinearity

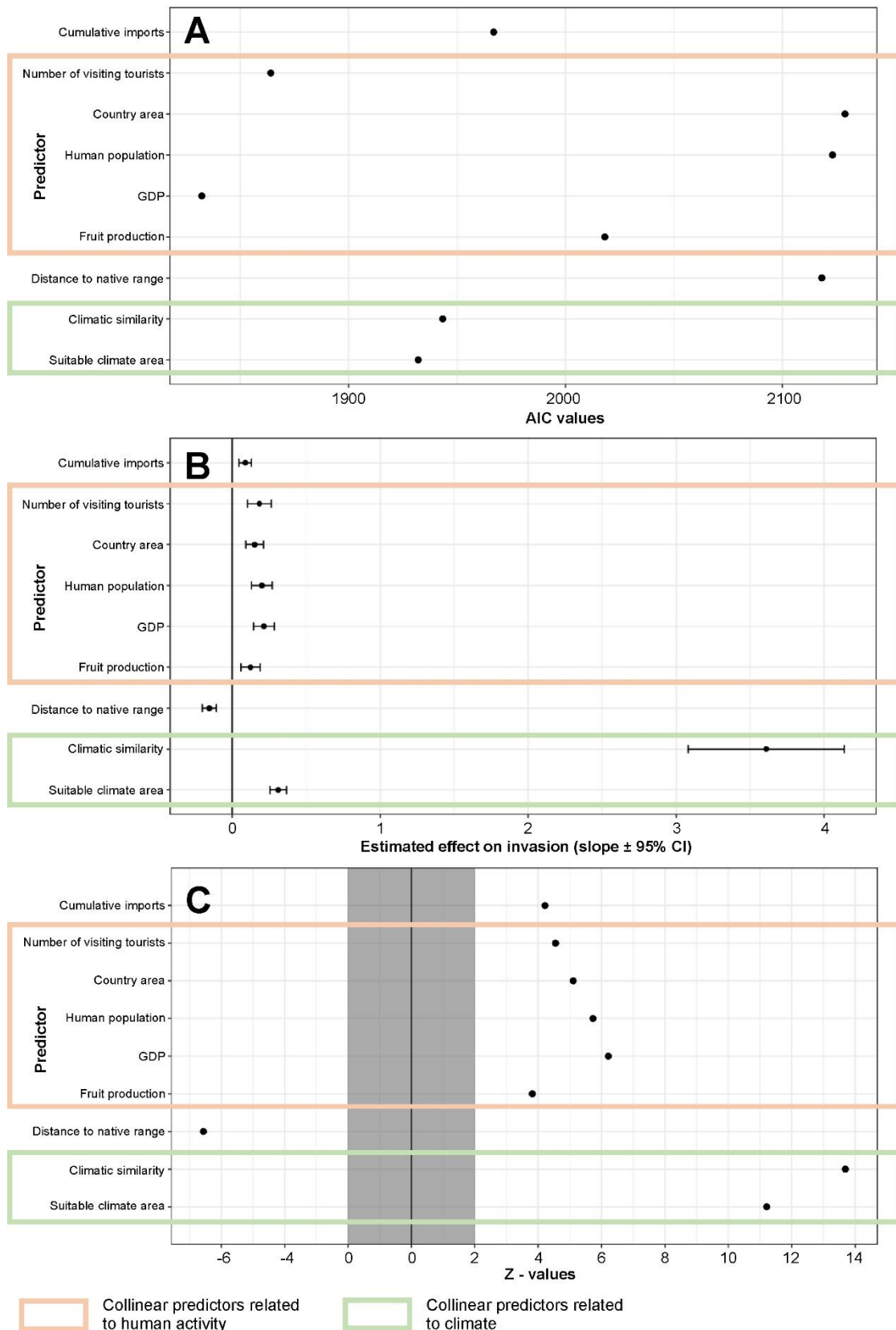
Table S5.4 Pairwise Pearson correlation coefficients between candidate predictors.

Variable	Human population	GDP	Fruit production	Country area	Number of visiting tourists	Climatic similarity	Suitable climate area	Cumulative imports	Distance to native range	Tephritidae invasion (0/1)
Human population	—	0.75	0.69	0.80	0.58	0.04	0.39	0.33	-0.04	0.05
GDP	0.75	—	0.40	0.59	0.74	-0.03	0.28	0.46	-0.04	0.05
Fruit production	0.69	0.40	—	0.62	0.35	0.08	0.34	0.18	-0.04	0.01
Country area	0.80	0.59	0.62	—	0.51	-0.01	0.40	0.23	-0.06	0.04
Number of visiting tourists	0.58	0.74	0.35	0.51	—	-0.06	0.19	0.44	-0.02	0.00
Climatic similarity	0.04	-0.03	0.08	-0.01	-0.06	—	0.60	-0.05	-0.02	0.16
Suitable climate area	0.39	0.28	0.34	0.40	0.19	0.60	—	0.07	-0.09	0.17
Cumulative imports	0.33	0.46	0.18	0.23	0.44	-0.05	0.07	—	-0.26	0.03
Distance to native range	-0.04	-0.04	-0.04	-0.06	-0.02	-0.02	-0.09	-0.26	—	-0.08
Tephritidae invasion (0/1)	0.05	0.05	0.01	0.04	0.00	0.16	0.17	0.03	-0.08	—

 Collinear predictors related to human activity

 Collinear predictors related to climate

Figure S5.2 Akaike Information Criterion (AIC) values (**A**); Slopes ($\pm$ 95% confidence limits, Confidence limits were estimated by multiplying the slope standard errors by two) (**B**) and Z-values (The gray area covers -2 to 2, dots outside of that rectangle were considered statistically significant) (**C**) for predictors used in a generalized linear mixed-effects model framework of tephritid invasion. Each predictor was fit separately, and thus figure depicts results from nine different models.



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