Insects that damage the wild populations of *Malus sieversii* in Kazakhstan

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**Abstract.** *Malus sieversii* is one of the main forest-forming wild-growing species in the mountain ecosystems of the south and southeast of Kazakhstan. Unfortunately, over the past half century, the area of wild populations of *M. sieversii* has dramatically decreased. One of the main dangers for this species is now insect pests, which caused huge damage to these wild forests. The main part of harmful to the wild apple organisms are arthropods, harming various degrees. Currently, there are 7 species of acariformes, 120 insect species from 7 orders associated with *M. sieversii*.

1. Introduction

*Malus sieversii* is one of the main forest-forming wild-growing species in the mountain ecosystems of the south and southeast of Kazakhstan. Modern genetic studyings of about 2500 modern apple varieties have shown that the Wild Apple (*M. sieversii*) is the progenitor of almost all varieties of cultivated apples [1]. The most part of populations are located in Zhongar, Aksu-Zhabagly, Karatau biosphere reserves as well as in Ile-Alatau national Nature Park. Unfortunately, over the past half century, the area of wild populations of *M. sieversii* has dramatically decreased, so the importance of preserving these apple forests dictates the requirements for strengthening their protection and developing a system of measures to protect against a variety of threats. One of the main dangers for this species is now insect pests, which caused huge damage to these wild forests. In this regard, it is necessary to monitor and research the biological and phenological features of the most important and dominant species of pests. In the case of mass reproduction of insect pests in wild fruit forests, *M. sieversii* is greatly weakened, causing a decrease in growth.

2. Methods

During our studies the generally accepted traditional methods and techniques devoted to the observation and collecting the field entomological material were used [2]. These classical entomological methods have some significant differences for each group of animals [3] and some minor modifications. Research were performed during the rout field trips in East and South East Kazakhstan.

3. Results

After one year research we created a check-list of the invertebrate species damaged wild populations of *Malus sieversii* in Zhongarian Alatau ridges and North Tien Shan, it is presented below.
### Check-list of Invertebrate species damaged wild populations of *Malus sieversii* (Lede.) M. Roem. in Kazakhstan

| Type Mollusca | Class Gastropoda | Order Stylommatophora |
|---------------|-------------------|------------------------|
| *Agriolimax agrestis* (Linnaeus, 1758) |

| Type Arthropoda | Class Arachnida | Order Acariformes |
|----------------|-----------------|-------------------|
| *Bryobia redikorzevi* (Reck, 1947) |

#### Family Tetranychidae

| Type Insecta | Order Homoptera | Suborder Aphidinea |
|--------------|-----------------|--------------------|
| *Tetranychus urticae* (Koch, 1836) |
| *Panonychus ulmi* (Koch, 1836) |
| *Tetranychus viennensis* (Zacher, 1950) |
| *Eotetranychus pruni* (Oudemans, 1931) |

#### Family Eriophyidae

| Type Insecta | Order Homoptera | Suborder Psyllinea |
|--------------|-----------------|--------------------|
| *Eriophyes mali* (Nalepa, 1891) |

#### Family Tenuipalpidae

| Type Insecta | Order Homoptera | Suborder Coccinea |
|--------------|-----------------|-------------------|
| *Cenopalpus pulcher* (Canestrini et Fanzago, 1876) |

#### Family Aphididae

| Type Insecta | Order Homoptera | Suborder Psyllinea |
|--------------|-----------------|--------------------|
| *Aphis pomi* (De Geer, 1773) |
| *Dysaphis mali* (Ferrari, 1872) |
| *Dysaphis devecta* (Walker, 1849) |
| *Eriosoma lanigerum* (Hausmann, 1802) |

#### Family Psyllidae

| Type Insecta | Order Homoptera | Suborder Coccinea |
|--------------|-----------------|-------------------|
| *Psylla mali* (Schmidberger, 1836) |
| *Psylla pyri* (Linnaeus, 1758) |

#### Family Diaphididae

| Type Insecta | Order Homoptera | Suborder Coccinea |
|--------------|-----------------|-------------------|
| *Epidiaspis leperi* (Signoret, 1869) |
| *Quadraspisidius ostreaeformis* (Curtis, 1843) |
| *Lepidosaphes ulmi* (Linnaeus, 1758) |

#### Family Coccidae

| Type Insecta | Order Homoptera | Suborder Coccinea |
|--------------|-----------------|-------------------|
| *Parthenolecanium corni* (Bouché, 1844) |
| *Eulecanium mali* (Borchsenius, 1955) |
| *Palaeolecanium bituberculatum* (Signoret, 1873) |
| *Rhodococcus turanicus* (Archangelskaya, 1937) |

#### Order Hemiptera

#### Family Tingidae

| Type Insecta | Order Thysanoptera |
|--------------|--------------------|
| *Stephanitis pyri* (Fabricius, 1775) |
Family Phlaeothripidae
24. *Haplothrips reuteri* (Karny, 1907)
25. *Frankliniella intonsa* (Trybom, 1895)

Order Coleoptera
Family Scarabaeidae
26. *Melolontha hippocastani* (Fabricius, 1801)
27. *Phyllopertha horticola* (Linnaeus, 1758)
28. *Maladera holosericae* (Scopoli, 1772)
29. *Epicometis hirta* (Poda, 1761)
30. *Oxythyrea funesta* (Poda, 1761)
31. *Pentodon idota Hrbst.* (Herbst, 1789)

Family Cerambycidae
32. *Tetrops praesta* (Linnaeus, 1758)

Family Curculionidae
33. *Anthonomus pomorum* (Linnaeus, 1758)
34. *Sciaphobus squalidus* (Gyllenhal, 1834)
35. *Phyllobius pyri* (Linnaeus, 1758)
36. *Psalidium maxillosum* (Dejean, 1821)
37. *Phyllobius urticae* (Linnaeus, 1758)
38. *Phyllobius oblongus* (Linnaeus, 1758)

Family Rhynchitidae
39. *Rhynchites bacchus* (Linnaeus, 1758)
40. *Rhynchites giganteus* (Kryn, 1832)
41. *Neocoenorhinidius pauxillus* (Germar, 1824)
42. *Coenorrhinus aequatus* (Linnaeus, 1767)
43. *Haplorhynchites coeruleus* (De Geer, 1775)

Family Chrysomelidae
44. *Chrysomela tremulae* (Fabricius, 1787)
45. *Melasoma populi* (Linnaeus, 1758)
46. *Luperus xanthopoda* (Schrank, 1781)

Family Scolytidae
47. *Scolytus mali* (Bechstein, 1805)
48. *Scolytus rugulosus* (Müller, 1818)
49. *Xyleborus dispar* (Fabricius, 1792)

Order Hymenoptera
Family Pamphiliidae
50. *Neurotoma saltuum* (Linnaeus, 1758)

Family Tenthredinidae
51. *Hoplocampa testudinea* (Klug, 1816)
52. *Croesus septentrionalis* (Linnaeus, 1758)
53. *Hoplocampa brevis* (Klug, 1816)
54. *Hoplocampa minuta* (Christ, 1791)

Family Torymidae
55. *Torymus druparum* (Boheman, 1834)

Order Diptera
Family Cecidomyiidae
56. *Dasyneura pyri* (Bouché, 1847)
57. *Dasyneura mali* (Kieffer, 1904)
58. *Thomasiniana oculiperda* (Rubsaamen, 1893)

Family Agromyzidae
59. *Phytomyza heringiana* (Hendel, 1922)
Family Tephritidae
60. Rhagoletis pomonella (Walsh, 1867)

Family Tortricidae
61. Cydia (Laspeyresia) pomonella (Linnaeus, 1758)
62. Laspeyresia pyrivora (Danilevsky, 1947)
63. Spilonota albicana (Motschulsky, 1866)
64. Grapholita molesta (Busck, 1916)
65. Spilonota ocelliana (Denis et Schiffermuller, 1775)
66. Enarmonia formosana (Scopoli, 1763)
67. Archips rosana (Linnaeus, 1758)
68. Archips crataegana (Hubner, 1799)
69. Archips podana (Scopoli, 1763)
70. Acleris variegana (Denis et Schiffermuller, 1775)
71. Argyrotaenia flavigiana (Thunberg, 1797)
72. Choristoneura diversana (Hubner, 1817)
73. Eupoecilia ambiguella (Hubner, 1796)
74. Hedya nubiferana (Haworth, 1811)
75. Cacoecia xylosteana (Linnaeus, 1758)
76. Ptycholoma lecheana (Linnaeus, 1758)
77. Adoxophyes orana (Fischer von Roeslerstamm, 1834)
78. Ancylis selenana (Guenee, 1845)
79. Exapate congrelatella (Clerck, 1759)
80. Croesia holmiana (Linnaeus, 1758)
81. Acleris ferrugana (Denis et Schiffermuller, 1775)
82. Cacoecia rosana (Linnaeus, 1758)

Family Glyphipterygidae
83. Simaethis pariana (Clerck, 1759)

Family Yponomeutidae
84. Yponomeuta malinellus (Zeller, 1838)
85. Yponomeuta padellus (Linnaeus, 1758)

Family Gemiostomidae
86. Leucoptera multifoliella (Costa, 1836)
87. Argyresthia conjugella (Zeller, 1839)
88. Cemiostoma scitella (Zeller, 1839)

Family Lyonetiidae
89. Lyonetia clarkeella (Linnaeus, 1758)

Family Momphidae
90. Blastodacna putripennella (Zeller, 1839)

Family Lithocolletidae
91. Callisto denticulella (Thunberg, 1794)
92. Gammaornix petiolella (Frey, 1863)
93. Lithocolletis blandiella (Fabricius, 1777)
94. Lithocolletis corilifoliella (Hubner, 1796)

Family Gelechiidae
95. Anarsia lineatella (Zeller, 1839)
96. Recurvaria nanella (Denis et Schiffermüller, 1775)
97. Recurvaria leucatella (Clerck, 1759)

Family Stigmeleidae
98. Stigmella maella (Stainton, 1854)

Family Coleophoridae
99. Coleophora hemerobiella (Scopoli, 1763)
100. Coleophora nigricella (Stephens, 1834)
101. Coleophora anatipemella (Hubner, 1796)

Family Pyralidae
102. Eurrhypara hortulata (Linnaeus, 1758)

Family Geometridae
103. Operophthera brumata (Linnaeus, 1758)
104. Erannis defoliaria (Clerck, 1759)
105. Angerona prunaria (Linnaeus, 1758)
106. Ennomos autumnaria (Werneburg, 1859)
107. Boarmia selenaria (Denis et Schiffermüller, 1775)
108. Boarmia consortaria (Fabricius, 1787)
109. Oporinia autumnata (Borkhausen, 1794)
110. Lycia hirtaria (Clerck, 1759)
111. Chloroclystis rectangulata (Linnaeus, 1758)
112. Opisthograptis luteolata (Linnaeus, 1758)

Family Noctuidae
113. Autographa gamma (Linnaeus, 1758)
114. Attethmia ambusta (Denis et Schiffermuller, 1775)
115. Agrotis segetum (Denis et Schiffermuller, 1775)
116. Agrotis ipsilon (Hufnagel, 1766)
117. Apatele tridentis (Denis et Schiffermuller, 1775)
118. Colocasia coryli (Linnaeus, 1758)

Family Lymantriidae
119. Euproctis chrysorrhoea (Linnaeus, 1758)
120. Lymantria dispar (Linnaeus, 1758)
121. Orgya antiqua (Linnaeus, 1758)
122. Dasychira pudibunda (Linnaeus, 1758)

Family Lasiocampidae
123. Malacosoma neustrium (Linnaeus, 1758)
124. Eriogaster lanestris (Linnaeus, 1758)

Family Cossidae
125. Zeuzera pyrina (Linnaeus, 1761)
126. Cossus cossus (Linnaeus, 1758)

Family Aegeriidae
127. Synanthedon myopaeformis (Borkhausen, 1789)

Family Arctiidae
128. Phragmatobia fuliginosa (Linnaeus, 1758)
129. Hyphantria cunea (Drury, 1773)

Family Pieridae
130. Aporia crataegi (Linnaeus, 1758)

4. Discussion

The most dangerous pests are arachnids and insects, including the most important species from of Coleoptera (22 species from 19 genera), Lepidoptera (69 species from 57 genera) and Homoptera (15 species from 14 genera). Less dangerous species are from orders Diptera, Hymenoptera and Thysanoptera. Insects-pests are divided into primary and secondary pests by ecological characteristics and nature of impact. Primary pests include species from Lepidoptera, Coleoptera and Hymenoptera, which settle on healthy trees and, as a rule, eat over the foliage. When outbreaks occur, these pests often cause the death of trees, preparing conditions for settling secondary pests [4]. Mass secondary
pests are beetles from the families of Scolytidae (3 species from 2 genera), Curculionidae (6 species from 4 genera), and Cerambicidae (*Tetrops praeusta* L.). Secondary pests are divided into physiological and technical.

Physiological insect pests hit living trees and destroy living tissues, and the technical ones are already processing the wood of dead trees. The most important and dominant species among insect pests that damage the wild populations of *M. sieversii* are: *Cydia pomonella* L., *Hyponomeuta malinella* Z., *Lyonetia clerckella* L., *Gemisto mascotella* Z., *Fponomeuta padelys* L., some species of Tortricidae, Aphinitea and Coccoidea, as well as some arachnids *Tetranychus urticae* Koch. and *Eriophyes malinus* Nae.

5. Conclusion
The main part of harmful to the wild apple organisms are arthropods, harming various degrees. Currently, there are 7 species of acariformes, 120 insect species from 7 orders associated with *M. sieversii*. Of the insect pests found, most of the species are polyphagous.

It should be noted that the development of measures to eliminate aggressive alien species of plants and their negative impact on natural phytocoenosis is an urgent problem in preserving the *M. sieversii* in Kazakhstan.

References
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