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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* (Ledeb.) M. Roem. in Kazakhstan**

Type Mollusca
Class Gastropoda
Order Stylommatophora

Family Agriolimacidae

1. *Agriolimax agrestis* (Linnaeus, 1758)

Type Arthropoda
Class Arachnida
Order Acariformes

Family Bryobiidae

2. *Bryobia redikorzevi* (Reck, 1947)

Family Tetranychidae

3. *Tetranychus urticae* (Koch, 1836)
4. *Panonychus ulmi* (Koch, 1836)
5. *Tetranychus viennensis* (Zacher, 1950)
6. *Eotetranychus pruni* (Oudemans, 1931)

Family Eriophyidae

7. *Eriophyes mali* (Nalepa, 1891)

Family Tenuipalpidae

8. *Cenopalpus pulcher* (Canestrini et Fanzago, 1876)

Class Insecta
Order Homoptera
Suborder Aphidinea

Family Aphididae

9. *Aphis pomi* (De Geer, 1773)
10. *Dysaphis mali* (Ferrari, 1872)
11. *Dysaphis devector* (Walker, 1849)
12. *Eriosoma lanigerum* (Hausmann, 1802)

Suborder Psyllinea

Family Psyllidae

13. *Psylla mali* (Schmidberger, 1836)
14. *Psylla pyri* (Linnaeus, 1758)

Suborder Cicadinea

Family Cicadellidae

15. *Typhlocyba rosae* (Linnaeus, 1758)

Suborder Coccinea

Family Diaspididae

16. *Epidiaspis leperii* (Signoret, 1869)
17. *Quadraspidiotus ostreaeformis* (Curtis, 1843)
18. *Lepidosaphes ulmi* (Linnaeus, 1758)

Family Coccidae

19. *Parthenolecanium corni* (Bouché, 1844)
20. *Eulecanium mali* (Borchsenius, 1955)
21. *Palaeolecanium bituberculatum* (Signoret, 1873)
22. *Rhodococcus turanicus* (Archangelskaya, 1937)

Order Hemiptera

Family Tingidae

23. *Stephanitis pyri* (Fabricius, 1775)

Order Thysanoptera

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 idiota* Hrbst. (Herbst, 1789)

Family Cerambycidae

- 32. *Tetrops praeusta* (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* (De Geer, 1775)
- 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* (Rubsamen, 1893)

Family Agromyzidae

- 59. *Phytomyza heringiana* (Hendel, 1922)

Family Tephritidae

60. *Rhagoletis pomonella* (Walsh, 1867)

Order Lepidoptera**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 ocellana* (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 ljugiana* (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 congreletella* (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 malifoliella* (Costa, 1836)
 87. *Argyresthia conjugella* (Zeller, 1839)
 88. *Cemiosoma scitella* (Zeller, 1839)

Family Lyonetiidae

89. *Lyonetia clerckella* (Linnaeus, 1758)

Family Momphidae

90. *Blastodacna putripennella* (Zeller, 1839)

Family Lithocolletidae

91. *Callisto denticulella* (Thunberg, 1794)
 92. *Gammaornix petiolella* (Frey, 1863)
 93. *Lithocolletis blancardella* (Fabricius, 1777)
 94. *Lithocolletis corilifoliella* (Hübner, 1796)

Family Gelechiidae

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

Family Stigmeleidae

98. *Stigmella malella* (Stainton, 1854)

Family Coleophoridae

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

Family Pyralidae

- 102. *Eurrhynx hortulata* (Linnaeus, 1758)

Family Geometridae

- 103. *Operophtera 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. *Atethmia ambusta* (Denis et Schiffermüller, 1775)
- 115. *Agrotis segetum* (Denis et Schiffermüller, 1775)
- 116. *Agrotis ipsilon* (Hufnagel, 1766)
- 117. *Apatele tridens* (Denis et Schiffermüller, 1775)
- 118. *Colocasia coryli* (Linnaeus, 1758)

Family Lymantriidae

- 119. *Euproctis chrysorrhoea* (Linnaeus, 1758)
- 120. *Lymantria dispar* (Linnaeus, 1758)
- 121. *Orgyia antiqua* (Linnaeus, 1758)
- 122. *Dasychira pudibunda* (Linnaeus, 1758)

Family Lasiocampidae

- 123. *Malacosoma neustria* (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 Cerambycidae (*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 mascitella* Z., *Fponomeuta padellys* L., some species of Tortricidae, Aphinidea and Coccoidea, as well as same 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 phytocenosis is an urgent problem in preserving the *M. sieversii* in Kazakhstan.

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