

SOME ENDANGERED INSECTS OF ARMENIA: PROPOSALS FOR RENOVATION OF THE COUNTRY'S RED BOOK AND DEVELOPMENT OF THE SYSTEM OF ESPECIALLY PROTECTED NATURE AREAS

Karagyan G.H.¹, Kalashian M.Yu.¹, Ghrejyan T.L.¹, Danchenko A.V.²

¹*Scientific Center of Zoology and Hydroecology NAS RA, P. Sevak 7,
Yerevan 0014, Armenia,*

²*Lomonosov Moscow State University, GSP-1, Leninskiye Gory 1/11,
Moscow 119991, Russia
gaykaragyan@yahoo.com*

Key words: Armenia, Southern Provinces, Red Book, renovation, endangered insects, System of Protected Natural Areas, development, Concept of Important Insect Areas

Ключевые слова: Армения, Южные области, Красная книга, обновление, угрожаемые насекомые, система охраняемых природных территорий, развитие, концепция ключевых энтомологических территорий

In the current edition of Red Book of the Republic of Armenia (Red Book..., 2010; Aghasyan, Kalashyan (eds.), 2010) 153 species of vertebrates (nearly 30% of country's vertebrate fauna) and 155 species of invertebrates (less than 1% of the fauna of invertebrates), out of which 139 insect species have been included.

Several thorough studies on insects of the yet unequally investigated Armenian territories have been carried out in the last years mainly by our entomological research group working in the Scientific Center of Zoology and Hydroecology, NAS RA. This activity was partly supported by RSG. Our proposals on insect conservation in Central Armenia were presented in G. Karagyan's 1st Report to RSG and partly published (Karagyan et al., 2014; Kalashian et al., 2015).

In the article we report some significant results of our investigations on entomofauna' conservation in Southern Provinces of Armenia (Vayots Dzor and Syunik). In the region 66 species of insects included into the first edition of Armenian Red Book (*l.c.*) are registered; out of these 15 species are known only from the Provinces above mentioned. For 22 red-listed species no conservation measures have been applied yet. Some of the region's ecosystems are degraded and even completely destroyed by agricultural practice, unregulated and often illegal tree-cutting, but mostly due to the development of mining. Existing EPNAs are not covering all the diversity of the region's ecosystems and range of endangered species.

The paper is based mainly on our results obtained during implementation of Dr. G. Karagyan's RSG Project (17140-2) and partly presented in the Report to RSG (https://www.rufford.org/files/17140-2%20Detailed%20Final%20Report_0.pdf). More than 40 insect species preliminarily assessed as threatened but not included into Armenian Red Book were registered in the several localities of Vayots Dzor and Syunik Provinces of Armenia. The revealed data were assessed and categorized using IUCN Red List' Criteria (IUCN, 2012 a, b) and, as a result, 25 species from 6 orders were selected and proposed for inclusion into the next edition of the Red Book; their brief descriptions are given below. Some data on butterflies were taken from Dr. G. Khanamiryan's Report to RSG and linked web-site (<https://www.butterfly-conservation-armenia.org>). One option must be emphasized: unlike IUCN, 2012b we are not downlisting some species forming single populations just near political borders of Armenia and Nakhchivan AR of Azerbaijan supposing that in such cases the IUCN Guideline's statements are not applicable.

Species proposed for inclusion into Red Book of the Republic of Armenia

1. *Cordulegaster vanbrinkae* Lohmann, 1993 (*Odonata: Cordulegastridae*)

The species is known by single registrations from Iran and Armenia. Actually, after the species' description from Elburz range in Iran only two populations were revealed in Syunik Province of Armenia (Ananian, 2014). The habitats are under immediate threat due to illegal tree-cutting which leads to change of hydrological conditions of the breeding water-body. It was reasonably categorized by V. Ananyan (*l. c.*) as CR B1ab(i,iii,iv)+B2b(ii,iii). No protection measures are applied for the species habitats.

2. *Reticulitermes lucifugus* Rossi, 1792 (*Blattoptera: Isoptera: Rhinotermitidae*)

Distributed in South and Eastern Europe from Mediterranean Region up to Caspian Sea coast. In Armenia the species occurs in Southern part of Meghri ecoregion and known by single colonies in arid landscapes threatened by overgrazing and mining activity. The species is a single representative of the infraorder Isoptera in Armenian fauna.

According to IUCN Criteria it is categorized as EN B 1a, 2b(iii). Occurs in "Arevik" National Park, but the zonation procedure for the Park has not been carried out yet, thus, real protection conditions cannot be assessed like for other species known from Park's territory and listed below.

3. *Clonaria nana* Mishchenko, 1941 (*Phasmatodea: Diapheromeridae*)

Endemic of Arax River Valley in Nakhchivan and Armenia; in our country known by very few observations in xerophilous habitats in Meghri region. The species is one of two representatives of the order in the fauna of Armenia.

According to IUCN Criteria it is categorized as EN B 1a, 2b(iii). Occurs in “Arevik” National Park.

4. *Pezodrymadusa magnifica* Werner, 1901 (*Orthoptera: Tettigoniidae*)

Rarely registered species, endemic of Southern part of Caucasian Ecoregion (Southern Georgia, Armenia, Nakhchivan), In Armenia occupies xerophilous habitats of Central and Southern regions, threatened by urbanization, overgrazing and somewhere by mining activity.

According to IUCN Criteria it is categorized as VU B1a 2a(ii,iii). The species habitats in Meghri region are partly included into “Arevik” National Park.

5. *Platycleis iljinskii* Uvarov, 1917 (*Orthoptera: Tettigoniidae*)

Rare species with extremely narrow distribution, restricted by Kaputjugh Mt. massive in Southern Armenia and Eastern Nakhchivan.

According to IUCN Criteria it is categorized as CR B1a. Species area is partly covered by the territory of “Zangezur” State Sanctuary.

6. *Eremopeza festiva* Saussure, 1884 (*Orthoptera: Pamphagidae*)

Narrowly distributed species, endemic of Central and Southern Armenia and Nakhchivan; was known from few isolated localities some of which are already destroyed due to agriculture development and urbanization.

According to IUCN Criteria it is categorized as EN B1a 2a(ii, iii). The species’ habitats in Meghri region are partly included into “Arevik” National Park.

7. *Nocarodes znojkoii* Miram, 1938 (*Orthoptera: Pamphagidae*)

Rare species with restricted distribution in Meghri and Zangezur ranges (most Southern Armenia and Eastern Nakhchivan); area of occupancy is partly degraded due to the mining activity.

According to IUCN Criteria it is categorized as EN B1a 2a(iii). Species area is partly covered by the territory of “Zangezur” State Sanctuary.

8. *Trechus dzermukensis* Iablokoff-Khnzorian, 1963 (*Coleoptera: Carabidae*)

The species with very narrow distribution, known only from Eastern part of Vardenis Range on the border of Armenia and Azerbaijan.

According to IUCN Criteria it is categorized as CR B1a. The species area is partly included into “Jermuk Hydrological” State Sanctuary which is in fact dedicated to the protection of springs but not of biodiversity.

9. *Trechus magniceps* Reitter, 1898 (Coleoptera: Carabidae)

Narrowly distributed species, endemic of Kaputjugh massive (in Armenia and Nakhchivan) and of the most NW part of Karabakh Highland.

According to IUCN Criteria it is categorized as EN B 1a. Species area is partly covered by the territory of “Zangezur” State Sanctuary.

10. *Pterostichus capitatus* Chaudoir, 1850 (Coleoptera: Carabidae)

The species is endemic of alpine habitats in Vayots Dzor Province on Eastern part of Vardenis Range near the border of Azerbaijan, the ecosystems are somewhere threatened due to overgrazing and mining activity.

According to IUCN Criteria it is categorized as EN B 1a 2a(ii, iii). The species areal is partly included into “Jermuk Hydrological” State Sanctuary which in fact protects the springs but not the biodiversity.

11. *Onthophagus diversicornis* Kirschenblatt, 1935 (Coleoptera: Scarabaeidae)

This species inhabiting burrows of voles was described from Ordubad (Nakhchivan); besides type series only few specimens are known from Central and Southern Armenia.

According to IUCN Criteria it is categorized as EN B 1a. Protected in “Khosrov Forest” State Reserve while, the territory is not covering all of the species’ range.

12. *Omophlus (Heliotaurus) emmae* Iablokoff-Khnzorian, 1959 (Coleoptera: Alleculidae)

This species is known by single registrations from Syunik Province; occupies mountain steppes which are under immediate threat due to overgrazing and infrastructure development.

According to IUCN Criteria it is categorized as CR B 1a 2a(ii, iii). No protection measures for the species have been applied yet. The species areal is partly included into “Jermuk Hydrological” State Sanctuary which in fact protects the springs but not biodiversity.

13. *Mycetocharina rjabovi* Iablokoff-Khnzorian, 1989 (Coleoptera: Alleculidae)

Narrowly distributed species, endemic for Vayots Dzor Province in Armenia and for Nakhchivan. In Armenia registered by single findings along the Arpa river; habitats are under threat of infrastructure development and somewhere of mining activity.

According to IUCN Criteria it is categorized as EN B 1a 2a(iii). No protection measures for the species have been applied yet.

14. *Trichodes zebra* Falderman, 1835 (Coleoptera: Cleridae)

Narrowly distributed species known from Southern Transcaucasia and North-Western Iran, in Armenia inhabits few localities in Vayots Dzor and Syunik Provinces; habitats are under threat of infrastructure development and somewhere of mining activity.

According to IUCN Criteria it is categorized as VU B1a 2(ii,iii). Occurs in “Gnishik” Protected Landscape (though, it should be mentioned that this type of PAs till now is not covered out of Armenian legislation) and in “Arevik” National Park.

15. *Cortodera colchica kalashiani* Danilevsky, 1999 (Coleoptera: Cerambycidae)

Parthenogenetic subspecies of Caucasian species, endemic of Western part of Meghri range with very restricted areal; the habitats are under the threat of uncontrolled grazing and somewhere of mining activity.

According to IUCN Criteria it is categorized as CR B1ab(ii,iii). No protection measures for the species are applied.

16. *Dorcadion sisianense* Lazarev, 2009 (Coleoptera: Cerambycidae)

Endemic of Northwestern part of Karabakh upland, the habitats are under immediate threat of uncontrolled grazing and partly of mining activity.

According to IUCN Criteria it is categorized as EN B1ab(ii,iii). No protection measures for the species are applied.

17. *Triphysa Phryne* Pallas, 1771 (Lepidoptera: Nymphalidae)

Distributed in Europe (incl. the Ukraine and Russia) and Asian Turkey; presented by local somewhat isolated populations. Considered as rare and included into Red Book of European Butterflies as Critically Endangered (Swaay van, Warren, 1999). Recently found in Armenia, occupies two isolated small (about 2-3 ha each) habitats in high mountains of Gegham and Vardenis Ranges. The habitats are under immediate threat of agricultural activities (overgrazing).

According to IUCN Criteria it is categorized as CR B1ab(ii,iii). No protection measures for the species are applied.

18. *Pseudochazara daghestana zangezura* Nekrutenko, 1989 (Lepidoptera: Satyridae)

The subspecies is endemic of Daralagyaz and Zangezur ranges in Nakhchivan and Armenia. In Armenia known by few observations from Gnishik (one spot) and Kajaran (two isolated spots); habitats are under threat of overgrazing and infrastructure development.

According to IUCN Criteria it is categorized as EN B1a. Two of known spots are covered by existing protected areas – “Zangezur” State Sanctuary and “Gnishik” Protected Landscape; one of the spots from neighboring Kajaran is out of protected territories, and its inclusion into the neighboring Sanctuary is of crucial importance for species conservation.

19. *Satyrus effendi* Nekrutenko, 1989 (Lepidoptera: Satyridae)

The species with very restricted distribution in Nakhchivan and Armenia, known from our country by single specimens from Eastern slopes of Kaputjugh Mt. massif and Vardenis Range in stony steppes at the altitudes 2900-3200 m which are under treat of overgrazing.

According to IUCN Criteria it is categorized as CR B1a. The species' habitats near Kajaran (Kaputjugh massif) are partly covered by "Zangezur" State Sanctuary.

20. *Pseudophilotes bavius egea* Herrich-Schäffer, 1852 (*Lepidoptera: Lycaenidae*)

The nominotypical subspecies is widely distributed in the steppe from Europe to Kazakhstan. A few records from North Turkey and Transcaucasia are to be referred to the subspecies *P. b. egea*, known from Armenia by single population from vicinity of Gnishik village; habitat is under immediate threat of overgrazing, somewhere also of infrastructure development. The distribution spot is covered by "Gnishik" Protected Landscape. According to IUCN Criteria it is categorized as EN B1a2ab(iii).

21. *Polyommatus (Sublysandra) cinyraea* Nekrutenko et Effendi, 1979 (*Lepidoptera: Lycaenidae*)

This species is endemic of Daralagyaz and Zangezur ranges in Nakhchivan and Armenia, here it is known by single observations from surroundings of Kajaran town in upper stream of the Kajaran river at the altitude 2600-2800 m. During 1998-2018 several microhabitats were located and studied. The population density is relatively low; our investigation shows that it can be categorized as CR B1a. The species habitat is near the border of "Zangezur" State Sanctuary, and its inclusion into the Sanctuary is of crucial importance for the species' conservation (Aghababyan, Khanamirian, 2018; our data).

22. *Hemaris croatica* Esper, 1800 (*Lepidoptera: Sphingidae*)

The species known from Europe, Central and Minor Asia and Caucasus, everywhere considered as rare. In Armenia known by a few registrations from isolated habitats in the North-Western, Central and Southern Provinces; the habitats are under immediate threat mainly of overgrazing.

According to IUCN Criteria it is categorized as VU B1a2ab(iii). Only two populations are protected in "Khosrov Forest" State Reserve and "Gnishik" Protected Landscape, however, majority of species' habitats are out of PAs;

23. *Hemaris tityus* Linnaeus, 1758 (*Lepidoptera: Sphingidae*)

The species is distributed in some European countries, Central and Minor Asia and Caucasus, everywhere considered as rare. In Armenia known by a few registrations from the isolated habitats in the North-Western, Central and Southern Provinces; the habitats are under immediate threat mainly of overgrazing, haymaking and somewhere of ploughing up.

According to IUCN Criteria it is categorized as VU B1a2ab(iii). Only one of distribution spots in Armenia is covered by "Zangezur" State Sanctuary.

24. *Akbesia davidi* Oberthür, 1884 (*Lepidoptera: Sphingidae*)

Rare species sporadically recorded in countries of Western Asia, known from Armenia by single recent registrations in Meghri ecoregion; somewhere localities are under potential threat of mining activity.

According to IUCN Criteria it is categorized as EN B 1a. Occurs in the territory of “Arevik” National Park.

25. *Neoris huttoni naessigi* De Freina, 1992 (*Lepidoptera: Saturniidae*)

Distributed in Central and Minor Asia, Transcaucasia, Iran. In Armenia the species is known by single findings from Meghri region; low number of collected specimens of this rather big moth is an obvious evidence of low population density and rarity of the species; habitat is under immediate threat of mining activity.

According to IUCN Criteria it is categorized as EN B 1a 2ab(i, iii). Occurs in the territory of “Arevik” National Park.

Application of data on insects for development of the System of Protected Natural Areas of Armenia and proposal of Concept of Important Insect Areas

Effectiveness of the System of Protected Natural Areas of whatever concrete region depends, in particular, on the representativeness of the components of biodiversity presented in the system. Taking into account that invertebrates, especially insects are the predominant part of biodiversity of most terrestrial ecosystems it must be stressed that their study and assessment have to be crucial part of assessment of existing PAs as well as during planning of the new ones. It was shown that 60% of red-listed Armenian insect species are presented in the existing PAs till now (Fayvush et al., 2011). In the framework of G. Karagyan’s RSG Projects we have carried out this kind of studies and analysis for selection of the territories most important for entomofauna conservation basing mainly on the data on endangered insect species. Some of such territories for Central Armenia were proposed by M. Kalashian et al. (2015). The territories for Southern Armenia are briefly described below.

The territories proposed are partly coinciding with sites suggested for Armenian part of Emerald Network; our data were taken into account during their selection and justification (Fayvush et al., 2017). Information on these sites has been submitted to the Secretariat of Bern Convention but till now has not been approved by the Government of RA and, thus, has no legal status in the country yet. These sites are now under revision by implementing “Emerald” working group.

1. Gnishik. The territory situated in Western part of Vayots Dzor Province between Areni, Mozrov and Gnishik villages is characterized by incredibly high richness of entomofauna, especially of Lepidopterans. Natural habitats vary from semi-desert to mountain steppe and meadows, including also riparian forest, rocky biotopes, etc. Twenty two species registered in Armenian Red Book occur here, including one species of orthopterans, five species of beetles, thirteen of butterflies and two of moths,

and one species of hymenopterans. It should be particularly stressed that in this restricted territory occur fifteen lepidopteran species from thirty two ones registered in Armenian Red Book. Two species from Resolution 6 of Bern Convention (one butterfly and one moth) are registered here as well. Two more butterfly (*Pseudochazara daghestana zangezura*, *Pseudophilotes bavius egea*), one moth (*Hemaris croatica*) and one beetle (*Trichodes zebra*) species from this area are proposed for inclusion into the next edition of Armenian Red Book.

Habitats are under threats of grazing, infrastructure development, recreation, etc. The territory now is included into so-called “Community-based protected landscape”. Meaning current legislation of RA is no more than good intentions, thus, we are proposing to give legal status to the territory, e. g., of State Sanctuary. Besides, it is necessary to include “Mageli” Cave into this PA as a Natural Monument which is single locality of red-listed troglobiont beetle species *Pristonychus arenicus* Kalashian, 1979, and which is under immediate threat of planned reconstruction for tourist and even restaurant purposes.

The territory partly coincides with Emerald Site_AM0000012 "Gnishik Area".

2. “Jermuk” planned National Park. Meaning insects conservation issues, two territories are proposed for inclusion into Park as parts of its reserve zone.

- **Herher-Gndevaz Area.** The territory is situated on the foothills of Vardenis Range between Arpa and Her-Her river gorges. The main ecosystems are Juniper light forest, phrygana, bushes and rocky communities. Ten insect species from Armenian Red Book occur here, including one orthopteran species, two dragonflies, two beetles, two butterflies and two moths. One moth species is included into Resolution 6 of Bern Convention. Besides, two beetle species (*Mycetocharina rjabovi* and *Trichodes zebra*) are proposed for inclusion into the next edition of country’s Red Book.

The ecosystems are moderately disturbed by overgrazing; potential threats are illegal tree and bush cutting (mainly for household heating purposes) and recreation activities.

The territory partly coincides with Emerald Site_AM0000009 “Djermuk Area”.

- **Sarer Sartsali Area.** The territory is situated to the North of Jermuk town in the most Eastern part of Vardenis Range near Azerbaijan border. Different types of high mountain ecosystems (subalpine and alpine meadows and carpets, rocky and wet biotopes, etc.) are presented here. These types of ecosystems are very poorly represented in the existing system of PAs of Armenia. Two species from Armenian Red Book are known from the territory: one orthopteran and one beetle, the last one is known only from

this territory which is its type locality. Two beetle species endemic for this area (*Trechus dzermukensis* and *Pterostichus capitatus*) are proposed for the next edition of Armenian Red Book.

The ecosystems are moderately disturbed; the main registered threat is uncontrolled grazing during summertime.

3. Gorhayk-Sarnakunk. The territory is situated on the upper stream of the Vorotan river between Gorhayk and Sarnakunk villages, including hollow of Spandaryan artificial water body and mountain slopes of South exposition. Different types of mountain ecosystems (mountain steppes, subalpine meadows, rocky and wet biotopes, as well as mirror of water-body) are presented in the area proposed. These types of ecosystems are very poorly represented in the existing system of PAs of Armenia. Two species from country's Red Book, one beetle and one butterfly occur here, and one beetle species (*Dorcadion sisianense*) endemic for the area and described from Gorhayk is proposed for inclusion into the next edition of Armenian Red Book.

The habitats are under immediate threat of uncontrolled grazing and partly of mining activity of neighboring Amulsar mine.

4. Sevlich-Ishkhansar. The territory is situated to the North of Goris town in the most NW part of Karabakh Highland near Azerbaijan border between hollow of Lake Sev Lich (including "Sev Lich" State Sanctuary which covers only the lake's mirror and no terrestrial ecosystems) and Mt. Mets Ishkhansar and continued to NW along the edge of mount range. Different types of high mountain ecosystems (alpine meadows and carpets, rocky and wet biotopes, etc.) are presented here. These types of ecosystems are very poorly represented in the existing system of PAs of Armenia. Two longhorn beetle species endemic for Armenia and included into country's Red Book occur here. One beetle species endemic for Armenia (*Trechus magniceps*) is proposed for the next edition of Armenian Red Book.

The ecosystems are moderately disturbed; the main registered threat is uncontrolled grazing during summertime. It is proposed to enlarge existing sanctuary incorporating into its territories described above.

5. Khndzoresk. The area is situated in the most North-Eastern part of Syunik Province near Khndzoresk village. It is occupying geologically unique and beautiful canyon; its territory is covered with bushes and trees amongst high rocks, some patches of riparian forest along streams are presented as well. Six species from Armenian Red Book are registered here, including one species of beetles, one species of butterflies, two species of moths and one hymenopteran species. Besides, here occurs one species of moths from Resolution 6 of Bern Convention. The area is under strong pressure of overgrazing and tourist activities.

The territory is partly coinciding with Emerald Site_AM0000018 "Khndzoresk Area".

6. “Tatev” Planned National Park. “Tatev” is planned to establish National Park covering various habitats (forests, steppes and meadows, wetlands and rocky biotopes, etc.) in Eastern Part of Syunik Province. Eleven species from Armenian Red Book are registered here including one orthopteran species, four species of beetles, two species of butterflies, two species of moths, and two hymenopteran species. Here occurs one species of moths from Resolution 6 of Bern Convention. Besides, one dragonfly (*Cordulegaster vanbrinkae*) and one beetle species (*Omophlus emmae*) are proposed for inclusion into country’s Red Book. Depending of ecosystem type they are threatened by illegal tree-cutting, overgrazing and somewhere of tourist activity and infrastructure development.

The territory partly coincides with Emerald Site_ AM0000016 “Tatev Area”.

7. Vicinities of Kapan. This small territory is situated Northwards of Kapan town, covering mainly ecosystem of so-called “sibljak” (scrub of *Palyurus spinachristi*). This type of ecosystems is not presented in existing Armenian PAs. Five insect species from Armenian Red Book occur here including one beetle, one butterfly, two moths and one hymenopteran species. The area is under threat of neighbouring mining territories.

The territory is partly coinciding with Emerald Site_AM0000008 “Impassable brushwood” picked out mainly due to botanical reasons; our proposal is for supporting of establishment of this site.

8. Vicinities of Kajaran. The area is situated Westwards of Kajaran town occupying Eastern slopes of Kaputjugh Mt. massif. It includes various habitats: upper belt of oak forest, steppe, meadows, lakes, gorge of upper stream of the Voghtchi river, etc. Eleven species from Armenia Red Book are registered here including three beetles, six butterflies and two moths. One moth species is included into Resolution 6 of Bern Convention. These unique landscapes are defined by other species of conservation interest proposed for the next edition of country’s Red Book including one orthopteran species (*Platycleis iljinskii*), one beetle (*Trechus magniceps*), three butterflies (*Pseudochazara zangezura*, *Satyrus effendi*, *Polyommatus cinyraea*) and one moth (*Hemaris tityus*). Lower part of the territory proposed is already partly destroyed by semi-legal construction of Micro HPP.

The territory is partly coincide with “Zangezur” State Sanctuary and Emerald Site_AM0000015 ”Zangezur Area”.

9. “Arevik” National Park. The Park was established in 2009 but the zonation procedure is not implemented yet. We are proposing four territories for inclusion into reserve zone of the Park basing on data on endangered insects. Territories are covering some parts of Emerald Site_AM0000014 “Arevik National Park”.

- **“Meghri pass-Lichk-Vank-Kaler” Area.** The territory is located downwards of Meghri Pass in the upper belt of Meghri Range. It includes various ecosystems from alpine and subalpine meadows to broad-leaved forest; streams and rocky habitats are presented as well. Five species from Red Book of RA distributed here including two species of beetles and three species of butterflies. Besides, two more Armenian endemic taxa, namely one orthopteran species (*Znojkiiana znojkoï*) and one beetle (*Cortodera colchica kalashiani*) are proposed for inclusion into the next edition of Red Book. The most upper part of the site is under threat of planned mining activity; it is proposed to include this area into the Park.

- **“Lehvaz-Gudemnis” Area.** The territory is situated Northwestwards of Meghri town on the slopes of Meghri range. It includes oak and juniper light forests with presence of *Amygdalus* trees, partly broad-leaved forest and tugai. From this site eleven species from Red Book of RA are known: one orthopteran, one beetle, four butterflies, two moths, two hymenopteran and one dipteran species. Three more insect species are proposed for the next edition of the country’s Red Book including one beetle (*Trichodes zebra*) and two moths (*Akbesia davidi*, *Neoris huttoni*). The territory is under threat of overgrazing, somewhere also of infrastructure development and mining activity.

- **“Shvanidzor-Nrnadzor-Khustup” Area.** The territory proposed occupies the most South-Western part of Armenia, including areas of “Arevik” National Park and partly of “Khustup” State Sanctuary. Various habitats are presented here from semi-desert through forests of different types to high mountain landscapes (e. g., alpine and subalpine meadows). Fourteen insect species from country’s Red Book are registered here including five beetle species, seven species of butterflies and two species of moths. One moth from Resolution 6 of Bern Convention is registered as well. Four more species are proposed for the next edition of the Red Book, including one termite (*Reticulitermes lucifugus*), one orthopteran (*Eremopeza festiva*), one beetle (*Onthophagus diversicornis*), and one moth (*Akbesia davidi*) species. The habitats are under various threats, including infrastructure development (particularly road construction), overgrazing, illegal tree-cutting, etc.

Besides Emerald Site “Arevik National Park”, the territory is partly coinciding with Emerald Site_AM0000015 “Zangezur Area”.

- **“Artsvakar-Alvank” Area.** The site occupies foothills of Meghri Range between Artsvakar gorge Eastwards of Meghri town and Alvank village. The main ecosystems are Juniper light forest with presence of *Amygdalus* trees, phrygana, bushes and rocky communities. Fourteen insect species included into Armenian Red Book are as follows: two dragonflies, one orthopteran, seven beetles, two moths, one hymenopteran and one dipteran species. One moth from Resolution 6 of Bern Convention is

registered as well. Another four insect species – one termite (*Reticulitermes lucifugus*), one stick insect (*Clonaria nana*), one beetle (*Trichodes zebra*) and one moth (*Akbesia davidi*) are proposed for inclusion into the next edition of country's Red Book. The habitats are under threat of spring overgrazing especially of goats.

Inclusion of the territories mentioned above into PAs System of Armenia will improve representativeness of the System of the country as a whole not only at species but also at ecosystem levels.

Basing on our analysis we are proposing to erect new category of areas crucial for biodiversity conservation namely "Important Insect Areas" which must be some integral part for definition of Key Biodiversity Areas (IUCN, 2016) together with well known Important Plant Areas (Darbyshire et al., 2017), Important Bird and Biodiversity Areas (Important..., 2016) and Prime Butterfly Areas (Swaay van, Warren, 2003). In our opinion, there are some points supporting this suggestion, e.g.:

- Insects are the most diverse group of living creatures; their study allows to get precise and statistically reliable data on biodiversity of any terrestrial and freshwater area;
- Insects as a whole together with some other invertebrates, plants and some less mobile vertebrates, being tightly integrated in ecosystems are providing conservationists with obviously most precise data convenient for exact definition and delimitation of the areas which need special conservation attention.

It is proposed to develop this concept in details including elaboration of respective criteria, categories' scope, etc. Preliminarily some criteria can be suggested: occurrence of several rare species and/or single but the most vulnerable, extra local or very narrowly distributed species, relatively good condition of ecosystems with rather low level of anthropogenic disturbance (if relevant), and level of protection of the type of containing ecosystems of the region surveyed. Some pilot projects for assessment of the effectiveness of application of this concept for conservation issues of different territories could be carried out.

Acknowledgements

We would like to express our deepest gratitude to Dr. George Fayvush (Institute of Botany NAS RA, Armenia), Mr. Vasil Ananian and Mr. Alexander Malkhasyan (WWF Armenia Branch Office), Dr. Karen Aghababyan and Dr. Gurgen Khanamiryan (TSE – Towards Sustainable Ecosystems NGO, Yerevan, Armenia) for their invaluable support.

The present study was partly supported by The Rufford Small Grants Foundation (Project no. 13316-1 and 17140-2).

References

Aghababyan K., Khanamirian G. 2018. The state of *Polyommatus myrrha cinyraea* Nekrutenko & Effendi, 1979 in Armenia // Electronic Journ. Nat. Sci of NAS RA, 1(30): 27-29.

Aghasyan A.L., Kalashyan M.Yu. (eds.). 2010. The Red Book of Animals of the Republic of Armenia. Yerevan, "Zangak" publ., 368 p. (in Armenian and English).

Ananian V. 2014. On the need of protection of goldenring *Cordulegaster vanbrinkae* in Armenia // Biological Journal of Armenia, 66 (4): 27-30 (In Russian).

Darbyshire I., Anderson S., Asatryan A. et al. 2017. Important Plant Areas: revised selection criteria for a global approach to plant conservation // Biodivers Conserv., 26: 1767. <https://doi.org/10.1007/s10531-017-1336-6>

Fayvush G., Arakelyan M., Agababyan K., Alexanyan A., Aslanyan A., Ghazaryan A., Hovhannisyan M., Kalashyan M., Nahapetyan S. 2017. The "Emerald" Network in the Republic of Armenia. Yerevan, «Van Aryan» publ., 144 p. (in English and Armenian).

Fayvush G.M., Baloyan S.A., Vardanyan Zh.H., Kalashyan M.Yu., Tamanyan K.G. 2011. On improvement of the network of specially protected nature areas in Armenia // Takhtajania, 1: 185-189 (in Russian with Armenian and English summary).

Important Bird and Biodiversity Areas (IBAs). 2016. BirdLife. www.birdlife.org. Retrieved 2016-01-15.

IUCN. 2012a. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, UK. ii+30 pp.

IUCN. 2012b. Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. Gland, Switzerland and Cambridge, UK: IUCN. iii + 41pp.

IUCN. 2016. A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0 . First edition. Gland, Switzerland: IUCN.

Kalashian M.Yu., Karagyan G.A., Stepanyan I.E., Danchenko A.V. 2015. Application of data on some rare insects of Armenia for planning of development of country's system of EPNA. In: "Prospective of conservation and rational use of natural complexes of Specially Protected Natural Areas". Proceedings of the International scientific and practical conference, 26-29 August, 2015, Domzhericy, Republic of Belarus: 259-261 (in Russian).

Karagyan G.H., Kalashian M.Yu., Danchenko A.V., Khachatryan H.G. 2014. Rare and threatened species of insects proposed for inclusion into Red Book of the Republic of Armenia. In: Proceedings of the International conference "Biological diversity and conservation problems of the fauna of the Caucasus - 2", September 23-26, 2014, Yerevan, Armenia: 195-200.

Red Book of the Republic of Armenia. 2010. Appendix to Resolution of the Government of RA N 71-n from 29.01.2010. Official bulletin of the Republic of Armenia, 6(740)1: 1-367. (in Armenian).

Swaay van, C., Warren M. 2003. Prime Butterfly Areas in Europe. Priority Sites for Conservation. De Vlinderstichting Wageningen, 690 p.

Swaay van, C., Warren M. 2003. Red Data book of European butterflies (*Rhopalocera*). Nature and Environment, No. 99, Council of Europe Publishing, Strasbourg, 291 p.