



Final Report of the Project

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“Identification of Priority Areas for the Conservation of Endangered Insect Species of Ararat Valley in Armenia”



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Project background

Armenia is a small mountainous country which has level of biological diversity incredibly high for such small territory of Temperate Zone. On the other hand, biota of Armenia is under hard anthropogenic pressure because of the high density of human population, developed industry and agriculture. Ararat valley is one of the most interesting regions of Armenia also characterized by high level and specificity of biodiversity, particularly of insects, being one of the most valuable biodiversity hotspots of not only Armenia but of whole Caucasus ecoregion. At the same time its ecosystems are most endangered in the country and fragmented to isolated islets.

Project covered territory of Armenian part of Ararat valley, including both Ararat plane and slopes of surrounding mountains (see polygon in the Chapter *Field Work*, Fig. 1). In this territory are presented more than half of insect species included into Red Book of Armenia (Aghasyan, Kalashyan (eds.), 2010). From here 89 Red Book species are listed, among these 43 species are known in the country only from Ararat valley. For 28 red listed species no conservation measures are applied yet.

For many species included into the Red Book of RA distributional data were given from literature sources (Ter-Minassian, 1947; Plavilstshikov, 1949; Iablokoff-Khnzorian, 1967, 1976; Avagyan, 1975, 1984; Mardjanian, 1986; Arakelian, 1994; Tuzov (ed.), 1997, 2000; et al.) and old collection materials, where usually only the names of neighbouring settlements could be obtained; for these species exact locality data are actually unclear. Hence distributional data on them need clarification.

Besides species included into the Book there are many species of high conservation value (e.g. Armenian endemics) on which existing data are not enough for assessment of their status; information of them is necessary for further actualization of the country's Red Book. Accumulation and generalization of distributional data is quite necessary for detection of the sites most important for conservation of insects fauna and for elaboration of measures of territorial protection of endangered insects, in particular, in justification of further development of the system of the country's Protected Areas; now they are not covering all the diversity of valley's ecosystems and range of endangered species.

Additionally, for elaboration of effective protection measures information on ecology, biology of endangered species, as well as assessment of condition of containing ecosystems, current and potential threats are necessary. So, our project was dedicated first of all to obtaining and generalization of modern and precise data on the condition of entomofauna of the target area. Special issue of the project is preparation of background information for inclusion of data on Armenian species into IUCN Red List of Threatened Species; first of all we are meaning

endemic species on which data collected could be enough for world's scale assessment and categorization.

Another important component of our project is public awareness rising activity. It is well known that any nature conservation have to be based on scientific background and on involvement of civil society. But insects' conservation problems are traditionally neglected by majority of stakeholders, even by conservationists' society. In particular, it is obvious that in the country and farmer communities any insects are considered as the pests, as something harmful. It can be said that idea of insect protection sounds rather strange for the members of these communities. Hence, approach to change this mentality was one of the targets of our work.

Project goal and objectives

General goal of the project is enforcement of the multilateral conservation measures of the insects of Ararat valley, Republic of Armenia, which include scientific, planning and public awareness rising components. This includes the following objectives:

- Create GIS-based database on endangered insect species of Ararat valley, which containing all the data available from existing sources and collected during project implementation;
- Collect data on current distribution, some ecological and biological data on endangered insect species of Ararat valley;
- Select and assess insect species of special conservation interest not included yet into Red Book of Armenia;
- Prepare documents for IUCN SSC with categorization and assessment of Armenian species and populations for data inclusion into IUCN Red List of Threatened Species;
- Perform public awareness rising activity, including preparation and dissemination illustrative and educational material, performing meetings and lectures among target groups of population (local communities, including educational organisations, staff of protected areas, etc.);
- Develop recommendations and draft Action Plan for conservation of insects of Ararat valley.

So, the project was based on combination of field surveys, laboratory studies, data analysis and preparation of different documents dedicated to insect protection. It includes also public awareness rising activities.

Progress in objectives achieving

Field works

Field work covered territory of Armenian part of Ararat valley, including both Ararat plane and slopes of surrounding mountains (see polygon in Fig. 1). Observations were carried out in all landscape belts presented here and in several types of ecosystems – sandy desert, semi-desert of different types, saline marches and other wetlands, steppe, subalpine and alpine meadows, light forests, forests.

Expeditions were carried out to the several localities of the study area in April-September 2013. One extra expedition note anticipated in the Working Plan was carried out in April, 2014 to cover some additional areas and to study spring aspect of insect fauna conditions. In all expeditions participated principal investigator (Dr. Gayane Karagyan), research scientist-entomologist Dr. Mark Kalashyan from Scientific Center of Zoology and Hydroecology, as well as assistants (postgraduate student Anna Ayvazyan from the same Scientific Center and master student G. Tokhatyan from Yerevan State University). In the expeditions in the period mid May - beginning of July participated also specialist on Lepidoptera Dr. Alexander Danchenko from Moscow State University (Russia).

Observations were conducted in 31 localities of Ararat valley (Fig. 1).

In 2013 the following expeditions were carried out:

- 4-6 May – env. Khanjyan and Lukashin vill. (Armavir Province) (locs. 1, 2);
- 7 May – env. Echmiadzin town (Armavir Province) (loc. 3);
- 19-21 May – env. Geghard vill. (Kotayk Province) (loc. 4);
- 27-31 May – S slope of Arailer Mt. (border of Kotayk and Aragatsotn Provinces) (locs. 5, 6);
- 11-16 June – “Khosrov Forest” Reserve (Ararat Province) (locs. 7, 8);
- 17-19 June – “Goravan Sands” Sanctuary (Ararat Province) (loc. 9);
- 2-3 July – env. Margara vill., Arax riv. bank (Armavir Province) (loc. 10);
- 5-7 July – env. Hatsavan vill. (Kotayk Province) (loc. 11);
- 14-15 July – env. Lusashogh and Lanjanist vill. (Ararat Province) (locs. 12, 13);
- 16-18 July – “Goravan Sands” Sanctuary and Surenavan vill. (Ararat Province) (locs. 14, 15);
- 20-24 July – env. Arzakan vill. (Aghveran gorge) (Kotayk Province) (loc. 16);
- 9-12 August – env. of Aknalich, Metsamor, Araks, Lenughi, Aratashen, Griboyedov villages (Armavir Province) (locs. 17-22);
- 1-4 September – S slope of Aragats Mt. (points at the altitudes from 1300 to 3200 m above sea level) (locs. 23-26).

Extra expedition was carried out in 24-27 April, 2014, including:

- 24 April – env. Nubarashen settlement (inside Yerevan administrative border) (loc. 27), btw. Azat artificial water body and Hatsavan vill. (Kotayk Province) (loc. 28);
- 25 April – btw. Ashnak and Dalarik villages (Armavir Province) (loc. 29);
- 26 April – S slope of Hatis Mt., NNW Zar vill. (loc. 30);
- 27 April – Hrazdan riv. gorge btw. Nurnus and Argel villages (loc. 31).



Figure 1. Map of study area and observation localities.

During expeditions the territories above mentioned were examined using traditional entomological methods of insects' collection and observation (incl. sweeping, by hand collection, use of UV and visible light, etc., Fig. 2) (Golub et al., 2012). The Red Book insects were mainly identified in the field; some doubtfully identified specimens were collected for subsequent laboratory study. Pictures of the species revealed were taken if it was available using existing tools; pictures of typical landscapes were taken as well. Herbarium of host plants was collected if appropriate. Some observations were made on habitat peculiarities and quality (meaning, mainly, the level of anthropogenic pressure) to assess the current and potential threats to the containing ecosystems. Data on this issue were collected also during discussions with local peoples.



Figure 2. During field work.

Laboratory studies and data analysis

In the laboratory collected insects (several specimens of Coleoptera, Odonata, Lepidoptera and Orthoptera doubtfully identified in the field) were elaborated and then identified using existing identification guides (see References) and sometimes by comparison with the specimens from the entomological collections of our Scientific Center. The materials were deposited in the same collections. Some materials on moths (Lepidoptera: Heterocera) were sent to identify to Dr. Olexa Dunda (Czech Republic), but no Red Book species were revealed. Host plants collected were identified by Dr. George Fayvush (Institute of Botany, National Academy of Sciences of Armenia).

For further analysis GIS-based database was designed. The sections of database correspond to the requirements of IUCN Red List (IUCN, 2012 a, b).

To the database were included all the data collected during project implementation as well as all available data from different sources – literature, collections, personal communications from colleagues, etc.

Achieved outcomes

During project implementation 55 insect species included into Red Book of Armenia were registered. Due to rather short time of field work not all the species preliminarily reported for the study area were registered (see Annex 1 presenting all Red Book species known from

Ararat valley, with species found by us marked “*”). For all registered species exact locality data more precise than those in Red Book are revealed, from these for 9 species quite new localities which were not mentioned in the Book were revealed (marked by “**”).

According to our analysis 24 species from 4 orders preliminarily assessed as endangered but not included yet into the current edition of Red Book of RA were registered. The data on these species were analyzed using IUCN Red List’ Criteria (IUCN, 2012 a, b), they were assessed and categorized. List of them is presented below (Table 1), picture’ one representative of each order included in Figure 3.

Table 1. List of species, proposed for inclusion into the next edition of Red Book of the Republic of Armenia

NN	Taxa	Proposed status and criteria used*	Comments
	Order Neuroptera Family Nemopteridae		
1.	<i>Lertha ledereri</i> (Sélys-Longchamps, 1866)	CR (B 1a, 2ab(ii,iii))	Only one population of very restricted area is known in Armenia; taking into account poor flying ability of this insect no capacities of its population restoration from neighbouring Northern Turkey populations could be supposed.
2.	<i>Olivierina extensa</i> (Olivier, 1811) (Fig.3D)	VU (B 1a, 2ab(ii,iii))	Eastern Mediterranean species restrictedly distributed in Ararat valley with the same characteristics of population restoration abilities as for previous species.
	Order Orthoptera Family Tettigoniidae		
3.	<i>Saga ephippigera</i> Fischer von Waldheim, 1846 (Fig. 3A)	VU (B 1a, 2ab(ii,iii))	Rather widely distributed in Mediterranean region species, in Armenia presented by nearly isolated for this wing-less cricket population distributed mainly in unprotected arid and semi-arid landscapes.
	Order Coleoptera Family Carabidae		
4.	<i>Harpalus brevisculus</i> Chaudoir, 1846	CR (B 1a, 2ab(ii,iii))	Endemic of Southern Transcaucasia, in Armenia known from single localities in Ararat plane isolated by agricultural lands. No localities are under protection.
5.	<i>Zuphium araxidis</i> Iablokoff-Khnzorian, 1972	EN (B 1a, 2ab(ii,iii))	Armenian (<i>s.l.</i>) endemic known from single localities in Ararat and Nakhichevan valleys in Arax riv. basin. No localities are

			under protection.
6.	<i>Xanthomelina zajtzewi</i> (Eichler, 1924)	VU (B 1a, 2ab(ii,iii))	Described from Turkmenistan; isolated population was revealed in “Goravan sands” sanctuary.
	Family Scarabaeidae		
7.	<i>Aphodius inclusus</i> Reitter, 1892	CR (B 1a, 2a)	Only single population of very small area completely isolated from other known Caucasian and Central Asian population is known from Aragats Mt.
	Family Buprestidae		
8.	<i>Acmaeodera ghilarovi</i> Volkovitsh, 1988	CR (B 1ab(ii,iii), 2ab(ii,iii))	Described from Turkmenistan; isolated population was revealed near “Goravan sands” sanctuary but out of its borders.
9.	<i>Sphenoptera latesulcata</i> Jakovlev, 1886	VU (B 1ab(ii), 2ab(ii,iii))	Eastern Mediterranean species represented in Armenia only in Ararat valley by single isolated populations.
	Family Tenebrionidae		
10.	<i>Odocnemis recticollis</i> (Allard, 1876)	EN (B 1a, 2ab(ii,iii))	The species is endemic of Caucasus Eco-region occurring in most NE Turkey and in S Transcaucasia; it has in Armenia restricted distribution composed of a few isolated islets; no capacities of restoration of Armenian populations from others could be supposed for this medium-sized and wing-less beetle.
11.	<i>Dichillus araxidis</i> Reitter, 1889	EN (B 1a, 2ab(ii,iii))	The same as for previous species
12.	<i>Oogaster piceus</i> (Ménétriés, 1832)	EN (B 1a, 2ab(ii,iii))	The same as for previous species
13.	<i>Stenosis armeniacus</i> (Motschulsky, 1849)	EN (B 1a, 2ab(ii,iii))	The same as for previous species
	Family Cerambycidae		
14.	<i>Apatophysis vedica</i> Danilevsky, 2008	CR (B 1a, 2a)	Recently described endemic of Armenia.
15.	<i>Phytoecia (Coptosia) antoniae</i> (Reitter, 1889)	EN (B 1a, 2ab(ii,iii))	The species is endemic of Caucasus Eco-region occurring in most NE Turkey, most NW Iran and in S Transcaucasia; it has in Armenia restricted distribution.
16.	<i>Phytoecia (Kalashania) erivanica</i> Reitter, 1899 (Fig. 3C)	VU (B 1a, 2ab(ii,iii))	The species is endemic of Caucasus Eco-region occurring in most NE Turkey, and in S Transcaucasia; it has in Armenia restricted distribution.
	Order Lepidoptera Family Sphingidae		
17.	<i>Sphingonaepiopsis gorgoniades</i> (Hübner, 1819)	VU (B 1a, 2ab(ii,iii))	East Mediterranean species presented in C Armenia by few local populations. Abundance is

			very low.
18.	<i>Rethera komarovi</i> (Christoph, 1885)	VU (B 1a, 2ab(ii,iii))	East Mediterranean species presented in C Armenia by few local populations in rather endangered arid landscapes. Abundance highly fluctuates.
	Family Hesperidae		
19.	<i>Thymelicus acteon</i> (Rottemburg, 1775)	EN (B 1ab (ii), c(iv))	Known only from few localities in C Armenia, no one of them is under protection; abundance is assessed by low and sharply fluctuating.
20.	<i>Muschampia tessellum</i> (Hübner, 1803) (Fig. 3B)	VU (B 1ab(ii, v)c(iv))	Known only from several localities in C Armenia, no one of them is under protection; abundance is assessed by moderate and sharply fluctuating.
	Family Satyridae		
21.	<i>Coenonympha lyllus</i> (Esper, 1805)	VU (B 1ab(ii, v)c(iv))	Known mostly from Southern part of the country, very locally with abundance sharply fluctuating.
	Family Pieridae		
22.	<i>Zegris eupheme menestho</i> (Menetries, 1832)	VU (B 1ab(ii, v)c(iv))	Widespread in Armenia, but known mostly from South part of the country. Moderately abundant with abundance sharply fluctuating.
	Family Lycaenidae		
23.	<i>Agrodiaetus admetus yeranyani</i> Dantchenko et Lukhtanov, 2004		Endemic for Armenia subspecies of East Mediterranean species. Known from several more or less isolated localities in open landscapes at the middle altitude of mount ridges of C and S Armenia. Moderately abundant with abundance sharply fluctuating.
24.	<i>Agrodiaetus belovi</i> Dantchenko et Lukhtanov, 2004	VU (B 1ab(ii, v)c(iv))	Sub-endemic of Caucasian Ecoregion, in Armenia known by several isolated populations with sharply fluctuating abundance.

*As it is visible from the table, for assessment distributional criteria were used nearly exclusively; quantitative criteria commonly are not available for insects and, moreover, sometimes nearly inapplicable for these animals; for instance, numbers of specimens in identification of each category (from CR to VU) look at least ridiculous: “50 specimens” (CR – C2a); “250 specimens” (EN – C2a), even – “1000 specimens” (VU – C2a) – all these don’t mean anything for any insect population.

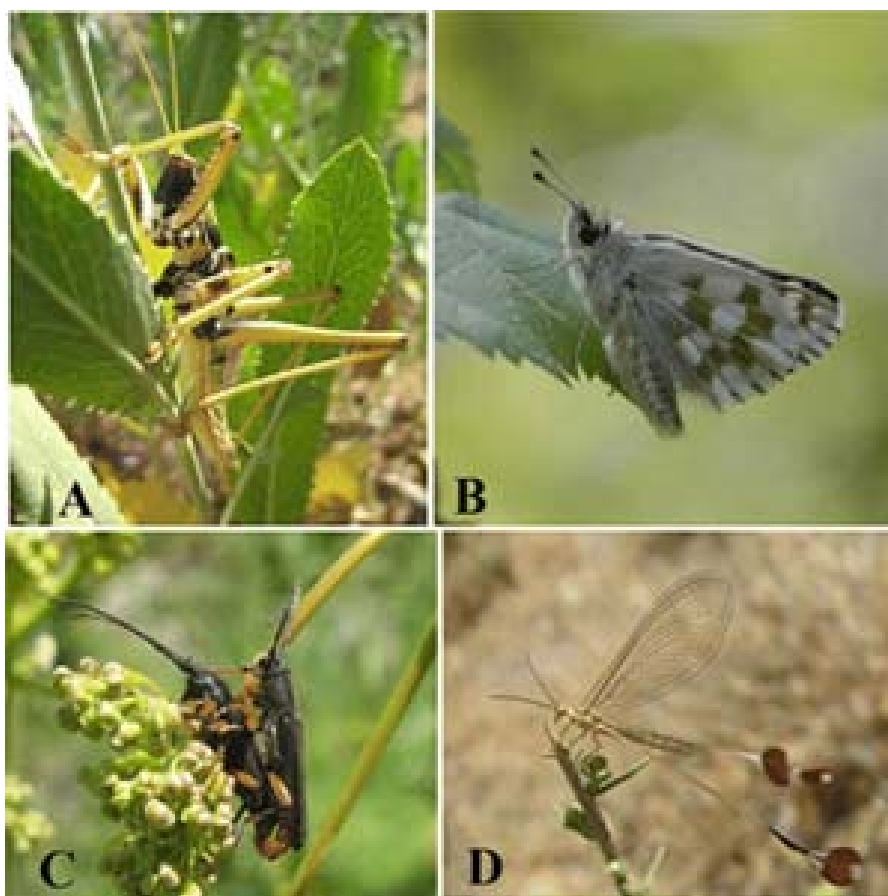


Figure 3. A - *Saga ephippigera*; B - *Muschampia tessellum*; C - *Phytoecia erivanica*; D - *Olivierina extensa*

Fact sheets for each species proposed for inclusion into the next edition of Armenian Red Book are elaborated according the scheme used in current Red Book (in Armenian, English translation of one example is given below – see Example 1). All these fact sheets were collected and designed as a brochure for further publication and dissemination among stakeholders in case of appropriate financial support.

Example 1. Fact sheet for species proposed for inclusion into the next edition of Red Book of RA

Family Cerambycidae

***Apatophysis vedica* Danilevsky, 2008**



Status. A rare species of restricted distribution. According to IUCN Criteria categorized as CR (B1a b(iii)).

Brief description. Longhorn beetle of moderate size (9.5-22.0 mm), body pale brownish with more or less distinct white pubescence. Male with common for longhorns developed wings and normally developed elytra. Female is wingless with shortened elytra.

Distribution. Endemic of Ararat valley in Armenia.

Distribution in Armenia. Recently described from single localities in Ararat valley: env. of Vedi (near “Goravan sands” Sanctuary), vicinities of Surenavan and Hatsavan villages.

Habitats. Stony semi-deserts with predomination of wormwood *Artemisia flagrans* and xerophilous Chenopodiaceae.

Biological traits. Imago flies to light from end of June till mid-August. Larvae are multiphagous, develop in the roots of several Chenopodiaceae (e.g., *Salsola erucoides*) and Fabaceae (*Alhagi maurorum*), etc. Generation is supposedly one year.

Population size and its trends. Rare species known by single specimens.

Major threats. Containing ecosystems are under pressure of spring grazing and illegal bush cutting in the forest-less district; vicinities of “Goravan sands” Sanctuary are now endangered to complete destroying due to mining activity.

Conservation measures. Not applied yet.

Suggested conservation measures. Creation of Protected areas in the vicinities of Hatsavan and Surenavan villages. Enlargement of “Goravan sands” sanctuary with inclusion of surrounding stony semi-desert areas.

For further proposal on inclusion of Armenian insect species into IUCN Red List of Threatened Species 29 Armenian endemic species were analysed; from these 14 species were selected and assessed according to IUCN Red List requirements. List of them and one Document example are presented below (See Table 2 and Example 2).

Table 2. Armenian endemic species proposed for inclusion into IUCN Red List of Threatened Species

NN	Taxa	Proposed status	Comments
	Order Orthoptera Family Acrididae		
1.	<i>Nocarodes nodosus</i> Mistschenko, 1951	CR B2a	Known from very few localities around Vedi town; Its area of occupancy is about 200 km ² , and with Extent of occurrence is assessed as about 20 km ² .
	Order Homoptera Family Margarodidae		
2.	<i>Porphyrophora hammelii</i> Brandt, 1833	CR B1b(i,ii,iii) +2ab(i,ii,iii)	The species is living in the saline lands (so-called “solonchaks”) which were under melioration during last decades. As a result, Extent of occurrence declined at least for five times from 100 km ² to 20 km ² ; now the species is surviving in small isolated islets.

	Order Coleoptera Family Carabidae		
3.	<i>Chylotomus alexandri</i> Kalashian, 1999	CR B 1a2a	Type locality (isolated Odzasar mountain) is only habitat for <i>Ch. alexandri</i> . It has very restricted Area of occupancy coincides with Extent of occurrence which is assessed as about 200 hectares (2 km ²).
	Family Elateridae		
4.	<i>Cardiophorus araxicola</i> Khnzorian, 1970	CR B1b(i,ii,iii) +2ab(i,ii,iii)	The species is living only in sandy desert in “Goravan sands” sanctuary; even having the Protected Area status, the area of sands during last two decades decreased from 200 to 80 hectares.
	Family Buprestidae		
5.	<i>Sphenoptera khnzoriani</i> Kalashian, 1996	CR B2a	Known only from the surroundings of Vedi town near the border of “Goravan Sands” Sanctuary; containing ecosystem is now under the threat of complete destruction due to mining activity
	Family Meloidae		
6.	<i>Mylabris sedilithorax</i> Sumakov, 1924	EN B1a	The species lives in the open landscapes in the system of Mount ranges of C Armenia having restricted Area of occupancy and Extent of occurrence
	Family Tenebrionidae		
7.	<i>Cylindronotus erivanus</i> (Reitter, 1901)	EN B1a	The species lives in the open landscapes in the system of Mount ranges of C Armenia having restricted Area of occupancy and Extent of occurrence.
8.	<i>Ectromopsis bogatchevi</i> (Khnzoryan, 1957)	CR B2ab(iii)	Species of very restricted distribution limited by small islets of clay semi-desert near Yerevan; ecosystems are under immediate threat due to urbanisation.
	Family Cerambycidae		
9.	<i>Conizonia kalashiani</i> Danilevsky, 1992	CR B1a	Inhabits isolated mountain in C Armenia; abundance is very low.
	Family Chrysomelidae		
10.	<i>Cryptocephalus araxicola</i> Khnzorian, 1968	EN B1ab(iii)	Species of very restricted distribution limited by small islets of clay semi-desert near Yerevan; ecosystems are under immediate threat due to urbanisation
	Family Curculionidae		
11.	<i>Cyclobaris richteri</i> Ter-Minasian, 1955	CR B1b(iii) +2ab(iii)	The same as for previous species
12.	<i>Baris mirifica</i> Khnzorian, 1958	CR B1b(iii) +2ab(iii)	The same as for previous species

Conservation measures. Currently not applied. The species habitats are proposed for inclusion into Protected Area consisting of Odzasar Mt. and Yerakh hill).

Analysis and generalization of distributional data allowed to identify some areas most important for entomofauna, in particular, endangered insect species conservation. We based mainly on the following criteria – occurrence of several rare species and/or single but most vulnerable endemic species, relatively good condition of ecosystems with rather low level of anthropogenic disturbance and level of representativeness of the type of containing ecosystems into existing system of country’s PAs. These are, first of all, Mt. Arailer, vicinities of Surenavan and Hatsavan villages, Mt. Odzasar, environments of Geghard monastery (see Map in Fig. 4); these territories are briefly described below. In the following descriptions Armenian (*sensu lato*) endemics (sometimes known from Nakhichevan part of Arax riv. valley) are marked “*”, and the species, included into Annex II of Bern Convention are marked “**”. Species, for which protection measures were not applied yet, are underlined.



Figure 4. Proposed Protected Areas in Ararat valley.

Mt. Arailer (Fig. 4, area 1).

Arailer is one of the extinct volcano (2577 m above sea level). The mountain is extremely interesting from the geomorphological point of view. It is a carrier of the richest gene pool of flora and fauna as well. Eleven insect species from Armenian Red Book occur here: *Sympecma paedisca* (Brauer, 1877), **Armenohelops armeniacus* Nabozenko, 2002, **Cylindronotus erivanus* (Reitter, 1901), *Dorcadion kasikoporanum* Pic, 1902, **Conizonia kalashiani* Danilevsky, 1992, ***Parnassius mnemosyne rjabovi* Sheljuzhko, 1935,

*****Parnassius apollo kashtshenkoi*** Sheljuzhko, 1908, *****Papilio alexanor orientalis*** Romanoff, 1884, *Colias aurorina* Herrich-Schaffer, [1850], *Proterebia afra hyrcana* (Staudinger, 1901), *Tetralonia macroglossa* (Illiger, 1806). Among these, Arailer is single known locality for *Conizonia* worldwide and only known in Armenia locality for *Dorcadion*. Two other species are endemics of Armenia and three are included into Annex II of Bern Convention. *Parnassius apollo* is assessed in IUCN Red List as VU. Besides, three butterfly species are proposed by us for inclusion into next edition of Armenian Red Book: *Muschampia tessellum* (Hübner, [1803]), *Thymelicus acteon* (Rottemburg, 1775), *Zegris eupheme* (Esper, [1804]), as well as longhorn beetle *Phytoecia erivanica* Reitter, 1899 and darkling beetle *Odocnemis recticollis* (Allard, 1876).

Botanists' data are independently supporting our estimation. According to botanists studies, here are presented several main types of vegetation of Armenia. More than 650 species of vascular plants are registered in flora of the mountain which consists about 20% of Armenia's flora. 25 of them are included into Red Book of RA.

Condition of the mountain's ecosystems is rather good; the main permanent threat is uncontrolled grazing, in some places – rather limited illegal cutting. As a protection measure it is proposed to create here sanctuary under supervising of MoNP of RA.

Vicinities of Hatsavan (Fig. 4, area 2).

The territory is situated between Hatsavan village and Azat artificial water-body. The area is rather gently sloping; the unique arid ecosystems (semidesert, somewhere wetlands with predomination of *Phragmites*) on gypsiferous clay are presented here. This type of ecosystems is not represented in the existing system of PAs not only of Armenia, but, according to our awareness, in whole Southern Caucasus. Six species from Armenian Red Book occur here: *Craspedostethus permodicus* (Faldermann, 1835), **Laena constricta* Khnzorian, 1957, **Adelphinus ordubadensis* Reitter 1890, **Phytoecia pici* Reitter, 1892, *****Papilio alexanor orientalis*** Romanoff, 1884, *Tomares romanovi* (Christoph, 1882). Eight species are proposed for the next edition of Armenian Red Book: *Saga ephippigera* Fischer von Waldheim, 1846, *Xanthomelina zajtzevi* (Eichler, 1924), **Apatophysis vedica* Danilevsky, 2008, *Muschampia tessellum* (Hübner, [1803]), *Thymelicus acteon* (Rottemburg, 1775), *Zegris eupheme* (Esper, [1804]), *Coenonympha lyllus* (Esper, 1805), *Olivierina extensa* (Olivier, 1811).

The ecosystems are rather undisturbed, potential threats are spring grazing, illegal bush cutting in the forest-less district. The proposed status is creation of sanctuary under the

supervising of Natural Reserves and Parks Complex which is managing adjacent “Erebuni” Reserve.

Vicinity of Geghard monastery (Fig. 4, area 3).

The territory is situated on the slopes of right side of Geghard river gorge near Geghard monastery. The main ecosystems are phrygana, bushes and rocky communities. Twelve insect species from Armenian Red Book occur here: **Gomphocerus armeniacus* (Uvarov, 1931), **Cardiophorus pseudogramineus* Mardjanian, 1977, **Sphenoptera geghardica* Kalashian & Zykov, 1994, **Armenohelops armeniacus* Nabozhenko, 2002, ***Parnassius mnemosyne rjabovi* Sheljuzhko, 1935, ***Papilio alexanor orientalis* Romanoff, 1884, *Colias aurorina* Herrich-Schaffer, [1850], *Maculinea arion zara* Jachontov, 1935, *Agrodiaetus ninae* Forster, 1956, *Anthophora cinerea* Frieze, 1919, *Xylocopa violacea* Linnaeus, 1758, *Bombus armeniacus* Radoszkowski, 1877, including four Armenian endemics and two species from Annex II of Bern Convention. Besides these, another three species are proposed by us for inclusion into next edition of Armenian Red Book – *Phytoecia antoniae* (Reitter, 1889), *Phytoecia erivanica* Reitter, 1899 and *Rethera komarovi* (Christoph, 1885).

The ecosystems are moderately disturbed by grazing; potential threats are illegal bush cutting in the forest-less district and, especially, recreation activity, including further development of infrastructure. The territory has to be passed under the supervising of “Khosrov Forest” reserve with the status of sanctuary.

Mt. Odzasar and Yerakh Hill (Fig. 4, area 4).

Odzasar and Yerakh Hill are composing isolated hillside massive consisting from not so high Odzasar double-headed mountain (1470 m a.s.l.) and prolonged Yerakh hill in the North-East part of Ararat valley. Ecosystems presented are semidesert at the foot, then isolated islets of phrygana and dry steppe. Six species from Armenian Red Book occur here: **Chylotomus alexandri* Kalashian, 1999, **Poecilus festivus* (Chaudoir, 1868), *Anisoplia reitteriana* Semenov, 1903, **Tanyproctus araxidis* Reitter, 1901, **Tanyproctus vedicus* Kalashian, 1999, *Craspedostethus permodicus* (Faldermann, 1835). Four of these are Armenian endemics, and Odzasar is single known locality for *Chylotomus* worldwide which is of stressing importance of this locality. Besides, one species, *Stenosis armeniacus* (Motschulsky, 1849), is proposed for the next edition of Armenian Red Book.

Proposed status of this locality is creating sanctuary under the supervising of neighbouring “Khosrov forest” State Reserve or, at least, including it into buffer zone of the latter with controlled regime of nature management.

Vicinity of Surenavan (Fig. 4, area 5)

The territory assessed as important for entomofauna conservation is situated along foot of Urts Ridge in Eastern part of Ararat valley to the North of Surenavan village. The Ridge itself was the part of “Khosrov Forest” State Reserve but due to unclear (actually and unfortunately – quite clear) reasons was transferred to the possession of some private enterprise. But even foothills are characterized by interesting biota. Mainly stony semidesert with shrubby plots is presented here. Five red-booked species are registered here: *Coenagrion vanbrinkae* Lohmann, 1993, **Glaphyrus caucasicus* Kraatz, 1887, **Tanyproctus vedicus* Kalashian, 1999, **Cyphostethe semenovi* Reitter, 1895, *Satanas gigas* Eversmann, 1885. Among these, three species are endemics of Armenia. Besides, another four species are proposed by us for inclusion into next edition of Armenian Red Book – *Xanthomelina zajtzewi* (Eichler, 1924), *Oogaster piceus* (Ménétriés, 1832), *Stenosis armeniacus* (Motschulsky, 1849), **Apatophysis vedica* Danilevsky, 2008. Probably, protection status has to be assigning to **Sphenoptera bellamyi* Kalashian, 2014 recently described from here.

The ecosystems are rather undisturbed, potential threats are spring grazing, illegal bush cutting in the forest-less district. Proposed status of this locality is creating sanctuary under the supervising of neighbouring “Khosrov forest” State Reserve.

Proposals for protection of these territories with respective grounds are included into our Action Plan and will be submitted to the responsible body – Ministry of Nature Protection of RA. Besides, it is supposed to prepare booklets for each territory; as an example in the framework of our project respective booklet concerning Arailer Mountain was designed and published (Fig. 5).



Figure 5. Booklet. Arailer Mountain (cover and inside pages).

Recommendations and draft Action Plans for protection of endangered insect species and their most threatened containing ecosystems were produced. These documents need some

discussions and harmonization with some stakeholders including authorities of different levels, non-governmental organizations and scientists from academic and high education institutions.

Public awareness issues

This part of our work included preparation of illustrative and educational materials, their dissemination and conducting meetings and lectures among target groups of population. Poster presenting some most valuable and/or most attractive insect species occurring in Ararat valley and included into Red Book of the Republic of Armenia were prepared and published (in 50 copies, the example imaged in mid-term report); for each species brief information concerning their ecology, conservation value and status, distribution, current and possible protection measures were presented. Calendar for 2014 presenting several endangered insect species both included into modern edition of Armenian Red Book and some species, which were selected during our work for inclusion into the further edition was designed and published as well (in 100 copies, the example imaged in mid-term report).

All these materials were disseminated in local communities during our visits (see below), as well as among some other stakeholders including Ministry of Nature Protection of RA, some institutions of higher education in Yerevan (Yerevan State University, Armenian State Pedagogical University, Armenian National Agrarian University), Nature Protection Departments of the Marzpetarans (Governments of the provinces) situated in the study area (Ararat, Aragatsotn, Kotayk, Armavir), Armenian offices of international conservationists' organizations (WWF, REC). Besides, materials were passed to Headquarters of "Khosrov Forest" reserve (which includes also "Khor-Virap" and "Goravan sands" state sanctuaries) and protected areas of Reserve-parks complex of the Ministry of Nature Protection of RA ("Erebuni" reserve, "Vordan karmir" sanctuary) and brief presentations for staff were carried out.

Meetings and short time lectures with local communities' authorities and members (including scholars of the communities' schools) were conducted in 26 settlements, as follows:

Armavir Province – Jrrarat, Arazap, Margara, Khanjan, Dalarik;

Ararat Province – Goravan, Surenavan, Armash, Yeraskh, Masis, Artashat, Marmarashen;

Kotayk Province – Arzakan, Hatsavan, Geghard, Garni, Goght, Kaputan, Zar, Zovashen;

Aragatsotn Province – Apnagyugh, Byurakan, Antarut, Ashnak;

Yerevan district (with the status of province) – Mushavan, Nubarashen.

During lectures were presented general information on insects, their crucial role for functioning of terrestrial ecosystems, usefulness of some species for economics, necessity of

protection of insects together with their containing ecosystems, some general principles of nature conservation, including reed-booking process, etc. For concrete communities special attention was paid to the Red Book species occurring in the community's territory.

Minutes of some of these meetings are presented in Figs. 6, 7.



Fig. 6. Lecture in Secondary school of Goravan vill.



Fig.7. Meetings with local community of Surenavan vill.

Besides, some information dealing insect studies and conservation was presented as a lecture named “Contemporary methods of field entomological researches” at the “Workshop of modern field work techniques of biodiversity research” (12-13 June, 2013, Tsaghkadzor), partially sponsored by RSGF (Fig. 8). During this event students’ training in the field was carried out as well.



Figure. 8. Lecture at the workshop in Tsaghkadzor.

Capacity building issues

In the framework of the project one post-graduate and MSc student were trained in both field and laboratory methods of insect investigation, PhD thesis is under preparation, MSc diploma

on beetle's taxonomy was successfully presented in the Yerevan State University; besides, they got experience in presentation of conservation issues in the schools and local communities. Another issue of capacity building is distribution of illustrative and didactic materials in the schools where they will be continuously used in education process.

Farther dissemination of the materials

Out of timescale of the Project dissemination of the results is planned, as follows:

1. The project output (report, recommendations, draft Action Plan) will be submitted to the Ministry of Nature Protection, to the high educational institutions in Yerevan (e.g. Yerevan State University, Yerevan State Pedagogical University, etc.), and to Scientific Council of Scientific Centre of Zoology and Hydroecology of Academy of Sciences of Armenia.
2. Proposals for inclusion of additional insect species into further edition of Red Book of Armenia with datasheets will be submitted to the MoNP of RA which is responsible for Red Book management.
3. Documents on species proposed for inclusion into IUCN Red List of Threatened Species will be submitted to IUCN SSC.
4. Scientific papers will be prepared and published in peer-reviewed journals.
5. The project results will be shared with scientists in different conferences and workshop, in particular it is planned to report some results in the II International Scientific Conference "Biological diversity and conservation problems of the fauna of the Caucasus" which have to be held in coming September in Yerevan, Armenia.

Our Action Plan will be presented to the working group of 5th National Report to the CBD which is responsible for elaboration of country's Strategy and Action plan until 2020.

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Annex 1. List of species listed in the Red Book of the Republic of Armenia known from Ararat valley (species observed during project implementation are marked “*”)”)

NN	Taxa	Status	Comments
	Order Odonata		
	Family Coenagrionidae		
1.	<i>Lestes macrostigma</i> (Eversmann, 1836)	VU B1b+B2b	
2.	<i>Sympecma paedisca</i> (Brauer, 1877)	VU B1b+B2b	
3.	* <i>Coenagrion vanbrinkae</i> Lohmann, 1993	VU B1a+B2a	No protection measures applied yet
4.	<i>Erythromma lindeni</i> (Selys, 1840)	CR B2a	No protection measures applied yet
	Family Platycnemididae		
5.	<i>Platycnemis pennipes</i> (Pallas, 1771)	EN B1a+2a	No protection measures applied yet
	Family Aeshnidae		
6.	* <i>Hemianax ephippiger</i> (Burmeister, 1839)	EN B1ab(iii)+2ab(iii)	No protection measures applied yet
	Family Gomphidae		
7.	<i>Gomphus ubadschii</i> Schmidt, 1953	EN B1b+B2b	No protection measures applied yet
	Family Libellulidae		
8.	* <i>Libellula pontica</i> Selys, 1887	EN B2ab(iii)	No protection measures applied yet
	Order Orthoptera		
	Family Acrididae		
9.	* <i>Nocarodes nodosus</i> Mistschenko, 1951	CR B2a	See Comment in Table 2
10.	* <i>Gomphocerus armeniacus</i> (Uvarov, 1931)	VU B1a+B 2a	
	Family Bradyporidae		
11.	* <i>Bradyporus dilatatus</i> Stal, 1875	VU B1a+B2a	
	Family Tettigoniidae		
12.	* <i>Phytodrymadusa armeniaca</i> Ramme, 1939	EN B1a+B2a	**
13.	<i>Scotodrymadusa satunini</i> (Uvarov, 1916)	CR B2ab(iii)	No protection measures applied yet
	Order Homoptera		
	Family Margarodidae		
14.	* <i>Porphyrophora hammelii</i> Brandt, 1833	CR B1b(i,ii,iii)+2ab(i,i i,iii)	See Comment in Table 2 **
	Order Coleoptera		
	Family Carabidae		
15.	* <i>Trechus infuscatus</i> Chaudoir, 1850	CR B2a	
16.	<i>Chylotomus alexandri</i> Kalashian, 1999	CR B2a	No protection measures applied yet; See Comment in Table 2
17.	* <i>Poecilus festivus</i> (Chaudoir, 1868)	VU B1b(iii)+B 2b(iii)	**
	Family Cholevidae		
18.	<i>Philomessor kalashiani</i> Khnzorian, 1988	CR B1a+B2a	No protection measures applied yet
	Family Scarabaeidae		
19.	<i>Glaphyrus calvaster</i> Zaitzev, 1923	EX	The species is assessed as EX; the last known specimens were

			collected 1931
20.	* <i>Glaphyrus caucasicus</i> Kraatz, 1887	EN B1ab(iii)+B2ab(iii))	
21.	<i>Adoretus rubenyani</i> Kalashian, 2002	CR B1a+B2a	No protection measures applied yet
22.	* <i>Anisoplia reitteriana</i> Semenov, 1903	EN B1ab(iii)+B2ab(iii))	
23.	* <i>Pharaonus caucasicus</i> (Reitter, 1893)	CR B1ab(ii,iii,v)+B2a b(ii,iii,v)	
24.	* <i>Tanyproctus araxidis</i> Reitter, 1901	EN B1a+B2a	
25.	* <i>Tanyproctus vedicus</i> Kalashian, 1999	CR B1a+B2a	No protection measures applied yet **
26.	<i>Pseudopachydema medvedevi</i> Khnzorian, 1971	CR B1a+B2a	No protection measures applied yet
	Family Elateridae		
27.	<i>Aeoloides figuratus</i> (Germar, 1844)	VU B1a	
28.	* <i>Cardiophorus araxicola</i> Khnzorian, 1970	CR B1ab(ii,iii,v)+B2a b(ii,iii,v)	See Comment in Table 2
29.	<i>Cardiophorus pseudogramineus</i> Mardjanian, 1977	EN B1a	
30.	* <i>Craspedostethus permodicus</i> (Faldermann, 1835)	VU B1b(iii)+B2b(iii)	
	Family Buprestidae		
31.	* <i>Acmaeoderella pellitula</i> (Reitter, 1890)	EN B1a+B2a	
32.	* <i>Sphenoptera geghardica</i> Kalashian & Zykov, 1994	EN B1ab(iii)	
33.	<i>Sphenoptera khnzoriani</i> Kalashian, 1996	EN B2a	See Comment in Table 2
	Family Meloidae		
34.	* <i>Mylabris sedilithorax</i> Sumakov, 1924	EN B1a	See Comment in Table 2
	Family Alleculidae		
35.	* <i>Cteniopus persimilis</i> Reitter, 1890	EN B1a+B2a	No protection measures applied yet
	Family Tenebrionidae		
36.	* <i>Adelphinus ordubadensis</i> Reitter 1890	EN B1a	No protection measures applied yet
37.	* <i>Armenohelops armeniacus</i> Nabozhenko, 2002	EN B1a	
38.	* <i>Cylindronotus erivanus</i> (Reitter, 1901)	EN B1a	No protection measures applied yet; see Comment in Table 2
39.	* <i>Ectromopsis bogatchevi</i> (Khnzoryan, 1957)	CR B2ab(iii)	No protection measures applied yet; see Comment in Table 2
40.	* <i>Laena constricta</i> Khnzorian, 1957	EN B1ab(iii)+B2ab(iii))	**
41.	* <i>Cyphostethe semenovi</i> Reitter, 1895	EN B 1ab(iii)+B2ab(iii)	**

	Family Cerambycidae		
42.	* <i>Cerambyx cerdo acuminatus</i> Motschulsky, 1852	VU B1a+B2a	
43.	* <i>Dorcadion kasikoporanum</i> Pic, 1902	CR B1a	No protection measures applied yet
44.	<i>Conizonia kalashiani</i> Danilevsky, 1992	CR B1a	No protection measures applied yet; See Comment in Table 2
45.	* <i>Phytoecia pici</i> Reitter, 1892	EN B1a	
46.	* <i>Agapanthia korostelevi</i> Danilevsky, 1985	EN B1a+B2a	
	Family Chrysomelidae		
47.	* <i>Cryptocephalus araxicola</i> Khnzorian, 1968	EN B1ab(iii)	See Comment in Table 2
	Family Curculionidae		
48.	<i>Cyclobaris richteri</i> Ter-Minasian, 1955	CR B1ab(iii)+B2ab(iii)	No protection measures applied yet; See Comment in Table 2
49.	* <i>Baris mirifica</i> Khnzorian, 1958	CR B1ab(iii)+B2ab(iii)	No protection measures applied yet; See Comment in Table 2
	Order Lepidoptera		
	Family Papilionidae		
50.	* <i>Parnassius mnemosyne rjabovi</i> Sheljuzhko, 1935	VU B1a	
51.	* <i>Parnassius apollo kashshenkoi</i> Sheljuzhko, 1908	VU A1cde	
52.	* <i>Papilio alexanor orientalis</i> Romanoff, 1884	VU B1ab(iii)+B2ab(iii)	
	Family Pieridae		
53.	<i>Artogeia bowdeni</i> (Eitschberger, [1984])	CR B1a+B2ab(iii)	
54.	* <i>Colias aurorina</i> Herrich-Schaffer, [1850]	VU B1b(iii)+B2b(iii)	
55.	* <i>Colias chlorocoma</i> Christoph, 1888	VU B1ab(iii)+B2ab(iii)	
	Family Satyridae		
56.	<i>Proterebia afra hyrcana</i> (Staudinger, 1901)	VU B1a+B2a	
	Family Nymphalidae		
57.	* <i>Melitaea vedica</i> Nekrutenko, 1975	EN B1a+B2a	See Comment in Table 2
	Family Lycaenidae		
58.	* <i>Tomares romanovi</i> (Christoph, 1882)	VU B1ab(iii)+B2ab(iii)	
59.	* <i>Maculinea alcon monticola</i> (Staudinger, 1901)	VU B1a+B2a	
60.	* <i>Maculinea arion zara</i> Jachontov, 1935	VU B1a+B2a	
61.	* <i>Plebejus transcausicus</i> (Rebel, 1901)	EN B1a+B2ab(iii)	
62.	* <i>Neolysandra diana</i> (Miller, 1923)	EN B1a+B2a	No protection measures applied yet
63.	* <i>Agrodiaetus eriwanensis</i> Forster, 1960	EN B1a+B2a	
64.	<i>Agrodiaetus huberti</i> Carbonell, 1993	EN B1a+B2a	

65.	* <i>Agrodiaetus ninae</i> Forster, 1956	VU B1a+B2a	
66.	<i>Agrodiaetus surakovi</i> Dantchenko et Lukhtanov, 1994	EN B1a+B2a	
	Family Sphingidae		
67.	* <i>Hyles hippophaes caucasica</i> (Denso, 1913)	VU B1a+B2a	
68.	* <i>Proserpinus proserpina</i> (Pallas, 1772)	VU B1a+B2a	
	Family Geometridae		
69.	<i>Cidaria avetianae</i> Wardikian, 1974	EN B1a+B2a	
70.	<i>Eupithecia alexandriana</i> Wardikian, 1972	EN B1a+B2a	No protection measures applied yet
71.	<i>Eupithecia hamleti</i> Wardikian, 1985	CR B2a	No protection measures applied yet
72.	<i>Eupithecia sergiana</i> Wardikian, 1972	CR B2a	No protection measures applied yet
73.	<i>Ortholitha kuznetzovi</i> Wardikian, 1957	EN B1a+B2a	No protection measures applied yet
	Family Arctiidae		
74.	<i>Axiopoena karelini</i> Ménétriés, 1842	VU B 1ab(iii)+B 2ab(iii)	No protection measures applied yet
	Order Hymenoptera Family Megachilidae		
75.	<i>Lithurge fuscipenne</i> Lepeletier, 1841	VU B1a+B2a	No protection measures applied yet
76.	<i>Megachile deseptoria</i> Peres, 1884	VU B1a+B2a	
77.	<i>Osmia cerinthides</i> F. Morawitz, 1876	VU B1a+B2a	
78.	* <i>Archianthidium pubescens</i> Morawitz, 1872	EN B2a	No protection measures applied yet
	Family Anthophoridae		
79.	<i>Anthophora cinerea</i> Frieze, 1919	VU B1a+B2a	
80.	<i>Anthophora robusta</i> Klug, 1845	VU B1a+B2a	
81.	* <i>Tetralonia macroglossa</i> Illiger, 1806	EN B2a	**
82.	* <i>Xylocopa violacea</i> Linnaeus, 1758	VU B1a+B2a	**
	Family Apidae		
83.	* <i>Bombus armeniacus</i> Radoszkovski, 1877	VU B1a+B2a	
84.	* <i>Bombus niveatus</i> Kriechbaumer, 1870	VU B1a+B2a	
85.	<i>Bombus alagesianus</i> Skorikov, 1937	EN B1a	
	Family Formicidae		
86.	<i>Crematogaster subdentata</i> (Mayr, 1877)	EN B2a	
87.	<i>Cataglyphis machmal</i> Radtschenko & Arakelian, 1991	CR B2a	No protection measures applied yet
	Order Diptera Family Asilidae		
88.	* <i>Satanas gigas</i> Eversmann, 1885	VU B1ab(iii)+B2ab(iii)	**
89.	* <i>Machimus erevanensis</i> V. Richter, 1963	EN B1ab(iii)+B2ab(iii)	See Comment in Table 2

* Species registered during Project implementation.

** Species for which quite new localities were revealed.

Version: Final Page 7/160. MIME Deliverable 23 " Final Report. List of Figures. Figure 1: a, b, C and d-weighting [inchem, 2008].26. The most important limitation to the validation of the MIME Project is the scepticism of the air operators. The first seminar planned was cancelled because of miscommunication on the intended outcome of the. MIME project. One of the most important goals for the second period of the project has been to improve. this communication and manage the expectations of the air operators with respect to the results of MIME. F) Interactions between projects and validation exercises: The list of projects and validation. exercises has been built around the Program Validation Objectives. Project Management Skills, Final Report. Page 2. 2. Introduction. The work of the Project Management (PM) Skills Task Force began in August, 2009. We started with a careful study of our Charge, and two references: the Background preceding the charge and the UC Collaborative Digital Projects Principles, Roles, and Responsibilities document that had been prepared in 2007, following the VDX Implementation Project. Our final recommendations are the main body of this report, and, as mentioned above, they are based upon input from the ACGs and SOPAG as well as analysis of the survey responses. We have also drawn upon our own individual experiences as project managers and as UC library staff members to inform our thinking. Project evaluation series. Final Report of the Project "Strengthening Agricultural Market Information Systems. Globally and in Selected Countries (Bangladesh, India and Nigeria) Using Innovative Methods and Digital Technology". FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS OFFICE OF EVALUATION November 2017. Food and Agriculture Organization of the United Nations Office of Evaluation (OED) This report is available in electronic format at: <http://www.fao.org/evaluation> The designations employed and the presentation of material in this information product do not imply the expression of