

Шаумян	15	1,4	360	33,6	430	40,2	231	21,6	30	2,8	4	0,4
Шуши	12	1,1	335	31,4	433	40,7	245	23,0	36	3,4	4	0,4
Маргуні	11	1,2	272	30,1	498	55,2	105	11,7	13	1,4	4	0,4

Во флорах Гадрутского, Кашатагского и Мартунинского районов наиболее распространены древне-средиземноморские элементы.

### ЗАКЛЮЧЕНИЕ

Анализ хорологической структуры указывает на неоднородность флоры Арцаха и свидетельствует о тесных связях флоры исследуемой территории с одной стороны с флорой Древнего Средиземноморья, с другой – с флорой Бореального подцарства.

Соответственно, можно заключить, что по территории Арцаха проходит граница между Бореальным и Древнесредиземноморским подцарствами (Тахтаджян, 1978), что подтверждается и значительным увеличением влияния Древнего Средиземноморья при продвижении по территории Арцаха с севера на юг, с уменьшением высоты местности над уровнем моря и увеличением аридности климата.

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*Արցախի հանրապետության պետական համալսարանի, կենսաբանական ֆակուլտետի, Կենսաբանության և Գեոբուսաբանության ֆակուլտետի, Մարտնոցային Կարաբաղի ֆլորայի խումբի պրոֆեսոր*  
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### SOME NEW RARE ECOSYSTEMS OF ARMENIA

The article contains brief descriptions of 16 new ecosystems that should be included in the classification scheme of habitats (EUNIS) adapted to the conditions of Armenia. These ecosystems were highlighted in the preliminary work on the elaboration of the Red Book of Ecosystems of Armenia, which should include all rare ecosystems of the republic, the disappearance or degradation of which can seriously damage the biodiversity of the republic.

*Rare ecosystems, Armenia, biodiversity conservation*

**Файвуш Г. М., Алексанян А. С., Ованисян Р. И. Некоторые новые редкие экосистемы Армении.** В статье приводятся краткие описания 16 новых экосистем, которые должны быть включены в адаптированную к условиям Армении классификационную схему местообитаний EUNIS. Данные экосистемы были выделены в ходе предварительных работ по составлению Красной книги экосистем Армении, в которую

должны быть включены все редкие экосистемы республики, исчезновение или ухудшение состояния которых может нанести серьезный ущерб биоразнообразию республики.

*Редкие экосистемы, Армения, сохранение биоразнообразия*

**Ֆայվուշ Գ. Մ., Ալեքսանյան Ա. Ս., Հովհաննիսյան Հ. Ի. Հայաստանի որոշ նոր հազվագյուտ էկոհամակարգեր.**

Հոդվածում բերված է 16 նոր էկոհամակարգերի նկարագրություն, որոնք ընդգրկվելու են Հայաստանի պայմաններին հարմարեցված EUNIS դասակարգման սխեմայում: Այս էկոհամակարգերը առանձնացվել են Հայաստանի էկոհամակարգերի Կարմիր գրքի ստեղծման նախնական աշխատանքների ընթացքում: Այս գրքում ընդգրկվելու են հանարապետության բոլոր հազվագյուտ, անհետացման եզրին գտնվող էկոհամակարգերը, որոնց վիճակի վատթարացումը կարող է մեծ վնաս հասցնել հանրապետության կենսաբազմազանությանը:

*Հազվագյուտ էկոհամակարգեր, Հայաստան, կենսաբազմազանության պահպանություն*

The richness of Armenia's biological diversity (about 3,800 species of vascular plants, 428 species of algae, 399 moss species, 4,207 species of fungi, 464 lichen

species, 549 vertebrate species, about 17,200 species of invertebrates (The fifth ..., 2014) is connected with the richness and diversity of natural ecosystems. All main ecosystems of the Caucasus are represented in Armenia (except for humid subtropics) - deserts and semi-deserts, steppes, meadow-steppes, forests and open forests, subalpine and alpine vegetation, intrazonal ecosystems.

Ecosystems and vegetation cover are extremely rapidly changing elements of nature. Succession changes in vegetation caused by biogenic and abiogenic factors change both the vegetation in general, and the distribution and ratio of habitats. In recent centuries, the anthropogenic factor has a very serious impact on vegetation and ecosystems. It has to be noticed, that at the first stages of the human civilization development, when primitive people were nomads and, mainly, collectors, the effect of the anthropogenic factor on nature was minimal, on average at the level of the zoogenic factor. Later, when people moved to a settled way of life, the human influence is intensified, the transformation of natural ecosystems into agroecosystems, agrocenoses, pastures, hayfields, and also into ecosystems of human settlements begins. With the passage of time, this influence was intensified and intensified, in addition to direct impact on natural ecosystems, indirect pollution of the environment by greenhouse gases, wastes, etc. appeared. All this leads to a change and destruction of existing ecosystems and the emergence of new ones. The same leads to the emergence of new habitats, very often synanthropic. All this causes, on the one hand, the reduction of populations of local rare species of plants and animals, up to their complete extinction, and on the other hand - facilitates the penetration and spread of foreign, often invasive and unwanted species. From the point of view of conservation of nature and biodiversity, undoubtedly, the most important are natural, preferably unchanged habitats, which represent the most important elements of the country's biodiversity, in particular endemic plants and animals. However, when studying biodiversity in general and working in practical purposes, it is absolutely necessary to know about all habitats in the country.

In 2016, the Government of the Republic of Armenia approved the "Strategy and National Action Plan for the Conservation of Biodiversity of Armenia" (Strategy ..., 2016), one of the main targets of which is to prevent the loss and degradation of natural habitats. And in connection with this, one of the tasks was to assess the vulnerability of rare ecosystems of the Republic both from human impact, and from climate change and other factors.

In 2016, we published a monograph "Habitats of

Armenia" (Fayvush, Aleksanyan, 2016), in which we used the adapted scheme of EUNIS habitat classification and provided full (for that time) annotated catalog of ecosystems of Armenia. Over the past two years, we have continued to study the ecosystems of the Republic, aiming to identify the rarest of them, in order to prepare the Red Book of Ecosystems of Armenia, like the Red Book of Bulgaria (Biserkov et al., 2015) or European Ecosystems (Janssen et al., 2016) according to the methodology, proposed by the IUCN (Bland et al., 2016). In the course of this work, we were faced with the fact that a number of rare ecosystems, often containing rare species included in the Red Data Book of Armenia (Tamanyan et al., 2010), did not find their place in the existing EUNIS system. We decided to describe them as new ones (like in our monograph), placing them into the EUNIS classification scheme on a corresponding place with the addition of the suffix "AM". It should be noted that the IUCN proposes to use its own ecosystem and habitat classification scheme (<http://www.iucnredlist.org/technical-documents/classification-schemes/habitats-classification-scheme-ver3>), but this scheme is very general and is intended to indicate the habitats of individual rare species of animals and plants. Therefore, we prefer to adhere to the EUNIS system using its principles and methods.

In this work we use the scheme of floristic regions of Armenia elaborated by Armen Takhtajan (Тахтаджян, 1954) with changes proposed in our previous work (Таманян, Файвуш, 2009).

Below, we give brief descriptions of the new rare ecosystems (habitats) of Armenia identified by us. Later they will be included in the Red Book of Ecosystems of Armenia.

### C. Inland surface waters

#### C1.2 – Permanent mesotrophic lakes, ponds and pools

**C1.2241-AM** – Floating *Utricularia intermedia* colonies. Floating bladderwort (*Utricularia intermedia*) colonies in not very rich in trophic substances waters. The ecosystem occupies a very small area and is represented only in two small lakes in the Lori floristic region on the Lori plateau (Klor and Kiz-Kala Lakes) in the middle mountain belt.

#### C3.2 – Water-fringing reedbeds and tall helophytes other than canes

**C3.21111-AM** – Freshwater *Phragmites australis* and *Thelypteris palustris* beds. Very rare ecosystem in Armenia, in fact only one such habitat is known -

\* See color illustration pages

the island on Lake Chmoe (photo 1)\*in the Darelegis floristic region near the village Martiros. Here in the first layer *Phragmites australis* dominates, and in the second - *Thelypteris palustris* (photo 2)\*. Also *Carex acuta*, *C. diandra*, *C. pseudocyperus* are abundantly represented, and in the water side by side grow *Menianthes trifoliata* and *Utricularia vulgaris*.

**C3.291-AM** – Water-fringing large sedge communities with *Carex acuta* dominance (photo 3)\*. A relatively rare in Armenia species *Elatine alsinastrum* is growing here, and in the water near the shore a rare included in the Red Book of Armenia species *Callitriche hermaphroditica* is represented. This ecosystem is best represented on Lake Chili in the Aparan floristic region, but here it suffers very much from overgrazing, as the lake serves as a watering place for all animals that are grazed in its vicinity.

#### **E. Grasslands and lands dominated by forbs, mosses or lichens**

##### **E1.2 – Perennial calcareous grassland and basic steppes**

**E1.2E13-AM** – Mountain *Stipa-Festuca* steppes with complex *Stipa* species dominance – *Stipa transcaucasica*, *S. lessingiana*, *S. capillata*). In the Shirak floristic region in vicinity of Arteni Mountain in the ecosystem *Rhaponticoides hajastana* is a codominant, and the plant community contains the very rare Armenian endemic *Centaurea takhtadjanii* and some other not common species: *Centaurea pseudoscabiosa* ssp. *glehnii*, *C. carduiiformis*, *Cousinia brachyptera*, *Tomanthea aucheri*, *Eryngium campestre*.

##### **E1.4 – Mediterranean tall-grass and wormwood – *Artemisia* - steppes**

**E1.4511-AM** – Wormwood semi-desert with *Iris lycotis* (photo 4)\*. The ecosystem occupies a small area in the eastern part of the Ararat valley in the Ararat floristic region in the vicinity of the village Tigranashen at an altitude of 1200-1300 m above sea level. *Artemisia fragrans* is a dominant in the community, and *Iris lycotis* (rare, included in the Red Book of Plants of Armenia species) is very abundantly represented. The composition of vegetation also includes *Stipa arabica*, *Moltkia coerulea*, *Taeniatherum crinitum*, *Kochia prostrata*, *Koelpinia linearis*.

##### **E2.1 – Permanent mesotrophic pastures and aftermath-grazed meadows**

**E2.1611-AM** – Grass meadow-steppes with *Acanthus dioscoridis*. Only one such ecosystem is known in Armenia - at the foot of Hadis Mountain in the Ararat floristic region. *Festuca valesiaca*, *Koeleria macrantha* and *Dactylis glomerata* are dominants in the ecosystem, *Hordeum bulbosum*, *Eremopoa persica*,

*Stipa tirsia* are quite abundant, and the rarest in Armenia included in the Red Book of *Acanthus dioscoridis* is abundant in relatively stony places. In the ecosystem, *Rosa spinosissima* and *Cerasus incana* grow as separate bushes, and *Scutellaria orientalis*, *Stachys atherocalyx*, *Phlomis tuberosa*, *Cerintho minor*, *Crambe orientalis*, *Coronilla varia*, *Verbascum pyramidatum*, *Vicia grossheimii* are also present in the grass cover.

#### **F. Heathland, scrub and tundra**

##### **F3.2 – Submediterranean deciduous thickets and brushes**

**F3.24761-AM** – Shibliak – *Paliurus spina-christi* thorn scrub with *Iris iberica* (photo 5)\*. A very rare ecosystem (it is known only in vicinity of Ptghavan village in Idjevan floristic region), where *Paliurus spina-christi* is a dominant, and the rarest in Armenia *Iris iberica* grows very abundantly. The ecosystem is represented in the lower mountain belt at an altitude of 400-600 m above sea level. In its composition *Rosa spinosissima*, *Bothriochloa ischaemum*, *Cynodon dactylon*, *Medicago lupulina*, *Teucrium polium* are represented as well.

**F3.24762-AM** – Shibliak – *Paliurus spina-christi* thorn scrub with *Paeonia tenuifolia* (Photo 6)\*. The only ecosystem in Armenia in which *Paliurus spina-christi* is a dominant, and the rare included in the Red Book of Armenia *Paeonia tenuifolia* is quite abundantly represented. The ecosystem is represented in South Zangezur floristic region in the vicinity of Syunik village, on the slopes of Khaladge river gorge. *Jasminum fruticans*, *Rosa spinosissima*, *Bothriochloa ischaemum*, *Tulipa sosnovskyi* (included in the Red Book of Armenia), *Cousinia takhtadjanii*, *Ophrys oestriifera*, *Aegilops cylindrica*, *Teucrium polium*, *Hordeum bulbosum* participate in the composition of the ecosystem.

##### **F9.1 – Riverine scrub**

**F9.131-AM** – Montane river gravel low brush with *Chamaenerion dodonaei* (photo 7)\*. A very rare ecosystem that occurs only in the Lori floristic region in the foothills in places where mountain rivers enter Lori Mountain plateau. The composition of the ecosystem includes with a small abundance of *Salix caprea* (on the edges), *Filipendula ulmaria*, *Sanguisorba officinalis*. There are only two very small habitats known - in vicinity of Katnarat village and on the river Dzoraget.

#### **G. Woodland, forest and other wooded land**

**G1.A – Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland**

\* See color illustration pages

**G1.A1D121-AM** – Oak forests (*Quercus ibérica*) with *Crataegus spp.* and *Cornus mas* and *Coronaria coriacea* in undergrowth (photo 8)\*. *Carex humilis*, *Elymus caucasicus*, *Poa nemoralis*, *Bromus japonicus*, *Origanum vulgare* also are represented in the grass cover. The ecosystem occupies very small area in the South Zangezur floristic region in the vicinity of Shikahoh village.

**G1.A324-AM** – Hornbeam forests with *Staphyllea pinnata* in undergrowth (photo 9)\*. A rare ecosystem that occupies an area of 4200 m<sup>2</sup> at an altitude of 900 m above sea level on the northern gentle slope (steepness to 25°) in the vicinity of Barekamavan village in the Noyemberyan District (Ijevan floristic region). The forest type here is mixed hornbeam forest; the hornbeam (*Carpinus betulus*) is a dominant. Linden and walnut and occasionally beech accompany it. The undergrowth is very dense, *Staphyllea pinnata* and *Cornus mas* are dominants in the undergrowth. On the investigated site, 879 *Staphyllea pinnata* bushes with a height of 0.5 to 5 m were recorded.

#### H. Inland unvegetated or sparsely vegetated habitats

##### H2 – Screes

**H2.3511-AM** – Mobile screes in alpine belt on Aragats Mountain. Young screes, usually on steep slopes with very characteristic floristic composition including *Alopecurus tuscheticus*, *A. textilis*, *Erysimum gelidum*, *Alchemilla sericea*, *Campanula saxifraga ssp. aucheri*, *Allium schoenoprasum*, *Coluteocarpus vesicaria*, *Catabrosella fibrosa*, *Veronica orientalis*, *Corydalis alpestris*, *Catabrosella araratca*, *Sibbaldia procumbens*, etc. Some rare included in the Red Book of plants of Armenia grows in this ecosystem: *Draba araratca*, *Draba hispida*, *Didymophysa aucheri*, *Isatis takhtadjanii*, *Pseudovesicaria digitata*, *Dracocephalum botryoides*.

**H2.3512-AM** – Mobile screes in alpine belt on Gegham range. Young screes, usually on steep slopes with very characteristic floristic composition including *Alopecurus tuscheticus*, *A. textilis*, *Erysimum gelidum*, *Alchemilla sericea*, *Campanula saxifraga ssp. aucheri*, *Allium schoenoprasum*, *Coluteocarpus vesicaria*, *Catabrosella fibrosa*, *Veronica orientalis*, *Corydalis alpestris*, *Catabrosella araratca*, *Sibbaldia procumbens*, etc. Some rare included in the Red Book of plants of Armenia grows in this ecosystem: *Draba araratca*, *Eunomia rotundifolia*, *Vavilovia formosa*, *Didymophysa aucheri*, *Nepeta lamiifolia*

**H2.3513-AM** – Mobile screes in alpine belt on Zangezur and Meghri ridges and on Khustup Mountain.

Young screes, usually on steep slopes in South Zangezur and Meghri floristic regions with very characteristic floristic composition including *Allium kunthianum*, *A. schoenoprasum*, *A. szovitsii*, *Bupleurum polyphyllum*, *Aetheopappus pulcherrimus*, *Sedum oppositifolium*, *Carex tristis*, *Alopecurus aucheri*, *Bromopsis variegata*. Some rare included in the Red Book of plants of Armenia grows in this ecosystem: *Silene khustupica*, *Carum komarovii*, *Campanula zangezura*, *Silene depressa*, *Silene raddeana*, *Scrophularia amplexicaule*, *Viola caucasica*, *Thlaspi zangezuricum*, *Vavilovia formosa*, *Dracocephalum botryoides*.

##### H3 – Inland cliffs, rock pavements and outcrops

**H3.1B221-AM** – Ancient volcanic cliffs of Arteni Mountain. The ecosystem is developed on rocks and cliffs that has remained from ancient volcanic activity and are not covered by later lava strata from Aragats Mountain. The floristic composition includes species typical for such habitats (*Asplenium septentrionale*, *Cystopteris fragilis*, *Cheilanthes persica*, *Ephedra procera*, *Scariola orientalis*, *Onosma tenuiflora*, *Arabis caucasica*, *Campanula crispa*, *Nepeta mussinii*, *Scutellaria orientalis*, *Cotoneaster armena*, *Parietaria elliptica* and others. ), as well rare, included in the Red Book of plants of Armenia: *Campanula massalskyi*, *Hieracium pannosum*, *Bupleurum sosnovskyi*.

**H3.411-AM** – Armenian wet inland cliffs with *Adiantum capillus-veneris* (photo 10)\*. Ecosystem is represented on Urts mountain range, in the gorges of Arpa and Vorotan rivers (“Devil bridge”) on the altitude 900-1300 m above the sea level. *Adiantum capillus-veneris* is included in the Red Book of plants of Armenia.

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#### MAIN ECOSYSTEMS OF THE LAKES OF LORI PLATEAU (ARMENIA)

The article gives a brief description of the ecosystems of the lakes of the Lori plateau. These ecosystems belong to categories C (Inland surface waters) and D (Mires, bogs and fens). Ecosystems of the category D are located either at the edges of lakes or in the place of overgrown or drying lakes. Among the ecosystems listed in article 10 are described for the first time.

*Ecosystems, EUNIS, Armenia, Lori Lakes*

**Туманян А. А., Алексанян А. С., Файвуш Г. М. Основные экосистемы озер Лорийской нагорной равнины Армении.** В статье приводится краткая характеристика экосистем озер Лорийской нагорной равнины. Приведенные экосистемы относятся к местообитаниям категорий С (Внутриконтинентальные поверхностные воды) и D (Болота и переувлажненные местообитания), при этом экосистемы второй категории располагаются или по краям озер, или на месте зарастающих или высыхающих озер. Среди приведенных в статье экосистем 10 описываются впервые.

*Экосистемы, EUNIS, Армения, Лорийские озера*

**Թումանյան Ա. Ա., Ալեքսանյան Ա. Ս., Ֆայվուշ Գ. Մ. Լոռվա սարահարթի լճերի էկոհամակարգերը.** Հոդվածում բերված են Լոռվա սարահարթի լճային էկոհամակարգերի համառոտ բնութագրերը: Նկարագրված էկոհամակարգերը պատկանում են բնակմիջավայրերի C (ներգամաքային մակերեսային ջրեր) և D (ճահիճներ և գերխոնավ բնակմիջավայրեր) կատեգորիաներին: Ընդ որում երկրորդ կատեգորիային պատկանող էկոհամակարգերը գտնվում են կամ լճերի եզրերին կամ չորացող ու ճահճացող լճերի տեղում: Հոդվածում բերված էկոհամակարգերից 10-ը նկարագրվում են առաջին անգամ:

*Էկոհամակարգեր, EUNIS, Հայաստան, Լոռվա լճեր*

The Lori Mountain plateau is located in Northern Armenia and is included in the Lori floristic region (Takhtadjan, 1954; Tamanyan, Fayvush, 2009). There are about 30 small relict lakes (from 0.5 to 10 hectares) on average, located at an altitude of 1400-1600 m above the sea level. The plain, along with these lakes, stands out as the "Important Plant Area" (Asatryan, Fayvush, 2013) and is included in the number of areas of particular interest to the ecological network "Emerald" (Fayvush et al., 2016).

The flora and vegetation of the Lori lakes are very original and interesting from the botanical and environmental points of view. Thus, the flora of 11 lakes studied by us includes 187 species of vascular plants belonging to 86 genera from 34 families (Khandjan, Tamanyan, 2011; Tamanyan, 2014; Fayvush et al., 2014), 8 of which are included in the Red Book of Plants of Armenia (Tamanyan et al., 2010). The research of vegetation in the Lori Lakes was initiated by A. L. Takhtadjan (1939), and then A. M. Barsegyan during many years studied the vegetation, summarizing the results in his monograph (Barsegyan, 1990). The current state of the flora and vegetation of 11 lakes was investigated by A. A. Tumanyan (2014).

In this article we tried to summarize all available data and present a scheme of the ecosystems of the lakes and surroundings areas of the Lori Mountain plateau on the basis of the habitats classification scheme of EUNIS (Fayvush, Aleksanyan, 2016) with new additions and some changes. Below all the ecosystems identified by us are shortly described (the suffix "AM" is used for ecosystems not listed in previous publications and