

The number and the age structure of rare endemic species cenopopulation *Lonicera Iliensis* Pojark

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Abstract. The article is dedicated to the studies of number and age structure of three populations and nine cenopopulations of a rare and endemic species from of Ile-Balkhash region, Kazakhstan, Honeysuckle Ili. The provided analyses has determined that the age spectrum maximum of cenopopulations 1-4 and 7-9 goes to average generative individuals, in cenopopulation 5 – to vegetative individuals, in cenopopulation 6 – to vegetative and average generative ones as well. All the populations are complex; they contain the individuals of pre-generative, generative, and post-generative states. Vital status of Honeysuckle Ili is various in those three populations. The main concern is about population No. 1 in the downstream of the Ili River, which is situated near with locality using this area for grazing. Moreover the climate conditions of the Ili River's downstream are getting more and more arid. So, in order to save the population No. 1 of Honeysuckle Ili, it is necessary to take this territory under the control. The vital status of populations No. 2 and No. 3 is good and the process of recovery goes normally.

[Mukhitdinov N.M., Karasholakova L.N., Kurmanbayeva M. S. **The number and the age structure of rare endemic species cenopopulation *Lonicera Iliensis* Pojark.** *Life Sci J* 2014;11(6s):459-463] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 96

Keywords: population, cenopopulation, number, age structure.

Introduction

The problem of protection and rational use of plants gene pool, including endemic and rare ones, is getting more and more urgent. In order to save and protect plants species, especially those, which natural conditions raise serious concerns, and also to provide rational use of plant resources, the registration of all the plants species in need of protection should be done.

One of those species is *Lonicera iliensis* Pojark., which exists only in Kazakhstan. That is why the other countries do not have any data about population of Honeysuckle Ili. The foreign sources are providing some data about populations of other species of this plant. *Lonicera iliensis* Pojark. is a rare, almost endemic species, which areal is decreasing rapidly. The areal and the occurrence, the middle watershed of the Ili River, are not large, because the biggest part is covered with water of the Kapchagay Reservoir [11]. *Lonicera iliensis* Pojark. propagates by seeds. It blooms in May-June, fructifies in June-July. The habitat is watershed valleys of the Ili River, in lower mountain and piedmont plains, in floodplain riparian forests, poplar- and willow scrubs. It is a mesophyte.

The rare and endemic plants are very important components of flora, that is why they should be taken into the account during various ecological researches. The majority of them is mentioned in the IUCN Red List of Threatened Species and formally is protected by Law.

The study of rare and endemic plant species is a part of environmental studies; despite its integrity, population is genetically heterogeneous. Populations are isolated from one another geographically and genetically. Geographical borders, for example, could be mountain systems and bodies of water.

The population method in botanic is getting very popular, because it is based not only on visual methods, but also takes into account the great verity of data, which characterize the development of species in definite conditions [4].

The majority of our time scientists study the cenopopulations of plant species, which provide the stability of certain communities formed by them, in general – protection of biodiversity [4,12,15].

Cenopopulation of plant species (phytocenopopulation) is an aggregate of the same species individuals within the same plants community. Cenopopulation, as well as any other system is in a process of development. Its dynamics is determined by the influence of abiotic and biotic factors. Often the natural flow of dynamic processes is damaged by human activities.

The various strategies of *Lonicera Confusa* species' management and protection were proposed, including the protection from the human activity, in order to facilitate the natural regeneration, the structure of germplasm and growing up the plants collected from different populations in order to provide the choice for elite lines, which could be used in agricultural practice of medical materials [9].

For example, the evaluation of projected changes by the comparison of intraspecific competitiveness of the North American Honeysuckle Japanese (*Lonicera japonica* Thunb.) was held [1].

Honeysuckle Japanese (*Lonicera japonica* Thunb.) possesses morphological and physiological peculiarities which provide its domination on fragmented landscapes. Due to vegetative reproduction and competitiveness the plant increases the territory of its areal. This plant is widely used in traditional Asian medicine and decoration. Unfortunately, it was prohibited to use it in some regions because of the decrease in the quantity of those plants. Combination of cutting and foliar with glyphosate was proved as effective method of control. Besides, the planting of Honeysuckle Japanese in the private gardens should be encouraged, this way it will be possible to increase and to control the quantity of the plants, and also to avoid the expensive measures, which were taken in Ontario [5].

The signs of individual plants organs were analyzed as well as the observations according to morphological methods in order to determine the origin and possibilities of hybrid species *Lonicera xylosteum* L. and *Lonicera nigra* L in natural populations in Slovakia. The obtained results show that the variability happens on the level of species. More pronounced variability was proved to *L. xylosteum* in the form and size of a leaf, when less intensive variability was observed to *Lonicera nigra* L. for the leaf and stem length [8].

As far as we know, the dendrochronological methods were used in order to study the influence of plants onto the tier tree growth [3, 6, 7].

Unfortunately, the human activity provides a negative impact onto flora's species and population diversity of the wholes regions. Irrevocably the dozens of species are disappearing, changing specific and geographic structure of the vegetation cover of the Earth. Those violations are happening everywhere; they change historical structure of populations, and as a consequence, restrict the possibilities of genetic exchange, weaken the adaptive abilities.

Endemics of the region *Berberis iliensis*, *Limonium michelsonii*, and *Lonicera iliensis* are included into the list of the environmental objects, which have important ecological, scientific, and cultural significance, by the Resolution of the Government of the Republic of Kazakhstan No. 521 dated 21.06.2007.

Materials and methods

The base of this research is the materials collected during 2010 – 2012. The object of the research was chosen to be a rare and an endemic species of Ile-Balkhash region, Kazakhstan, *Lonicera iliensis* Pojark.

Ile-Balkhash region, the place of the research, is a part of a large, untrained South Balkhash cavity, which stretches from the southern shore of Lake Balkhash to Malaysary ridge and from Chu-Ili Mountains to spurs Zhetysu Alatau.

The study of Honeysuckle Ili's populations was done with route-reconnaissance method using GPS navigation. Geobotanical descriptions were carried out by conventional methods CIS (Commonwealth of Independent States) [2]. During the determination and characterization of age conditions, the methods described in works of T.A. Rabotnov [10], A.A. Uranov [13], L.B. Zaugolnova, and others were used [14].

Results and discussions

We have found and examined three populations (nine cenopopulations) of Honeysuckle Ili.

Population No. 1 (1-3 cenopopulations) were found in Balkhash district of Almaty region, in the floodplain of the Ili River, near the village Bacanas, below the former pioneer camp. By GPS coordinates: N 44045.784 /, E 076019.710 /, altitude above the sea level- from 351 m to 398 m of alluvial-meadow Soil. Within populations three plant associations involving *Lonicera iliensis* Pojark. were identified and described. There were: dog rose-willow-honeysuckle association; honeysuckle-dog rose association with willow; and dog rose-willow-honeysuckle association with elaeagnus. Projective cover of the first and second association was 95-100%, in the third - 90-95%. Floristic composition and structure of these associations are identical, species composition and occurrence of trees and shrubs, both within individual associations and the general population does not change. In the vertical structure of the tree and shrub associations 4-6 tier structure were observed: a willow-dog rose-honeysuckle association; tier I was *Elaeagnus oxycarpa* Schlecht., height 550 cm; tier II - *Salix niedzwieckii* Goerz., *S.caspica* Pall. height 450 cm; tier III - *Lonicera iliensis* height 330 cm; , IV tier - *Rosa alberti* Regel height of 250 cm; tier V - *Halimodendron halodendron* (Pall.) Voss, height is about 210 cm, and tier VI - *Lycium ruthenicum* Murr. height 80 cm; honeysuckle - dog rose in association with willow tier I was *Salix niedzwieckii*, *S.caspica* height of 420 cm; tier II - *Elaeagnus oxycarpa*, *Berberis iliensis* height 320- 330sm; tier

III - *Lonicera iliensis*, *Rosa alberti* height 250-280 cm; IV tier - *Halimodendron halodendron*, *Trachomitum lancifolium* (Russan.) Pobed. (= *Apocynum lancifolium* (Russan.) Hara height of 200 cm; in dog rose-willow-honeysuckle association with elaeagnus tier I was *Elaeagnus oxycarpa* height 600 cm; II tier - *Salix niedzwieckii*, *S.caspica* height 530 cm; III tier - *Lonicera iliensis*, *Berberis iliensis* height 330 cm; IV tier - *Rosa alberti*, *Halimodendron halodendron*, *Trachomitum lancifolium* (= *Apocynum lancifolium* (Russan.) 210-250 cm in height; V tier - *Lycium ruthenicum* height 80 cm.

Most abundantly here were observed dog rose, then honeysuckle, dogbane and willow.

Population No. 2 was found in Raiymbek district of Almaty region in the floodplain of the Chilik River near the village Algabas, below the bridge. The GPS coordinates are: N 43012.079 /, E 078031.412 /, altitude above the sea level - from 1216 to 1232 m above sea level Alluvial-meadow soil with close occurrence of boulder-pebble deposits. Within populations three shrubland associations were identified and described. There were: poplar and shrub association, sea buckthorn and shrub association with poplar and shrub – sea buckthorn association. Projective cover in the first association was 75-80% in the second and third - 95-100%. Floristic composition and structure of these associations are identical, species composition and occurrence of trees and shrubs, both within individual associations and the general population does not change. 4-5 tiered structure was observed in the vertical aspect of the tree and shrub associations: poplar- shrub association's tier I was *Populus talassica* Kom. height 30 m; tier II - *Hippophae rhamnoides* L., 15 m high; tier III - *Salix niedzwieckii*, *S.caspica*, *Betula tianschanica* Rupr. height of 500 - 550 cm; IV - *Rosa alberti*, *Lonicera iliensis* height of 370-450 cm; sea buckthorn shrub in association with poplar I *Populus talassica* tier was up to 35 m; tier II - *Hippophae rhamnoides* 7 m high; tier III - *Salix niedzwieckii*, *S.caspica*, *Betula tianschanica*, height 450-500 cm, IV tier - *Lonicera iliensis*, *Ulmus pumila* L. 350-370 cm tall, V tier - *Rosa alberti* height 300 cm; in sea-buckthorn shrub-tier associations I was *Hippophae rhamnoides* 9 m high; tier II - *Populus talassica* height 750 cm; tier III - *Betula tianschanica* height 600 cm; tier IV - *Salix niedzwieckii*, *S.caspica*, *Lonicera iliensis*, *Rosa alberti* height 450-500 cm.

Most abundantly here were observed poplar, dog rose, sea buckthorn, and honeysuckle.

Population No. 3 was found in Raiymbek district of Almaty region in the floodplain of the

Charyn River, on the left bank in the tract Aktogai. Coordinates for GPS:

N 43012.959 /, E 078050.576 /, altitude above the sea level - from 1142 to 1156 m of alluvial-meadow soil. Within populations three shrubland associations were identified and described. There were: honeysuckle - poplar, poplar-shrub, and sea buckthorn-poplar-honeysuckle association. Projective cover in the first association was 90-95% in the second and third - 95-100%. Floristic composition and structure of these associations are identical, species composition and occurrence of trees and shrubs, both within individual associations and the general population does not change. A 4-tier structure was observed in the vertical aspect of the tree and shrub associations: a honeysuckle - poplar association tier I were *Populus talassica*, *Salix niedzwieckii*, *S.caspica* height of 40-45 m; tier II - *Hippophae rhamnoides* height 750 cm; tier III - *Lonicera iliensis*, *Rosa alberti* height 400-600 cm; tier IV - *Lonicera tatarica* L. height 220 cm; in poplar and shrub associations tier I was *Populus talassica* height of 25 m; tier II - *Salix niedzwieckii*, *S.caspica*, *Hippophae rhamnoides*, *Rosa alberti* height 700-750 cm; tier III - *Lonicera tatarica*, *Lonicera iliensis*, *Berberis iliensis* M.Pop. 500-550 cm height; tier IV - *Trachomitum lancifolium* (= *Apocynum lancifolium* (Russan.) height of 360 cm, in sea buckthorn-poplar-honeysuckle association tier I were *Populus talassica*, height 35m; II tier – *Salix niedzwieckii*, *S.caspica*, *Hippophae rhamnoides* height 750 - 800 cm; III tier - *Lonicera iliensis* height 510 cm; IV tier – *Rosa alberti*, *Lonicera tatarica* height 300-360 cm.

Most abundantly here were observed dog rose, honeysuckle, poplar, and sea buckthorn.

The study of the structure and age situations of the three populations (nine cenopopulations) *Lonicera iliensis* Pojark. showed that the main components of plant communities with *Lonicera iliensis* Pojark. are shrubland species. Within the territories of the lower reaches of the Ili River, there are: Caspian willow, willow of Nedzvedskiy, *Elaeagnus oxycarpa*, and poplar heterophyllous. Within the territories of the upper reaches of the Chilik River - Talas poplar, aspen, *Elaeagnus oxycarpa*, sea buckthorn, Tian Shan birch. Within the territories of the tract Aktogai in the upper reaches of the Charyn River: Talas poplar, willow of Nedzvedskiy, willow of Michelson, *Elaeagnus oxycarpa*, and rarely - sea buckthorn.

Table – The number of Honeysuckle Ili plants with mentioned ontogenetic status and their % participation in the population.

| Ontogenetic status | No. of population | | | | | | | | | | | | | | | | | | | | |
|--------------------|-------------------|-----------|-----------|-----------------------|-----------|-----------|-----------|------------|-----------|-----------|-----------|------------|--|--|--|--|--|--|--|--|--|
| | 1 | | | 2 | | | | | | 3 | | | | | | | | | | | |
| | 1 | 2 | 3 | No. of cenopopulation | | | total | 7 | 8 | 9 | total | | | | | | | | | | |
| Immature | 3 /4.8% | 0 | 0 | 3 /1.7% | 0 | | | | | | | | | | | | | | | | |
| Veget. | 0 | 0 | 2 /3% | 2 /1.1% | 27 /21.4% | 57 /62.6% | 47 /28.7% | 131 /34.4% | 14 /13.2% | 6 /10.2% | 8 /11.3% | 28 /11.9% | | | | | | | | | |
| Young gener. | 16 /25.8% | 5 /10.4% | 23 /33.8% | 44 /24.7% | 20 /15.9% | 14 /15.4% | 47 /28.7% | 81 /21.3% | 40 /37.7% | 2 /3.4% | 25 /35.2% | 67 /28.4% | | | | | | | | | |
| Average gener. | 43 /69.4% | 36 /75.9% | 33 /48.5% | 112 /23% | 29 /15.4% | 14 /16.5% | 27 /18.4% | 70 /18.4% | 46 /43.4% | 28 /47.5% | 29 /40.8% | 103 /43.4% | | | | | | | | | |
| Old gener. | 0 | 7 /14.6% | 9 /13.2% | 16 /9% | 16 /12.7% | 0 | 8 /4.9% | 24 /6.3% | 3 /2.8% | 21 /35.6% | 7 /9.9% | 31 /13.1% | | | | | | | | | |
| Subsenil | 0 | 0 | 0 | 0 | 21 /16.7% | 3 /3.3% | 17 /10.4% | 41 /10.8% | 3 /2.8% | 1 /1.7% | 1 /1.4% | 5 /2.1% | | | | | | | | | |
| Senil | 0 | 0 | 1 /1.5% | 1 /0.6% | 13 /10.3% | 3 /3.3% | 18 /11% | 34 /8.2% | 0 | 1 /1.7% | 1 /1.4% | 2 /0.8% | | | | | | | | | |
| Total | 62 | 48 | 68 | 178 | 126 | 91 | 164 | 381 | 106 | 59 | 71 | 236 | | | | | | | | | |

The analysis of the number, density and age structure of cenopopulations (Table I) shows that in the age range 1-3 cenopopulations maximum occurs at average generative individuals (respectively 69.4% , 75% and 48.5%) , in the cenopopulation 4 average generative individuals (23 %), in the cenopopulation 5 vegetative individuals (62.6%), in the cenopopulation 6 vegetative and average generative individuals (28.7% and 28.7 %), in populations 7-9 average generative individuals (respectively 43.4%, 47.5%, 40.8%).

After the comparison of three populations (figure), it is obvious that in Population 1 the maximum is represented by average generative individuals (62.9%), in Population 2 – vegetative individuals (34.4%) and in Population 3 by average generative individuals (43, 4%). All populations are complete, because there are the individuals of pre-generative, generative, and post-generative stages of the development.

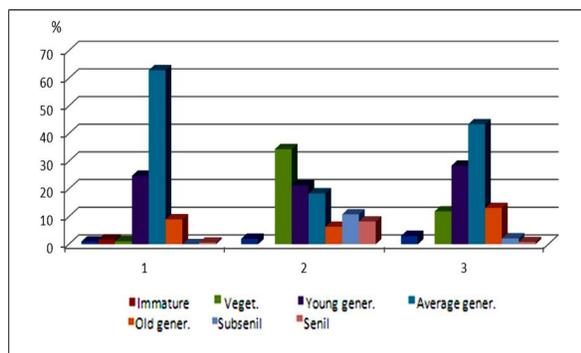


Figure -1. % participation in populations of honeysuckle Ili plants with mentioned ontogenetic status

Conclusion

Vital status of *Lonicera iliensis* Pojark. is various in three populations. The main concern is about Population No. 1 in the downstream of the Ili River; firstly, here it is in a satisfactory state of life only along the bayou of the Ili, where during spring snowmelt and heavy rains, the water flows. In other parts of the floodplain, it is very rare and its living conditions are poor. Besides, its recovery process is very slow. Secondly, Population No. 1 (neighborhood of Bakanas village) is located very close to the village and is heavily used for grazing. Also the climatic conditions of the lower flow of the Ili River are turning more arid. Therefore, in order to keep the population No. 1 of *Lonicera iliensis* Pojark. it is necessary to take this territory under the control.

In a population No. 2 of *Lonicera iliensis* Pojark. within the conditions of the middle flow valley of the Chilik River and in Population No. 3 in the tract Aktogai of the Charyn River, the vital state of Honeysuckle Ili is good and the recovery goes normally. Inside these populations it is possible to find all the age states. It proves that here the natural recovery of *Lonicera iliensis* Pojark. is normal and it goes good. In the nearest future the populations of *Lonicera iliensis* Pojark. at these two points are out of danger.

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4/24/2014