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Ontogenetic Structure Cenopopulations of *Spiraea hypericifolia* L. in Turkestan Ridge (Uzbekistan)

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Abstract: ***The article investigated the ontogenetic structure of S. hupericifaolia in the Turkestan ridge in 9 cenopopulations (CP) part in Uzbekistan. According to the study, 1,4,7 cenopopulations are left-side, and 2, 3, 5, 6, 8, 9 cenopopulations are characteristic of the central ontogenetic spectrum. The ontogenetic spectrum that is characteristic for the species is centralized. According to the delta-omega classification (2001), it was found that cenopopulations ripening (CP 1, 2, 5, 6, 7, 9), mature (CP 3, 8) and young (CP 4).***

Keywords: *Spiraea hypericifaolia* L., Uzbekistan, Turkestan ridge, cenopopulation, ontogenetic structure.

1. Introduction

Currently, biodiversity conservation of rare plants in the world and the state of their cenopopulations (prevalence, density, especially age composition) will not only assess their current state, but will also help them arrive at specific conclusions about these species in the future [1]. It is necessary to carry out cenopopulation studies to study the restoration of natural vegetation, methods of adaptation of species to the external environment, and the possibility of introducing rare plant species. As a result, it is possible to evaluate plant survival strategies [17].

The *Spiraea* L. genus is one of the largest families of the Rosaceae, and scientists estimate the number of species in a variety. In particular, worldwide S.Y. Sokolov and O.A. Svyazeva according to, 90 species, A.A. Grossheim (1934) 40, M.S. Alexandrova - 100, O.A. Panas data according to, there are 130 species [13].

In Uzbekistan, there has been much research on the introduction and phonologic development of *Spiraea* L. species in the local context. As it is known, the Botanical Gardens of the Academy of Sciences of Uzbekistan contains plant expositions from various continents. Specifically, the collection sites of the species *Spiraea* L. are also known. Rusanov (1972) has been successful in introducing representatives of the *Spiraea* L. series not only in Uzbekistan but also in Central Asia. To date, the Botanical Garden of Tashkent lists more than 30 different species. Of these, 2 are native to North America, 5 to the Far East, 2 to Europe, 25 to China, and 3 to Central Asian flora [4, 9, 10].

2. Material and methods

In the study of species ontogenesis proposed by T.A. Rabotnov (1950), and followed by the methods used by A.A. Uranov and his students [5, 14].

The age composition of the species was studied in 7 stages (j, im, v, g1, g2, g3, s). The methods adopted for the study of the structure of the cenopopulations (CP) have been used [5, 16]. The classification proposed by Jivotovsky [18] was used in the study of CP types. The method of transect removal (20x1) was used to determine the structure of cenopopulations. Ecological density of the species Odum [12], degree of recovery of the species A.R. Ishbirdin [8], the rate of aging coefficient of cenopopulation was determined by the method proposed by N.V. Glotov [7].

3. Result and discussion

It is worth noting that to date no specific research has been carried out in Uzbekistan to assess the ontogenetic structure and current state of cenopopulations of *Spiraea* species.

Our research was conducted in different parts of the Turkestan Range in 2015–2019 years (Figure.1).

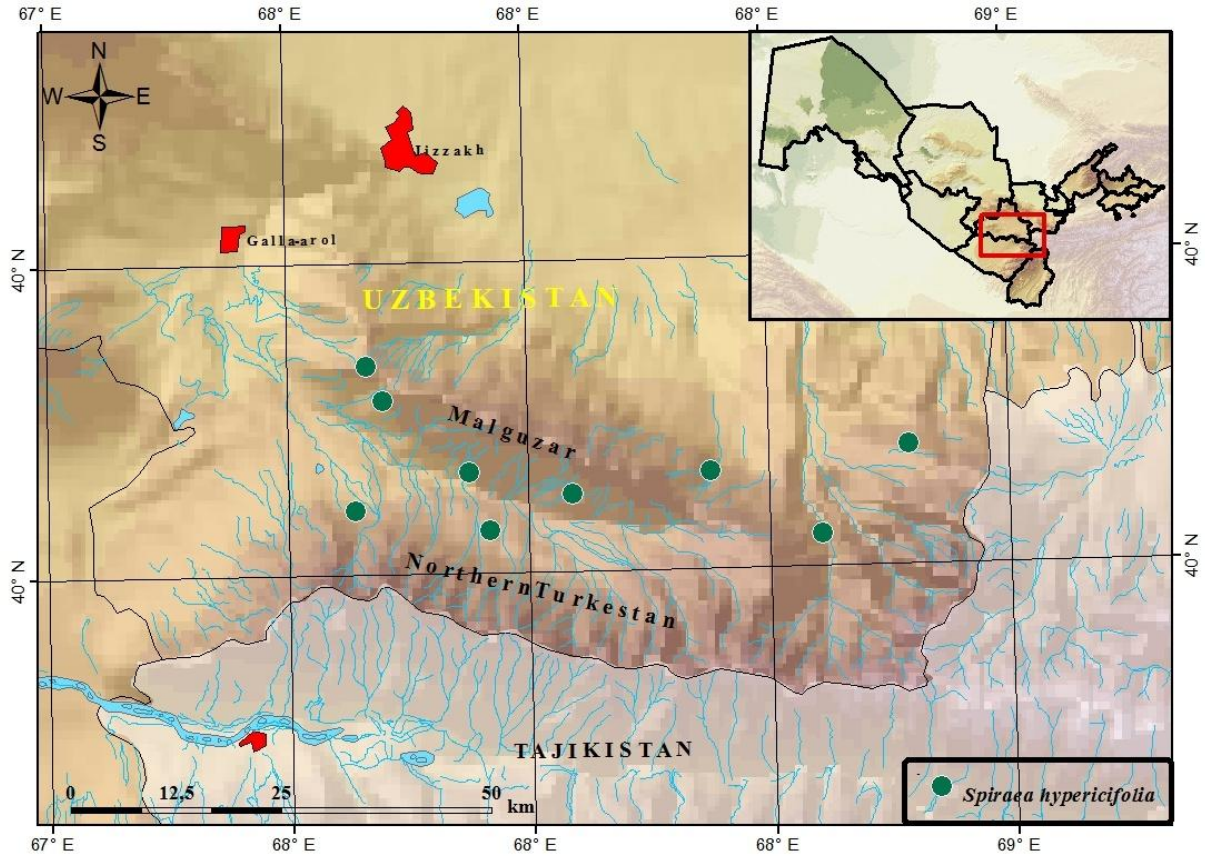


Figure 1: Map scheme of the study area

The ontogenetic structure of 9 cenopopulations of *S. hypericifolia* was investigated. The age composition of the species was studied in 7 stages (j, im, v, g1, g2, g3, c) based on the study of morphological features of the plant. The study analyzed the age composition of *S. hypericifolia* in various cenopopulations. In the cenopopulations noted, very few or none of the bites of the j, g3 and c stages were observed. In some cenopopulations, the percentage of *im* stage bites is low (Table 1).

Table 1: Age structure of *S. hypericifolia* cenopopulations

№ CP	Age structure (%)						
	j	*im*	*v*	*g1*	*g2*	*g3*	*s*
1	0	6,25	43,75	18,75	25	6,25	0
2	0	7,69	23,07	15,38	53,84	0	0
3	0	0	19,04	28,57	52,38	0	0
4	3,70	14,81	40,74	18,5	18,5	3,70	0
5	5,12	12,82	17,94	15,38	41,02	5,12	2,56
6	10,34	6,89	13,79	20,68	41,37	3,44	3,44
7	7,14	0	42,85	14,28	28,57	7,14	0
8	0	0	25	12,5	50	12,5	0
9	3,03	9,09	27,27	18,18	36,36	3,03	3,03

Data from the available literature and results from field studies indicate that the ontogenic spectrum characteristic for *Spiraea hypericifolia* is the central spectrum. The longer duration of the middle generative stage (g2) than the other stages allows the characteristic spectrum of the species to be centralized [2, 3, 15]. This law has been confirmed in our research.

Populations in each age group are referred to as full-fledged cenopopulation. According to the literature, invasive or regressive types of cenopopulations are completely absent, and regression cenopopulations do not produce virgin individuals, and invasive cenopopulations are generative and senile individuals. At the same time, normal cenopopulations can be both full and complete. At the same time, full membership of cenopopulations is a temporary condition and may be caused by various environmental factors. Ecologically, each CP is characterized by its numerical parameters, age composition, area of the occupied range and a number of other indicators [6].

The area of the range is related to the extent of individual activity of this species and the natural conditions in the area. Different species have different populations of plants. The number of bites in the cenopopulations was assessed by a minimum. Decrease in the minimum would result in the death of the bush in certain years or a decline in their number [11].

The studies noted that cenopopulations noted are typical of the left-handed and centralized spectrum. No cenopopulations of bimodal and right-sided ontogenetic spectra were observed.

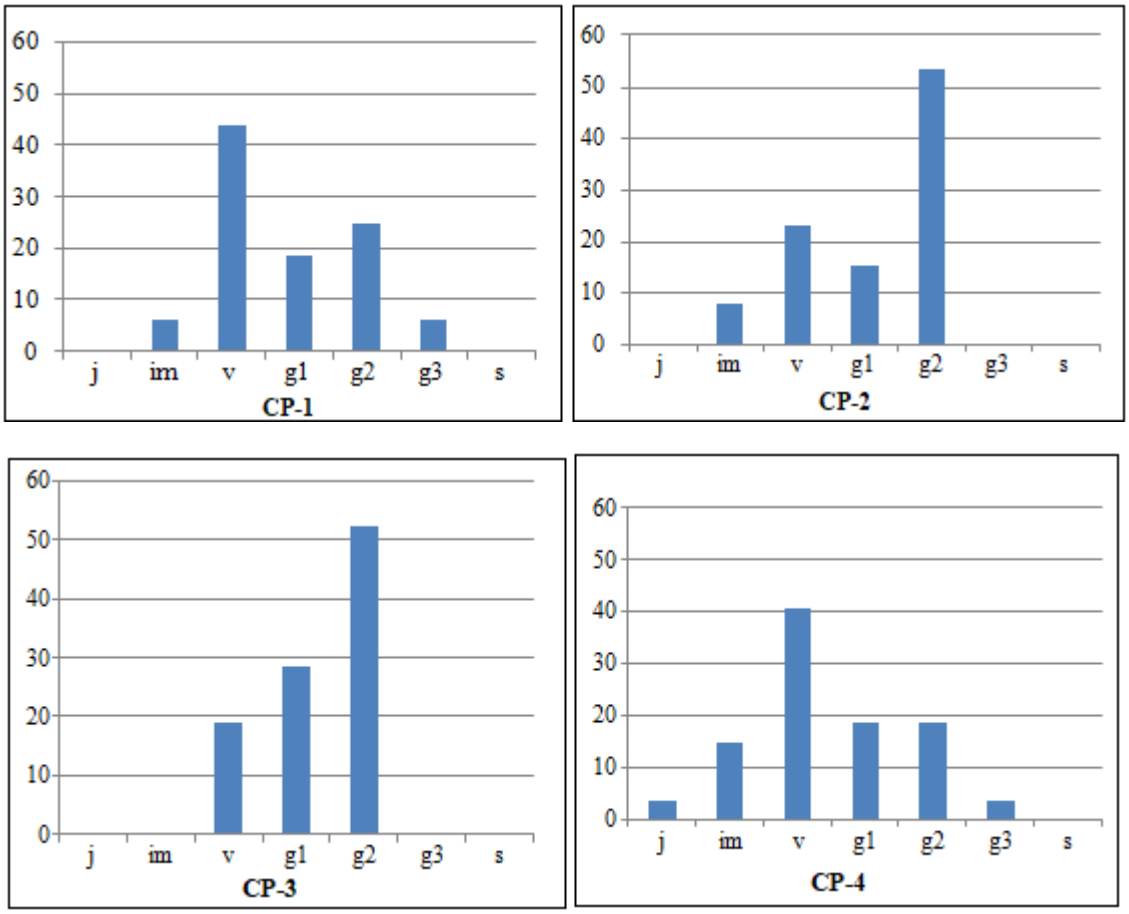
Left-side ontogenetic spectrum: The left-handed ontogenetic spectrum is often peaked, with peak (or peak) vegetation in virginil phase (CP 1, 4, 7). In these cenopopulations, the virginil stage bites were found to be between 40.74 and 43.75%. All the left-sided spectrum-specific cenopopulations are incomplete. In left-sided ontogenetic spectrum-specific cenopopulations, the juvenile and the immature stage bush are not high. This is due to the

elimination of seeds. Regular livestock grazing in these areas during the year and the fact that cenopopulations are isolated from rock-gravel cenopopulations do not allow the seeds to germinate freely. Or it can be done in difficult stages. Seed germination is not always successful in this environment. Low level of lawn in cenopopulations is associated with lower soil fertility. The large proportion of virgin stage bites in the cenopopulations is directly related to the length of this phase. The results obtained from the studies and the available data in the literature indicate that this phase lasts from 3 to 7 years.

In addition, the Turkestan ridge skirts are markedly different from other ecotopes due to their ephemeral and ephemeroid properties, and the locals prefer to graze on these pastures in the early spring for more efficient use. This, in turn, dramatically increases the level of grass species studied.

Centralized ontogenetic spectrum. One of the features of this ontogenetic spectrum is the high proportion of genera (g2) and the elderly generator (g3). The characteristic spectrum, which is typical of the constituents, is the centralized spectrum. 2, 3, 5, 6, 8, 9 cenopopulations of *S. hypericifolia* are typical of centripetal, and in these cenopopulations the g2- g3 stage bumps are between 39.39 - 62.5%. About 50% of cenopopulations are full members (CP 5, 6, 9) and 2, 3 and 8 are full members of the cenopopulations (Figure 2).

In these cenopopulations, the number of prehistoric bumps is low due to their inability to reach the generative cycle due to various factors. Despite the good fertility of the species in the natural environment, their transition to the next stages is a complex process. Floods and strong dominant species in the region do not allow young shoots to evolve freely during the year, followed by strong winds and rain. In addition, as we have already mentioned, the generative period of the species is much longer than that of the pre- and post-generations, which results in the accumulation of generative bites in these cenopopulations.



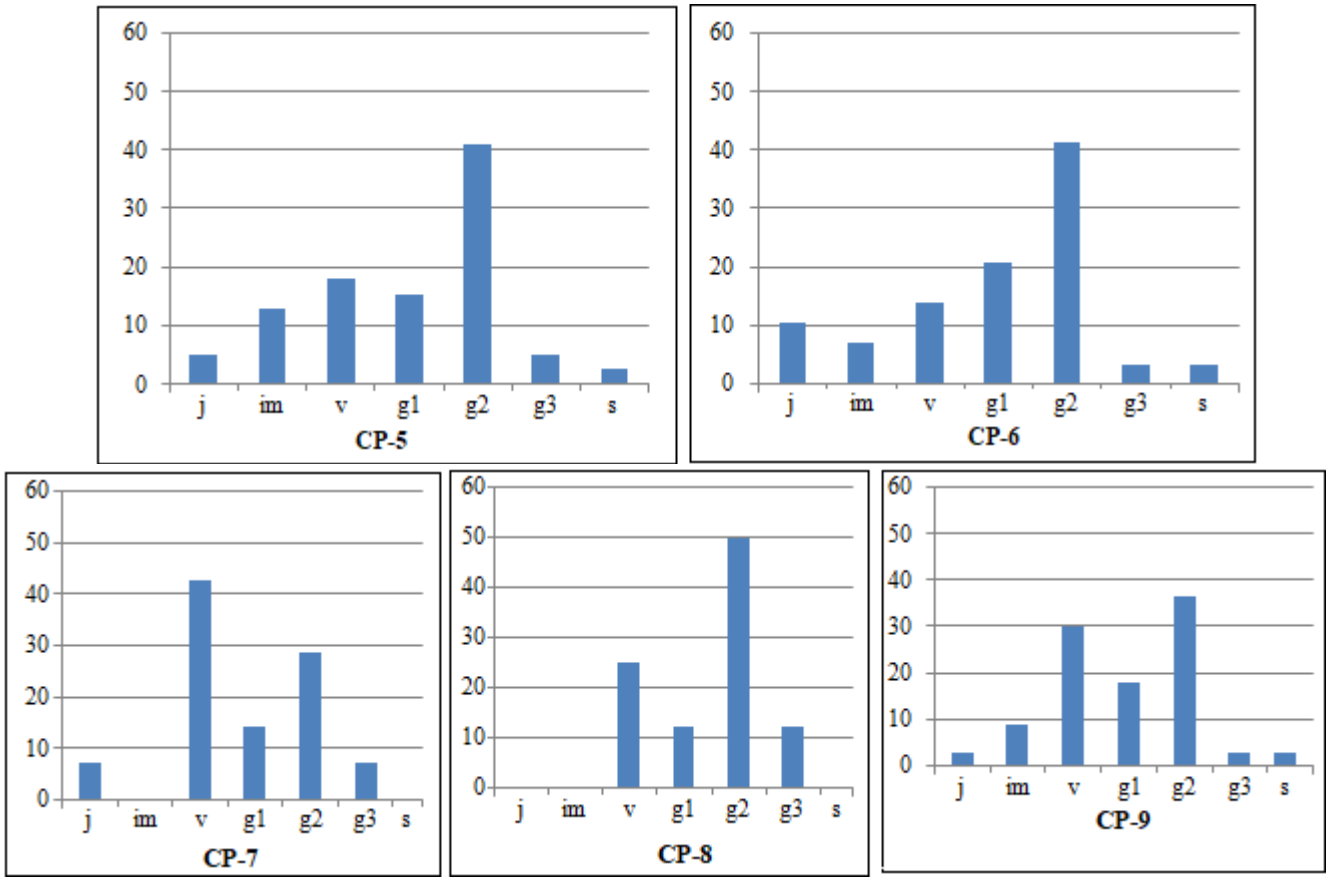


Figure 2: Ontogenetic structure cenopopulations of *Spiraea hypericifolia*

This is directly related to the longer duration of the g2 phase than the other ontogenetic stages. Some literature indicates that this phase lasts from 10 to 25 years. In addition, the plant is resistant to a number of environmental factors during this period.

The highest percentage of generative bites was recorded at CP 8 with 62.5%. Observations have shown that a high proportion of generative larvae in the cenopopulation (due to the seeds they contain) does not always lead to a dramatic increase in the number of young shoots. Most of the seedlings sprouting from the seed die during the grass season due to various factors (Figure 4.5). The smallest proportion of bush at g2- g3 stage was noted at CP 9 (39.39%).

Typically, the baseline or average value of the ontogenetic structures of the cenopopulations (if the number of studied cenopopulations is 10 or more is the basic ontogenetic structure) or the average value of the actual cenopopulations (if the number of studied cenopopulations is less than 10) and its structure depends on the species' biology. whether the set spectrum type is suitable.

Comparison of the average values of ontogenetic structures of cenopopulations isolated from different environmental and geographic conditions. According to the results, the average value of the ontogenetic structure is centrally and peaks (the proportion of middle-aged generative shoots is high). The ontogenetic spectrum characteristic of the representatives of the series is centralized. This is also reflected in our research. The average value of the ontogenic spectrum is a full member, and the proportion of middle-aged generative bands is 38.20% (Figure 3.).

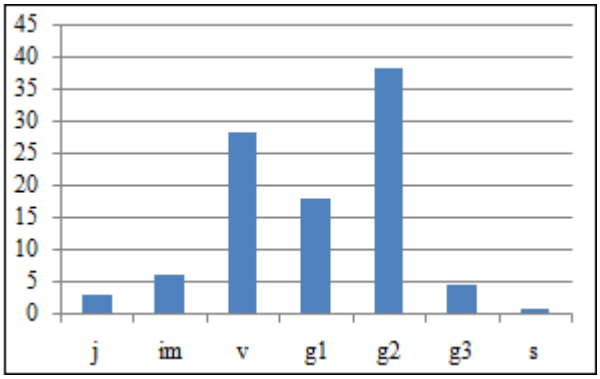


Figure 3: The average value of the ontogenetic structures of cenopopulations of *Spiraea hypericifolia*

This is due to the fact that this phase is longer than the other stages. It was followed by the highest percentage of shoots in the virgin stage (28.46%).

The highest proportion of the bush at this stage is due to the longer duration of the virgin phase than the juvenile and immature stages. Heavy rainfall and strong winds during the year prevent the free development of lawn and juvenile grasses. In addition, *S. hypericifolia* is an increase in rock-gravel environments, mainly among large boulders. Seed germination is not always successful in this environment.

Demographic indicators of *S. hypericifolia* in cenopopulations were analyzed during the study. In the mentioned cenopopulations, *S. hypericifolia* was not

recorded as dominant or subdominant. The number of bites in the cenopopulations is one of the main criteria for assessing their condition. The total and ecological density of the beds in *S. hypericifolia* cenopopulations was investigated. In the cenopopulations it was noted that their number varies from 13 to 39. In the cenopopulations, the density of the bush was determined by the transect method. In particular, the density of bush was 1,65-1,95 in $1m^2$, and the ecological density was 0,81-2,29.

In the assessment of the demographic status of cenopopulations, the analysis of their regeneration and aging indices is of great importance. The rate of recovery is estimated by the percentage of generative bites in the cenopopulations [7, 8]. The highest percentage of species recovery was recorded in cenopopulations 3 and 8, with a recovery rate of 3 - 4.25. It was noted that the percentage of genera bites in these centenary spectr ophotometric specimens is 75-80.95%.

It was noted that the recovery rate of 1 and 7 cenopopulations was 1.0. In macular cenopopulations, characteristic of left-sided ontogenetic spectrum, it is observed that the pre-generative period and the number of shoots in the generative period are equal (50%). In all of the cenopopulations studied, the index of aging was almost zero (0–0.3), with most of the beds being killed during the generative period (Table-2).

Table 2: Demographic characterics cenopopulations of *Spiraea hypericifolia*

№CP	The individuals density of species per 1m2, pieces.	Ecological density of 1 m2, pieces.	Total individuals	I_r	I_o
1	0,8	1,06	16	1,0	0
2	0,65	0,81	13	2,25	0
3	1,05	1,23	21	4,25	0
4	1,35	1,68	27	0,68	0
5	1,95	2,29	39	1,71	0,02
6	1,45	1,81	29	2,11	0,03
7	0,7	0,82	14	1,0	0
8	1,2	1,5	24	3	0
9	1,65	1,94	33	1,36	0,03

Note: I_r—recovery index; Io-older index; P_{ecol}—ecol-ecological density of individuals/m2 (pc).

It is known that data on the types of cenopopulations of *S. hypericifolia* are not reported in the literature. In the course of the studies, the types of cenopopulations were identified using delta-omega [18] classification (Table 3).

Table 3: Type cenopopulations of *S. hypericifolia*

№CP	Delta (Δ)	Omega (ω)	Type CP (Zhivotovsky, 2001)
1	0,27	0,64	Ripening
2	0,34	0,77	Ripening
3	0,36	0,82	Mature
4	0,22	0,56	Young
5	0,33	0,67	Ripening
6	0,34	0,68	Ripening
7	0,28	0,63	Ripening
8	0,40	0,80	Mature
9	0,31	0,66	Ripening

Note: Δ—age population index; ω—efficiency index;

According to Zhivotovsky [18] classification, cenopopulations can be classified into 6 types. The study of the types of cenopopulation allows us to arrive at specific conclusions in the future about the unique, rare and extinct plants distributed in a given area. The delta-omega classification of bush ages and its efficacy shows that most of the cenopopulations (CP 1, 2, 5, 6, 7, 9) were found to be old (CP 3, 8) and young (CP 4) type. In these xenopopulations, the delta (Δ) was found to be 0.22-0.40 omega (ω) in the range 0.56-0.80 (Figure 4).

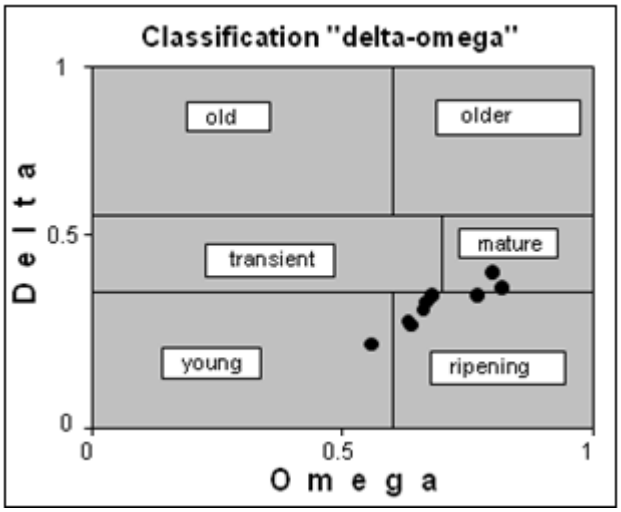


Figure 4: Type cenopopulations of *S. hypericifolia*

4. Conclusions

The study was conducted in different eco-phytocenotic conditions of the Turkestan Range. The results of the present study show that the presence of *S. hypericifolia* as dominant or subdominant was not noted in the xenopopulations. The ontogenetic structure of the species indicates that the majority of the studied cenopopulations (CP 1, 2, 3, 4, 7, 8) are full members. Only 3 cenopopulations (CP 5, 6, 9) are full members. This also showed that xenopopulations were not normal. Seven of the cenopopulations were observed to be specific (Fig. 4). Accurate representation of the geographical coordinates of the studied cenopopulations will be important in the future monitoring.

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