CURRENT CONDITION AND BIOECOLOGICAL FEATURES OF WIDESPREAD ALIEN PLANTS IN SEASIDE AJARA (GEORGIA, SAKARTVELO)

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Abstract: Seaside Ajara, as a region with unique climatic and geographical conditions, is a favorable environment for the spread of alien plants. In recent decades, the spread of alien species has been observed in the region. Some species were not characterized by mass distribution in the past, but are now widespread.

Based on the conducted studies, 75 species of 27 families, 57 genera, are distinguished, which are widely spread in Seaside Ajara.

The families separated by the abundance of species are *Compositae* and *Poaceae* with 14 species each.

The majority of the described species are perennials. Annual monocarps are represented by 24 species, biennial monocarps by 2 species, and polycarps by 28 species. Trees, shrubs, and plants with woody stems are represented by 21 species.

More than half (54%) of the studied species are of East Asian origin.

Some of the widespread species described in coastal Ajara are typical invasive species. Some were present in very few specimens in the past, but have recently become widespread. Some have recently invaded and established themselves, e.g., Bur cucumber (*Sicyos angulatus* L.), Canadian goldenrod (*Solidago canadensis* L.), and Brazilian verbena (*Verbena brasiliensis* Vell.).

Canadian goldenrod (*Solidago canadensis* L.) and Brazilian verbena (*Verbena brasiliensis* Vell.) were first recorded on the Colchis Plain in the 30s-40s of the 20th century. They appeared in the Ajara floristic region at the end of the last century, and their mass spread occurred in the previous 2 decades, which must result from anthropogenic impact and global climate change.

Keywords: Foreign origin species; Alien species; Life form; Bioecology; Invasion.

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Introduction. The appearance of an alien species in a local area does not always mean that it has already become established in a given habitat. It is possible that the plant will continue to exist in the

second, third or subsequent years after its appearance, but the existing soil and climatic conditions will not be favorable for it, it will not be able to reproduce and expand its distribution area, or the opposite will happen: it will reproduce, expand its distribution area, cause ecological, economic or human health problems and appear as an invasive and weedy species. This is especially noteworthy in the context of ongoing global climate change and extreme weather.

The spread of alien plants in the floristic region of Ajara has a long history. Since the beginning of the last century, significant transformations have taken place in the vegetation of Seaside Ajara. The ranges of many relict species have been greatly reduced, and some have disappeared entirely. This period coincided with the large-scale development of the Colchic forests and wetlands, as well as the expansion of subtropical crops – such as tea, citrus, tung, and bamboo plantations, which facilitated the introduction and establishment of alien plant species.

The introduction and spread of alien plants continue to this day.

According to the literature, alien species in Ajara were initially studied incidentally during the investigation of native flora. Among the early researchers are Shavrov (1910), Voronov (1916), and Grossheim (1916, 1929). Later, important contributions were made by Morozova (1957), Manjavidze and Matinian (1964), Dmitrieva (1967), and Memiadze (1971) (Davitadze, 2001).

Since the last decade of the last century, special studies by Davitadze have been devoted to the species and bio morphological composition of the adventitious flora of Ajara (Davitadze, 1974; Davitadze, 1980; Davitadze, 1997; Davitadze, 2001; Davitadze, 2002).

At the beginning of the current century, the study of alien species in Seaside Ajara was continued by researchers from the Institute of Phytopathology and Biodiversity of Shota Rustaveli State University of Batumi. In recent years, several additional alien species have been described (Mikeladze et al., 2014; 2015; 2017; 2018; 2019; Mikeladze & Sharabidze, 2020; Mikeladze & Bolkvadze, 2021; Mikeladze et al., 2021; 2023), and the invasive nature of certain species has been confirmed (Mikeladze et al., 2023).

According to both literature sources and our own investigations, the number of alien species in the floristic region of Ajara is close to 500, although not all are widely distributed. Some are recorded in databases but are rare in the field, while others that were previously sporadic are now widespread.

Based on all of the above, it is important to determine the current status of widely distributed alien species in Seaside Ajara.

Methodology. After processing literary sources and compiling relevant databases, traditional botanical expeditions and floristic surveys were conducted across Seaside Ajara. To determine species composition, background vegetation descriptions were carried out, with special attention paid to the most widely distributed alien plant species.

For species identification and the study of their bioecological characteristics, various taxonomic keys and scientific publications were used (Dmitrieva, 1990a; Dmitrieva, 1990b; Davitadze, 2002; Kikodze et al., 2010).

The classification and origin of species were determined based on global plant databases – *Plants of the World Online* (POWO, 2025) and *World Flora Online* (WFO, 2025).

Discussion. Based on the analysis of data obtained from fieldwork and literature, 75 widely distributed alien species have been identified in Seaside Ajara: *Ambrosia artemisifolia* L., *Acalypha australis* L., *Ailanthus altissima* (Mill.) Swingle., *Aleurites fordii* Hemsl., *Amaranthus albus* L., *Amaranthus caudatus* L., *Amaranthus lividis* L., *Artemisia vulgaris* L., *Bellis perennis* L., *Bidens bipinnata* L., *Bromus japonicas* L., *Catalpa speciosa* Warder., *Chenopodium ambrosoides* L., *Cinnamomum glanduliferum* Meissn., *Clerodendron bungei* Steud., *Commelina communis* L., *Crassocephalum crepidioides* (Bnth)., *Cyperus difformis* L., *Datura stramonium* L., *Deutzia scabra* Thunb., *Duchesnea indica* (Jacks.) Focke., *Eleusine tristachya* Kunth., *Elodea Canadensis* Michx., *Erigeron annus* (L.) Pers., *Erigeron canadensis* L., *Erigeron crispus* Pour., *Erigeron bonariensis* L., *Euphorbia maculata* L., *Galium ruthenicum* Willd.,

Gnaphalium affine D.Don., *Hydrangea macrophyla* (Thunb.) Ser., *Hydrocotyle ramiflora* Maxim., *Hydrocotyle vulgaris* L., *Juncus tenius* Willd., *Kyllinga gracillima* Miq., *Lespedeza juncea* (L.) DC., *Ligustrum japonicus* Thunb., *Lonicera japonica* Thunb., *Microstegium vimineum* (Trin.) A.Camus., *Microstegium japonicum* (Miq.)Koidz., *Miscanthus sinensis* Anderss., *Narcissius poeticus* L., *Oenthera biennis* L. (Onagra biennis L) Scop., *Ophiopogon japonicus* (L.f.) ker., *Oplismenus undulatifolius* (Ard.) Beauv., *Oxalis corniculata* (L.) Small., *O. violacea* L., *Paspalum dilatatum* Poir., *P. paspaloides* (Michx.) Scribn., *Perilla nankinensis* (Lour.) Decne., *Plectranthus scutellarioides* (L.) R.Br., *Phytolacca americana* L., *Phyllostachys edulis* (Carrière) J.Houz., *P. bambusoides* Siebold & Zucc., *Pleioblastus argenteostriatus* (Regel)Nakai/(*Pleioblastus pumilus*)., *Pseudosasa japonica* (Steud.) Makino., *Pseudosasa hindsii* (Munro) C.D.Chu & C.S.Chao., *Pseudosasa humilis* (Mitford)/Pleioblastus humilis., *Polygonum cuspidatum* Sieb et Zucc., *Reynoutria japonica* Houtt., *Polygonum thunbergii* Sieb et Zucc., (L.) H.Gross/Persicaria perfoliata L.. *Pueraria hirsuta* (Thunb) C.K. Schneid., *Quercus acutissima* carruth., *Q. myrsinaefolia* Blume., *Rhus javanica* L., *Robinia pseudoacacia* L., *Solanum carolinensis* L., *S. pseudocapsicum* L., *Solidago canadensis* L., *Spirea japonica* l.f., *Tagetes minuta* L.,*Verbena brasiliensis* Vell., *Viola prionantha* Bunge., *Vitex rotundifolia* L.f.,/V. trifolia subsp. *litoralis* Steenis., *Xanthium californicum* Greene., *X. spinosum* L., *X. strumarium* L.

These 75 species are distributed among 27 families and 57 genera (Table 1).

Table 1. Number of Species by Family

№	Family	Number of Species
1	Compositae	14
2	Poaceae	14
3	Amaranthaceae	4
4	Lamiaceae	4
5	Euphorbiaceae	3
6	Hydrangaceae	3
7	Leguminosae	3
8	Polygonaceae	3
9	Solanaceae	3
10	Araliaceae	2
11	Cyperaceae	2
12	Fagaceae	2
13	Oxalidaceae	2
14	Rosaceae	2
15	Simaroubaceae	2
16	Asparagaceae	1
17	Bignoniaceae	1
18	Caprifoliaceae	1
19	Commelinaceae	1
20	Oleaceae	1
21	Onagraceae	1
22	Juncaceae	1
23	Phytolaccaceae	1

24	Verbenaceae	1
25	Violaceae	1
26	Amaryllidaceae	1
27	Rubiaceae	1

The number of species in the families varies. The most numerous families are the *Compositae* and the *Poaceae* with 14 species each. The *Amaranthaceae* and the *Lamiaceae* are represented by 4 species each. These four families account for 48% of the described species, while the remaining 23 families account for 52% (Table 1, Diagram 1).

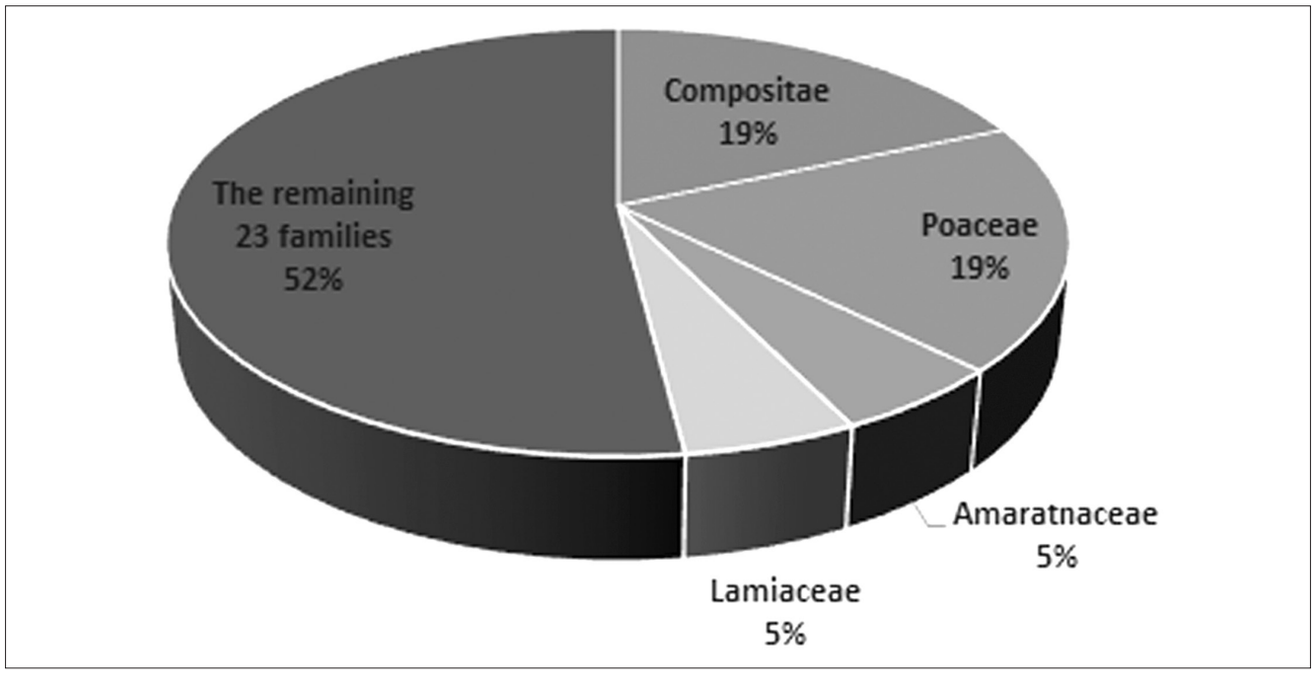

Figure 1. Spectrum of Species by Family

The distribution of alien plants, in addition to abiotic and biotic factors, depends on the bioecological features of each species. According to morphological, developmental, and reproductive characteristics, the studied species exhibit diverse life forms (Table 2).

Table 2. Number of Species by life form

№	Life Form	Quantity
1	Annual monocarp	24
2	Rhizomatous polycarp	10
3	Evergreen shrub	8
4	Tap-rooted polycarp	6
5	Deciduous tree	5
6	Creeping polycarp	5
7	Deciduous shrub	4
8	Evergreen tree	3
9	Climbing plants polycarpic	3
10	Biennial monocarp	2

11	Tuberous polycarp	2
12	Bulbous polycarp	1
13	Tightly grass polycarp	1
14	Semi-shrub	1

Among them, polycarpic perennials dominate with 28 species, represented by various growth forms: Rhizomatous polycarps (10 species): *Acalypha australis, Elodea Canadensis, Galium ruthenicum, Juncus tenuis, Kyllinga gracillima, Ophiopogon japonicus, Paspalum dilatatum, Polygonum cuspidatum, Solanum carolinensis, Solidago canadensis*; Tap-rooted polycarps (6 species): *Chenopodium ambrosoides, Duchesnea indica, Phytolacca americana, Artemisia vulgaris, Verbena brasiliensis, Viola prionantha*; Creeping polycarps (5 species): *Hydrocotyle ramiflora, H. Vulgaris, Microstegium japonicum*, *Oplismenus undulatifolius, Paspalum paspaloides*; Tightly grass polycarp (**1** species): *Miscanthus sinensis*; Bulbous polycarp (1 species): *Narcissus poeticus*. Tuberous polycarps (2 species): *Oxalis corniculata*, *O. violacea*. Climbing polycarps (3 species): *Lonicera japonica, Pueraria hirsute, Vitex rotundifolia L.f. /V. trifolia subsp. litoralis*)

The second most represented group consists of monocarpic plants (26 species), including 24 annuals: *Ambrosia artemisifolia, Amaranthus albus, Amaranthus caudatus, Amaranthus lividis, Bellis perennis, Bidens bipinnata, Bromus japonicas, Commelina communis, Crassocephalum crepidioides, Cyperus difformis, Datura stramonium*, *Erigeron annus, Erigeron canadensis, Erigeron crispus, Euphorbia maculata, Microstegium vimineum, Perilla nankinensis, Polygonum thunbergii, Polygonum perfolatum, Tagetes minuta, Xanthium californicum, Xsanthium spinosum, Xsanthium strumarium*, and 2 biennials: *Gnaphalium affine, Oenthera biennis*.

Woody plants, shrubs, and species with lignified stems (including bamboos) are represented by 21 species, of which 11 are evergreen and 10 deciduous.

Analysis of Species Origin

According to arealogical and florogenetic analysis, the widely distributed alien species in Seaside Ajara belong to several major geographical elements (Table 3).

Table 3. Spectrum of Species by Geographical Origin

№	Origin	Number of Species
1	East Asia	41
2	Atlantic Europe	2
3	South America	10
4	North America	18
5	Central and South America	2
6	Mediterranean region	2

The majority of species -41 taxa (54%) are of East Asian origin, forming the dominant floristic element in Seaside Ajara. North American species account for 24%, South American for 13%, while the remaining regions together represent 9% of the total (Table 3, Fig. 2).

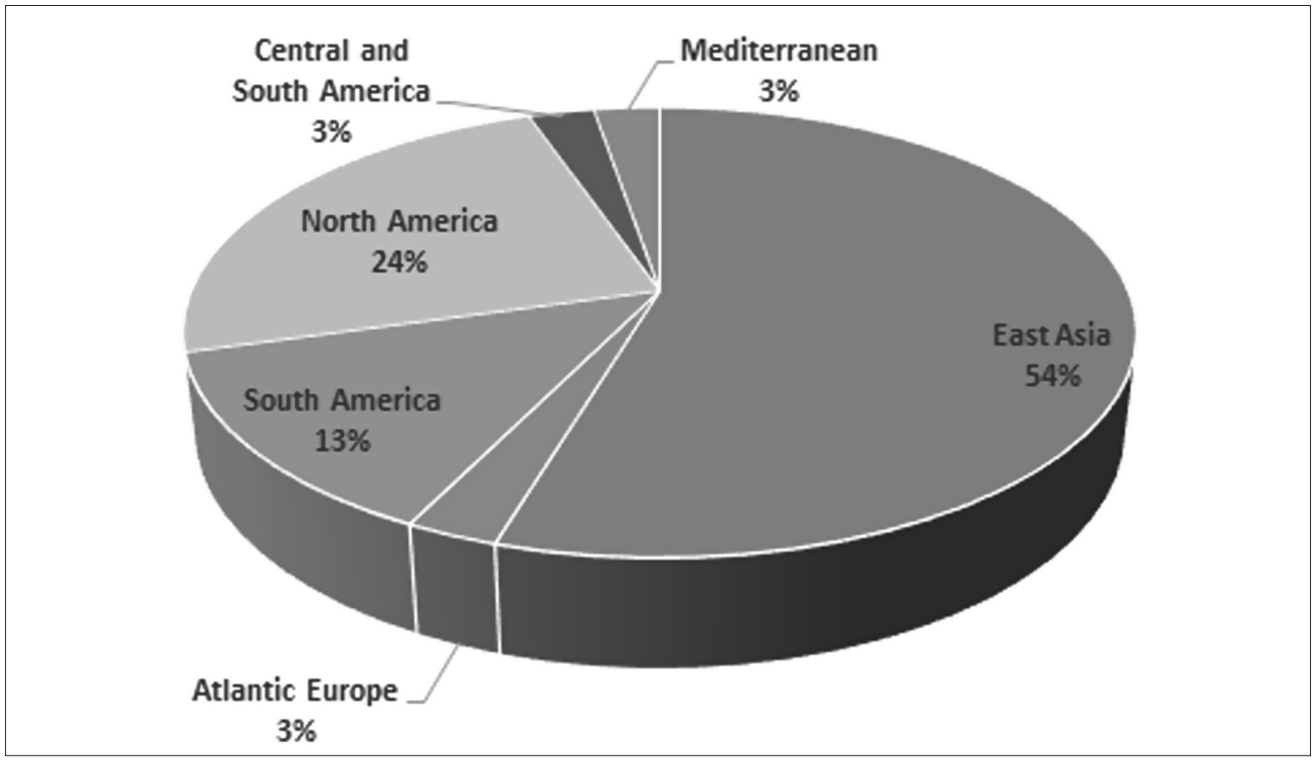

Figure 2. Spectrum of Species by Origin (%)

The abundance of East Asian species depends not only on diaspora dispersal and the species' ability to adapt, but also on the similar soil and climatic conditions of the coastal zone of East Asia and Ajara.

As for Mediterranean-origin plants, Soviet and post-Soviet scientific sources indicate that they were once relatively abundant in the Ajara floristic region. However, according to current global plant databases (*POWO*, 2025; *WFO*, 2025), most of these taxa are now recognized as native to both the Mediterranean and the Caucasus region; therefore, such species were not included in the present analysis.

Conclusions. The floristic region of Ajara represents one of the most unique and species-rich territories of Georgia. Its biodiversity is determined not only by native flora but also by the presence of alien plant species that have been introduced and naturalized over various historical periods.

Based on literature review and field investigations, 75 alien plant species were identified as widely distributed across Seaside Ajara. These belong to 27 families and 57 genera, with *Compositae* (Asteraceae) and *Poaceae* being the most species-rich (14 species each).

Most of the recorded species are perennials. 24 species are annual monocarps, 2 biennial monocarps, and 28 polycarpic perennials. Woody plants, shrubs, and species with lignified stems (including bamboos) are represented by 21 species.

More than half (54%) of the studied alien species are of East Asian origin.

Some of the widespread species described in coastal Ajara are typical invasive species. Some were present in isolated specimens in the past, but have recently become widespread. Some have recently invaded and established themselves, e.g., Bur cucumber (*Sicyos angulatus*), Canadian goldenrod (*Solidago canadensis*), and Brazilian verbena (*Verbena brasiliensis*).

Solidago canadensis and *Verbena brasiliensis* were first documented in the Colchic Lowland in the 1930s–1940s, later appearing in the floristic region of Ajara by the end of the 20th century. Their rapid expansion during the past two decades is likely a result of anthropogenic pressure combined with global climate change.

In light of these findings, it is essential to maintain continuous monitoring of alien species and to evaluate both their negative and positive impacts on ecosystem services and regional biodiversity.

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