



The Social WASP Fauna of Riparian Tuqai Forest in Khorezm Region Uzbekistan (HYMENOPTERA, VESPIDAE)

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ABSTRACT

An inventory of social wasps was carried from March 2019 to September 2019 in a section of riparian tuqai forest along the Amu Darya River in Cholish Urgench district, Khorezm region, Uzbekistan. Two dynamic collecting strategies (dynamic collecting and point examining employing a fluid snare) and one inactive strategy (teased PET bottle trap) were utilized. Thirteen species having a place to six genera were recorded. The foremost copious were *Polistes dominula* and *Vespula germanica*. These species have a place to the genus *Polistes* and *Vespula*, which was prevailing within the test. Concerning inspecting strategies, the dynamic collecting ones examined the most prominent abundance esteem.

Key Words: Wasps, Turanga, Attractive, Species, Ethanol, Polistine, Vegetation, Tuqay.

INTRODUCTION

Khorezm is one of the oases of the great historic civilizations of Central Asia, fed by the ancient river Oxus, today the Amu Darya River. For at least 3,000 years, water from the Amu Darya and Syr Darya rivers supported thriving agricultural communities and since Soviet times a flourishing fishing industry - in the Aral Sea Basin. But during the Soviet era, and more so since the late 1950s, the Amu Darya and Syr Darya waters were abstracted excessively and used in greatly expanded irrigation systems to secure the production of cotton, the "white gold".¹

This dramatic expansion of the irrigation system resulted in a substantial decrease in water inflow to the Aral Sea from 43 km³ year⁻¹ in the year 1960 to an average of 9 km³ year⁻¹ during 2001-2005. This widespread and ever-increasing physical and economic water scarcity in the Aral Sea Basin, exacerbated by climate change and land degradation, is threatening ecological sustainability and economic development in Central Asia. These problems are exemplified in the Khorezm region, a district located in the northwest of Uzbekistan. Khorezm depends to a large extent on agriculture. Thus, development is essentially based on the economic, ecological, and social sustainability of agricultural land use.¹

A forest fragment is defined as a natural vegetation area interrupted by natural or anthropic barriers (e.g., roads, villages, agricultural and forestall crops, pastures, mountains, lakes, dams) which are capable of significantly diminishing the flow of animals, floral resources, pollen and seeds. Native tuqai forests have been exploited for years in a degrading manner, resulting in a number of environmental problems such as species extinctions, local climate change, soil erosion, siltation, and eutrophication of watercourses. In order to monitor the effects of changes in the environment, to develop conservation strategies on a local scale, information on the biodiversity of an area is essential.

Representatives of the Vespidae family are the largest of the species by the number of species of insects. In the world fauna, there are 5274 species of bees whose six small families are 256 generations¹. There are 1046 species in the Palearctic and 817 in 31 generations in Russia². Vespidae comprises species that are remarkably abundant, widely distributed³, and actively participate in local food webs⁴. Uzbekistan hosts a not big diversity of social wasps, reaching a total of 23 species, about 2.3% of the social wasp species described worldwide.

According to the above information, this study aimed to conduct an inventory of the diversity of social wasps in an area of

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Riparian tuqai forest in the Urgench district Khorezm region, increasing the data on the diversity of social wasps of the State and to compare richness, equitability, and diversity obtained through the several methods used.

MATERIALS AND METHODS

Social wasps (Vespidae, Polistinae) were sampled monthly from March 2019 to September 2019 for two seasons, covering the entire period of the adult summer from to along the southwest edge of a riparian tuqai forest fragment by the margins of the Amu Darya River. In a landscape with the surrounding matrix composed by turanga (*Populus mutabilis*) and oleaster (*Elaeagnus angustifolia*) plantations, in the rural area in Cholish, of Urgench district (Fig. 1).

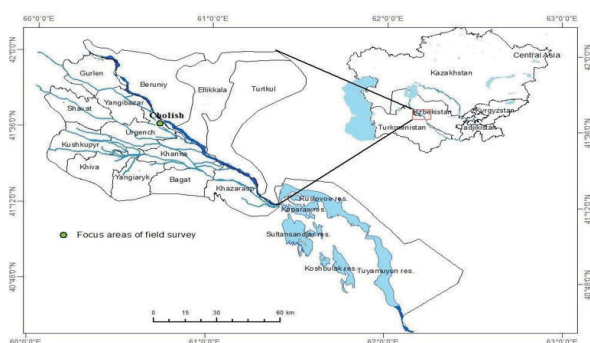


Figure 1: Map area of field survey (Urgench district, tuqai forest Cholish).

The area is a lowland plant located in the NW part of Uzbekistan, along the lower reaches of the Amu Darya river, between 60°E-61°E longitude and 41°N-42°N latitude, at 113-138 m above sea level. The climate is extremely continental, with an average annual precipitation of 80-90 mm. An average temperature in January is -5°C, in July +30°C. Meadow, meadow marshy, marsh-sandy a typical alkali soils prevail. The climate of the oasis is greatly influenced by the deserts of Kyzylkum and Karakum⁵.

The traditional method of collecting materials was entomological net, Mericle molding vessels⁶ (Fig. 2). During the study, more than 344 social wasps of 13 species from 6 genera and 4 subfamilies were caught. Specification of the species composition of the Vespidae bees was used by comparative charts of foreign scientists and the insect catalog.



Figure 2: Entomological trap.

The determination of adults and measurement of the parameters of the nest cells was carried out using the stereoscopic binocular MBS-2. The collected material was identified by determinants⁷⁻¹⁰. To confirm the correct definition of species, collection materials to confirm the correct definition of the species, collect materials from the Zoological Scientific Research Institute.

Three different methods were used for sampling the wasps: (BT - attractive PET bottle traps, AC - Active collection, PS - Point Sample using liquid bait and). The baited PET bottle trap BT method consisted in 10 attractive traps made with 2 L PET type bottles (Polyethylene Terephthalate Bottles) installed along a 1000 meter trail bordered by riparian vegetation and sugarcane plantation. The traps were set on the edge of the vegetation at a height of approximately 1.5 meters¹¹, with a 100 meters interval between traps¹². Each bottle had four circular orifices at the middle, and contained 200 ml of attractive liquid¹³⁻¹⁴ consisting of natural industrialized guava juice and sugar solution¹⁵⁻¹⁶. After a week, traps were removed. The attractive liquid sifted and all social wasps encountered were fixed in 70% ethanol.

Active collecting AC (without the use of any attractive) consisted of active searching for individuals along the same 1000 meter trail mentioned before collected with an entomological net, at the time of greatest foraging activity between 10:00 am to 3:00 pm¹⁷. Rounds of active collecting were made at two different days each month by four independent collectors on the same transect where the bottle traps were placed. The collected individuals were associated with the nearest trap point for further analysis and comparisons. The method of point sampling using a liquid bait was made with a sucrose solution (1: 4, commercial sugar: water) with 2 cm³ of salt for each half liter of solution which was sprayed over the vegetation at 10 marked points along the sampling trail (with a distance of 100 meters between points).

At least 30 minutes after spraying, active searching was performed by two independent collectors on the vegetation for 3 minutes with the aid of an entomological net¹⁸⁻²¹. To analyze the equality of samples obtained from each sampling method, the Kruskal-Wallis test (BioEstat 5.0 version 5.0²² was used. For the test, the raw abundance data of each species, and the relative abundances (percentage) were used.

RESULTS AND DISCUSSION

After 12 months of sampling activity in the rural area in Cholish, Khorezm region, 13 species of six genera of social wasps were found. A total of 344 individuals were collected: 59.82% of them belonged to the genus *Polistes*, the genus *Vespula* 31.1 % belonged to the genus *Vespa* 5.82 %, *Eumenes* 0.87% and 2.9 % to the genus *Mesochorus* (Table 1). The species with greater abundances (Table 1) were *Polistes dominula*

(113 individuals, relative abundance=32.85%) and *Vespa germanica* (103 individuals, relative abundance=29.94%). *Polistes dominula* is known as the polistine species with the largest nests and colonies.

Table 1: Abundance of wasp species collected with the three methods (AC - Active collection, PS - Point Sample using a liquid bait and BT - attractive PET bottle traps), total abundance and relative abundance (%) of species collected in Amudarya River's riparian tuqay in Urgench district (Uzbekistan). (AC - Active collection, PS - Point Sample, BT - Bottle Traps).

| Nº | Species | AC | PS | BT | Total | Relative abundance |
|----|--|-----|----|----|-------|--------------------|
| 1 | <i>Vespa germanica</i> (Fabricius, 1793) | 69 | 28 | 6 | 103 | 29,94 |
| 2 | <i>Vespa flavopilosa</i> (Jacobson, 1978) | 3 | 1 | 0 | 4 | 1,16 |
| 3 | <i>Polistes dominula</i> (Christ, 1791) | 72 | 32 | 9 | 113 | 32,85 |
| 4 | <i>Polistes wattii</i> (Cameron, 1900) | 49 | 27 | 11 | 87 | 25,30 |
| 5 | <i>Polistes biglums</i> (Linnaeus, 1758) | 3 | 0 | 1 | 4 | 1,16 |
| 6 | <i>Vespa orientalis</i> (Linnaeus, 1771) | 14 | 6 | 0 | 20 | 5,82 |
| 7 | <i>Eumenes mediterraneus</i> (Kriech, 1879) | 2 | 0 | 0 | 2 | 0,58 |
| 8 | <i>Masaris carli</i> (Von Shulthess, 1922) | 1 | 0 | 1 | 2 | 0,58 |
| 9 | <i>Masaris longicornis</i> (Kuzn, 1923) | 2 | 1 | 0 | 3 | 0,87 |
| 10 | <i>Masaris gussakovskii</i> (Kostylev, 1935) | 1 | 0 | 0 | 1 | 0,29 |
| 11 | <i>Masaris saussurei</i> (Carl, 1921) | 0 | 1 | 1 | 2 | 0,58 |
| 12 | <i>Masaris smirnovi</i> (Kostylev, 1925) | 2 | 0 | 0 | 2 | 0,58 |
| 13 | <i>Avispa alfarera</i> | 1 | 0 | 0 | 1 | 0,29 |
| | Total abundance | 219 | 96 | 29 | 344 | 100 |
| | Total richness | 12 | 7 | 6 | 13 | |

With regard to the methods used for sampling social wasps (active collecting, point sample using liquid bait, and baited bottle traps), a remarkable aspect to note was their large complementarities. The method of AC - active collection responsible for the capture of 219 individuals belonging - 63,7% to 12 species (six genera), with only *Masaris saussurei* being exclusive. The method of PS - point sampling using a liquid bait was responsible for the capture of 96 individuals belonging - 27,9 % to 7 species (four genera), *Polistes biglums*, *Eumenes mediterraneus*, *Masaris carli*, *Masaris gussakovskii*,

Masaris smirnovi, *Avispa alfarera* being exclusive, BT - bottle traps method, 29 individuals belonging - 8,4% to 6 species (three genera), with *Vespa flavopilosa*, *Vespa orientalis*, *Eumenes mediterraneus*, *Masaris longicornis*, *Masaris gussakovskii*, *Masaris smirnovi*, *Avispa alfarera* were obtained.

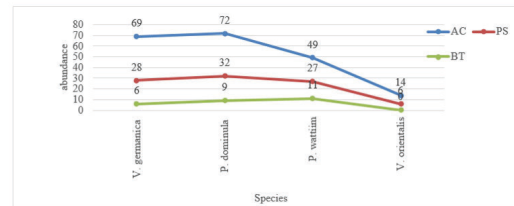


Figure 3: Rarefaction curves through samples, the social wasp fauna of riparian tuqai forest: Active collecting (AC), Point sampling using a liquid bait (PS), and attractive PET bottle trap (BT).

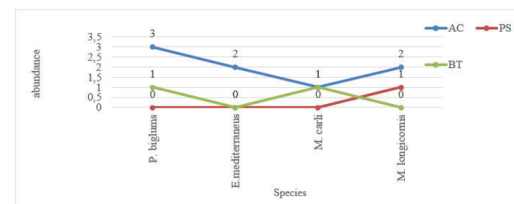


Figure 4: Rarefaction curves through samples, the social wasp fauna of riparian tuqai forest: Active collecting (AC), Point sampling using a liquid bait (PS), and attractive PET bottle trap (BT).

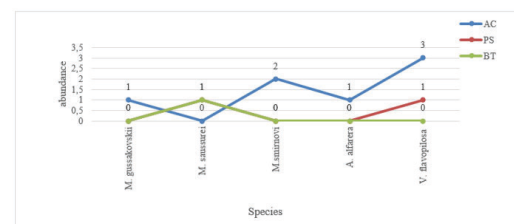


Figure 5: Rarefaction curves through samples, the social wasp fauna of riparian tuqai forest: Active collecting (AC), Point sampling using a liquid bait (PS), and attractive PET bottle trap (BT).

The most efficient method, regarding the number of species collected, was the active collection, responsible for capturing 219 (63.66%) of the species, followed by point sampling using a liquid bait 96 (27.91%) and baited PET bottle traps 29 (8.43%).

From Fig 3-5 we can see, active collecting (AC), point sampling liquid bait (PS) methods are attractive PET bottle trap (BT) is more beneficial, in gathering species it includes total 315 (91,57%). The results of the research show that the re-

cent regeneration of tuqai forests on the banks of the Amu Darya has played an important role in increasing the species composition and number of species of wasp fauna.

CONCLUSION

The foremost copious were *Polistes dominula* and *Vespa lagermanica*. These species have a place to the genus *Polistes* and *Vespa*, which was prevailing within the test. Concerning inspecting strategies, the dynamic collecting ones examined the most prominent abundance esteem.

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