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Full-text article

FIRST RECORD OF *PAMMENE BLOCKIANA* (LEPIDOPTERA: TORTRICIDAE) IN RUSSIA

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The study reports the first record of the tortricid moth *Pammene blockiana* from Russia. Its males were captured in Sochi in May 2025 in pheromone traps baited with the synthetic sex pheromone of the quarantine pest, the Oriental fruit moth *Grapholita molesta*. A total of 48 males of *P. blockiana* were collected from seven traps deployed in gardens and ornamental tree plantings in Sochi. The species was identified based on morphology (forewing pattern and genitalia) and DNA barcoding. The specimens from Sochi showed low genetic variability (0.2 % among three males from three sites) and clustered with individuals from Greece, with a maximum genetic distance of 1.4 %. In DNA-barcoding fragment, *Pammene oxycedrana* was the closest to *P. blockiana*, with a minimum genetic distance of 5.4 %, followed by *Pammene juniperana* (7.1 %). Regular catches in the pheromone traps suggest that *P. blockiana* is established and potentially abundant in Sochi. As its larvae damage cones of *Cupressus* and *Juniperus,* the species may represent a potential threat to Cupressaceae in man-made plantings and nature along the Black Sea coast. New data on the species distribution and the photographs of moth and male genitalia of *P. blockiana*, as well as the photographs of the related moth species are provided. The species diagnosis is given to distinguish *P. blockiana* from closely related species associated with Cupressaceae in Europe. Possible ecological consequences and the risk of further spread of *P. blockiana* are discussed.

Keywords: new record, tortricid moth, *Cupressus*, *Juniperus*, pheromone trapping, DNA barcoding, Back Sea coast of Russia

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Introduction

Regions with warm climates and high plant diversity are often among the most vulnerable to biological invasions (Bellard et al., 2016). The Black Sea coast of Russia represents a hotspot for introduction and establishment of alien phytophagous arthropods (Karpun et al., 2025).

On the Russian Black Sea coast, Cupressaceae species occur both in cultivation and nature (Karpun, 2010; Karpun, Kunina, 2014; Litvinskaya, 2011; Klemeshova, Karpun, 2024). Of 81 species used as ornamentals in the region, 47 (e.g., 58 %) belong to *Cupressus, Hesperocyparis,* and *Juniperus* (Adams et al., 2009; Karpun, 2010; WFO Plant List, 2025). These taxa are highly valued for their evergreen foliage, diverse growth forms, adaptability to subtropical climates, and aesthetic appeal (Klemeshova, Karpun, 2024). Their abundance in resort landscapes make such plantings attractive for colonization by phytophagous insects, including invasive alien species. For instance, an invasive beetle *Lamprodila* (*Palmar*) *festiva* (Linnaeus, 1767) (Coleoptera, Buprestidae) is known as a destructive pest on the Black Sea coast of Russia killing Cupressaceae plants both in urboecosystems and nature (Volkovitsh, Karpun, 2017).

On Cupressaceae, in total 22 species of phytophagous insects have been recorded so far in Sochi, of which 16 species predominantly damage needles, three species affect branches and stems, two species attack young shoots, and one species develops in cones (Shiryaeva, Garshina, 2000; Volkovitsh, Karpun, 2017; Karpun, 2018; Karpun et al., 2024). Within Tortricidae, three species are associated with Cupressaceae, in particular *Cacoecimorpha pronubana* (Hübner, 1799) with *Cryptomeria japonica* (Thunb. ex L.f.) D.Don, *Platycladus orientalis* (L.) Franco, *Sequoia sempervirens* (D.Don) Endl., *Epinotia nanana* (Treitschke, 1835) with *Cunninghamia lanceolata* (Lamb.) Hook., and *Blastesthia tessulatana* (Staudinger, 1871) with *Cupressus*, *Thuja*, and *Juniperus* species (Shiryaeva, Garshina, 2000; Karpun, 2018). Among these, only *B. tessulatana* is known on the Russian Black Sea coast to cause damage to cypress cones.

In May 2025, we detected noticeable number of a tortricid *Pammene blockiana* (Herrich-Schäffer, 1851) in pheromone traps baited with the synthetic sex pheromone of *Grapholita molesta* (Busck, 1916) (Lepidoptera: Tortricidae), a quarantine pest in Russia (Federal Service … 2025; Stryukova, Stryukov, 2022). Thus, here we provide the first confirmed record of this species in Russia, as well as highlight the attraction of *P. blockiana* to this pheromone. Furthermore, we give some notes on the species taxonomy and molecular genetics, and provide the photographs of collected specimens and male genitalia. Finally, we discuss possible impact and the risk of further species spread.

Materials and methods

Study region

The study was conducted in Sochi in May 2025. Sochi is the largest resort city located on the northeastern coast of the Black Sea in Krasnodar Territory (Russia). The city extends approximately 150 km along the coast and stretches inland into the adjacent mountainous region (Anisimov, Bityukov, 2007). The coastal zone is characterized by a humid subtropical climate, with warm winters and hot, humid summers (Fedina, 1968). In contrast, the foothills and highlands exhibit distinct montane climatic conditions resulting from the altitudinal zonation. The region receives 2.200–2.400 hours of sunshine annually; mean annual precipitation is about 1.534 mm. June and July are the driest months, whereas December and January the wettest (Fedina, 1968). The annual sums of temperatures above 10 °C range from 4.400 °C along the coast and foothills to 2.500 °C in the lower and middle mountain belts (Fedina, 1968).

In the urban landscapes of Sochi, *Cupressus sempervirens* L., *C.* × *leylandii* A.B. Jacks. & Dallim., *Hesperocyparis lusitanica* (Mill.) Bartel, *H. arizonica* (Greene) Bartel, *Juniperus chinensis* L., and *J. sabina* L. are the most widespread Cupressaceae species (Karpun, Kunina, 2014).

The Sochi Arboretum, located in the Khosta District of Sochi, is a designated cultural heritage site of Russia. It holds one of the largest collections of subtropical ornamental plants in Russia, i.e., approximately 1.700 taxa, including species, varieties, and cultivars (Shiryaeva, 2015). The collection currently includes 54 species of Cupressaceae (WFO Plant List, 2025).

Field sampling

Sampling was conducted in Sochi from 28 April to 28 May 2025. The pheromone traps of delta shape with stick inner surface, produced by the All-Russian Plant Quarantine Center (VNIIKR) and showed satisfactory efficiency, were used in the study (Glebov et al., 2021). A total of nine pheromone traps were deployed: two during the first period of time (28 April – 15 May) and seven during the second period (16–28 May). They were installed at three sites: (1) the garden of the Subtropical Scientific Centre of the Russian Academy of Sciences (both periods) (Fig. 1), (2) the area adjacent to the Sochi Arboretum (second period only), and (3) within the Sochi Arboretum itself (second period only).

The traps were placed at a height of ~1.5 m on the trees of *Prunus cerasifera*, *P. persica*, *P. serrulata*, and *Malus domestica* (Rosaceae), as the initial objective was the monitoring of Rosaceae-feeding *G. molesta*. Accordingly, the traps were baited with synthetic sex pheromone of *G. molesta*, consisting of Z8-dodecenyl acetate, E8-dodecenyl acetate, and Z8-dodecenol (produced by VNIIKR). During 28 April–15 May, the traps were left unattended and collected in mid-May. From 16 to 28 May, the traps were inspected every 2–3 days; captured moths were removed from sticky surfaces directly in field, transferred to filter paper, and stored in plastic Petri dishes. On 28 May, all traps and the catches of moths were transported to the VNIIKR laboratory for further examination.

Data analysis, species identification, photographing

In the laboratory, the catches from the pheromone traps were examined and the number of the moth specimens recorded. For two localities where by three traps were installed, the differences in the number of caught *P. blockiana* specimens were analyzed using Mann–Whitney U-test (Siegel, Castellan, 1988).

Specimens of *P. blockiana* were removed from the glued surface of the traps and mounted following standard entomological techniques (Dyakov, 1996). Male genitalia were prepared according to the method described in Kovalenko et al. (2024).

The moth specimens were photographed with a Canon EOS 6D digital SLR camera (Japan, Canon) with a Canon MP-E 65 mm f/2.8 1-5X Macro lens (Japan, Canon), which was mounted on a Kaiser Copy Stand RS 2 XA stationary copying table (Germany, Kaiser) with a smooth feed along the axis of the optical system. Images of the genitalia structures were taken using hardware and software complex based on a stereo microscope Nexcope NSZ818 (China, Nexcope). A series of frames (up to 180) was captured at different focal planes. These image stacks were processed using the focus-stacking software Zerene Stacker (Version. 1.04 Build T2024-11-18-1210). Resultant images of adults and their genitalia were further edited using Adobe Photoshop 2021. For comparison, the specimens of other Cupressaceae-feeding *Pammene* species distributed in Europe (e.g., *P. juniperana* (Milliere, 1858)*, P. oxycedrana* (Milliere, 1876)*, P. mariana* (Zerny, 1920)), stored in the collection of Zoological Institute RAS (St. Petersburg), were also studied and photographed.

The collected moth specimens were deposited in the entomological collection of the All-Russian Plant Quarantine Center (Bykovo, Moscow Region) (38 specimens) and the collection of the Zoological Institute RAS (St. Petersburg) (10 specimens).

DNA barcoding

Three adults of *P. blockiana* collected from the pheromone traps at three sites in Sochi were used for DNA barcoding. The DNA was extracted from the thorax of each specimen using the DNA-Extran-2 reagent kit (Syntol, Moscow) following the manufacturer's protocol.

A 658 bp fragment of the mitochondrial COI gene was amplified using the primers LCO1490/HCO2198 (Folmer et al., 1994). The PCR mixture contained 5 μL of 5X MasDD buffer (Dialat), 2 μL each of 10 μM forward and reverse primers, 2.5 μL DNA template, and 13.5 μL deionized water. Amplification was carried out with the following thermal profile: 94 °C for 10 min; 5 cycles of 94 °C for 30 s, 45 °C for 30 s, 72 °C for 1 min; 35 cycles of 94 °C for 30 s, 51 °C for 1 min, 72 °C for 1 min. PCR products were separated on a 1.5 % agarose gel using the Fusion system (Vilber Lourmat). Products were purified with the GeneJET PCR Purification Kit (Thermo Fisher Scientific). Bidirectionally Sanger sequencing (Sanger et al., 1977) was performed on an ABI PRISM 3500xl DNA Analyzer.

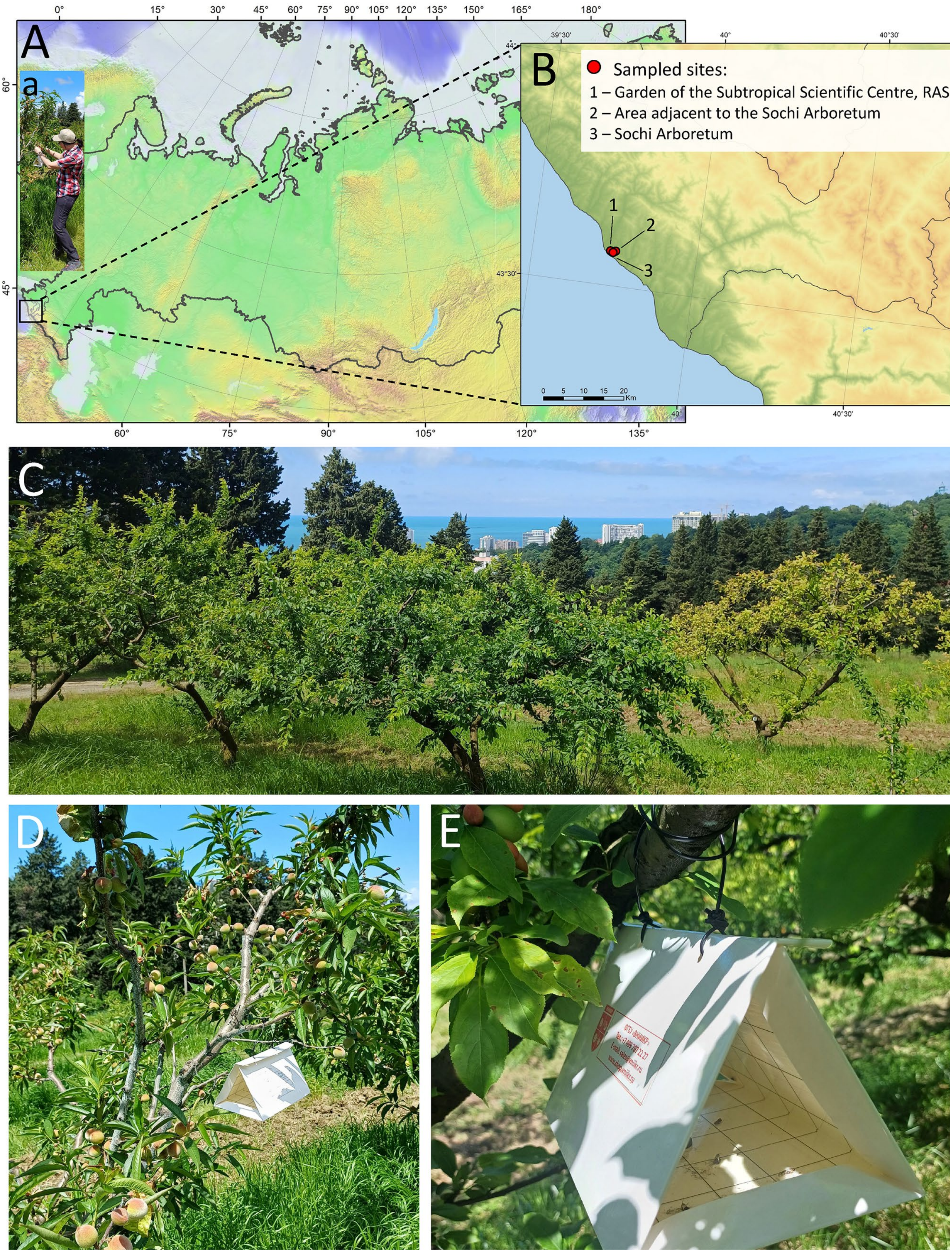

Figure 1. Study region and deployment of pheromone traps, May 2025. A, B – location of the sampled sites; C – view to the garden of the Subtropical Scientific Centre RAS; D, E – delta pheromone traps baited with synthetic sex pheromone of *Grapholita molesta* placed on peach (D) and plum (E) trees. Inset (a) in map A: a photograph of the first author installing a pheromone trap

Рисунок 1. Район исследований и расстановка феромонных ловушек, май 2025 г. A, B – расположение точек сбора материала; C – вид на сад Субтропического научного центра РАН; D, E – дельтовидные ловушки с синтетическим половым феромоном *Grapholita molesta*, установленные на деревьях персика (D) и сливы (E). Вставка (а) на карте A: фотография первого автора, устанавливающего феромонную ловушку

In addition, seven publicly available DNA barcodes from BOLD were included for comparison: *P. blockiana* (3 specimens from Greece), *P. juniperana* (3 specimens: 2 from Germany, 1 from the Netherlands), and *P. oxycedrana* (1 specimen from Cyprus). No sequences of *P. mariana* are currently available in BOLD for analysis. Specimen details are provided in Table 1. Voucher data, sequences and trace files are available at dx.doi.org/10.5883/DS-PAMMENE.

The sequences of *P. blockiana* from Sochi were aligned together with borrowed sequences of three *Pammene* species in BioEdit 7.2.5 (Hall, 1999). A maximum likelihood (ML) tree was constructed in MEGA X (Kumar et al., 2018) using the Kimura two-parameter model with 2000 bootstrap replicates. Interspecific and, where available, intraspecific genetic distances were calculated using the same method. One DNA barcode of *G. molesta* from Georgia (Lovtsova J.A., Kochiev M.V. coll.) was used to root the tree.

Table 1. Specimen data of *Pammene blockiana* and other Cupressaceae-feeding *Pammene* species used for molecular genetic analysis

Таблица 1. Данные экземпляров *Pammene blockiana* и других видов рода *Pammene*, развивающихся на семействе Кипарисовые, использованных для молекулярно-генетического анализа

No.	Process ID Идентификационный номер	Country Страна	Locality Локалитет	Sampling date Дата сбора	Collectors Сборщик	Depositaria* Место хранения
			Pammene blockiana			
1	L30	Russia	Sochi	27.05.2025	Kovalenko M.G., Lovtsova J.A.	VNIIKR
2	L31	Russia	Sochi	27.05.2025	same as above	VNIIKR
3	L32	Russia	Sochi	27.05.2025	same as above	VNIIKR
4	LEASX044-21	Greece	Crete	29.04.2001	Wimmer J.	TLF
5	BSNTN1523-24	Greece	Crete	03.06.2023	Berggren K., Voith R.	RCKB
6	BSNTN1524-24	Greece	Crete	03.09.2023	Berggren K.	RCKB
			Pammene juniperana			
7	BGENL226-23	Netherlands	Drenthe	17.06.1974	Huisman K.J.	NBC
8	FGMLM036-18	Germany	Bavaria	29.05.2017	Segerer A.H.	BSCZ
9	FGMLH474-16	Germany	Bavaria	12.06.2015	same as above	BSCZ
			Pammene oxycedrana			
10	LECYP195-23	Cyprus	Iskele	09.09.2023	Huemer P.	TLF
			Outgroup: *Grapholita molesta*			
11	PIPRF076-25	Georgia	Dusheti	14.05.2019	Lovtsova J.A., Kochiev M.V.	VNIIKR

*Depositaria: BSCZ – Bavarian State Collection of Zoology; NBC – Naturalis Biodiversity Center; RCKB – Research Collection of Kai Berggren; TLF – Tiroler Landesmuseum Ferdinandeum; VNIIKR – All-Russian Plant Quarantine Center.

Results

During the first monitoring period (28 April–15 May), no *P. blockiana* specimens were captured in the pheromone traps in Sochi. In contrast, during the second period (16–28 May 2025), 48 specimens were caught in all seven pheromone traps. Of these, 37 specimens were captured in three traps in the garden of the Subtropical Scientific Centre RAS, 10 specimens in three traps in areas adjacent to the Sochi Arboretum (Table 2), and a single specimen in the Sochi Arboretum (not included in Table 2, as only one trap was deployed at this site).

At the two sites, where by three traps were deployed, the number of males varied from 2 to 19 per trap, averaging 3.3 ± 1.1 males per trap in the area adjacent to the Sochi Arboretum

Table 2. Number of *Pammene blockiana* males captured in the pheromone traps in Sochi, May 2025

Таблица 2. Количество самцов *Pammene blockiana*, пойманных в феромонные ловушки в Сочи в мае 2025 г.

Trap no. Номер ловушки	Area adjacent to the Sochi Arboretum Территория, прилегающая к Сочинскому дендрарию	Garden of the Subtropical Scientific Centre RAS Сад Субтропического научного центра РАН
1	3	19
2	5	13
3	2	5
Sum сумма	10	37
average ± St.Er. среднее ± ст. ошибка	3.3±1.1*	12.3±4.9*

* No statistical difference (Mann-Whitney U-test: U = 0.5, Z = 1.52, $p > 0.05$).

and 12.3 ± 4.9 males per trap in the garden of the Subtropical Scientific Centre RAS (Table 2). No statistically significant difference was detected between these two sites (Table 2).

Studied material (Fig. 2). ***P. blockiana*:** Paralectotype of *P. cupressana* Zerny, 1927 (=*blockiana*), ITALY, "Ob. Italien. Gardasee, Gargnano Majdl. Zerny '13", female (Zoological Institute RAS (St. Petersburg) (ZISP)); RUSSIA, Krasnodar Territory, Sochi, garden of the Subtropical Scientific Centre of the Russian Academy of Sciences, 43.5722 N, 39.7519 E, 77 m a.s.l., 20–26.05.2025, 37 males; area adjacent to the Sochi Arboretum Sochi Arboretum, 43.5699 N, 39.7400 E, 15 m a.s.l., 23–28.05.2025, 10 males; Sochi Arboretum, 43.5704 N, 39.7425 E, 44 m a.s.l., 20.V.2025, 1 male, Kovalenko M.G. and Lovtsova J.A. legit. (for all specimens in Sochi); NORTH MACEDONIA, Treskas Schlucht, W. v. Skopje, 20–30.V.1956, Dr. F. Kasy, female (ZISP); CROATIA, Grun (Dubrovnik), Anf. Juni 1933, Jos. Klimesch, female (ZISP); Stipanska I. Šolta, 22.V.57 Novak (ZISP). ***P. juniperana*:** FRANCE, Hautes-Alpes, L'Argentière-la-Bessée, 14.V.25, female (ZISP). ***P. oxycedrana*:** Europe, "Gall.(ia) m. 78", coll. Wocke, male (ZISP). ***P. mariana*:** CROATIA, "Spalato 5.50 Hw." coll. Wocke, female (ZISP).

Morphology. All specimens collected in Sochi in May 2025 (Fig. 2A) exhibited morphological characteristic for

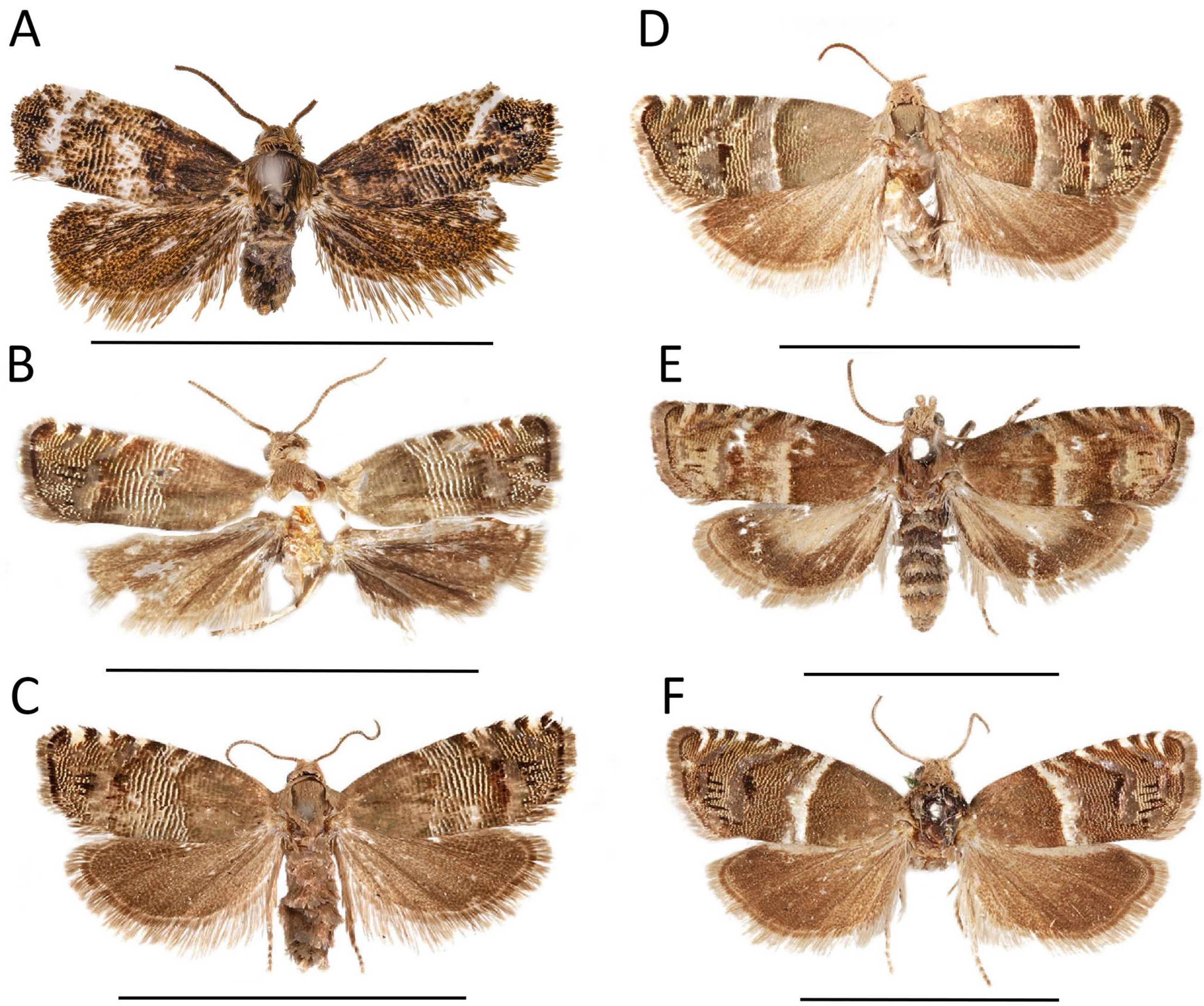

Figure 2. Adults of *Pammene blockiana* and related Cupressaceae-feeding *Pammene* in Europe. A – *P. blockiana*, Sochi, Russia (the specimen was collected from sticky pheromone trap, therefore some scales on forewings are missing); B – *P. blockiana* (in coll. as paralectotype of *Pammene cupressana* Zerny, 1927), Italy, "Gargnano"; C – *P. blockiana*, North Macedonia, "Skopje"; D – *Pammene juniperana*, France, "L'Argentière-la-Bessée"; E – *Pammene oxycedrana*, Europe, "Gall.(ia)" [probably France at the border with Italy]; F – *Pammene mariana*, Croatia, "Spalato" – Split. The specimens in figs B–E are stored in the collection of Zoological Institute RAS (St. Petersburg). The scale is 5 mm.

Рисунок 2. Имаго *Pammene blockiana* и других видов рода *Pammene,* развивающихся на семействе Кипарисовые в Европе. A – *P. blockiana*, Сочи, Россия (экземпляр был изъят из клеевой феромонной ловушки, поэтому чешуйки на крыльях частично стерты); B – *P. blockiana* (в коллекции подписан как паралектотип *Pammene cupressana* Zerny, 1927), Италия, "Gargnano"; C – *P. blockiana*, Северная Македония, "Skopje"; D – *Pammene juniperana*, Франция, "L'Argentière-la-Bessée"; E – *Pammene oxycedrana*, Европа, "Gall.(ia)" [возможно, Франция на границе с Италией]; F – *Pammene mariana*, Хорватия, "Spalato" – Сплит. Экземпляры, приведенные на рисунках B–E, хранятся в коллекции Зоологического института РАН (Санкт-Петербург). Шкала – 5 мм.

P. blockiana. Among 48 specimens examined, no notable variation was observed in forewing coloration or in the structures of male genitalia. In the pheromone traps in Sochi, only males of *P. blockiana* were captured. Nevertheless, for completeness, a brief note on the genitalia of both sexes is provided below.

Imago: wing span 7–8 mm. Head and thorax brownish-gray, slightly paler than basal area of forewing. Labial palpi short, pale greyish-yellowish, not visible from above. Basal field of forewing as approximately one-third of the wing, covered by brownish-grey slightly shining scales. Distal margin of basal field marked by darker slightly curved narrow transverse band. Median fascia consists of 7–10 alternating blackish-brown and white lines and begins from two whitish costal strigulae. Postmedian stria wide, formed by shining bluish-silvery scales and originates from third costal strigula. Dorsal part of postmedian stria forming inner line of ocellus. Outer line of ocellus absent, replaced by 2–3 blackish short streaks. In outer field two wide whitish costal strigulae present. Short metallic-shining line extends from distal costal strigula towards outer margin. Black marginal line along the base of unicolorous silvery-shining cilia slightly paler below wing apex. Hindwing unicolorous greyish-brown with slightly lighter basal third. Cilia greyish with dark line along base.

Male genitalia (Fig. 3)*:* distal part of sacculus strongly elongate ventrally, forming a long triangular prominence, highly characteristic for this species. Valval neck is short and narrow. Basal part of cucullus with short triangular ventral prominence. Distal part of cucullus curved ventrally. Aedeagus broad basally with patch of short cornuti in vesica.

Female genitalia: postostial part of sterigma very small and weakly sclerotized, cingulum long and narrow, postmedian part of ductus bursae slender and long. Corpus bursae large ovoid with two small curved signa on rounded base.

Diagnosis: P. blockiana is externally similar to a group of congeners (*P. juniperana*, *P. oxycedrana*, and *P. mariana*), whose larvae also feed on Cupressaceae. However, it can be reliably distinguished from these species by a combination of morphological characters.

P. blockiana is the smallest species in the group, with a wingspan of 7–8 mm, compared to 8–9 mm in *P. juniperana*, 10–11.5 mm in *P. oxycedrana*, and 8.5–11 mm in *P. mariana*. The most characteristic external diagnostic feature is the structure of the forewing ocellus. Unlike the other three species, which possess a complete outer ocellar line, in *P. blockiana* this line is entirely absent and replaced by 2–3 short blackish streaks. The median fascia is notably wide, consisting of 7–10 alternating dark and white lines.

In the male genitalia, *P. blockiana* is distinguished by a very deep incision on the ventral edge of the valva, forming a neck that is twice as narrow as the sacculus. In contrast, the valval neck in *P. juniperana* is about two-thirds the width

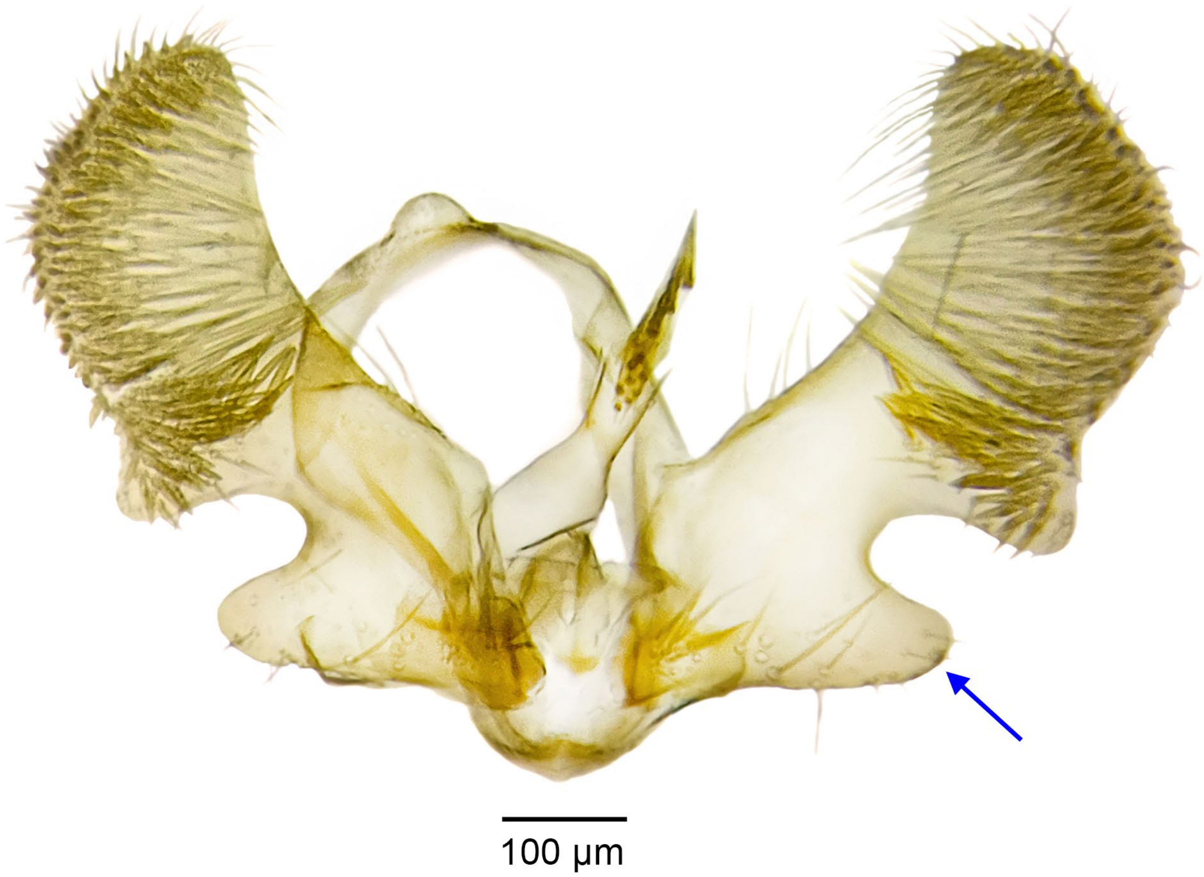

Figure 3. Male genitalia of *Pammene blockiana*, Sochi, Russia. The main diagnostic character, i.e., long triangular prominence on sacculus, is indicated by an arrow

Рисунок 3. Гениталии самца *Pammene blockiana,* Сочи, Россия. Стрелкой показан длинный треугольный выступ саккулюса – основной диагностический признак of the sacculus, while in *P. oxycedrana* and *P. mariana* it is almost as wide as the sacculus. The ventral prominence of the cucullus in *P. blockiana* is triangular with a pointed apex, whereas in *P. juniperana* it is rounded apically, and it differs in shape in the other species. In the female genitalia, *P. blockiana* differs from all mentioned species by possessing a long and narrow cingulum.

Biology. In Sochi, first *P. blockiana* males were documented in the second half of May. No further observations on the phenology are available.

Host plants: Cupressus sempervirens, *Juniperus excelsa*, and *J. foetidissima* (Kuznetsov, 1978; Razowski, 2003; Moraiti et al., 2019). These plants, together with the representatives of 11 other genera (*Callitropsis, Calocedrus, Chamaecyparis, Fokienia, Hesperocyparis, Microbiota, Platycladus, Tetraclinis, Thuja, Thujopsis,* and *Xanthocyparis*) constitute the subfamily Cupressoideae Rich. ex Sweet (Jagel, Dörken, 2015). In Sochi, particularly at the studied localities *Cupressus* and *Juniperus* are present (Table 3), including the species confirmed as host plants of the moth in Europe (Razowski, 2003; Moraiti et al., 2019).

The trophic association of *P. blockiana* with Cupressaceae links it to morphologically similar species: *P. juniperana*, *P. oxycedrana*, and *P. mariana*. While *P. blockiana* develops on *Cupressus* and *Juniperus* species, including its European hosts *C. sempervirens*, *J. excelsa*, and *J. foetidissima*, the other three species show a more specialized preference for junipers.

Pammene juniperana develops in cones of *J. communis* and *J. thurifera* (Danilevsky, Kuznetzov, 1968) and has two generations a year (Razowski, 2003). *P. oxycedrana* feeds on *J. oxycedrus* (Danilevsky, Kuznetzov, 1968; Razowski, 2003); full-grown larvae drop to the ground to pupate by the end of February (Razowski, 2003). *P. mariana* is a serious pest of *J. excelsa*, *J. foetidissima* and *J. oxycedrus* (Danilevsky, Kuznetzov, 1968), the plants which foliage and cones have commercial values (e.g., used for producing etheric oils and different beverages, for instance, gin) (Gari et al., 2020; Fotiadou et al., 2023). Larvae of *P. mariana* bore into cones and pupate inside whitish cocoon, producing one full generation per year, with a partial second generation. Notably, larvae of the second generation hibernate inside cones (Razowski, 2003).

DNA barcoding data (Fig. 4)**.** The specimens of *P. blockiana* from Sochi showed low variability (0.2%) and clustered together with specimens from Greece, with a maximum genetic distance of 1.4% (Fig. 4). The other two Cupressaceae-feeding *Pammene* species formed two distinct clusters in the tree (Fig. 4). The closest relative to *P. blockiana* was *P. oxycedrana*, with a minimum genetic distance of 5.4%, followed by *P. juniperana*, which showed a minimum genetic distance of 7.1% from *P. blockiana*. The minimum distance between *P. oxycedrana* and *P. juniperana* was 4.1%.

Distribution. *P. blockiana* is known from Mediterranean region of southern Europe. It was recorded in France (where the specimens were captured in pheromone traps with synthetic sex pheromone of *Cydia pomonella* (Chambón, 1994)), Italy, former Yugoslavia (Razowski, 2003), Slovenia, Croatia (Šumpich et al., 2022), Greece (Crete) (Huemer, 2025), Cyprus (Moraiti et al., 2019), and Turkey (Fig. 5)

In Razowski (2003), Germany is mentioned, although the confirmations from this country are lacking (Gaedike, 2017; Lepiforum, 2025). Earlier records from Transcaucasia (Caradja, 1916) require confirmation. Kuznetzov (1978) listed *P. blockiana* for the Black Sea coast without specifying the countries, likely referring to regions outside Russia, as no verified records from Russia existed until now. Our study documents the species on the Black Sea cost of Russia, specifically in Sochi, for the first time (Fig. 5).

Other Cupressaceae-feeding *Pammene* species are known from Europe: *P. juniperana* from France and Germany, *P. oxycedrana* from Southern France, Italy, and Crimea, *P. mariana* from former Yugoslavia (Dalmatia – Croatia), Turkey, Crimea, and western Caucasus (Razowski, 2003, Sinev et al., 2019).

Table 3. Species diversity of *Cupressus* and *Juniperus* (Cupressaceae) in Sochi

Таблица 3. Видовое разнообразие родов *Cupressus* и *Juniperus* (Кипарисовые) в Сочи

Genus Род	Localities Локалитеты	
	Sochi plantings (including areas adjacent to the Subtropical Scientific Centre RAS) Сочинские насаждения (включая территории, прилегающие к Субтропическому научному центру РАН)	Sochi Arboretum Сочинский дендрарий
Cupressus L.	**10 species:** *C. atlantica, C. chengiana, C. cashmeriana, C. duclouxiana, C. dupreziana, C. gigantea, C. hybrida, C. × leylandii, C. sempervirens*, C. torulosa*	**5 species:** *C. cashmeriana, C. duclouxiana, C. × leylandii, C. sempervirens*, C. torulosa*
Juniperus L.	**22 species:** *J. brevifolia, J. cedrus, J. chinensis, J. communis, J. davurica, J. deppeana, J. erythrocarpa, J. excelsa*, J. foetidissima*, J. horizontalis, J. isophyllos, J. oxycedrus, J. phoenicea, J. pinchotii, J. pseudosabina, J. rigida, J. sabina, J. sargentii, J. scopulorum, J. sibirica, J. squamata, J. virginiana*	**17 species:** *J. cedrus, J. chinensis, J. communis, J. davurica, J. deppeana, J. excelsa*, J. foetidissima*, J. isophyllos, J. oxycedrus, J. phoenicea, J. pinchotii, J. pseudosabina, J. rigida, J. sabina, J. scopulorum, J. sibirica, J. virginiana*

*Host plants of *P. blockiana* in Europe (Kuznetsov, 1978; Razowski, 2003; Moraiti et al., 2019).

Figure 4. COI Maximum likelihood tree showing the relationship of *Pammene blockiana* specimens from Sochi (Russia) to Cupressaceae-feeding *Pammene* species from Europe. Clusters are color-coded (light red, green, blue) to indicate different BINs. Bootstrap values >70 are indicated at the corresponding nodes

Рисунок 4. Дендрограмма филогенетических связей между *Pammene blockiana* из Сочи (Россия) и видами *Pammene*, развивающимися на Кипарисовых в Европе. Дендрограмма построена методом максимального правдоподобия на основе данных гена COI митохондриальной ДНК. Кластеры выделены разными цветами (светло-красным, зеленым, синим) для обозначения разных BIN-номеров. Значения бутстрепа >70 указаны рядом с соответствующими узлами

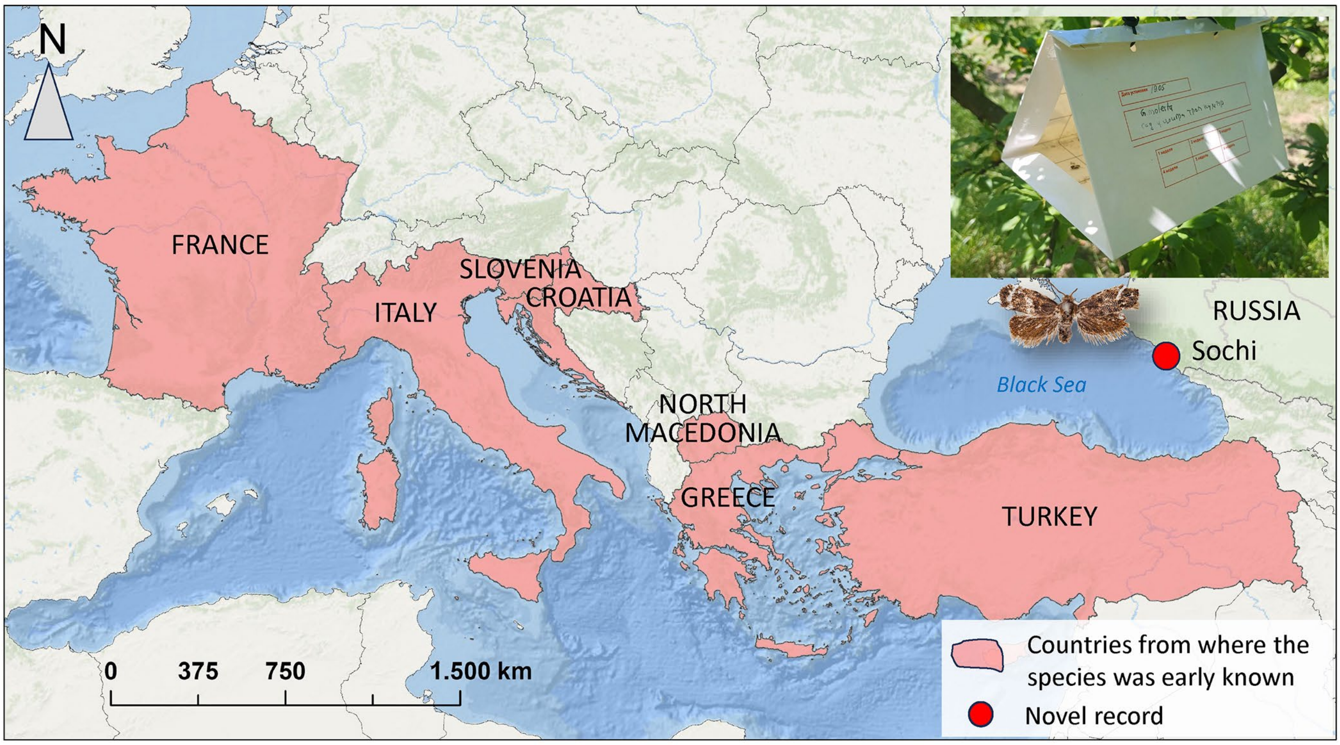

Figure 5. Schematic distribution of *Pammene blockiana* in Europe. Countries where *P. blockiana* was recorded are fully colored, although in some cases the species is known only from limited area, as per data from various sources (Chambon, 1994; Razowski, 2003; Moraiti et al., 2019; Šumpich et al., 2022; Lepiforum, 2025; Huemer, 2025). Germany and Transcaucasia, where the species presence requires confirmation, are not indicated on the map

Рисунок 5. Схема распространения *Pammene blockiana* в Европе. Страны, где обнаружена *P. blockiana*, закрашены полностью, хотя в некоторых случаях вид известен лишь с ограниченной территории, согласно данным из разных источников (Chambon, 1994; Razowski, 2003; Moraiti et al., 2019; Šumpich et al., 2022; Lepiforum, 2025; Huemer, 2025). Германия и Закавказье, где наличие вида требует подтверждения, на карте не обозначены

Discussion

This study provides the first confirmed record of *P. blockiana* in Russia, with its detection in Sochi. The species was identified based on morphology (forewing pattern and male genitalia) showing difference from other Cupressaceae-feeding *Pammene* species present in Europe (Razowski, 2003). Additionally, DNA barcoding clearly distinguished the studied specimens from *P. oxycedrana* and *P. juniperana* (*P. mariana* DNA barcodes were not available for the comparative analysis). Our finding extends the known range of *P. blockiana* eastward along the Black Sea coast, bridging a gap between its Mediterranean and Transcaucasian records. It also highlights the diagnostic stability of morphological and molecular characters across the species range.

The origin of *P. blockiana* in Russia remains uncertain. One possibility is that the species is native to southern Russia but remained undetected due to very low population density, becoming noticeable only recently. This hypothesis appears plausible, as Kuznetsov (1987) mentioned the species from the Black Sea coast, although without specifying exact localities or countries. The Black Sea coastline is, however, shared by six countries – Bulgaria, Georgia, Romania, Russia, Turkey, and Ukraine – making precise attribution challenging. Alternatively, *P. blockiana* may represent a recent introduction to Sochi through human-mediated transportation from Europe, particularly from Italy. The latter is conceivable given the historical influx of alien insect pests from Italy with ornamental plants for planting during the large-scale landscaping activities prior 2014, preceding the XXII Olympic Winter Games (Karpun, 2018, 2019; Karpun et al., 2025).

To our knowledge, this is the first record of *P. blockiana* males being attracted to traps baited with the synthetic sex pheromone of *G. molesta*. The synthetic pheromone of *G. molesta* is known to attract the variety of Tortricidae species (Akulov et al., 2014, 2025). The capture of *P. blockiana* males on the synthetic pheromone of *G. molesta* suggests some overlap in response to some pheromone components, a phenomenon previously reported in other tortricids (Velcheva, 2000). This cross-attraction could provide a practical basis for incidental monitoring (Akulov et al., 2025). Notably, during extensive field trials using *G. molesta* synthetic pheromone in the 1980s (Shutova, 1980) and subsequent large-scale surveys in Sochi region (Ignatova, 1981; Shiryaeva, 2000; Shiryaeva, Garshina, 2000; Karpun, Ignatova, 2010; Shiryeva, 2015; Karpun, 2018; Karpun et al., 2025), *P. blockiana* was never recorded, further complicating the assessment of its current status in the area.

The absence of *P. blockiana* specimens in traps deployed between the end of April and mid-May suggests that the flight of this species begins in Sochi no earlier than mid-May. From 20 May (first detection date) until 28 May (the date when the traps were removed), the species was regularly detected in the pheromone traps. Based on these observations, we hypothesize that the flight peak may occur in June, although no data are currently available to confirm this. Whether the species produces one or multiple generations per year in Sochi remains also unclear. Addressing this question would require a dedicated study with pheromone traps deployed continuously over several months.

Pammene blockiana has no quarantine status in Russia or elsewhere. However, few related species are recognized as quarantine pests in some parts of world, including *Pammene fasciana* (Linnaeus, 1761), which is listed as such for the USA, Chile, and Turkey, and *Pammene rhediella* (Clerck, 1759) for Argentina (EPPO, 2025). These species, however, feed on different host plants: *P. fasciana* on *Castanea sativa* and *Quercus robur* (Fagaceae), while *P. rhediella* is associated with *Crataegus, Malus, Prunus,* and *Pyrus* (Rosaceae) (Lepiforum, 2025).

To date, only three host plants have been reported for *P. blockiana* in Europe: *Cupressus sempervirens*, *Juniperus excelsa*, and *J. foetidissima* (Razowski, 2003; Moraiti et al., 2019). However, on the Russian Black Sea coast, besides these species other representatives of Cupressaceae also grow. Given the fact that *P. blockiana* can develop on more than one genus (i.e., exhibits oligophagy), it is plausible that it may also utilize other members of Cupressaceae, especially from subfamily Cupressoideae, as host plants.

Although *P. blockiana* has not been reported as a pest of major economic significance, a study from Cyprus demonstrated its involvement in seed damage of *J. foetidissima* (Moraiti et al., 2019). On the island, cone infestation reached 30–90%, caused by four seed-feeding Lepidoptera: three *Pammene* species (*P. blockiana, P. juniperana*, and *P. mariana*) and one argyresthiid, *Argyresthia aurulentella* (Stainton, 1849). However, the contribution of each species to the overall seed damage remains unclear (Moraiti et al., 2019).

Relatively high number of *P. blockiana* individuals captured in Sochi indicates that the species can be abundant in the region. As its larvae develop in cones of *Cupressus* and *Juniperus*, it may represent a potential threat to ornamental Cupressaceae species, which are widely planted on the Black Sea coast of Russia (Karpun, Kunina, 2014; Klemeshova, Karpun, 2024). Furthermore, on the north of this region, there are natural forests with *J. excelsa* and *J. foetidissima*, the species listed in the Red Book of the Russian Federation (Litvinskaya, 2024; Litvinskaya, Fateryga, 2024), which may also be affected.

Conclusions

The discovery of *P. blockiana* in Sochi highlights the need for continued surveys in Southern Russia, particularly in areas where Cupressaceae plants grow. Given regular catches of *P. blockiana* in Sochi and its ability to damage cones of *Cupressus* and *Juniperus*, the moth may pose risks to the conservation value of botanical collections and natural plantings, especially those containing endangered *Juniperus* species. From a plant protection perspective, clarification of the moth's host range is especially critical, as if additional taxa prove susceptible, the potential impact of the tortricid species may be considerably greater than currently assumed. Further research should also focus on exploring the life cycle of *P. blockiana* in the climatic conditions of Southern Russia and defining the species current distribution. The latter should involve molecular genetic means to identify source populations and pathways of spread, and assess the potential for expansion to other regions and countries where Cupressaceae plants are present.

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Полнотекстовая статья

ПЕРВАЯ НАХОДКА *PAMMENE BLOCKIANA* (LEPIDOPTERA: TORTRICIDAE) В РОССИИ

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В статье сообщается о первой находке кипарисовой плодожорки (*Pammene blockiana*) в России. Самцы данного вида были отловлены в Сочи в мае 2025 года при помощи клеевых ловушек с синтетическим половым феромоном карантинного вредителя – восточной плодожорки *Grapholita molesta*. Всего было отловлено 48 самцов *P. blockiana* в семь ловушек, установленных в садах и декоративных насаждениях г. Сочи. Вид был идентифицирован по морфологическим признакам (рисунку передних крыльев и строению гениталий), а также при помощи ДНК-баркодинга. Образцы из Сочи показали низкую генетическую изменчивость (0.2% среди трёх самцов из трёх точек) и сформировали один кластер с образцами вида из Греции с максимальной генетической дистанцией 1.4%. По фрагменту гена COI митохондриальной ДНК к *P. blockiana* наиболее близка плодожорка *Pammene oxycedrana* с минимальной генетической дистанцией 5.4%, за которой следует *Pammene juniperana* (7.1%). Регулярные отловы в феромонные ловушки позволяют предположить, что кипарисовая плодожорка обитает в Сочи и встречается там отнюдь не при низкой численности. Поскольку ее гусеницы повреждают шишки кипариса и можжевельника, вид может представлять потенциальную угрозу для кипарисовых в искусственных насаждениях и в природе вдоль побережья Черного моря. В статье представлены новые данные о распространении вида, приведены фотографии бабочки и гениталий самца *P. blockiana*, а также фотографии бабочек близких видов. Указаны диагностические признаки кипарисовой плодожорки, позволяющие отличить ее от близкородственных видов, связанных с кипарисовыми в Европе. Обсуждаются возможные экологические последствия и риск дальнейшего распространения *P. blockiana*.

Ключевые слова: новая находка, листовертка, кипарис, можжевельник, феромонные ловушки, ДНК-баркодинг, Черноморское побережье России

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