Phenological groups of snout moths (Lepidoptera: Pyralidae, Crambidae) of Rostov-on-Don area (Russia)

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Abstract. Results of pyralid moths caught into light-traps in the Rostov-on-Don area during 2006–2012 were analysed. Diagrams are presented of phenological group subdivisions made on the basis of quantitative data of pyralid imago activity from spring to autumn.

Samenvatting. Felonogie van enkele groepen grasmotten (Lepidoptera: Pyralidae, Crambidae) in het Rostov-on-Don gebied (Rusland)
De resultaten van mottenvangsten in lichtvallen in de streek van Rostov-on-Don gedurende 2006–2012 worden geanalyseerd. Diagrammen worden voorgesteld waarin fenologische groepen worden onderscheiden gebaseerd op kwantitatieve gegevens van de mottenactiviteit van lente tot herfst.

Résumé. La phénologie de quelques pyralides (Lepidoptera: Pyralidae, Crambidae) dans la région de Rostov-on-Don (Russie)
Les résultats des captures dans des pièges lumineux dans la région de Rostov-on-Don durant la période de 2006–2012 sont analysés. Des diagrammes sont présentés avec des groupes phénologiques basés sur des informations quantitatives des activités des Pyraloidea du printemps à l'automne.

Key words: Rostov-on-Don area – pyralid moths – phonological groups – light-trapping.

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Material

In the Rostov-on-Don area during 2006–2012 there were caught 203 species of snout moths (Pyraloidea) by light-trapping. Total amount of specimens – 87,767 ex., trapping localities – 55, trapping nights – 504. Monitoring of the moths was carried out from early spring to late autumn. In this way a vast material for phenological analysis was collected. An original quantitative database was accumulated in "Access". For pyralid species identification the private collection of A. N. Poltavsky was used with further checking in the Zoological Institute of Russian Academy of Sciences (Saint-Petersburg).

Discussion

The numerical data were grouped in a source matrix as follows: the quantity of collected specimens of each pyralid species from all trapping localities was summarized for each 10 calendar dates consistently. Thus, all further phenological data analysis was carried out with 10 days intervals.

In the fauna of any region there are always some moth-species, which we meet in only a few specimens. Data about such species are insufficient for the authentic conclusions about phenology. Therefore all pyralid species, collected only in 1–2 calendar dates were excluded from the source matrix. So, for only 149 species the phenological groups were determined (table S1 – http://webh01.ua.ac.be/vve/Phegea/Appendices/Phegea 42-1_page_22.pdf).

The pulsing diagrams (Figures 1, 2) represent 3 main phenological groups of pyralid moths in the Rostov area: early summer (ES), late summer (LS) and autumn (AU). In diagram-1 the width of lines is proportional to the number of imagines of trapped pyralid species. Actually flying periods of all groups are considerably coinciding.

The climate of the Rostov area is characterized by a short spring, hot summer, warm autumn and mild winter. These features are amplified in connection with the global warming (Poltavsky *et al*. 2008). This creates favourable conditions for the development of multivoltine moths. Such pyralids dominate in the LS phenological group, which includes 67,1% of all species. Simultaneously it prolongs the flight period of univoltine pyralids.

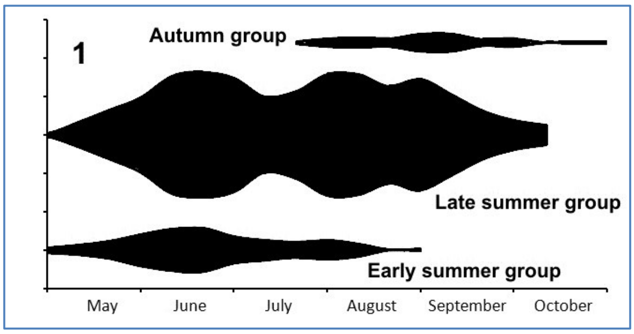

Figure 1. Species number of pyraloid phenological groups in the Rostov area.

As substantiation for the phenological groups subdivision we choose the periods of mass flying activity, which is shown in diagram-2. The width of lines in this diagram is not proportional to the number of trapped moths. In descriptive reasons the scales of lines corresponds as: ES:LS:AU/4:60:6. Moreover, the species *Loxostege sticticalis* (Linnaeus) is excluded from further calculations, as its specimens represent 66,3% of the total moths number and could radically mask the real dynamics of the phenological groups activity.

Diagram-2 visually displays, that the ES-group is active in 2 periods: 3rd decade of May and 2nd decade of June; the LS-group is active in the beginning of August and the AU-group in the 1st decade of September.

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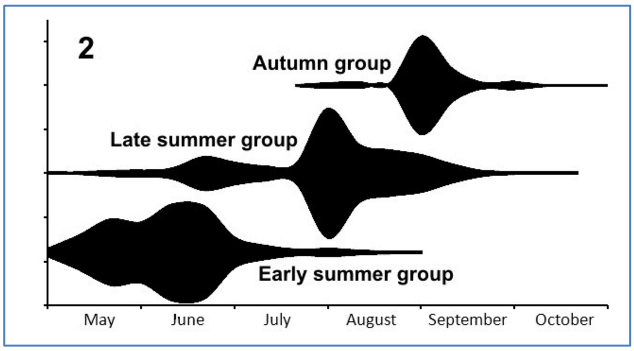

Figure 2. Specimens number of pyraloid phenological groups in the Rostov area.

The form of this diagram undoubtedly depends on some dominating species. In the ES-group the following 5 pyralid species dominate: *Chrysocrambus craterellus* (Scopoli), *Ch. linetellus* (Fabricius), *Platytes cerussella* (Denis & Schiffermüller), *Thisanotia chrysonuchella* (Scopoli), and *Evergestis frumentalis* (Linnaeus). They represent 78,9% of the specimens in the trapping samples. In the LS-group the following 8 pyralid species dominate: *Euchromius superbellus* (Zeller), *E. ocellea* (Haworth), *Pyrausta sanguinalis* (Linnaeus), *Sitochroa verticalis* (Linnaeus), *Aporodes floralis* (Hübner), *Nomophila noctuella* (Denis & Schiffermüller), *Homoeosoma nebulellum* (Denis & Schiffermüller), and *Phycitodes lacteella* (Rothschild), representing 68,6% of the specimens. In the AU-group, locally in dry steppes only *Actenia brunnealis* (Treitschke) dominates, representing 66,2% of the specimens.

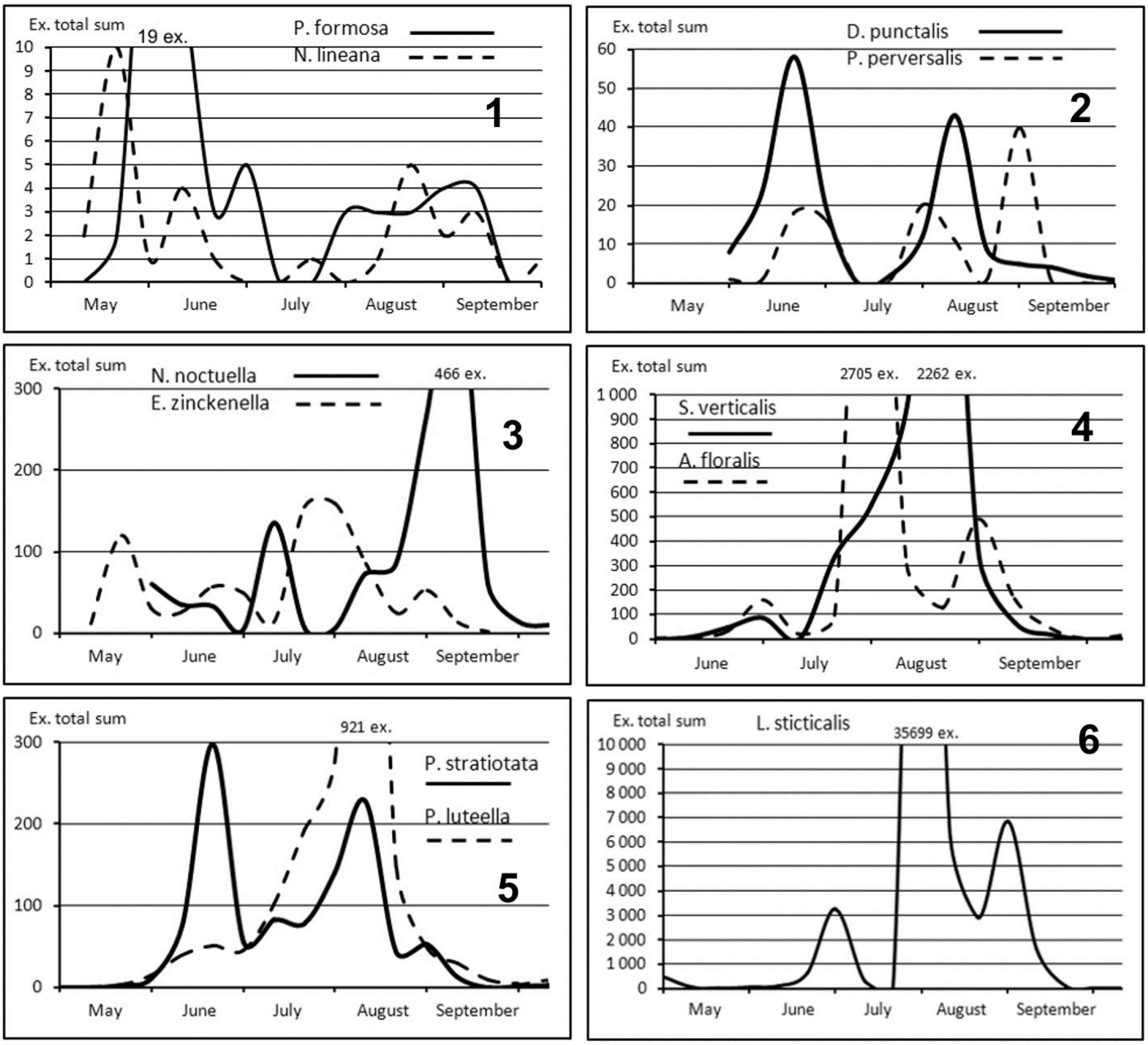

Figure 3. Seasonal dynamics of pyraloid species imago in the Rostov area.

Examples of seasonal multivoltine pyralid activity (LS-group) are presented in Figure 3. The peaks in the graphics of species flying to the light-traps must be critically interpreted as separate generations. For instance, 2 divided peaks match to 2 generations in *Dolicharthria punctalis* (Denis & Schiffermüller) (#2) and *Parapoynx stratiotata* (Linnaeus) (#5). But 3 peaks in *Pyralis perversalis* (Herrich-Schäffer) (#2) and 5 peaks in *Nyctegretis lineana* (Scopoli) (#1) match probably also to 2 generations of each species, as integrated data for these graphics were obtained from various regional populations with different ranges of density. Similar graphics are present in *Sitochroa verticalis* (Linnaeus) (#4) and *Pediasia luteella* (Denis & Schiffermüller) (#5) with a very small 1st generation.

Indistinct indication of the first generation also masking the real voltinism in the cases of *Etiella zinckenella* (Treitschke) (#3), *Loxostege sticticalis* (Linnaeus) (#6) and *Aporodes floralis* (Hübner) (#4), so that it is difficult to separate exactly 2 or 3 possible generations. The last two species represent a double-peak (in August-September), but in *Aporodes floralis* this is the 2nd generation, whereas for *Loxostege sticticalis* it represents the 3rd generation.

Researchers in others regions of Russia allocate similar phenological groups of pyralids. In particular, for the southern part of the Far East of Russia, where a humid monsoon climate prevails, the distribution of 83 species of pyralids is as follows: 1) early summer group (10 species) – active in May-June, 2) summer group (64 species) – active in June-July or June-August, 3) late summer group (5 species) – active from the 3rd decade of June to the 1st decade of September, 4) trans spring-summer-autumn group (4 species) – active during May-September, or April–October (Shevtzova & Streltzov 2009). Actually, the authors could have united the small 4th group with the 2nd, as we did here.

While the Rostov-on-Don area is one of the greatest agricultural regions of Russia, there are some pest pyralids present in its fauna. But really mass pest species are only few: *Loxostege sticticalis*, *Evergestis frumentalis*, *Homoeosoma nebulellum*, *Sitochroa verticalis*, and *Nomophila noctuella*. It looks like a high regional biodiversity of pyralid moths provided by their good adaptation for artificial biotopes of agrolandscape.

The voltinism of Pyraloidea undoubtedly depends not only on climatic conditions, but also on the available food resources, which are the richest in the crop fields. Some species are perfectly adapted for feeding on weeds, e.g.: *Aporodes floralis* and *Phycitodes lacteella*. Larvae of the 1st generation of the pest species *Etiella zinckenella* feed on peas, while those of the 2nd generation feed on the beans of *Robinia pseudoacacia* L., which is widely spread in the Rostov area, as green hedges around the fields. Moreover, the pupae of each generation of *Etiella zinckenella* and some other pyralid moths can enter diapause till the following year. So, if the last summer (or autumn) generation can not find enough food, the whole population will be safe for further existence anyway.

Conclusions

Quantitative monitoring of pyraloid moths in the Rostov-on-Don area in 2006–2012 allows to subdivide 149 species into 3 phenological groups, of which the late summer group is dominant. If to compare pyraloids with noctuid moths, investigators subdivide the latter sometimes into 14 more or less distinctly separated phenological groups or aspects (Shchurov 2005). Phenological classification of pyraloids could be also more fractional, but the small abundance of many species is the limiting factor for correct conclusions.

An interesting fact is that there is not any investigation in which the decision about phenological groups subdivision made on the base of quantitative data of pyralid moths imago activity. It looks like a big lack of total moth's monitoring explorations.

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