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# *MANTIS RELIGIOSA* (DYCTIOPTERA, MANTIDAE) INFECTED BY *WOLBACHIA*

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***Mantis religiosa* (Dyctioptera, Mantidae) Infected by *Wolbachia*. Bilousov O. O., Chaplinska M. V., Zhuk O. W., Gorobchyshyn V. A., Kozeretska I. A. —** For the first time, endosymbiotic bacteria of the genus *Wolbachia* were found to infect soothsayers, *Mantis religiosa* (Linnaeus, 1758). Mantises were collected at two locations in vicinity of Mykolaiv and Kaniv, Ukraine. Tested individuals were not infected by Cardinium and Spiroplasma.

Key words: *Mantis religiosa*, Dyctioptera, Mantidae, *Wolbachia*, *Cardinium*, *Spiroplasma*.

***Mantis religiosa* (Dyctioptera, Mantidae), инфицированные *Wolbachia*. Белоусов А. О., Чаплинская М. В., Жук О. В., Горобчишин В. А., Козерецкая И. А. —** Впервые установлено наличие эндосимбиотических бактерий рода *Wolbachia* у богомолов *Mantis religiosa* (Linnaeus, 1758). Богомолы были пойманы в двух местонахождениях (окрестности Николаева и Канева, Украина). Особи не были инфицированы бактериями родов *Cardinium* и *Spiroplasma*.

Ключові слова: *Mantis religiosa*, Dyctioptera, Mantidae, *Wolbachia*, *Cardinium*, *Spiroplasma*.

## Introduction

Bacteria of the genera Wolbachia, Cardinium, and Spiroplasma, which cause a variety of sexual reproduction modifications, as cytoplasmic incompatibility, parthenogenesis, male killing, feminization, etc., attract attention of the scientists from diverse fields of biology worldwide. Studies of their distribution in natural and laboratory populations, the mechanisms of their influence on host organisms, the ways of their transmission (and so distribution), as well as other aspects of their symbiosis, are among primary research interest topics. Up to date, approximately 66% of the investigated insect species of Coleoptera, Orthoptera, Lepidoptera, Dyctioptera, Diptera, Hymenoptera and other groups have been found to be infected with bacteria of the genus *Wolbachia*, which have also been found in 35% of the investigated crustaceans, nematodes, spiders, springtails, and other invertebrate animal groups (Goryacheva, 2004; Markov, Zakharov, 2006; Serbus et al., 2008; Teixeira et al., 2008).

Among mantids, a Chinese species *Tenodera sinensis* (Stoll, 1813) was tested for the presence of *Wolbachia* but the infection was not found (Week et al., 2003).

*Mantis religiosa* (Linnaeus, 1758) is a widespread species with diverse trophic connections with other species (Reitze, Nentwig, 1991), which can potentially distribute bacterial endosymbionts.

## Material and methods

Material examined. Ukraine, environs of Kaniv, 2 ♀, Mykolaiv, 1 ♀ (Chaplinska leg.). The insects from Kaniv descended from the same ootheca.

DNA was extracted using QIAamp DNA Micro Kit ("Qiagen", USA) following manufacturer's instructions. The presence of *Wolbachia* sp., *Cardinium* sp., and *Spiroplasma* sp. in DNA samples was established by PCR using specific primers. Primers for *Wolbachia* were specific to a 438 bp fragment of 16S rDNA (5′-CAT ACC TAT TCG AAG GGA TAG-3′, 5′-AGC TTC GAG TGA AAC CAA TTC-3′) (Rasgon *et al.*, 2006); for

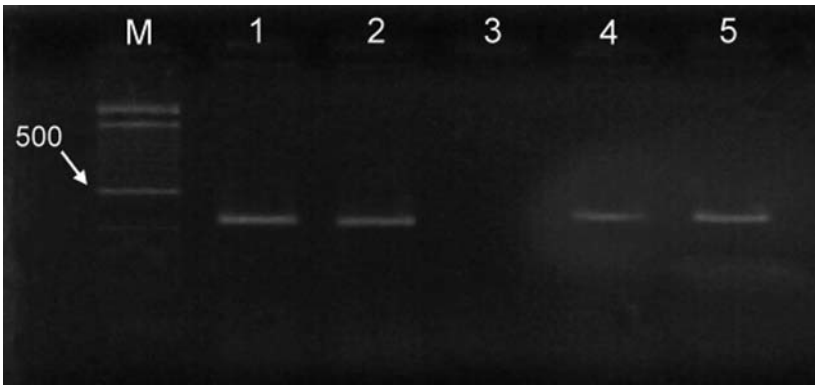


Fig. 1. *Wolbachia* infection diagnostics of *M. religiosa* from Ukrainian populations: M — molecular weight marker (100 bp); 1 — fragment of *Wolbachia* 16S rDNA in DNA samples of *M. religiosa* imagos (1) from the Kaniv population; 2 — fragment of *Wolbachia* 16S rDNA in DNA samples of *M. religiosa* imago (2) from the Kaniv population; 3 — negative PCR control (water instead of DNA), 4 — fragment of *Wolbachia* 16S rDNA in DNA samples of *M. religiosa* imago from the Mykolaiv population; 5 — positive PCR control for *Wolbachia* sp. (*D. melanogaster* wild type Uman strain).

Рис. 1. Диагностика украинских популяций *M. religiosa* на присутствие *Wolbachia* sp. инфекции: M — маркер молекулярной массы (100 п. о.); 1 — фрагмент 16S рДНК *Wolbachia*, образец ДНК *M. religiosa* Каневской популяции (1); 2 — фрагмент 16S рДНК *Wolbachia*, образа ДНК *M. religiosa* Каневской популяции (2); 3 — негативный контроль ПЦР (вода вместо ДНК); 4 — фрагмент 16S рДНК *Wolbachia*, образец ДНК *M. religiosa* Николаевской популяции; 5 — позитивный контроль ПЦР для *Wolbachia* sp. (линия дикого типа *D. melanogaster* «Умань»)

*Cardinium* — a 393 bp fragment (5′-TAC TGT AAG AAT AAG CAC CGG C-3′, 5′-GTG GAT CAC TTA ACG CTT TCG-3′) (Zchori-Fein, Perlman, 2004); for *Spiroplasma* — a 421 bp fragment (5′-GCT TAA CTC CAG TTC GCC-3′, 5′-CCT GTC TCA ATG TTA ACC TC-3′) (Kageyama et al., 2006).

## Results and Discussion

The intracellular prokaryotic symbiont Wolbachia sp. was found in all three M. religiosa females (fig. 1). Neither Cardinium sp. nor Spiroplasma sp. were detected in any of the samples. Symbiotic bacteria have been already detected in other insects of the order Dyctioptera (Vaishampayan et al., 2007).s However, *Wolbachia* is recorded from *M. religiosa* and species of the *Mantis* for the first time.

The presence of Wolbachia sp. in all three analyzed mantid individuals, concerning the distance between the two sampling regions, shows a widespread infection among Ukrainian mantid populations.

At the same time, it should be mentioned that no phenotypic effects of *Wolbachia* sp. in *M. religiosa* were found. The ways of its intrusion into Ukrainian populations require further research as well.

As the absence of *Cardinium* and *Spiroplasma* is ambiguous due to small sample size, further screening is needed to clarify the infection pattern with these bacteria.

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