



UDC 595.132:598.2(477)

FIRST RECORD OF *DICHEILONEMA CICONIAE* (NEMATODA, DIPLOTRIAENOIDEA) FROM *CICONIA NIGRA* (AVES, CICONIIDAE) IN UKRAINE

Ya. Yu. Syrota^{1*}, Yu. I. Kuzmin¹, V. N. Lyaskivskiy², V. V. Kobylinsky², I. B. Vasylykivska²

¹ Schmalhausen Institute of Zoology, NAS of Ukraine,
vul. B. Khmelnytskogo, 15, Kyiv, 01030 Ukraine

² Kyiv Zoological Park, 32, Peremohy prosp., Kyiv, 04116 Ukraine

*E-mail: sirota@izan.kiev.ua

First Record of *Dicheilonema ciconiae* (Nematoda, Diplostriaenoidea) from *Ciconia nigra* (Aves, Ciconiidae) in Ukraine. Syrota, Ya. Yu., Kuzmin, Yu. I., Lyaskivskiy, V. N., Kobylinsky, V. V., Vasylykivska, I. B. — Five specimens of a parasitic nematode *Dicheilonema ciconiae* (Schrank, 1788) were collected from black stork, *Ciconia nigra* Linnaeus, in Kyiv Zoological Park. Identification of the nematodes was confirmed by morphological examination of the specimens collected. The ornamentation of the body cuticle in caudal region of males (area rugosa) is first described in *D. ciconiae*.

Key words: nematodes, *Dicheilonema*, birds, black stork, Ukraine.

Introduction

Dicheilonema ciconiae (Schrank, 1788) (Nematoda, Diplostriaenoidea) is a parasite of fish-eating birds from the families Ciconiidae and Ardeidae reported from Europe, Azerbaijan, Russia and Central Asia (Sonin, 1968; Baruš et al., 1978; Sonin et al. 1983; Sitko, Heneberg, 2015). The helminth is parasitic in the respiratory system of birds; usually it is located in the air sacs.

Black stork, *Ciconia nigra* Linnaeus (Aves, Ciconiiformes, Ciconiidae) is widely distributed in Europe and Asia. The species is rare and protected in most countries (BirdLife International, 2012). That is why the information on helminth parasites of black stork is deficient; 10 nematodes are known to parasitise this host in Palaearctic (Baruš et al., 1978; Mutafchiev, Georgiev, 2008).

We examined one specimen of black stork from Kyiv Zoological Park, post mortem, for the presence of endoparasites. Several helminth species were found (Syrota et al., 2015; Greben et al., 2016), and among them were five nematodes collected from the air sacs and identified as *D. ciconiae* based on morphological characters. Since the host is rarely examined by parasitologists, and the parasite was first found in Ukraine, we present its morphological description herein.

Materials and methods

In February 2015 a black stork died in the Kyiv Zoological Park. The animal was necropsied and helminths were found in different sites of the animal. Two females and three males of *D. ciconiae* were collected from the air sacs. Nematodes were fixed in heated 70° alcohol and stored in 70° alcohol. Before light microscopic examination, nematodes were cleared in lactophenol. Anterior and posterior extremities of one female and two males were studied under the light microscope AmScope T690B with a digital camera. This microscope was used for examination of most morphological features. Structure of the caudal papillae and surface of the cuticle in males were examined under Zeiss Axio Imager M1 microscope equipped with differential interference contrast. Drawings were made with the aid of drawing tube. Measurements in the text are given in micrometres unless otherwise stated.

Results

Description of *Dicheilonema ciconiae* (Schrank, 1788)

General morphology. Large nematodes. Males smaller than females. Cuticle thick, its surface finely transversely striated. Mouth opening small, terminal. Two sclerotised trapeziform tooth-like elevations present on each side of mouth (fig. 1, *B*). Posterior to elevations, epaulette-like structures present (fig. 1, *C*). Posterior margin of each epaulette divided into three lobes: one short lateral and two longer submedian. Cephalic papillae composed of internal circle of four papillae situated at submedian lobes of epaulettes and external circle of four papillae located close to lateral edges of submedian lobes of epaulettes (fig. 1, *B*, *C*). Amphids located close to posterior edges of lateral lobes, at level of exterior papillae (fig. 1, *B*, *C*). Mouth opening small, leading into short muscular part of oesophagus. Glandular part of oesophagus wide, longer than and distinctly separated from muscular part (fig. 1, *A*). Nerve ring, excretory pore and border between oesophagus and intestine inconspicuous in studied specimens.

Male (2 specimens). Body length 9.6–9.8 cm, maximum body width 554–570. Muscular part of oesophagus 488–491 long. Caudal alae present (fig. 2, *A*), about 3.5 times longer than tail. Area rugosa distinct in posterior part on ventral surface of body and caudal alae (fig. 2, *A*), beginning from level of anterior edge of alae. Ornamentation consisting of minute rounded plaques arranged in transverse rows; some plaques fused transversely (fig. 2, *C*).

Precloacal caudal papillae (fig. 2, *A*): four pairs (1–4) pedunculate ventrolateral, one pair (5) pedunculate subventral, and one unpaired ventral; subventral pair and unpaired papilla located close to cloacal aperture (fig. 2, *B*). Postcloacal papillae: one pair pedunculate ventrolateral (6); one pair (7) sessile, lateral, located close to posterior extremity (fig. 2, *A*); three pairs (8–10) minute, subventral, located close to posterior extremity (fig. 2, *D*). Phasmids pore-shaped, sublateral, located just anterior to level of 8th pair of papillae (fig. 2, *A*, *D*).

Spicules unequal and dissimilar (fig. 1, *D*). Left spicule narrow, pin-like, 1.0–1.1 mm long. Right spicule 314–321 long. Right spicule provided with narrow ala. Tail short and blunt, 153–175 long.

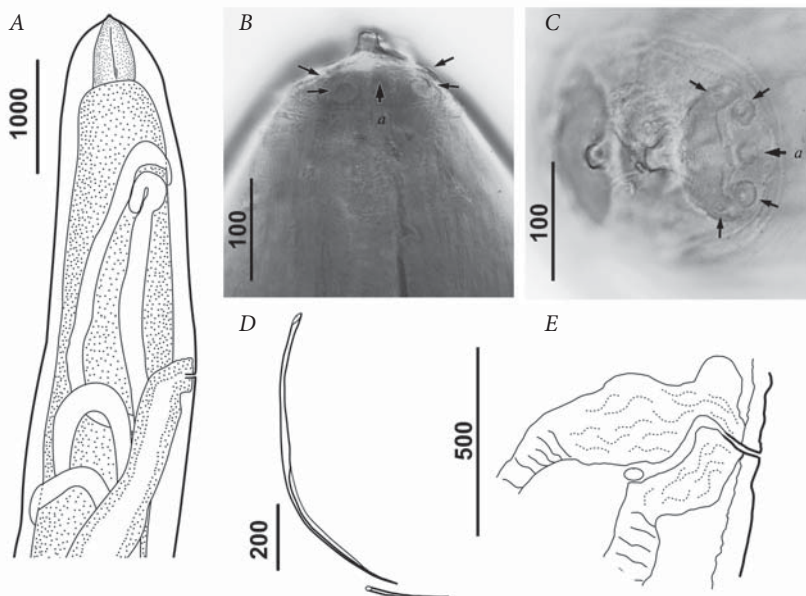


Fig. 1. Morphology of *Dicheilonema ciconiae*: *A* — anterior part of female, lateral view; *B* — anterior extremity of female, lateral view, showing apical tooth, papillae (arrows) and amphid (*a*); *C* — apical extremity of female showing epaulette-like structures, tooth-like elevations, papillae (arrows) and amphid (*a*); *D* — spicules, lateral view; *E* — vagina, lateral view. Scale bars in micrometres.

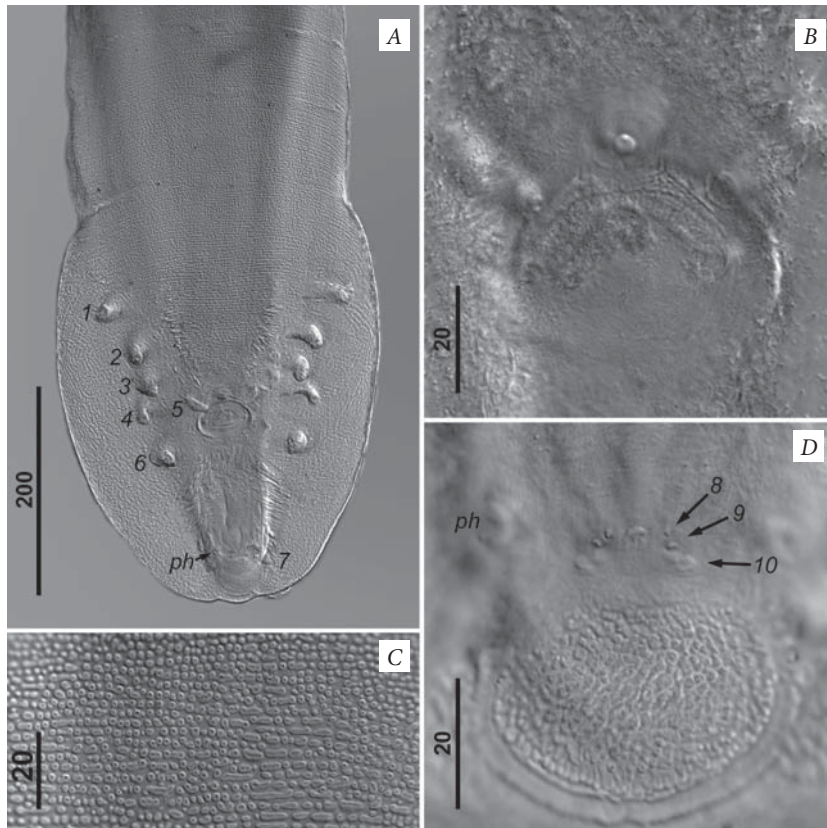


Fig. 2. *Dicheilonema ciconiae*: details of caudal morphology in males: A — posterior part of body, ventral view, showing lateral alae, papillae (numbered) and phasmids (*ph*); B — Cloacal region, ventral view, showing sub-ventral pair of papillae and unpaired ventral papilla; C — Cuticular ornamentation in pre-cloacal region; D — Posterior extremity showing papillae 8–10 and phasmids (*ph*). Scale bars in micrometres.

Female (1 specimen). Body length about 75 cm, maximum body width 1.8 mm. Muscular part of oesophagus 561 long. Vulva in anterior part of body, at 2.7 mm from anterior end. Vagina short, thick-walled, with narrow lumen; walls with distinct muscular fibres (fig. 1, E). Lumen in vagina vera more distinctly cuticularised. Ovejector almost straight, with muscular walls, its posterior region obscured with numerous loops of uteri and ovaries (fig. 1, A). Loops of genital system filling almost entire body, from region of muscular oesophagus up to caudal part. Tail rounded, 161. long. Egg size 45–54 × 24–25 (n = 10); eggs with fully formed larvae.

Discussion

We identified the studied nematode specimens as *D. ciconiae* due to the following characters: size and shape of spicules, location of vulva, length of body (Sonin, 1968), as well as due to their parasitism in *C. nigra*. To the best of our knowledge, cuticular ornamentation on the ventral side of caudal part of the body (area rugosa) was not described in any of *Dicheilonema* species. Herein, area rugosa is first described in *D. ciconiae*. Similarly, an area rugosa with similar fine bosses was described in *Serratospiculum guttatum* (Schneider, 1866), belonging to closely related genus, but absent in other *Serratospiculum* spp. (Bain & Mawson, 1982).

Before our studies, *D. ciconiae* has never been reported from the territory of Ukraine, though the species is known from a large neighbouring territory in the Palaearctic (Sonin,

1968). Apparently, the scattered known distribution and rare findings of this species are due to scarce helminthological information on its usual hosts: *Ciconia* spp. For example, only about 6 black storks are mentioned as investigated by Smogorzhevskaya (1976), and, for the best of our knowledge, no helminthological studies of this host species in Ukraine have been published during the last decades.

The studied stork was brought to the zoo from Kyiv Region, Borodyanka District, the Tal River in May 2014. It was kept in the aviary of the zoo till its death. The diet of the stork consisted of fish and minced meat. The intermediate hosts of *D. ciconiae* are unknown. In a related species, *D. rhaeae* (Owen, 1843), insects from the order Orthoptera are the intermediate hosts, and reptiles (lizards, snakes) may be the paratenic hosts (Vakarenko, 1999). It could be suggested that some arthropod species, terrestrial or aquatic, are the intermediate hosts for *D. ciconiae*, as well. Since in Kyiv Zoo the orthopterans can only accidentally enter the aviary and they are hardly infected with *D. ciconiae*, we presume that the stork has acquired the *D. ciconiae* infection under natural conditions.

Microscopic studies were done using the equipment of the Centre of Collective Use of Scientific Equipment "Animalia" (I. I. Schmalhausen Institute of Zoology, NAS of Ukraine). We are sincerely grateful to Kyiv Zoological Park for materials provided for the study.

References

- Bain O., Mawson, P. M. 1981. On some oviparous filarial nematodes mainly from Australian birds. *Records of the South Australian Museum*, **18**, 265–284.
- Baruš, V., Sergeeva, T., Sonin, M., Ryzhikov, K. 1978. *Helminths of fish-eating birds of the Palearctic Region I. Nematoda*. Academia Praha, Moskva; Praga, 1–318.
- BirdLife International. 2012. *Ciconia nigra*. The IUCN Red List of Threatened Species 2012: e.T22697669A40235605. <http://dx.doi.org/10.2305/IUCN.UK.2012-1.RLTS.T22697669A40235605.en>. Seen on 06 June 2016.
- Greben, O. B., Kudlai, O., Korol, E. N., Korniyushin, V. V., Vasilkovska, I. B., Kobylinsky, V. A. 2016. New Record of *Chaunocephalusferox* (Digenea, Echinostomatidae) from *Ciconia nigra* in Ukraine including morphological and molecular data. *Vestnik Zoologii*, **50** (2), 99–104.
- Mutafchiev, Y., Georgiev, B. B. 2008. A new acuariid nematode, *Syncuaria mackoi* n. sp. (Spirurida), from *Ciconia nigra* (L.) (Ciconiiformes: Ciconiidae) in Europe. *Systematic Parasitology*, **70**, 71–79.
- Sitko, J., Heneberg, P. 2015. Composition, Structure and Pattern of Helminth Assemblages Associated with Central European Herons (Ardeidae). *Parasitology International*, **64** (1), 100–112.
- Smogorzhevskaya, L. A. 1976. *Helminths of diving and marsh fowl of the fauna of Ukraine*. Naukova Dumka, Kyiv, 1–416 [In Russian].
- Sonin, M. D. 1968. *Filariata of animals and man and the diseases caused by them. Diplotrienoidea. Osnovy nematologii. Vol. XXI*. Nauka, Moskov, 1–392 [In Russian].
- Sonin, M. D., Larchenko T. T., Merdov, M., Petrova, K. 1983. Suborder Filariina. In: Kurashvili B.E. *Nematodes and acanthocephalans of birds of Black Sea and Caspian Sea Regions*. Mecniereba, Tbilisi, 121–143 [In Russian].
- Syrota, Ya. Yu., Kharchenko, V. O., Lyaskivskiy, V. N., Kobylinsky, V. V., Vasylykivska, I. B. 2015. Finding of two species from the tribe Synhimantea (Nematoda, Acuariidae) in the Kyiv zoological park. *Vestnik Zoologii*, **49** (6), 483–488.
- Vakarenko, O. G. 1999. *The life cycle and the parasite system of the nematode Dicheilonemarheae (Filariata: Diplotrienoidea) under the conditions of 'Askania Nova' reserve*. PhD thesis. Kyiv, 1–20 [In Ukrainian].

Received 14 June 2016

Accepted 30 September 2016