

UDC 595.121:598.243

CESTODE PARASITES OF BIRDS OF SUBORDER CHARADRII FROM SYVASH LAKE, UKRAINE

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Cestode Parasites of Birds of Suborder Charadrii from Syvash Lake, Ukraine. Greben O. B. — Twelve birds species of the suborder Charadrii of the families Charadriidae, Recurvirostridae, Scolopacidae, Glareolidae were examined at Syvash Lake (Ukraine) in spring 2011. Cestodes were found in 82.1 % of examined birds. Seventeen cestode species of 6 families were found. *Aploparaksis octacantha* from *Calidris alpina* and *Echinocotyloides dubininae* from *C. ferruginea* are new geographical records for the first time in Ukraine. *Glareola pratincola* is a new host record for *Nadejdolepis paranitidulans*. Cestodes of the genus *Microsomacanthus* were found in waders apparently due to the infection (2.8 %) in their intermediate hosts, gammarid crustaceans.

Key words: Charadrii, cestodes, Syvash Lake, Ukraine.

Цестоды птиц подотряда Charadrii Сиваша, Украина. Гребень О. Б. — Весной 2011 г. на озере Сиваш (Украина) было исследовано 12 видов куликов подотряда Charadrii, семейств Charadriidae, Recurvirostridae, Scolopacidae, Glareolidae. У 82.1 % исследованных птиц найдены цестоды. Обнаружено 17 видов цестод 6 семейств. *Aploparaksis octacantha* от *C. alpina* и *Echinocotyloides dubininae* от *C. ferruginea* впервые зарегистрированы в Украине. Для *Nadejdolepis paranitidulans* указан новый хозяин — *Glareola pratincola*. У куликов также найдены представители рода *Microsomacanthus*, что связано с заражённостью (2,8 %) промежуточных хозяев, гаммарусов.

Ключевые слова: Charadrii, цестоды, озеро Сиваш, Украина.

Helminth fauna of birds in Ukraine is rather completely studied, except for certain regions. One of them is the salt Lake Syvash in the South of Ukraine. The routes of spring and fall bird migrations pass through the Syvash region. At the same time, the lake is a bird nesting area. Waders are represented at Syvash better than the birds of other orders (34 species of 51 species registered in Ukraine) (Chernichko, 2011).

Detailed studies of bird helminth fauna of Syvash have not been carried out. Only the paper by Mashtakov (1964) reported on helminth parasites from gulls and terns in the region. The studies of the bird helminthes in southern Ukraine took place mainly in the region of the Black Sea Biosphere Reserve and in Crimea. Some data were collected in the Molochnyi estuary and Arabatskaya Strelka spit (Smogorzhevskaya et al., 1978, 1988; Kornyushin, Greben, 2013). Syvash is interesting not only due to its great diversity of birds but also because of the potential importance of revealing places where migratory birds can be infected by helminths.

The aim of this work was to study the species composition of cestodes of waders which are present in enormous numbers during spring migrations at Syvash Lake.

Material and methods

We examined birds that had occasionally died in ornithological mistnets in the course of ringing procedures in Eastern and Central Syvash in the spring of 2011. Birds were examined by the method of the complete helminthological dissection. Totally 39 individuals of birds belonging to 12 species were studied.

The invertebrates: gammarid crustaceans, talitrids and polychaetes were investigated. The material was collected in the places of the bird capture. Larvae of the cestodes were found only in *Gammarus* sp.

The tapeworms were rinsed in saline, fixed in 70 % ethanol, stained with acetocarmine and Mayer's haematoxylin. After differentiation, the tapeworms were dehydrated in the ascending ethanol series, cleared in clove oil and mounted in Canada balsam. Morphology of the scolex and cirrus was studied on temporary mounts in glycerin and on the permanent mounts in Berlese's medium.

Infection rates of the parasite species are given for each host species in parentheses. The prevalence is presented as ratio of infected/examined birds, and the intensity is given as range. All measurements are in micrometers unless otherwise stated.

Results

Thirty six specimens (92.3 %) of examined birds of Syvash were infected with helminth parasites. Flatworms prevailed in the helminth fauna. Cestodes had the highest prevalence, 82.1 %, and the prevalence of trematodes was 66.7 %. Nematodes were rarely found (10.3 % of birds infected). Acanthocephalans were found only in one ruff (*Philomachus pugnax*) — 2.6 %.

Cestodes of 17 species belonging to 6 families were recorded. Below we give the list of cestode species found. Brief morphological descriptions are given only for the species, which are new or rare for the fauna of Ukraine.

Family OPHRYOCOTYLIDAE Fuhrmann, 1907

1. *Ophryocotyle proteus* Friis, 1870

Hosts. *Calidris ferruginea* (2/6; 2–7 specimens); *Calidris alpina* (4/10; 1–13 specimens).

In Ukraine, the species has been previously found in birds of the suborder Charadrii, and also in *Larus genei* on the Black Sea Coast (Kornyushin, 1965, 1967; Leonov, 1958; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978, 1988).

Family DILEPIDIDAE Railliet et Henry, 1909

1. *Dichoanotaenia citrus* (Krabbe, 1869) Lopez-Neyra, 1944

Host. *Gallinago gallinago* (1/1; 2 specimens).

In Ukraine, the species has been previously found on the Black Sea Coast and in L'viv oblast (Kornyushin, 1965, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978).

2. *Dictymetra nymphaea* (Schrank, 1790) Spasskaja et Spassky, 1971

Host. *Glareola pratincola* (1/1; 5 specimens).

The species has been previously found in birds of the suborder Charadrii including the *Glareola* spp. on the Black Sea Coast of Ukraine (Iskova, Kornyushin, 1966; Kornyushin, 1965, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978, 1988).

3. *Trichocephaloides megalcephala* (Krabbe, 1869) Sinitzin, 1896

Host. *C. alpina* (4/10; 1–23 specimens).

In Ukraine, the species has been previously found in *C. alpina* and in *Calidris alba* on the Black Sea Coast (Kornyushin, 1965, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978, 1988).

4. *Trichocephaloides birostrata pontica* Korniushin, 1967

Host. *Calidris minutus* (1/4; 4 specimens).

In Ukraine, this species has been previously found in birds of the suborder Charadrii on the Black Sea Coast (Kornyushin, 1965, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978, 1988).

Family APLOPARAKSIDAE Mayhew, 1925

1. *Aploparaksis leonovi* Spassky, 1961

Host. *C. alpina* (1/10; 1 specimen).

One of 10 examined dunlins was infected by 1 specimen of *A. leonovi*. This is the second record of this species on the territory of Ukraine. *Aploparaksis leonovi* has been previously found in *C. minutus* in Chernigiv oblast (Kornyushin, Greben, 2000). We consider it possible that this species has been identified by Gąsowska as *Aploparaksis pseudofilum* Clerc,

1902 in *C. alpina* from the suburbs of Kyiv (Gašowska, 1932; Bondarenko, 1990). The tapeworms reported as *A. leonovi*, from *Tringa totanus* from Chernigiv oblast (Kornyushin, Pronina, 1983; Kornyushin, Greben, 2000) appeared to belong to another species — *Aploparaksis oschmarini* Spassky et Bobova, 1961 (Greben, 2008).

2. *Aploparaksis octacantha* Spasskyaja, 1950

Host. *C. alpina* (1/10; 1 specimen).

One specimen of this species was found in the caecum of *C. alpina*. The cestode is recorded for the first time for the territory of Ukraine.

Morphology (fig. 1). Total length of pre-gravid specimen with scolex 27.8 mm, maximum width 0.8 mm. Oval scolex 220 in length and 310 in diameter at level of suckers. Suckers rounded, slightly muscular, 100–110 in diameter. Rostellar sac 190 long and 110 wide, slightly muscular, crossing posterior margin of suckers. Cylindrical rostellum 150 long and 40 in diameter at level of hooks. Rostellum armed by 10 aploparaksoid hooks. General length of hooks 28–32. Length of blade 16–18; length of base with guard 18–25, length of guard 10–12.5, length of handle 5.

Neck not prominent. Strobila delicate. External segmentation beginning just posterior to scolex. Proglottids wider than long. Genital pores unilateral, opening in anterior third of lateral proglottid margin.

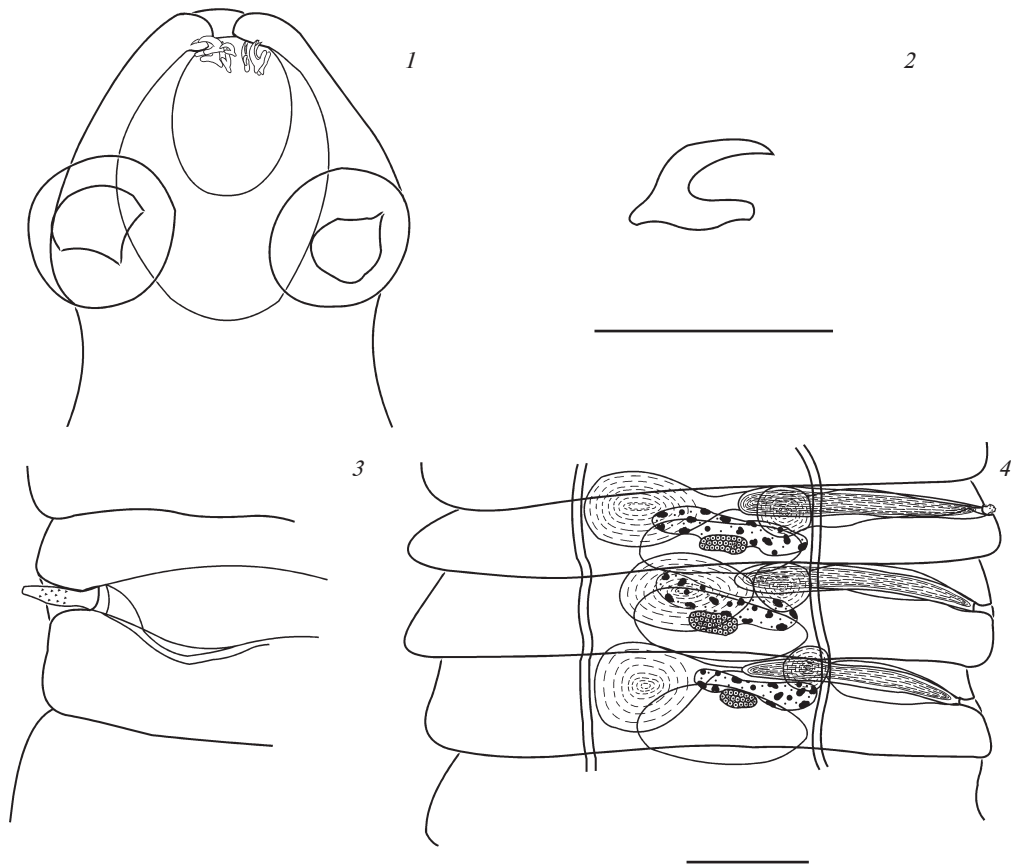


Fig. 1. *Aploparaksis octacantha*: 1 — scolex; 2 — rostellar hook; 3 — genital atrium; 4 — hermaphroditic proglottids. Scale bars: 1, 4 — 100 μ m; 2, 3 — 50 μ m.

Рис. 1. *Aploparaksis octacantha*: 1 — сколекс; 2 — хоботковый крючок; 3 — половой атриум; 4 — гермафродитные членики. Масштабные линейки: 1, 4 — 100 мкм; 2, 3 — 50 мкм.

Genital atrium small. Two pairs of osmoregulatory canals; their diameters 9 and 20. Transverse anastomoses not observed. Longitudinal musculature consisting of numerous small bundles and of 4 large bundles on each (dorsal and ventral) side of strobila.

Single oval testis is present, 45–65 × 70–115, elongated transversely, disposed in median field of proglottid. Cirrus-sac spindle-shaped, 130–190 × 18–30, crossing poral osmoregulatory canals, sometimes reaching midline of proglottid. Internal seminal vesicle occupying most of cirrus-sac. Pear-shaped external seminal vesicle, 80–120 × 50–80, situated near antiporal region of cirrus-sac or overlapping it dorsally. Cirrus very small, situated almost completely in within genital atrium, except for its unarmed distal part. Partially evaginated cirrus 15–20 long. Basal part of cirrus 5 wide; proximal part 7.5 long and 2.5–3 in diameter, unarmed. Median part of cirrus 6 long and 4 in diameter, covered with very small thin spines. Distal unarmed part of cirrus pipette-like, 1.3 in diameter.

Ovary elongate, with two indistinct lobes. Its maximum width 150. Irregularly shaped vitellarium 30–40 × 30–50 in size, postero-medial to ovary. Seminal receptacle 40–50 × 30–40, rounded or irregular, situated near poral osmoregulatory canals. Copulatory part of vagina funnel-shaped, 6–8 in diameter and 6–13 in length. Vaginal pore ventral or posterior to male pore. Conductive part of vagina tubular, narrow, entering seminal receptacle near poral osmoregulatory canals. Sacciform uterus developing in place of female gonads. Its lobes entering lateral fields. Cirrus-sac, external seminal vesicle, vagina and seminal receptacle present in gravid proglottides. Mature eggs not found in studied material.

This species was described from *Calidris temminckii* from West Siberia (Lake Chany) by Spasskaya (1950). It was found in various birds of the suborder Charadrii, mainly of the genus *Calidris*. *Aploparaksis octacantha* was registered under different names in Russia France and the USA (Alaska) (Bondarenko, Kontrimavichus, 1999; 2006).

3. *Aploparaksis stricta* (Spassky, 1963) Spasskaya, 1966

Cirrus-sac *C. alpina* (1/10; 6 specimens).

Previously in Ukraine this species has been found in the same host on the Black Sea Coast (Kornyushin, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978).

4. *Aploparaksidae* gen. sp.

Host. *R. avocetta* (1/2; 2 specimens).

Two scoleces with aploparaksoid hooks were found in *R. avocetta*. The species was not identified, because strobilae of the specimens were absent. Cestodes with hooks of such shape and length have not been registered in this host.

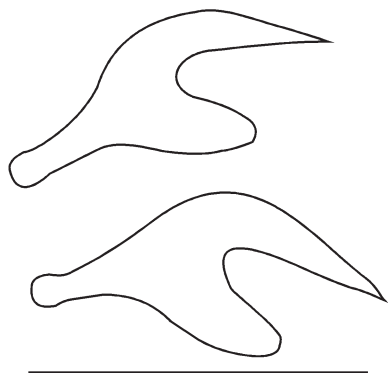


Fig. 2. Hooks of *Aploparaksidae* gen. sp. Scale bar 50 μm.

Рис. 2. Крючья *Арлопараксиде* gen. sp. Масштабная линейка 50 мкм.

Morphology (fig. 2). Scolex 360 long and 330 in diameter at level of suckers. Suckers rounded, 80 in diameter. Rostellar sac deep, 200 × 120. Rostellum short, 110 in length and 90 in width. Only four aploparaksoid hooks with elongated handles observed on scolex. Length of hooks 50; length of blade 24; length of base with guard 35; length of handle 15; length of guard 20.

5. *Wardium recurvirostrae* (Krabbe, 1869) Spassky et Spasskaya, 1954

Host. *Recurvirostra avocetta* (1/2; 21 specimens).

A parasite of avocet. In Ukraine it has been previously found on the Black Sea Coast (Kornyushin, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978, 1988).

Family ECHINOCOTYLIDAE Ariola, 1899

1. *Echinocotyloides longirostris* (Rudolphi, 1819) Korniyushin, 1983

Hosts. *Philomachus pugnax* (5/8; 2–17 specimens); *C. ferruginea* (1/6; 2 specimens); *G. pratincola* (1/1; 32 specimens).

A parasite of various birds of the suborder Charadrii. In Ukraine this species has been recorded on the Black Sea Coast and in Kyiv oblast (Korniyushin, 1967, 1969; Greben, 2008; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978, 1988).

2. *Echinocotyloides dubininae* (Deblock et Rose, 1962) Korniyushin, 1983

Host. *C. ferruginea* (2/6; 3–44 specimens).

This species is recorded for the first time in Ukraine.

Morphology (fig. 3). Small delicate strobila 7 mm long and 2.9 mm in maximum width. Scolex rounded 300–420 long and 270–350 in diameter at level of suckers. Suckers oval-shaped, elongated, 140–220 × 60–90. Lateral sucker margins armed with numerous transverse rows of hooklets 7.5 long, 5–6 hooklets in transverse row. Along anterior margins of suckers, number of hooklets diminishing to 3–4 per transverse row. In posterior direction, suckers armament interrupted. Five longitudinal rows of hooklets situated on bottom of suckers. Cylindrical rostellum 210–230 × 80–90, armed with 10 hooks of nitidoid type, 89–90 long. Blade of hook 50–55. Rostellar sac 270–290 × 100–110.

Neck 120–130 wide. Genital pores unilateral, opening in middle of lateral proglottid margin. Three rounded testes, 120–130 in diameter, situated in median field of male proglottids. During development of strobila, testes shifting to posterior part of proglottid. Cirrus-sac long, 130–170 × 20, crossing aporal osmoregulatory canals. Internal seminal vesicle occupying most of cirrus-sac. Rounded or oval external seminal vesicle 60–95 × 50–70 in size. Vesicle overlapping cirrus-sac antiporal end. Cirrus smooth, long and thin. Length of fully-evaginated cirrus 90; basal part 15 in diameter. Distal part of cirrus cone-shaped, 2.5 in diameter. Genital atrium with crown of hooks. Hooks 5 in length. External accessory sac opening into genital atrium ventral to cirrus-sac. Invaginated external accessory sac cone-shaped, about 35 deep, covered with thin spines.

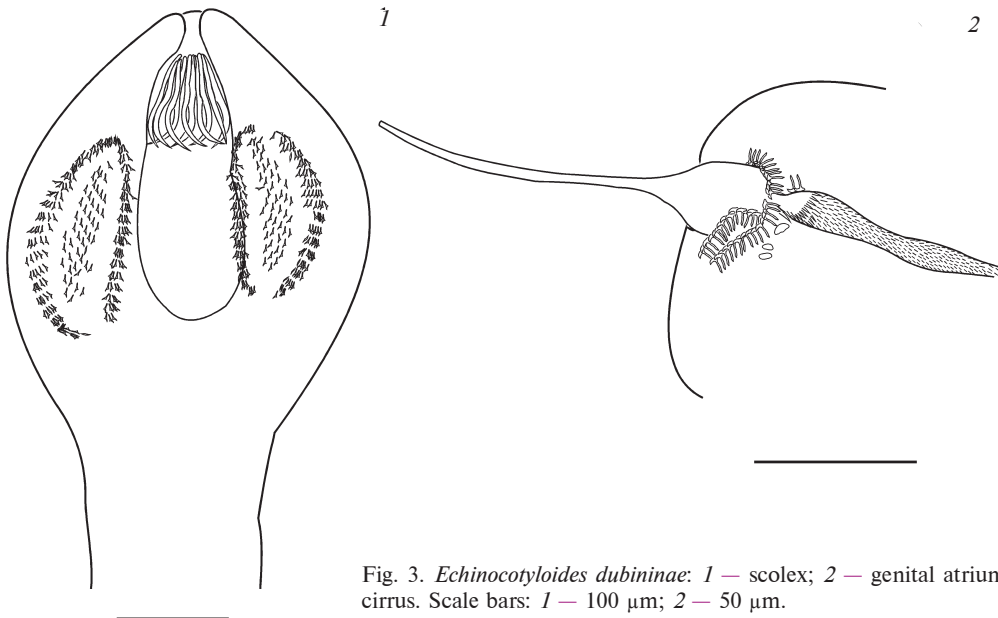


Fig. 3. *Echinocotyloides dubininae*: 1 – scolex; 2 – genital atrium and cirrus. Scale bars: 1 – 100 μm; 2 – 50 μm.

Рис. 3. *Echinocotyloides dubininae*: 1 – сколекс; 2 – половой атриум и циррус. Масштабные линейки: 1 – 100 мкм; 2 – 50 мкм.

Ovary slightly lobate, maximum width 180. Vitellarium oval, $30 \times 40-50$. Vagina not clearly viewed on the slides. Seminal receptacle round or oval, $40-45 \times 30-40$, ventral to cirrus-sac, situated in middle of proglottid. Uterus developing in place of female gonads, occupying almost entire proglottids. Eggs on stained slides oval, $17.5-20 \times 14-15$.

The species was described from *Calidris temminckii* and *Calidris ruficollis* in West Siberia and Primorsky Krai (Deblock, Rose, 1962). Later it was found in Kazakhstan (Gvozdev, Maksimova, 1985; Maksimova, 1989), Turkmenistan (Pelgunov, 1987) and Canada (Edwards, Bush, 1989).

3. *Echinocotyloides ukrainensis* (Kornyushin, 1969) Kornyushin, 1983

Host. *C. ferruginea* (1/6; 1 specimen).

In Ukraine, this species has been previously found in the same host and in *Limicola falcinellus* on the Black Sea Coast (Kornyushin, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978).

4. *Mariicotyle brachycephala* (Creplin, 1829) Kornyushin, 1983

Hosts. *P. pugnax* (2/8; 2-3 specimens); *C. ferruginea* (1/6; 3 specimens).

A parasite of birds of the suborder Charadrii. In Ukraine it has been previously found on the Black Sea Coast, in Crimea and in the Danube Delta (Kornyushin, 1967; Saakova, 1952; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978).

Family HYMENOLEPIDIDAE s. l. Ariola, 1899

1. *Microsomacanthus abortiva* (Linstow, 1904) Lopez-Neyra, 1932

Host. *R. avocetta* (2/2; 37-93 specimens).

A common parasite of the Anseriformes, rarely of Charadriiformes, everywhere in Ukraine (Smogorzhevskaya, 1976). Infection of avocet is accidental.

2. *Microsomacanthus paramicrosoma* (Gasowska, 1932) Yamaguti, 1959

Host. *R. avocetta* (2/2; 2-5 specimens).

A parasite of the Anseriformes. Previously, it has been found in numerous localities in Ukraine (Smogorzhevskaya, 1976). Infection of avocets is accidental.

3. *Nadejdolepis paranitidulans* (Golikova, 1959) Spassky, 1962

Hosts. *C. ferruginea* (1/6; 5 specimens); *C. alpina* (8/10; 5-52 specimens); *G. pratincola* (1/1; 5 specimens).

In Ukraine this species has been previously recorded on the Black Sea Coast in *Charadrius alexandrinus* (Kornyushin, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978). It is a parasite of the waders, rarely of gulls. *Glareola pratincola* is a new host for the parasite.

Family DIOECOCESTIDAE Southwell, 1930

1. *Gyrocoelia perversa* Fuhrmann, 1899

Host. *Charadrius alexandrinus* (1/2; 1 specimen).

In Ukraine, it has been previously found in the same host on the Black Sea Coast but identified as *Gyrocoelia paradoxa* (Linstow, 1906) (Kornyushin, 1965, 1967; Smogorzhevskaya, 1976; Smogorzhevskaya et al., 1978, 1988).

A host-parasite list of cestode species of the birds of the suborder Charadrii recorded from at Syvash Lake is presented in table 1.

Table 1. Cestodes of the birds of the suborder Charadrii from Syvash Lake (spring migration, 2011)

Таблица 1. Цестоды птиц подотряда Charadrii с озера Сиваш (весенняя миграция, 2011)

Host	Cestode species
Charadrius alexandrinus	Gyrocoelia perversa
R. avocetta	W. recurvirostrae, Wardium sp., M. abortiva, M. paramicrosoma
Tringa glareola*	—
Tringa erythropus*	—
Tringa stagnatilis*	Cestodes gen. sp.
Philomachus pugnax*	E. longirostris, M. brachycephala
Calidris minutus*	T. birostrata pontica
Calidris ferruginea*	O. proteus, E. longirostris, E. dubinini, E. ukrainensis, M. brachycephala, N. paranitidulans
Calidris alpina*	O. proteus, T. megalcephala, A. leonovi, A. octacantha, A. stricta, N. paranitidulans
Lymnocyptes minimus*	—
Gallinago gallinago*	D. citrus
Glareola pratincola	D. nymphaea, E. longirostris, N. paranitidulans

* Syvash migratory birds.

Discussion

In the present study, two out of 17 identified cestodes species *A. octacantha* and *E. dubinini*, were recorded for the first time in Ukraine. *Glareola pratincola* is a new host record for *N. paranitidulans*.

Cestodes of the genus *Microsomacanthus*, which are common parasites of anatids, were found in *R. avocetta* in the present study. Infection avocets by *Microsomacanthus* is obviously accidental. Intensity of infection was rather high (2–93 specimens), but all the specimens found were young. Such a high level of infection is apparently due to the infection of intermediate hosts, gammarid crustaceans. The larvae of the genus *Microsomacanthus* were found in 17 specimens of 601 examined gammarids (2.8 %) with the intensity 1–63 specimens. Gammarid crustaceans apparently are a significant part of the diet not only of anatids but also of avocets in Syvash.

Twelve of 17 registered cestodes species were found in migratory birds. The presence of young strobilae in spring shows that the infection of the birds of the suborder Charadrii takes place during the migration, thus the range of some northern species (*A. leonovi*, *A. octacantha*, *A. stricta*, *E. dubinini*, *N. paranitidulans*) is broader than it was previously considered. Therefore, bird migrations contribute to the spread of helminth parasites, particularly cestodes.

We are grateful to Professor I. I. Chernichko and O. I. Lisicina for their help in collecting the material and also to Professor V. V. Kornushin for his help in identification of the material.

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Received 29 April 2013

Accepted 1 October 2013