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M. V. Yurahno, A. V. Ivashov, L. A. Demidenko[1]

CONSORTIVE TIES OF CASPIAN SEAL WITH HELMINTHOFAUNA AS INDEX OF ITS POPULATIONAL STRUCTURE

Taurida National University named after V. I. Vernadsky
[1] Crimean State Medical University named after S. I. Georgievsky

Study of ties of Caspian seal with helminthes allowed to determine differences between its northern and southern populations. The consortive ties mark three subpopulations of the northern Caspian seal population characterized by a very specific content of consorts-helminthes.

Key words: Caspian seal, helminthes, population, consortiveties.

М. В. Юрахно, А. В. Івашов, Л. А. Деміденко[2]
Таврійський національний університет ім. В. І. Вернадського
[1]Кримський державний медичний університет ім. С. І. Георгієвського

КОНСОРТИВНІ ЗВ'ЯЗКИ КАСПІЙСЬКОГО ТЮЛЕНЯ ІЗ ГЕЛЬМІНТОФАУНОЮ ЯК ПОКАЗНИК ЙОГО ПОПУЛЯЦІЙНОЇ СТРУКТУРИ

На основі вивчення консортивних зв'язків каспійського тюленя із гельмінтами встановлені розбіжності між його північною та південною популяціями. Консортивні зв'язки чітко маркірують у межах північної популяції три субпопуляції тюленя, що характеризуються дуже своєрідним набором консортів-гельмінтів.

Ключові слова: тюлень, гельмінти, популяція, консортивні зв'язки.

Study of diverse integration levels of species in a population has considerable theoretical and practical interest (Naumov, 1963; Greig-Smith, 1967; Yablokov, 1982; Sadykov, 1983). Determination of mosaics of diverse level is possible not only on density criterion, but also on other signs, for example on phene or gene frequencies (Selander, 1970; Yablokov, 1979,1982), growth type (Korchagin, 1976), pequliarities of consortive ties (Ivashov, 1987, 2001) etc.

As it was shown previously (Yurahno et al., 2004) consortiveties of Caspian seal possess number of specific features, conditioned by pool reserve state of Caspian Sea and mutual relations between species formed historically.

Caspian Sea is a reserved pool with the area of 400 000 square km subdivided into three well-expressed parts having typical features and clear borders.

Climatic conditions of its northern part sharply differ from central and southern ones, pequliarly in autumn-winter season. Its northern part corresponds to almost all life conditions of pagophileous forms of genuine Caspian seals, southern part is its antipode and has a dry subtropical climate.

Pequliarities of ecological conditions on the south and north of Caspian Sea and also presence of isolated whelp places of Caspian seals in these two regions in reproduction period teriologists suppose that two local populations of Caspian seal exist in the aquatorium of Caspian Sea (Zemsky, Krylov, 1982*a*) It was founded that a northern population is heterogeneous and consists of two subpopulations (Zemsky, Krylov, 1982*b*). Isolation of the northern and southern Caspian populations in reproduction and deplumation period is without doubt, but data about distribution of Caspian seals in fattening period are very limited. It is not clear, whether beasts summering in the central part of Caspian Sea return to traditional whelp places or redistribute in this period accidentaly. At the same time a theoretically grounded possibility of population borders determination and their subdivisions on peculiarities of external system formatting ties exists (Ivashov, 1987). In tie with it the consideration of the question on base of consortive ties of Caspian seal with helminthes in different parts of its natural habitat is perspective.

METHODS

All Caspian seals were explored by the method of whole helminthological dissections of separate organs with specification of sea mammal helminthological dissections. The initial data were analyzed by the methods of mathematical statistics (Lakin, 1980). It is known that the Shennon index (Emeljanov, 1999) is the most suitable for evaluation of special diversity. Because

this index takes into account the abundance of every specie and abundance of helminthes changes from single individuals to hundred thousands the complex of features suggested by V. N. Beklemishev was used. Thus, extensiveness, index of abundance and index of special diversity (Beklemishev, 1970; Breev, 1976) were calculated. Similarity of helminthofauna species was determined with usage of a special composition similarity index (Sorensen, 1948).

RESULTS AND DISCUSSION

Comparison of helminthofauna in individual consortions of 343 Caspian seals from Ural river avandelta, 85 from delta of Volga, 159 from region of Kulaly island and 62 from region of Ogurchinsky islands displayed that from 19 species of helminthes studied in 1980–1985 years, only 7 species for all of compared regions were common. There were trematodes *C. badamschini*, *M. advena*, *P. truncatum*; cesthode *D. phocarum*; acanthocephal *C. tani*; nemathodes *A. shupacovi*, *P. caspicus* (*Table*).

Comparison of invasion extensiveness of Caspian seal from different parts of its area

Species of helminthes	Population			
	northern			southern
	Avandelta of Ural	Delta of Volga	Kulaly island region	Ogurchinsky island
	% ± m			
Bolboforus confusus	–	1,18 ± 1,17	–	–
Ciureana badamschini	89,5 ± 1,16	41,2 ± 5,33	91,0 ± 3,07	91,9 ± 3,14
Cyathocotylidae g. sp.	–	1,18 ± 1,17	–	–
Hysteromorpha triloba	9,32 ± 1,57	15,3 ± 3,90	–	–
Mesorchis advena	66,5 ± 2,55	69,4 ± 5,00	80,9 ± 4,21	71,0 ± 5,67
Opisthorchis felineus	–	30,6 ± 5,00	–	–
Paracoenogonimus ovatus	1,46 ± 0,65	41,2 ± 5,33	–	4,85 ± 2,69
Parascocotyle sinoecum	–	4,71 ± 2,29	–	1,62 ± 1,60
Pseudamphistomum truncatum	**91,0 ± 1,55**	**100,0 ± 1,16**	**36,4 ± 5,10**	**35,5 ± 5,97**
Pygidiopsis genata	0,29 ± 0,29	–	–	1,62 ± 1,60
Tylodelphys podicipina	–	1,18 ± 1,1	–	–
Diphyllobothrium phocarum	2,92 ± 0,91	2,35 ± 1,64	1,89 ± 1,08	1,62 ± 1,60
Ligula colymhi	16,3 ± 1,99	11,8 ± 3,50	–	–
Corynosoma caspicum	**44,6 ± 2,68**	**81,2 ± 4,24**	**95,5 ± 1,64**	**100 ± 1,59**
Pomphorhynchus laevis	0,58 ± 0,41	–	–	–
Anisakis schupakovi	**86,3 ± 1,85**	**68,2 ± 5,05**	**12,6 ± 2,63**	**74,2 ± 5,47**
Eustrongylides excisus	12,5± 1,79	60,0 ± 5,31	–	–
Dioctophyme renale	–	–	–	1,62 ± 1,60
Parafilaroides caspicus	**33,8± 2,55**	**23,5 ± 4,60**	**21,4 ± 4,35**	**16,1 ± 4,59**

The most diverse parasitofauna was in delta of Volga (16 species) and avandelta of Ural river (13 species), the most poor – in Kulaly island region (7 species). There are species registered only in Volga and Ural estuaries: trematodes *B. confusus*, *Cyatocotylidae gen. sp.*, *H. triloba*, *O. felineus*, *P. genata*, *T. podicipina* and acanthocephal *P. laevis* (representatives of freshwater fauna). They characterize belonging of Caspian seals to basic biocenoses, but can be used as indicators of local Caspian seal groups only with big caution, because these helminthes only during a short time live in a Caspian seal organism and if permanent influx of invasion is absent their hosts absolve from them. It can be a result of Caspian seals migration from desalted zones and related to changes of ecological factors (salinity, food composition).

If to exclude from the discussion typically freshwater parasites, then on the rest of species, among them the specific parasites of Caspian seal (*C. badamschini*, *M. advena*, *D. phocarum*, *A. schupacovi*, *P. caspicus*) are interesting, the distinctions of helminthofaunas compared are also very essential.

Such species as trematode *P. truncatum* and nematode *P. caspic* Caspian seal are important for determination of Caspian seal local groups. They localize in a liver and lungs correspondingly and cause to irreversible changes in staggered organs (regeneration and tissue calcification), preserving, as pathology-histological research show, after death of the parasites.

Almost all of the species have reliable distinctions on extensiveness of invasion and special diversity index. In particular, trematode *P. trucatum* and nematode *P. caspicus* are in 1,5–2,5 times more frequent in northern natural habitat, and acanthocephal *C. tani* in southern one.

Nemathode A. schupacovi has a very original nature of consort distribution within the host natural habitat. Caspian seals are strongly infected by this nemathode in the south and regions near Volga and Ural delta zones but in Kulaly island region and in Guryew row the infection is minimal. For example, *A. schupacovi* nemathode index of abundance in Kulaly region was in 53 times less than in Ogurchinsky island region and in 27 times less than in Ural avandelta. Samples of the nemathodes from on the south as well as from the north were represented by pubertal an unpubertal forms, and in Kulaly island region – only by third stage larvae. Such low infection level in Kulaly preserves during a long time, because as far back as in year 1958 Kurochkin (1958) chronicled this very weak invasion of the beasts only by the unpubertal *A. schupacovi*. Evidently, in aquatorium of Caspian Sea there are two intensive niduses of anizakidosis (north- and south-caspian), differentiated in the Kulaly region by a zone of a very low number of *A. schupacovi*. As well as Caspian seal is a definitive host of *A. schupacovi*, existence of isolated anizakidosis niduses during a long time is sufficiently grounded and related to isolation of two different sub-populations of Caspian seal in these regions. Subdivision of Caspian seal populations on northern and southern parts confirms the presence of northern and southern niduses of pseudo-amphistomosis. First of them is freshwater, and second – marine. A freshwater niduse is more intensive, because in its maintenance dry land mammals participate side by side with Caspian seals. Ataev (1970) reported about more high metacercaria *P. trucatum* infection level of fishes in the regions of Volga delta in comparison with the southern Caspian region.

Thus, analysis of consortive ties indicates that Caspian Sea is inhabited by two local Caspian seal populations. Exchange of individuals between these populations even if exists, is so insignificant, that the parasite-host relations in each region are not disturbed. It is indicated by stable meanings of special abundance index in one region and reliable different in other one. For example, during the period from 1980 to 1983 years a special abundance index of Caspian seal helminthes varied from 4,28±0,19 to 5,03±0,25. Meaning of the special abundance index of Caspian seal helminthes from different natural habitats in avandelta of Ural was 4,65±0,06; in avandelta of Volga – 5,83±0,21; in Kulaly island region – 3,40±0,10; in Ogurchinsky island region – 4,02±0,13. There are the distinctions on nature of age Caspian seals infection dynamics by A. schupacovi trematode and acanthocephal C. tani. For example, in Ural avandelta the abundance index of A. schupacovi is almost in linear dependence increases with beasts age; in Volga avandelta the abundance index within the limits of 20–40 specimens of Caspian seals from 1-year to 23-year age varies insignificantly and sharply increases in very old animals – more than 100 specimens.

On the south of Caspian Sea the other type of parasite-host relations was formed. In this region on background of generally high intensity of invasion abundant index of Caspian seals reaching puberty (5–7 years) sharply increases and is held up by level about 120 specimens in Caspian seals at age to 15 years then diminishes and increases again in old animals.

In northen Caspian seal population not less than three subpopulational consortions have similar composition of consort-parasite species but different in quantitative infection indexes of some helminthes may be determined. These groupings inhabit Volga and Ural avandeltas and the Kulaly island region.

The reliable distinctions ($p < 0,001$) attached to the infection extensiveness comparison of Pseudamphistomum truncatum trematode of Caspian seal from avandelta of Ural and delta of Volga, from avandelta of Ural and Kulaly island region; from Volga delta and Kulaly island region confirm this supposition.

Also the reliable distinctions ($p < 0{,}001$) were exposed attached to infection extensiveness comparison by Anisakis schupacovi trematode of Caspian seal from avandelta of Ural and Volga delta; from avandelta of Ural and Kulaly island region; from Volga delta and Kulaly island region. Very convincing and reliable distinctions are between infection extensiveness of Caspian seal by acanthocephal Corynosoma tani from avandelta of Ural and Volga delta; from avandelta of Ural and Kulaly island region; from Volga delta and Kulaly island region.

Besides that the similarity index of special composition by Sorensen testifies that Caspian seals from avandelta of Ural and Volga are the most similar groups on composition of consorts ($S = 0{,}733$). The least similarity was revealed between Caspian seals from Ural avandelta and Kulaly island ($S = 0{,}666$), Volga and Kulaly island ($S = 0{,}603$). The index between Caspian seals of Volga and Ogurchinsky island ($S = 0{,}500$) was the minimal.

As it was checked previously (Skriabin et al., 1982) helminthofauna complexes formed there can be preserved even attached to sufficiently high level of migratory activity of Caspian seals but if main part of individuals in reproduction and fattening period concentrates in regions traditional for their groups. The data of Caspian seals distribution based on analysis of consorts confirm teriologists conclusions from analysis of morphological and ecological researches of beasts of these three regions: 2 freshwater and 1 salted in region of Kulaly island (Zemsky, Krilov, 1982*a*, *b*).

CONCLUSION

Consortive ties of Caspian seal with helminthes are an important supplementary index of distinctions between the northern and southern populations.

Consortive ties clearly mark three subpopulations of Caspian seal characterized by very original composition of helminthes.

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