

**FRESHWATER JELLYFISH *CRASPEDACUSTA SOWERBYI* LANKESTER, 1880
(HYDROZOA, OLINDIIDAE) – 50 YEARS' OBSERVATIONS IN SERBIA**

DUNJA JAKOVČEV-TODOROVIĆ¹, VESNA ĐIKANOVIĆ¹, S. SKORIĆ², and P. CAKIĆ¹

¹*Siniša Stanković Institute for Biological Research, 11060 Belgrade, Serbia*

²*Institute for Multidisciplinary Research, 11030 Belgrade, Serbia*

Abstract – Detailed and relevant limnological investigations of Serbian waters were initiated in 1958 and have continued to the present. During the period 1971-2008 we monitored biological elements as a part of working studies/projects, including the distribution of the freshwater jellyfish *Craspedacusta sowerbyi* Lankester, 1880. We observed over 500 sampling sites in running and standing waters. Specimens of this hydro-medusa were found in five of them. Throughout the period of investigation, only the medusae stages were observed. Our purpose in this paper was to provide data of the records and distribution of this limnomedusa during the period 1958-2008 in inland waters of Serbia. These observations should contribute to knowledge on the limnofauna not only of the Balkan Peninsula but Europe as a whole.

Key words: Freshwater jellyfish, *Craspedacusta sowerbyi* Lankester 1880, medusa stage, distribution, Serbia.

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INTRODUCTION

All *Craspedacusta* species inhabit freshwater bodies of Eastern Asia (China and Japan). However, one species - *Craspedacusta sowerbyi* Lankester, 1880, has expanded its home-range and currently has a cosmopolitan distribution. The hydromedusae appear frequently in shallow pools alongside rivers. These pools experience the fluctuating plankton populations, temperatures and water levels caused by conditions in the main river system (Slobodkin and Bossert, 1991).

Craspedacusta sowerbyi is a freshwater medusa and has been found in different aquatic ecosystems. It typically inhabits freshwater lakes and rivers: freshwater lakes, large river systems, natural lakes, reservoirs, modified water bodies, aquaria and ornamental ponds (Beckett and Turanchik, 1980; Kanaev, 1949; DeVries, 1992; Tittizer et al., 2000; Peard, 2005). However, despite its ecological diversity, it seems to favor standing waters.

The life cycle of *C. sowerbyi* includes polyp stage and a free-swimming, sexually reproducing medusa



Figure 1. The map of sampling sites. Site numbers correspond to geographic names in Table 1.

Table 1. Distribution of *Craspedacusta sowerbyi* in Serbia

Site number	Site	Geogr.coordinate	Waterbody	Record	Reference
1	Pool near Velika Morava river, Čuprija	43°56.833' N 21°22.671' E	Natural shallow pools	1958	Grozdanić and Manojlović, 1958
2	Sava Lake near Belgrade	44°47.114' N 20°24.567' E	Man-made impoundment	1981 1994/95-2008	Kalafatić, 1983, Kalafatić et al. 1999
3	Lake Velika Peščara, near Zrenjanin	45°24.192'N 20°27.062'E	Artificial water basin	1998	Ludoški et al., 2004
4	Lake Miloševo near Jagodina	43°58.351' N 21°19.933' E	Reservoir	2003	Database, Faculty of Science, Kragujevac
5	Lake Šumarice near Kragujevac	44°01.231' N 20°53.566' E	Artificial reservoir	2004	Database, Faculty of Science, Kragujevac

stage. Both medusa and polyp feed on various zooplankton taxa (De Vries, 1992; Dumont, 1994). The polyp form has a much wider distribution than the hydromedusa form (Kato and Hirabayashi, 1991; Angradi, 1998).

This paper presents the occurrence and distribution of *Craspedacusta sowerbyi* in the inland waters of Serbia over the 50 years of investigations.

MATERIALS AND METHODS

Specimens of *C. sowerbyi* were collected from five localities of the Danube, Sava and Velika Morava River Basins in Serbia (Fig. 1). These specimens were stored in the collection of biological material of the Benthological Section, of the Department of Hydroecology and Water Protection, Institute for Biological Research, Belgrade. The biological material was collected by many researchers for several different research projects in the period 1958–2008 (WQMP, 1981-2008; Database - Faculty of Science, Kragujevac).

Samples were collected by sweeping through aquatic macrophytes with a planktonic net (mesh

size 20 - 50 µm), from the sediment using different bottom-samplers (Van-Veen - 370cm², Ekman - 225cm², Peterson grab - 400cm²) and with scuba-diving activities. Specimens were preserved in 70% alcohol and measured, while a few were maintained live in an aquarium and photographed using a digital camera, with 6 x magnification.

The taxonomic status was determined according to Kanaev (1949) and Jankowski (2001) using a stereomicroscope (magnifier 5 – 50 x) and microscope Krüss (10x10 and 10x40).

RESULTS

Specimens of *Craspedacusta sowerbyi* were collected at five sampling sites during the hydrobiological study of the inland waters of Serbia. In 1958 this freshwater jellyfish was registered in Serbia for the first time. All observed individuals were found only in standing waters (natural pools and artificial water bodies) at the free-swimming medusa stage (Fig. 1 and Table 1). Measurements of the collected limnomedusae by stereomicroscope show that the average length of the umbrella was from 12 to 20 mm.

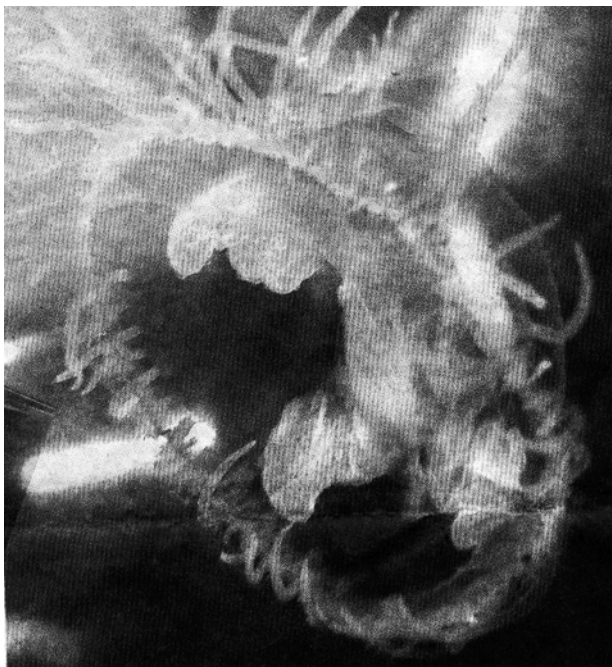


Figure 2. *Craspedacusta sowerbyi* Lankester 1880, sampling from Sava Lake, 26.07.2008.

A permanent monitoring program with the aim of health protection was performed on the Sava Lake, near Belgrade (locality 2, Table 1) (WQMP, 1981-2008).

The sampling sites where *Craspedacusta sowerbyi* were found are presented in Fig. 1.

Some of captured individuals were kept in an aquarium for a few days and photographed (Fig. 2).

DISCUSSION

The native range of *Craspedacusta sowerbyi* is freshwater bodies of Eastern Asia (China and Japan) and it has been spread to all continents except Antarctica (Dumont, 1994).

The first records in Europe of this limnocyndaria were from water-lily tanks at Regents Park, London in 1880 (Slobodkin and Bossert, 1991). In mainland Europe, the first observations were reported in 1901 in France (Sowerby, 1941)

and in Munich, Germany in 1905 (Dejdar, 1934; Geiter et al., 2002). In the Czech Republic the first finding was in 1934 (Jaslovská and Stloukal, 2004), in Slovakia 1961 (Farkašová and Stloukal, 2007), in Austria 1964, in Hungary 1995 (Jaslovská and Stloukal, 2004) and in Poland 1999 (Wiktor and Witkowski, 1999). The freshwater jellyfish appeared for the first time in Sweden in 1969 (Jernelöv et al., 1970; Lundberg and Svensson, 2003), and also in Lithuania in 2002 (Arbaciauskas and Lesutiene, 2005). The northernmost documented occurrence of *C. sowerbyi* is from Finland (Väinölä, 2002; Lundberg and Svensson, 2003).

The freshwater medusa was observed in Ukraine in the summer of 2002 (Jaslovská and Stloukal, 2004) and in Russia (Kanaev, 1949; Dumont, 1994).

We stress that the first findings of *C. sowerbyi* for the Balkan area were in 1958 in Serbia (Grozđanić and Manojlović, 1958) and in Montenegro in the River Crnojevića (Milovanović and Živković, 1965). In Croatia, medusae were recorded in 1992 and in Bulgaria in 1994 (Jaslovská and Stloukal, 2004).

The local occurrence of *Craspedacusta sowerbyi* depends to a great extent on environmental conditions such as temperature. Hydromedusae blooms are most common in summer and fall, from July to October, in still or slow-moving fresh water bodies, when the water temperature rises to at least 25°C. *Craspedacusta sowerbyi* does not advance from the polyp to the more readily identifiable hydromedusa stage in the absence of warm temperatures (Pennak, 1989; Kato and Hirabayashi, 1991; Angradi, 1998).

In the 50 years of biological monitoring of the inland waters in Serbia the polyp stage of *Craspedacusta sowerbyi* has not been found and the medusae stage is scarcely registered. The appearance of this cnidarian in five sites of Serbia was rare, in the range of 1 to 50 individuals. It is interesting to note that the mass appearance of hydromedusae occurs during summer, from July to September, when the temperatures of lake water are increased (20-26°C).

This limnomedusa only inhabits standing, natural and artificial water ecosystems in Serbia.

Craspedacusta sowerbyi has expanded its home-range mainly through unintentional introduction by humans (transported with ornamental aquatic plants) and currently has international distribution (Slobodkin and Bossert 1991).

These observations should contribute to knowledge on the limnofauna not only of the Serbia and Balkan Peninsula but Europe as a whole.

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СЛАТКОВОДНА МЕДУЗА *CRASPEDACUSTA SOWERBYI* LANKESTER, 1880 (HYDROZOA, OLINDIIDAE) - 50 ГОДИНА ИСТРАЖИВАЊА У СРБИЈИ

ДУЊА ЈАКОВЧЕВ-ТОДОРОВИЋ¹, ВЕСНА ЂИКАНОВИЋ¹, С. СКОРИЋ², и П. ЦАКИЋ¹

¹Институт за биолошка истраживања „Синиша Станковић“, 11060 Београд, Србија

²Институт за мултидисциплинарне студије, 11030 Београд, Србија

Опсежна и значајна лимнолошка истраживања вода у Србији отпочела су 1958. године и настављена до данас. Током целог истраживачког периода нађена је слатководна медуза *Craspedacusta sowerbyi* Lankester, 1880 на пет локалитета (бара на Великој Морави код Ћуприје, Савско језеро код Београда, језеро Велика

Пешчара код Зрењанина, језеро Милошево код Јагодине и језеро Шумарице код Крагујевца).

Представљени резултати су допринос досадашњих сазнања о налазима и дистрибуцији ове врсте у Србији, као и познавању лимнофауне Балканског полуострва и Европе.