

Some New Data on the Zooplankton Standing Crop Measurements in the Adriatic

Neki novi podaci o količinama zooplanktona u Jadranu

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There are very few papers dealing with the quantitative distribution of the zooplankton in the Adriatic. Some data on biomass (wet weight), settling volume and number of organisms have been published by Gamulin (1954), and recently by Battaglia, & Mozzi, Varagnolo (1960).

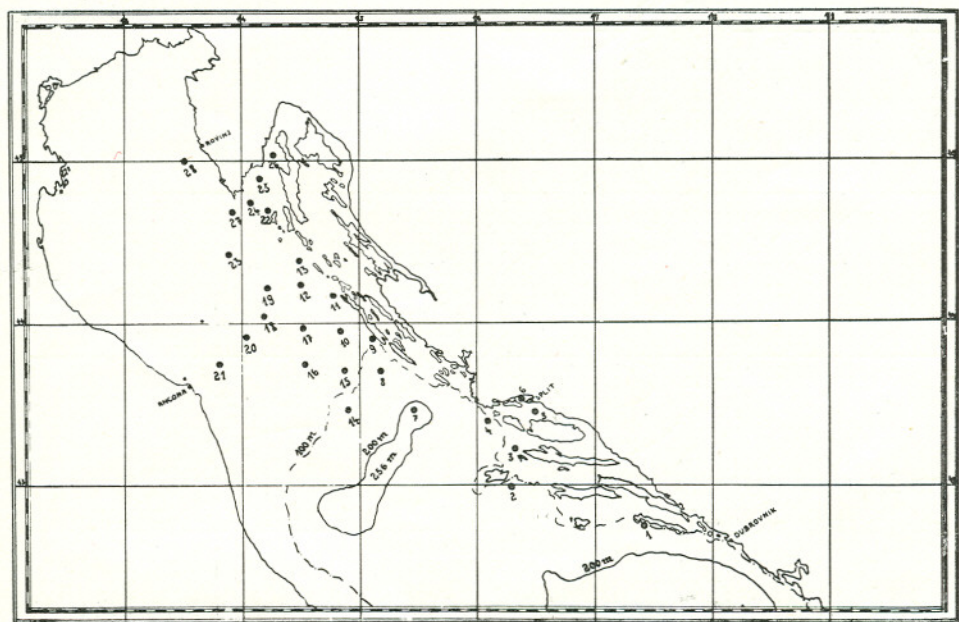


Figure 1. Plankton stations.

Certain efforts to fill this gap have been done in the Middle Adriatic during the last few years (Vučetić, 1960). The present paper contains some new data on dry weight of zooplankton crop in the North Adriatic (north of $43^{\circ}30'N$), obtained during sardine-echo survey cruises in 1960. The position of the 28 stations where plankton samples were taken can be seen in Figure 1.

The material was collected with Hensen-egg net (73/100—No. 3) and Nansen net (100—No. 8, No. OXX). The vertical hauls were made from four to five metres off the bottom to the surface with a hauling speed 0.5 m/sec. After having made a comparison of different methods for the estimation of zooplankton standig crop (Vučetić, 1957) we decided to use the dry weight method for the quantitative measurement. The weighted samples were dried at $110^{\circ}C$ until constant weight was obtained. Along with the dry weight measurement we also made counting of samples but we plan to measure the size of the more important zooplankton organisms too. The abundance of zooplankton is expressed in mg/m^3 of the dry weight in Table I. The effective filtration of nets was taken from Table 9 contained in the paper by Laevastu (1958).

To render our data more comparable we have prepared Table II using the June/July data only. The exception was made with stations 22, 24, 25 and 26 for which the information referring to the winter period only are given. Some data on the number of copepods found in $1 m^3$ have also been given in the same Table.

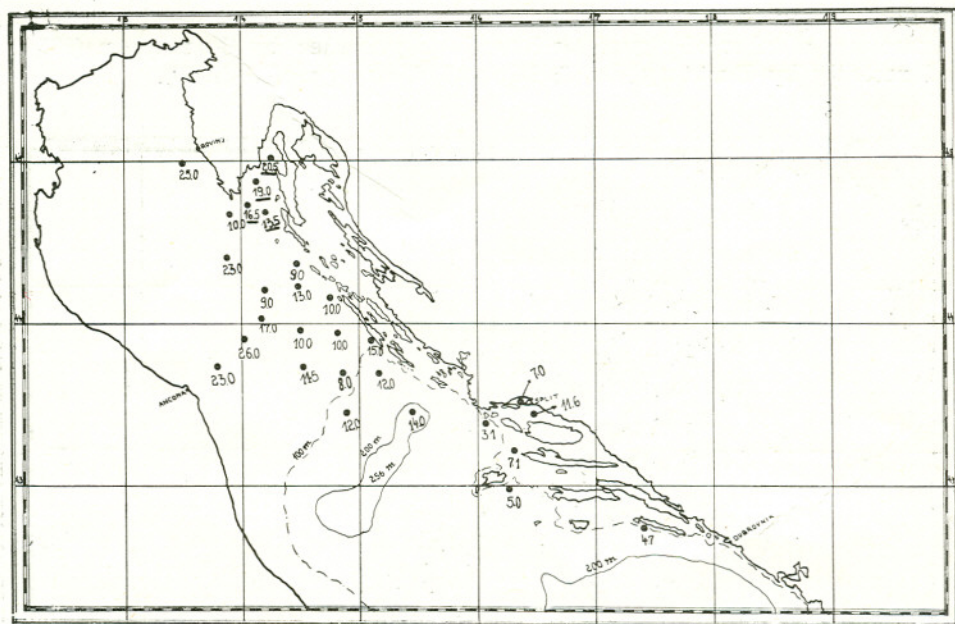


Figure 2. Dry zooplankton mg/m^3 in June/July, underlined number in November/December.

As evident from Figure 2. higher values for dry zooplankton have been found in the North Adriatic than in the Middle Adriatic. The June/July (1960) average for the North Adriatic (Stations 8–21, 22, 23, 27 and 28) was 14.3

T A B L E I

Station:	Locality:	Season:	Dry weight in mg/m ³ :	Remarks:	
1.	(1/G)	1951	Min.	2.0	Hensen egg'net (St. 1-7)
			Max.	12.6	
			Average	11.6	
		1952	Min.	2.2	
			Max.	15.9	
			Average	8.6	
		1953	Min.	0.5	
			Max.	7.0	
			Average	4.3	
		1954	Min.	1.4	
			Max.	7.2	
			Average	4.9	
2.	(2/S)	1959	Min.	2.3	
			Max.	8.6	
			Average	4.8	
		1960	Min.	2.1	
			Max.	10.6	
			Average	5.0	
3.	(3/P)	1959	Min.	0.4	
			Max.	10.0	
			Average	5.1	
		1960	Min.	2.3	
			Max.	9.0	
			Average	5.6	
4.	(4/M)	1954	Min.	2.9	
			Max.	20.0	
			Average	6.2	
		1955	Min.	4.5	
			Max.	14.1	
			Average	6.6	
		1956	Min.	1.6	
			Max.	7.0	
			Average	3.6	
		1957	Min.	1.6	
			Max.	6.2	
			Average	3.0	
5.	(5/O)	1954	Min.	7.3	
			Max.	22.0	
			Average	13.7	
		1955	Min.	4.6	
			Max.	11.3	
			Average	7.0	
6.	(6/K)	1954	Min.	2.6	
			Max.	26.6	
			Average	12.6	
		1956	Min.	3.3	
			Max.	14.4	
			Average	6.6	
		1957	Min.	2.2	
			Max.	5.5	
			Average	4.7	

Station:	Locality:	Season:	Dry weight in mg/m ³ :	Remarks:
		1959	Min. 4.0 Max. 10.3 Average 5.6	
		1960	Min. 4.4 Max. 13.3 Average 7.3	
7.	(7/B)	Blitvenica	1960 Juli	14
8.	(8/I)	Dugi otok	1960 May	10
				Nansen net (St. 7-28)
9.	(9/II)	Dugi otok	1960 June	15
			1960 May	15
			1960 June	10
			1960 July	20
			1960 Sept.	17
			1960 Nov.	6
10.	(10/III)	Dugi otok	1960 May	11
			1960 June	10
11.	(11/IV)	Dugi otok	1960 May	10
			1960 June	9
			1960 July	11
			1960 Sept.	12
12.	(12/V)	Dugi otok	1960 May	18
			1960 June	13
13.	(13/VI)	Dugi otok	1960 May	11
			1960 June	19
			1960 Sept.	12
			1960 Nov.	12
			1960 Dec.	5
14.	(14/VII)	Dugi otok	1960 May	29
			1960 June	9
			1960 July	15
			1960 Sept.	20
			1960 Novem.	4
15.	(15/VIII)	Dugi otok	1960 May	12
			1960 June	8
16.	(16/IX)	Dugi otok	1960 May	23
			1960 June	10
			1960 July	13
			1960 Sept.	16
			1960 Novem.	4
17.	(17/X)	Dugi otok	1960 May	18
			1960 June	10
18.	(18/XI)	Dugi otok	1960 May	15
			1960 June	14
			1960 July	20
			1960 Sept.	24
			1960 Novem.	7
19.	(19/XII)	Dugi otok	1960 May	36
			1960 June	9
20.	(20/AXI)	Ancona	1960 July	26
21.	(21/A)	Ancona	1960. July	23
22.	(22/K ₁)	Kvarner	1960 Nov.	18
			1960 Dec.	9
23.	(23/P ₂)	Pula	1960 July	23

	Station:	Locality:	Season:		Dry weight in mg/m ³ :	Remarks:
24.	(24/K ₂)	Kvarner	1960	Nov.	16	
			1960	Dec.	17	
25.	(25/K ₃)	Kvarner	1960	Nov.	23	
			1960	Dec.	15	
26.	(26/K ₄)	Kvarner	1960	Nov.	16	
			1960	Dec.	25	
27.	(27/P ₁)	Pula	1960	July	10	
28.	(28/R)	Rovinj	1960	July	25	

T A B L E II

	Station:	Locality:	Depth:	Season:		Dry weight/mg/m ³ :	Number of copepods on m ³ :
1.	1/G	Gonoturska	60	June-July	1952	4.7	465
2.	2/S	Stončica	100	June-July	1960	5.0	148
3.	3/P	Pelegrin	70	June-July	1960	7.1	280
4.	4/M	Maslinica	80	June-July	1957	3.1	370
5.	5/O	Omiš	50	June-July	1954	11.6	433
6.	6/K	Kaštela bay	30	June-July	1960	7.0	711
7.	7/B	Blitvenica	100	June-July	1960	14.0	216
8.	8/I	Dugi otok	90	June	1960	12.0	649
9.	9/II	Dugi otok	60	June-July	1960	15.0	577
10.	10/III	Dugi otok	60	June	1960	10.0	438
11.	11/IV	Dugi otok	50	June-July	1960	10.0	453
12.	12/V	Dugi otok	55	June	1960	13.0	727
13.	13/VI	Dugi otok	45	June	1960	9.0	581
14.	14/VII	Dugi otok	80	June-July	1960	12.0	350
15.	15/VIII	Dugi otok	70	June	1960	8.0	514
16.	16/IX	Dugi otok	70	June	1960	10.0	505
17.	17/X	Dugi otok	70	June-July	1960	11.5	542
18.	18/XI	Dugi otok	65	June-July	1960	17.0	653
19.	19/XII	Dugi otok	55	June	1960	9.0	406
20.	20/A XI	Ancona	77	July	1960	26.0	153
21.	21/A	Ancona	60	July	1960	23.0	264
22.	22/K ₁	Kvarner	40	Nov.-Dec.	1960	13.5	333
23.	23/P ₂	Pula	55	July	1960	23.0	557
24.	24/K ₂	Kvarner	45	Nov.-Dec.	1960	16.5	480
25.	25/K ₃	Kvarner	45	November	1960	19.0	580
26.	26/K ₄	Kvarner	45	November	1960	20.5	666
27.	27/P ₁	Pula	45	July	1960	10.0	533
28.	28/R	Rovinj	35	July	1960	25.0	365

mg/m³ and for the Middle Adriatic (stations 2, 3, 6 and 7) it was 8.1 mg/m³. The underlined data in Figure 2 refer to winter months (Dec./Nov.).

These higher values can, to some degree, be attributed perhaps to the qualitative difference between the North and Middle Adriatic plankton and to the different behaviour of the species occurring there. The North Adriatic zooplankton is composed of neritic species mostly eurythermal and euryhaline ones, with maximum population occurring during the summer months, exactly when most of our data were obtained in this area.

T A B L E III

Locality:	Dry zooplankton mg/m ³ :		g/m ² :	
ADRIATIC (1952-1960) (Station 1-28)	min.	4.7		(Vučetić, this paper)
	max.	26.0		
	average	13.0	0.49	
NORTH SEA (1947-1957) (Station N Flamborough line)	min.	43.0		(Wimpenny, 1952, 1957)
	max.	97.0		
	average	59.6	1.73	
ENGLISH CHANNEL (4 miles of Plymouth, 1949)	min.	—		(Harvey, 1950)
	max.	—		
	average	—	1.7	
N. W. BARENTS SEA (1953-1959, May/September)	min.	—		(Corlet, 1961)
	max.	—		
	average	—	11.6	
BLOCK ISLAND SOUND (1949)	min.	0.04		(Deevey, 1952)
	max.	44.0		
	average	19.34	0.58	

It may be useful to express the standing crop of plankton as dry weight per cubic metre or under square metre in the area compared with corresponding figures from elsewhere. Taking the data as a whole (Table III) it is possible to give an average value for all stations in the Adriatic and compare it with the North Sea average value (Wimpenny, 1952, 1957), English Channel (Harvey, 1950), Barents Sea (Corlet, 1961) and Block Island Sound (Deevey, 1952).

It is obvious that the zooplankton standing crop values in Adriatic are very low which is in accordance with the data on the abundance of nutrient salt (Ercegović, 1936; Buljan, 1953; Battaglia and &, 1960).

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NEKI NOVI PODACI O KOLIČINAMA ZOOPLANKTONA U JADRANU

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Kratak sadržaj:

U ovom preliminarnom radu izneseni su neki novi podaci o količinama zooplanktona u sjevernom Jadranu (sjevernije od 43°30'N), uglavnom sakupljeni za vrijeme krstarenja, u svrhu ispitivanja srdele. Osim toga pri izradi tabela koristili su se i podaci svih ranijih mjerenja izvršenih u razdoblju od 1951—1960. g. u srednjem i Sjevernom Jadranu. Usve je obuhvaćeno 28 postaja.

Materijal je sakupljen Hensenovom (73/100—No. 3) i Nansenovom (100—No. 8, No. OXX) mrežom. Vertikalni potezi uzeti su na udaljenosti od 4—5 m od dna do površine, a brzina povlačenja bila je 0,5 m/sek. Osim vaganja, zbog dobivanja suhe težine zooplanktona (metodikom vidi Vučetić, 1957) vršeno je i brojanje po grupama i vrstama, a namjerava se i izvršiti mjerenje najvažnijih planktonskih organizama, u prvom redu nekih kopepoda.

Da bi podaci bili bolje uporedivi, uzeti su kod izrade tabele II samo vrijednosti za razdoblje juni-juli. Za postaje 22, 24, 25 i 26 iznimno su donesene vrijednosti za novembar-decembar jer drugih podataka nije bilo.

Dobivene su veće vrijednosti suhe težine zooplanktona za sjeverni dio Jadrana (14,3 mg/m³) nego za srednji Jadran (8,1 mg/m³), a što se slaže i sa dosadašnjim nalazima za raspodjelu hranljivih soli u Jadranu (Ercegović, 1936; Buljan, 1953; Battaglia, &, 1960).

Srednjak svih vrijednosti suhe težine zooplanktona u Jadranu znatno je niži od odgovarajućih vrijednosti za druga mora (Tabela III).

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