IRON, COPPER AND MOLYBDENUM IN THE DIFFERENT BODY PARTS OF SOME CLUPEOIDS

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ABSTRACT

The amounts of iron, copper and molybdenum in the different tissues of eight species of clupeoids belonging to the genera *Stolephorus, Thryssa* and *Sardinella* were determined. In all the species, the concentration of each element did not bear any relation to size. It was observed that iron and copper were concentrated more in heart and liver than in stomach, pyloric caecae, kidneys, ovaries, testes, flesh and bone.

Iron, copper and molybdenum are essential trace elements in the nutrition of animals. Snyder (1958), Imanishi (1959, 1960), Kasinova (1961), Vasilieve et al (1973) and Window et al (1973) have contributed to our recent knowledge about the quantitative analysis of these three elements in different species of fishes.

Iron and copper contents in the flesh, liver, heart, ovaries, stomach, pyloric caecae, kidneys and bones of *Stolephorus heterolobus, S. indica, S. commersonii, Thryssa mystax, T. setirostris, T. vitrirostris, Sardinella fimbriata and S. jussieu* were estimated by the methods described by Sandell (1950) and Chilton (1953). Molybdenum content was estimated by the method described by Johnson and Arkley (1954).

The specimens were sorted into 30 mm size groups. The amout of each trace element was expressed as μ g|g of wet weight. The values were tested by the Analysis of variance at 5% level of probability in order to know whether the differences was significant.

In *S. heterolobus,* the amount of iron ranged from 4.81 to 7.38 μ g/g. In 1963, there was a decreasing trend from 5.58 to 5.04 μ g|g in the average amount of iron with increase in length, whereas the reverse was the case in 1964, as the values increased from 4.81 to 7.38 μ g|g. In *S. indica,* the values fluctuated from 1.71 to 4.16 μ g|g, while in *S. commersonii* the values showed an increasing trend along with increasing length in both the years. In *T. mystax, T. setirostris* and *T. vitrirostris,* the values in both the years fluctuated irrespective of increase in size, the range in the iron values being 3.5 to 5.0 μ g/g

for *T. mystax*, 2.72-5.3 μ g|g *for T. setirostris*, 2.32-4.32 μ g|g for *T. vitrirostris*. Similar fluctuations were also observed in the iron values of *S. jussieu* (range 2.92-4.62 μ g|g) and *S. fimbriata* (2.79-4.37 μ g|g).

The average copper content in *S. heterolobus ranged from* 0.10 to 0.20 μ g|g while the amount in *S. indica* varied from 0.11 to 0.52 μ g|g and *S. commersonii* from 0.16 to 0.25 μ g|g. When the values for both the years were considered, it was observed that there was no relationship between the amount of copper and the length of the fish. Similar inference could also be

TABLE 1. *The average iron, copper and molybdenum* (μ g|g) *in different size groups in different species of clupeoids.*

Name of species	1963					1964				
	40-60	70-90	100-120	130-150	160-190	40-60	70-90	100-120	130-150	160-180
					Iron					
S. h.	5.58	5.44	5.04	—	—	4.81	5.58	7.38	—	—
S. i.	2.75	3.03	3.07	2.93	—	2.83	3.51	1.71	4.16	—
S. c.	—	1.16	2.91	2.99	—	—	1.42	2.48	2.79	—
T. m.	4.09	4.58	4.03	3.50	5.97	—	4.03	4.97	5.00	4.24
T. s.	5.30	2.94	2.72	4.62	2.97	2.94	3.18	3.35	3.38	2.73
T. v.	—	2.32	3.69	3.38	4.31	—	3.02	2.82	2.71	2.02
S. J.	3.39	3.18	2.92	4.62	—	3.47	3.45	3.12	3.18	4.16
S. f.	2.79	3.71	4.37	—	—	4.15	3.65	3.33	4.17	—
					Copper					
S. h.	0.18	0.19	0.10	—	—	0.14	0.18	0.20	—	—
S. i.	0.17	0.11	0.22	0.18	—	0.18	0.18	0.52	0.25	—
S. c.	—	0.25	0.19	0.16	—	—	0.21	0.19	0.23	—
T. m.	0.15	0.23	0.12	0.12	0.14	—	0.17	0.08	0.19	0.11
T. s.	0.14	0.10	0.10	0.18	0.25	0.21	0.13	0.15	0.20	0.21
T. v.	—	0.29	0.23	0.20	0.13	—	0.22	0.21	0.29	0.19
S. j.	0.20	0.12	0.22	0.13	—	0.17	0.25	0.26	0.29	0.16
S. f.	0.14	0.18	0.17	0.20	—	—	0.19	0.25	0.16	—
					Molybdenum					
S. h.	0.035	0.025	0.012	—	—	0.037	0.049	0.092	—	
S. i.	0.034	0.049	0.057	0.008	—	0.035	0.066	0.025	0.038	
S. c.	—	0.084	0.043	0.063	—	—	0.022	0.064	0.066	
T. m.	0.026	0.034	0.027	0.048	0.058	—	0.086	0.017	0.060	
T. s.	0.034	0.024	0.038	0.047	0.073	0.062	0.047	0.048	0.093	
T. v.	—	0.058	0.054	0.052	0.070	—	0.150	0.060	0.074	
S. j.	0.092	0.029	0.035	0.030	—	0.050	0.090	0.032	0.028	
S. f.	0.032	0.049	0.071	—	—	0.038	0.116	0.045	0.050	

S. h.: S. heterolobus; S. i.: S. indica; S. c.: S. commersonii; T. m.: T. mystax; T. v.: T. vitrirostris; S. j.: S. jussieu; S. f.: S. fimbriata.

drawn for all the species of *Thryssa*, since the values did not keep any relation with the size. The range in the copper content varied in *T. mystax* 0.08-0.23 μ g|g *in T. setitostris*, 0.10-0.25 μ g|g and in *T. vitrirostris* 0.13-0.29 μ g/g. The copper content in *S. jussieu* and *S. fimbriata* ranged from 0.13 to 0.29 and from 0.14 to 0.25 μ g|g respectively. As in the other clupeoids, the copper content did not bear any relations to length in *Sardinella* species.

The molybdenum content in *S. heterolobus* ranged from 0.12 to 0.092 μ g|g and in 1963 it decreased with increase in size whereas in 1964, the molybdenum content increased with increase in size. In *S. indica*, the molybdenum content ranged from 0.008 to 0.57 μ g|g and *S. commersonii*, from 0.22-0.084 μ g|g and it was noticed that the amount of molybdenum did not increase with increase in size. Similar results were obtained in three species of *Thryssa*. In *T. mystax*, *T. setirostris* and *T. vitrirostris*, the range in molybdenum values were 0.017-0.086, 0.024-0.093 and 0.150-0.070 μ g|g respectively. In *S. jussieu* and *S. fimbriata* the molybdenum values fluctuated from 0.029 to 0.092 and 0.032-0.116 μ g|g respectively.

Further, it was observed that in all the eight species of clupeoids the differences in the amounts of iron, copper and molybdenum in different size groups were not significant at 5% level of probability. It was also observed that except in *T. setirostris* and *T. vitrirostris* in all the other species iron was concentrated more in the heart and liver than in the other parts of the body and minimum amounts were observed in the flesh. Similarly, copper was concentrated more in the heart and liver in all the species except *T. mystax* and *S. fimbriata* and, as in the case of iron, minimum amount was observed in the flesh.

TABLE 2. *Iron and copper contents* (μ g|g) *in different parts of body in different species of clpeoids. (for abbreviations see Table* 1)

Name of species	Flesh	Liver	Heart	Stomach	Pylaric caecae	Kidneys	Ovaries	Testes	Bones
S. h.	4.43	129.74	134.92	48.81	35.18	71.45	23.41	—	54.27
S. i.	5.41	193.48	206.91	75.17	20.60	101.63	17.34	—	25.37
S. c.	1.98	261.33	278.11	58.11	26.53	91.77	45.65	—	32.61
T. m.	1.71	34.77	64.33	10.40	32.72	32.05	10.38	—	21.67
T. s.	0.78	41.99	39.82	10.83	34.50	32.00	12.62	—	17.32
T. v.	3.90	36.37	32.98	17.40	32.02	22.69	13.50	—	12.50
S. f.	2.07	50.09	75.10	35.35	34.33	21.90	22.24	—	33.77
S. j.	4.11	71.66	93.69	43.75	41.26	55.96	—	40.79	31.19
S. h.	0.25	11.70	26.33	1.76	5.80	9.67	0.59	—	1.08
S. i.	0.22	11.81	15.74	7.61	10.57	7.99	5.17	—	3.11
S. c.	0.20	7.64	10.42	5.01	1.21	8.21	3.30	—	3.55
T. m.	0.07	2.76	5.42	0.23	8.21	15.73	1.05	—	0.58
T. s.	0.07	2.76	7.67	1.95	3.51	5.19	1.99	—	1.10
T. v.	0.18	5.30	8.05	5.03	4.68	4.59	1.76	—	1.43
S. j.	0.12	26.66	11.04	18.92	15.47	10.57	7.50	—	3.91
S. f.	0.15	11.86	1.76	38.91	5.14	24.63	1.14	—	6.49

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ON A LARGE SUNFISH *RANZANIA TYPUS* FROM THE SOUTHWEST COAST

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A sunfish (or trunkfish), *Ranzania typus,* measuring 616 mm total length and a maximum depth of 310 mm was caught at Erayumanthurai on the southwest coast (Kanyakumari district, Tamil Nadu) on 2-3-1984 in a shore seine. The gear had operated a distance of 1 km from the shore, up to a depth of 22 m. Coloured bluish, tending towards dark above and to silvery below, it had a smooth skin with small hexagonal plates. Six streaks of lighter colour with darker borders, emanated from near the dorsal margin between the snout and the gill slit, curved downwards to the ventral profile. The posterior three streaks were branched and contained dark spots, mostly round. Lips were produced forwards beyond teeth as a funnel, closing in a vertical slit.