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Times of Entering into the Vistula River of Summer and Winter Populations of Sea-Trout and Atlantic Salmon in the 1952 Year-cycle

by

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During the year-cycle of 1952 1.o39 specimens of sea-trout (Salmo trutta) and 19 specimens of Atlantic salmon were examined when entering the mouth of the river Vistula. The above number of examined fish amounted to 22.1% of the total number caught in the Vistula estuary which in 1952 consisted of 4.795 specimens. Salmon formed only 2% of the total number of sea-trout. Every fish was determined as to type (summer or winter), by means of the relative weight of the gonads in accordance with earlier described criteria (Berg, 1935; Kukucz, 196o, 1961; Nordquist, 1924; Zarnecki, 1936, 1952, 1952a, 1956, 1957, 1963). For this purpose 273 sea-trout and 11 salmon were opened. Only individuals showing distinct characters of the winter type were determined on the basis of external examination, which has been described previously (S.Zarnecki, M. Piątek, 1954).

The results of the sea-trout investigations can be summarized as follows:-

Females

1.In the period from January to May inclusive only 18 females were examined, because at that time the catches of sea-trout are always very poor. No specimen with augmented gonads was found. The appearance and weight of tested ovaries were similar to those of the fish entering the river in October and December, when the weight of the ovaries usually amounts to o.3-o.4% of the body weight, on an average.

2. In June 15 females out of 19 which were opened showed a small but distinct augmentation of the ovaries. The average weight of augmented gonads for 15 females was 1.47% of the body weight.

3. In July the weight of the ovaries of 32 females was already 3.5% of the body weight. Only 2 females did not show a distinct augmentation.

4. In August the augmentation continues to increase, amounting up to 8% (in one female).

5. In September two distinct groups occur in the mouth of the Vistula for the first time in the year-cycle. In a group of 24 females the relative weight of the ovaries amounted to 9.5% of the body weight on an average (attaining 15% even in some females). In the second group of only 3 females, the gonads were underdeveloped, which proves that in September the first individuals of the winter-type run occur. These relations were also observed in 195o (Zarnecki, 1963).

6. In October of every year the peak of the run entering the estuary of the Vistula is noted. In 1952, 789 females were examined. All of them were opened for sex determination. The ovaries, which were undeveloped, as the relative weight for 39 females only amounted to o.29% showed that we were dealing with the winter population. Among them no female of the summer type was found.

7. December. - 37 females were examined, and all of them belonged to the winter type.

Males

8. January-May. - In this period only 7 males were caught showing undeveloped gonads.

9. June. - The first male with augmented testes was recorded.

1o. July. - Further growth of gonads was observed in 6 males. In August no sea-trout males were caught.

11. September. - All the 16 males examined showed more developed gonads, their relative weight amounting to 4.41% of the body weight on an average.

12. October. - Out of 7 males, 4 were nearly mature whereas 3 represented the first arriving individuals of the winter-type population.

13. November. - In this month the run of the winter population attains its peak as observed every year. Only 1 male out of 37 represented the summer type. The remainder belonged to the winter type.

14. December. - 9 males of the winter type were observed.

The facts described above can be summarized as follows:-

a) During January to May (incl.) in 1952 no sea-trout with augmented gonads were found in the estuary of the Vistula.

b) The first individuals of both sexes with slightly enlarged gonads were met with in the month of June.

c) From July to September (incl.) a further growth of the gonads was noted. The last specimens with well-developed gonads were, as a rule, noted in October. Single laggards of sea-trout with large gonads could be found in November or December but only exceptionally (Figures 1 and 2).

d) In September the first individuals with undeveloped gonads occur in the mouth of the Vistula. In October they surpass in number the individuals with ripening gonads. In November and December sea-trout with undeveloped gonads enter, as a rule, the Vistula River in great numbers.

e) The facts presented under 1. to 4. above relating to the year-cycle in 1952 indicate that the distribution in time of the summer type and the winter-type run, is as follows:-

(i) the summer-type run begins, according to the size of the gonads, in June and ends, as a rule, in October (Figure 3),

(ii) the winter-type run begins in September and lasts until December. The undeveloped specimens caught in the subsequent winter months may belong either to the winter type which is characterized by undeveloped gonads or to the summer type comprising fish with retarded sexual development.

In this period of the year (January-May) it is not possible to distinguish the seasonal forms by means of the relative size of the gonads.

(iii) No difference between males and females as to the time of entering the Vistula River, was observed in the 1952 year-cycle.

The results of the salmon investigations are presented in Table 2. Out of 19 specimens 12 were females and 7 were males. 18 of these showed summer-type character and only 1 female belonging to the winter type. During recent years the rapid decrease in the number of winter salmon in the Vistula has been observed. The occurrence of only 1 female is in good agreement therewith. The spawning grounds of the winter salmon are situated in the rivers Skawa and Sola falling into the Vistula above Kraków, where the water pollution is greater. Furthermore, the dams in the region of Kraków have no adequate fish passes.

In 1952 Atlantic salmon amounted to only about 2% of the total number of sea-trout.

Summer salmon evidently entered the Vistula River during the period July-August-September, whereas the only winter female was caught in October. These few data do not disagree with the immigration pattern of the seasonal forms of sea-trout in the Vistula Basin (Zarnecki, 1956, 1963).

It has been found by means of calculations, based on the total catch of sea-trout in 1952, that the relation between the summer and the winter type is as 20:80.

In the case of the salmon this relation is reversed owing to the nearly total absence of the winter type, which recently lost the access to its spawning places in the Upper Vistula.

Berg, L. S.	1935	"Sommer und Winterrassen bei den anadromen Fischen". Zool.Inst.Akad.Wiss., Arch.Naturgesch., 4, Leningrad.
Kukucz, J.	196o	"Alterations in fat, water and protein contents of Vistula sea-trout in connection with their biology". Cons.Int.Explor.Mer, Salmon and Trout Cttee., No.129 (mimeogr.), Copenhagen.
Kukucz, J.	1961	"Some of the differences between summer and winter populations of sea-trout (Salmo trutta L.)." Cons.Int.Explor.Mer, Salmon & Trout Cttee., No. 77 (mimeogr.), Copenhagen.
Nordquist, O.	1924	"Times of entering of the Atlantic salmon (Salmo salar L.)in the rivers". Cons.Int.Explor. Mer, Rapp. et Proc.-Verb., XXXIII, Copenhague.
Zarnecki, S.	1936	"Wędrówki młodych troci dunajcowych z tarlisk do morza". ("On the migration of young sea-trout of the river Dunajec from the spawning places to the sea"). Extr. Bull.Akad.Polonaise Sci. et Lettres.
Zarnecki, S.	1952	"Rasy sezonowe u ryb łosośiowatych". Gosp.Rybn. 8, Warszawa.
Zarnecki, S.	1952	"Formy letnie łososi i troci w dorzeczu Wisły". Gosp.Rybn., 1o, Warszawa.
Zarnecki, S.	1956	"Summer and winter races of salmon and sea-trout from the Vistula River". Cons.Int.Explor. Mer, Salmon & Trout Cttee., (mimeogr.), Copenhagen.
Zarnecki, S.	1957	"The age and growth of seasonal populations of sea-trout entering the River Vistula in the autumn 1951". Cons.Explor.Mer., Salmon & Trout Cttee., No.73 (mimeogr.), Copenhagen.
Zarnecki, S.	1963	"Phenomenon of the differentiation of Atlantic salmon and sea-trout from the Vistula River into seasonal populations". Act.Hydrobiol. PAN, Kraków.
Zarnecki, S. & Piątek, M.	1954	"Odmienność metabolizmu u ras zimowych oraz letnich łososia i troci". Folia Biol., II, zesz.3-4, Warszawa.

PS. No tables have been received for this contribution.

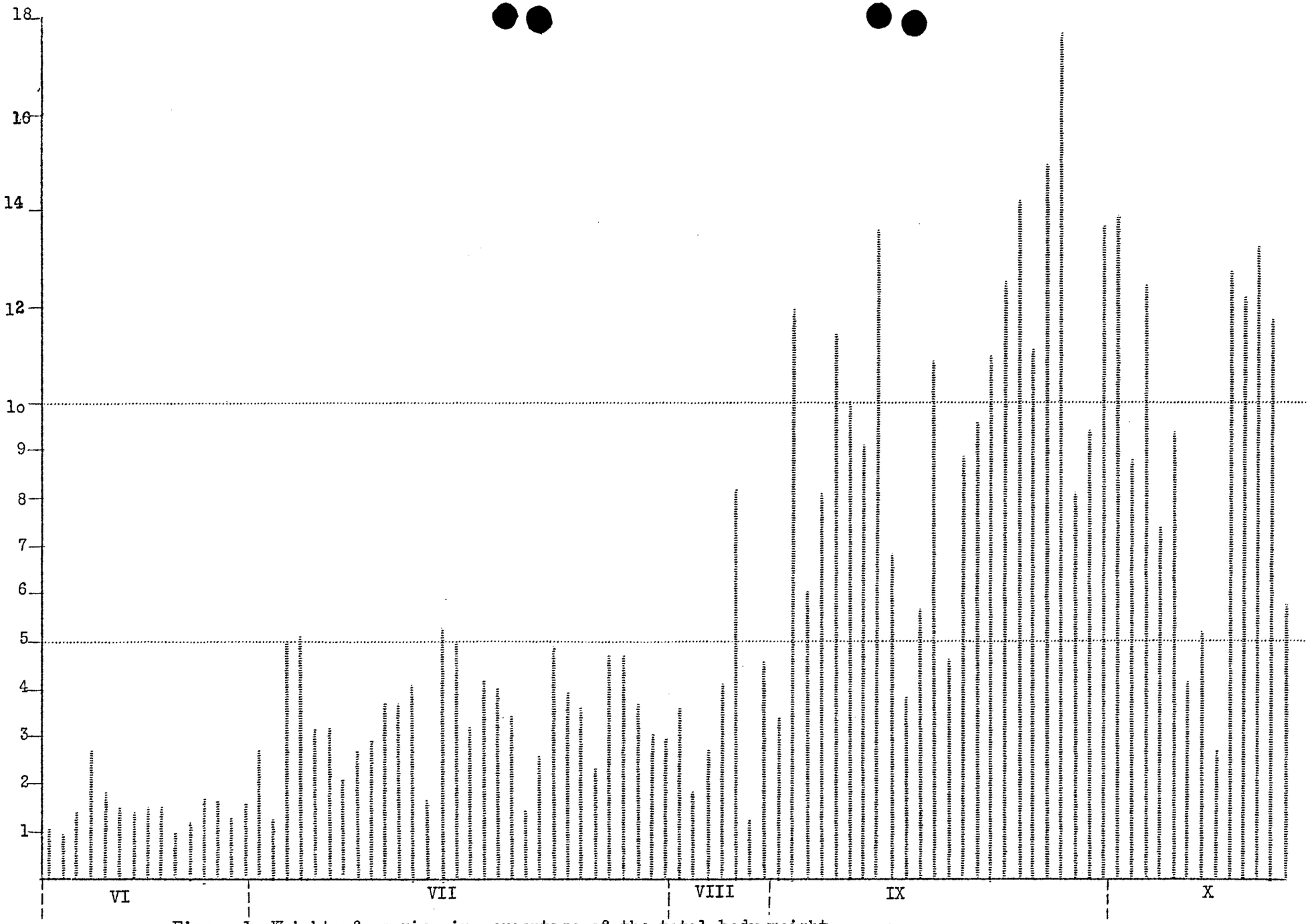

Figure 1. Weight of ovaries in percentage of the total body weight.

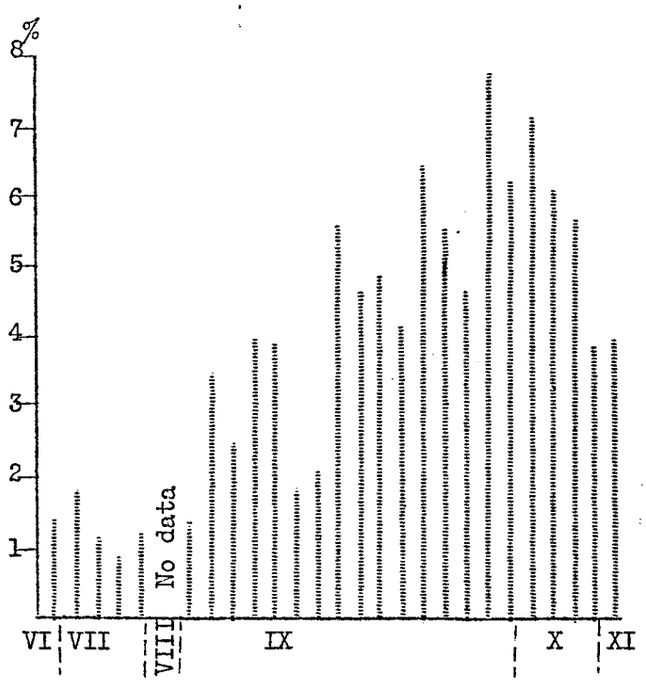

Figure 2. Weight of testicles in percentage of the total body weight.

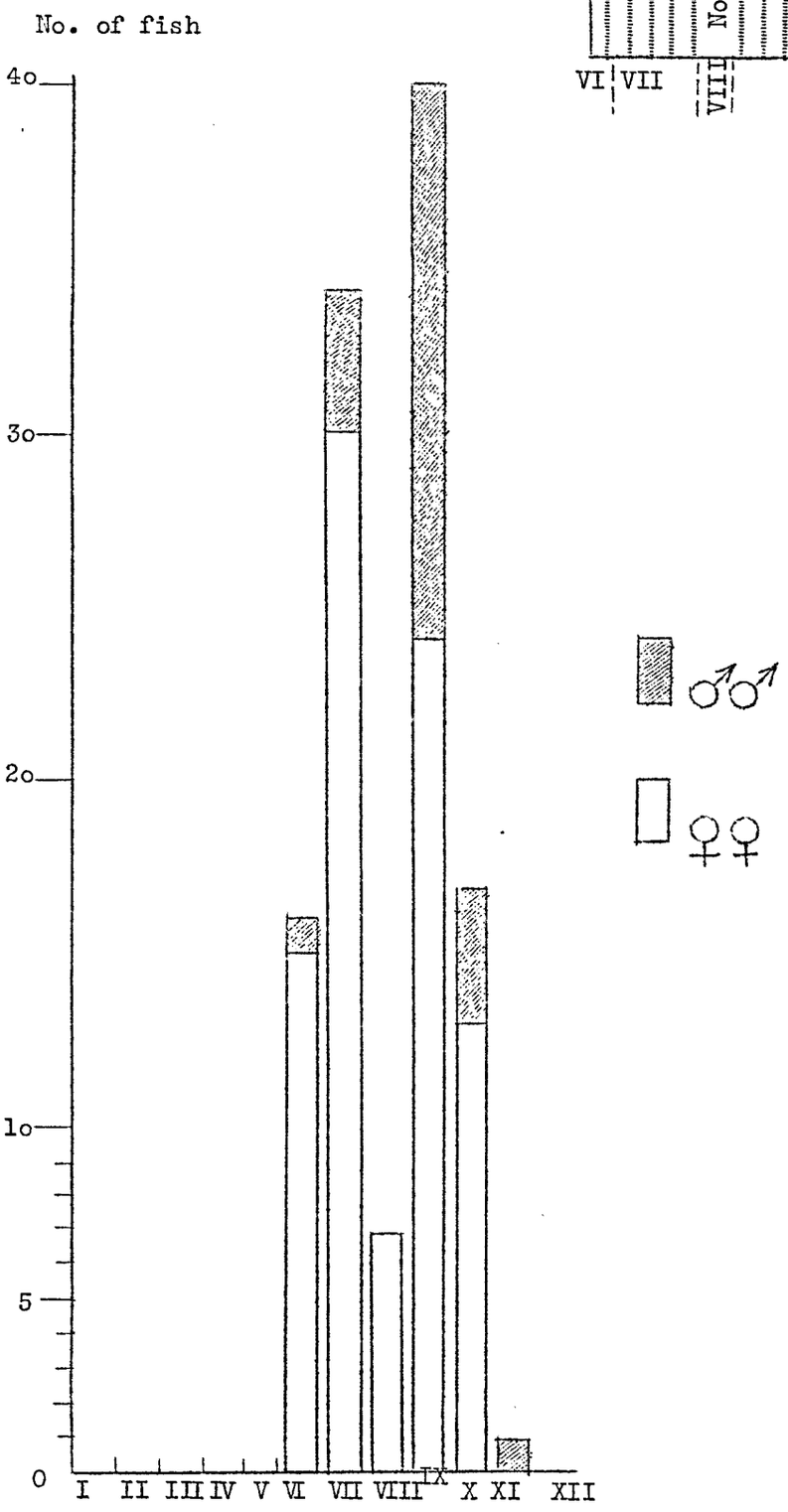

Figure 3. Number of fish belonging to the summer-type of sea-trout entering the Vistula River in the various months of 1952.

Table 1.

Sea-Trout
entering the River Vistula in 1952.

Coll. No.	Date of capture	Weight in kg	Length in cm	Gonads in percent of body weight
Small gonads - Winter group				
Females				
	Jan.			
2893	15	4.1	70	0.05
2905	17	6.4	79	0.78
2906	17	3.0	65	0.32
2907	17	4.8	78	1.54
2913	18	4.8	74	0.42
2927	23	1.8	56	0.06
2929	23	4.8	78	1.54
Males				
	Jan.			
2894	15	3.1	65	0.03
2914	18	7.7	88	0.39
2930	23	5.2	71	0.04
Females				
	March			
3018	17	5.8	76	0.51
3019	17	5.8	76	0.69
3020	17	4.3	73	0.57
3021	17	4.3	73	0.80
3023	17	3.5	71	0.28
3049	19	3.2	66	0.63
3050	19	3.8	71	0.39
3064	20	3.3	71	0.30
Males				
	March			
3053	19	5.5	76	0.45
3063	20	2.3	58	0.43
3081	29	8.5	93	0.24
Males				
	Apr.			
3101	5	4.2	75	0.05
Females				
	May			
3333	12	2.7	67	0.19
3340	22	4.4	72	0.45
Augmented gonads - Summer group				
Females				
	June			
3391	4	4.0	69	1.00
3413	13	3.6	65	0.97
3415	13	5.1	74	1.37
3430	14	4.8	73	2.68
3438	15	9.3	94	1.94
3439	15	8.0	88	1.50
3440	15	5.3	74	1.41
3441	15	5.2	74	1.52
3464	17	5.1	73	1.49
3476	18	7.4	85	0.95
3477	18	5.0	73	1.18
3482	19	4.2	71	1.67
3506	26	9.2	89	1.62
3507	26	5.6	77	1.34
3532	28	6.0	75	1.50
Males				
	June			
3431	14	5.5	76	1.45
Small gonads - Winter group				
Females				
	June			
3414	13	8.4	74	0.71
3478	18	4.0	69	0.50
3534	28	4.4	70	0.57
3535	28	3.7	63	0.27
Males				
	June			
3512	27	9.1	89	0.33
3513	27	7.1	77	0.49
3533	28	4.4	68	0.45
Augmented gonads - Summer group				
Females				
	July			
3637	22	5.5	75	2.73
3663	23	5.6	78	1.33
3664	23	7.5	83	5.00
3665	23	5.3	75	5.14
3666	23	4.5	69	3.11
3667	23	9.4	87	3.19
3668	23	6.0	80	2.05
3670	23	5.0	70	2.67
3671	23	6.0	76	2.92
3672	23	6.1	78	3.68
3673	23	6.0	74	3.75
3674	23	5.5	76	4.09
3693	24	6.0	79	1.67
3704	24	5.7	76	5.26
3705	24	5.1	73	5.05
3706	24	9.1	95	3.25
3707	24	4.3	73	4.12
3708	24	4.9	74	4.08
3731	25	5.2	80	3.37
3732	25	3.6	64	1.39
3733	25	11.0	96	2.55
3734	25	5.9	74	4.87
3735	25	5.6	77	3.93
3736	25	5.8	75	3.62
3739	25	8.8	90	2.27
3740	25	5.7	76	4.74
3741	25	5.8	74	4.74
3754	25	5.2	74	3.75
3755	25	5.2	74	3.05
3761	25	12.4	100	2.90

Table 1 (continued)

Coll. No.	Date of capture	Weight in kg	Length in cm	Gonads in percent of body weight
Augmented gonads - Summer group				
		Males		
	July			
3669	23	7.9	89	1.90
3730	25	4.9	72	1.21
3738	25	8.6	97	0.93
3753	27	7.4	85	1.35
Small gonads - Winter group				
		Males		
	July			
3545	2	5.4	74	0.56
3752	27	3.8	66	0.13
Augmented gonads - Summer group				
		Females		
	Aug.			
3774	3	9.8	97	3.65
3775	3	10.1	95	1.82
3776	3	4.0	69	2.75
3811	12	8.5	86	4.12
3823	27	3.9	69	8.21
3824	27	4.0	71	1.25
3825	27	7.7	91	4.63
	Sept.			
3828	1	3.0	61	3.33
3830	1	5.3	81	11.94
3837	2	10.0	95	6.00
3838	2	7.2	84	8.13
3839	2	7.6	88	11.39
3840	2	5.9	87	10.08
3842	2	5.7	77	9.12
3843	2	2.2	55	13.63
3849	4	2.9	59	6.85
3850	4	2.8	60	3.83
3865	11	6.6	86	5.66
3866	11	8.9	85	10.95
3868	15	4.1	80	4.61
3870	15	2.8	59	8.77
3872	15	2.8	60	9.62
3873	15	3.0	60	11.00
3876	16	4.0	67	12.50
3877	16	5.2	78	14.33
3882	17	4.6	70	14.99
3881	17	2.5	69	11.13
3887	19	4.1	73	17.68
3888	19	4.7	67	8.09
3966	29	8.0	80	9.38
3971	30	4.0	69	13.75
		Males		
	Sept.			
3829	1	3.6	63	1.38
3841	2	11.0	96	3.50
3844	3	6.3	85	2.54
3845	3	6.5	81	4.00
3846	3	3.2	64	3.91
3847	4	7.9	82	1.89
3860	10	8.5	88	2.06
3864	11	6.1	82	6.56
3880	17	5.9	85	4.24
3875	16	3.2	61	4.92
3869	15	2.7	60	4.69
3886	19	10.0	96	6.50
3906	22	12.5	106	5.60
3910	23	16.0	110	4.69
3973	30	2.5	60	7.84
3974	30	2.4	59	6.25
Small gonads - Winter group				
		Females		
	Sept.			
3905	22	4.3	67	0.50
3915	23	3.8	79	0.91
3972	30	2.7	60	0.55
Augmented gonads - Summer group				
		Females		
	Oct.			
3985	3	5.2	81	13.93
3991	3	2.8	60	8.77
3992	3	3.6	67	12.50
4003	4	2.5	59	7.39
4004	4	2.1	58	9.43
4005	4	4.8	69	4.11
4006	4	3.8	67	5.17
4008	4	2.3	57	2.59
4036	8	3.0	63	12.79
4071	10	4.5	66	12.22
4072	10	2.2	57	13.33
4073	10	2.7	61	11.85
4269	22	3.0	62	5.76
		Males		
	Oct.			
4002	4	3.0	61	7.21
4007	4	2.4	59	6.15
4017	6	3.6	66	5.75
4297	23	2.0	61	39.66
Small gonads - Winter group				
		Females		
	Oct.			
3980	2	4.8	77	0.34
3988	3	5.0	70	0.20
3989	3	4.3	68	0.12
3990	3	3.7	62	0.27
4020	7	3.5	64	0.29
4021	7	3.0	64	0.33
4037	8	4.7	68	0.52
4038	8	5.7	78	0.96
4058	10	5.0	71	0.30
4074	10	3.0	63	0.33
4075	10	3.8	66	0.26
4076	10	2.8	59	0.71
4077	10	3.0	65	0.50
4105	11	2.8	63	0.36
4106	11	3.3	64	0.30
4107	11	3.0	64	0.30

Table 1 (continued)

Coll. No.	Date of capture	Weight in kg	Length in cm	Gonads, % of body weight	Coll. No.	Date of capture	Weight in kg	Lenght in cm	Gonads % of body weight
Small gonads - Winter group					Small gonads - Winter group				
	Females					Females			
	Oct.					Oct.			
4133	14	3.4	65	o.29	4365	28	3.8	66	o.39
4134	14	4.5	69	o.22	4366	28	3.2	63	o.31
4135	14	4.6	68	o.33	4378	28	6.3	78	o.32
4136	14	4.3	66	o.23	4379	28	6.1	74	o.25
414o	16	4.6	69	o.33	4398	29	2.o	59	o.49
4141	16	2.9	61	o.17	44o6	3o	2.8	58	o.35
4142	16	3.5	64	o.43	44o7	3o	3.o	71	o.33
4143	16	3.4	62	o.29	441o	3o	4.o	67	o.25
4148	16	2.9	63	o.17	4411	3o	4.o	66	o.26
4214	19	5.9	75	o.25	4413	3o	4.o	74	o.49
4215	19	2.8	61	o.36	4418	31	4.6	69	o.32
4216	19	3.9	67	o.26	442o	31	3.o	66	o.33
4217	19	3.4	65	o.29	4421	31	4.o	7o	o.25
4229	2o	2.o	59	o.49	4422	31	4.o	69	o.37
423o	2o	2.o	6o	o.48	4424	31	4.1	69	o.24
4231	2o	2.o	56	o.5o	4425	31	4.o	68	o.38
4232	2o	2.o	6o	o.49	4426	31	4.8	72	o.31
4244	21	9.8	86	o.2o	4427	31	3.9	65	o.26
4252	21	2.7	59	o.37	4429	31	4.o	66	o.25
4253	21	2.o	55	o.5o	443o	31	4.4	68	o.34
4266	22	4.o	68	o.37	4431	31	2.5	63	o.4o
4267	22	4.o	68	o.37	4432	31	3.8	66	o.26
4268	22	2.5	58	o.4o	4433	31	3.4	65	o.43
4277	22	9.o	84	o.55					
4278	22	6.o	78	o.49			Males		
4279	22	2.1	59	o.48		Oct.			
43o8	23	2.o	6o	o.24	4o16	6	9.o	86	o.22
43o9	23	2.o	59	o.25	4412	3o	4.o	72	o.12
4318	23	2.6	59	o.58	4428	31	4.8	69	o.1o
4361	27	4.o	7o	o.25					
4362	27	3.5	67	o.43					
4363	27	2.o	62	o.72					
4364	28	4.2	68	o.24					

Table 2. Salmon entering the River Vistula in 1952

Coll. No.	Date of capture	Place of capture	Weight in kg	Total length in cm	Weight of gonads in g	Weight of gonads in %
			Females			
	July					
358o	7	Tczew	9.5	94		
3625	22	Mikoszewo	12.o	1oo		
3629	22	Tczew	12.o	1o5		
	Aug.					
3814	21	Mokoszewo	9.5	94		
	Sept.					
3848	4	Tczew	7.o	88	59o	8.37
3861	1o	Tczew	9.1	97	32o	3.52
3879	17	Mikoszewo	7.7	87	-	-
3884	18	Tczew	1o.5	1oo	8oo	7.62
3963	27	Tczew	5.8	83	675	11.54
3962	27	Mikoszewo	8.o	93	125o	15.62
	Oct.					
3981	2	Tczew	9.o	95	1425	15.83
4169	17	Świbno	5.3	79	1o	o.o2
			Males			
	Apr.					
3231	11	Świbno	3.6	73		
	July					
3612	21	Tczew	12.5	125	[illegible]	
3635	22	Tczew	1o.o	1oo	72o	
3644	23	Tczew	2o.o	125		
	Sept.					
3862	1o	Tczew	1o.5		585	5.57
3871	15	Tczew	16.o		72o	4.5o
3922	25	Tczew	15.o		675	4.22