STURGEONS, FAMILY *ACIPENCERIDAE*

Of the five sturgeon species inhabiting the Black Sea, the most abundant are: the Russian sturgeon, *Acipenser guldanstadti,* the starred sturgeon, *Acipenser stellatus* and the great sturgeon, *Huso huso*. The sturgeons spawn in the rivers Danube, Dnieper, Rioni and Kizil-Irmak, and form the separate populations or national stocks which compose the major component of sturgeon stocks in the Black Sea. That is why the main distribution and catches of these fish species occur in the north-western part of the basin (Avertsev, 1960; Ambroz and Kiriljuk, 1979; Kolarov, 1986; Shlyakhov and Akselev, 1993). According to FAO Fishery Statistics this yield comes from three areas: area 05 - Bulgaria and Romania; area 07 - former USSR and area 37 - Bulgaria, Romania and former USSR.

The sturgeon catches during the period 1963-1992 are presented in **Table 24**.

The expert assessment of the real level of sturgeon catches must take into consideration illegal poacher catches in the former USSR, but similar corrections for Bulgarian and Romanian illegal catches have not been included.

According to data of trawl surveys (Ambroz and Kiriljuk, 1969; Shlyakhov and Akselev, 1993) the stock sizes of sturgeons are given in **Table 25**.

Trawl surveys are carried out in February and March. During the period 1966-1981 the areas investigated covered almost all the wintering ground of the Russian sturgeon, starred sturgeon and the young individuals of the great sturgeon. Mature specimens of the great sturgeon from the Danube population winter at depths 60-120 m along the entire western coast , including the continental shelf off the southern Crimean waters. Therefore, the stock abundance of the great sturgeon is underestimated and this appraisal concerns mainly immature fish. The area investigated after 1981 is smaller and includes Kirkinitsky Bay and the western part of Tendra, covering almost completely the wintering grounds of the Russian sturgeon and also the main parts of the range of the starred sturgeon and the young fish of the great sturgeon.

TABLE 24. Sturgeon catches in the north-western part of the Black Sea and the Danube

Year	According to FAO statistics		Expert assessment of the actual catches	
	Sturgeons	Russian sturgeon	Sturgeons	Russian sturgeon
1964	401.54	21.07	461.54	26.33
1965	457.61	28.32	502.61	35.41
1966	448.46	26.20	480.46	32.75
1967	342.90	72.00	367.90	90.00
1968	265.90	21.60	266.90	27.00
1969	298.20	28.80	313.20	36.00
1970	248.50	23.74	263.50	29.73
1971	230.80	30.24	244.80	37.80
1972	259.40	29.52	269.40	36.87
1973	281.40	24.48	295.40	30.60
1974	326.70	42.48	356.70	53.10
1975	242.60	39.70	256.60	49.48
1976	207.50	29.37	219.50	37.40
1977	238.30	69.98	278.30	97.90
1978	249.01	65.69	294.01	96.49
1979	229.26	44.08	250.26	63.74
1980	199.10	67.91	252.10	101.62
1981	171.30	60.91	214.30	87.62
1982	160.00	60.28	201.00	86.35
1983	155.00	60.28	196.00	86.35
1984	151.00	58.50	190.00	82.80
1985	119.00	34.67	183.00	73.81
1986	89.00	31.25	125.00	53.57
1987	98.00	47.88	153.00	79.65
1988	90.00	44.96	151.00	85.43
1989	61.00	28.25	106.00	60.62
1990	87.00	51.89	134.00	88.48
1991	32.00	23.58	87.00	67.73
1992	130.00	90.80	208.00	138.31
	42.00	24.04	323.00	194.42

TABLE 25. Sturgeon numbers (x 10^{-6} specimens - all species of ages 1-33) in the north-western part of the Black Sea (according to trawl surveys)

Year	Russian sturgeon	Starred sturgeon	Great sturgeon	Total N (x 10^{-6})	Total B (th.tonnes)
1966 - 1974	0.209	0.738	0.284	1.219	21.4
1975 - 1978	0.768	1.280	0.512	2.560	32.6
1981	0.616	1.792	0.392	2.800	34.7
1984	1.600/ 0.231*	1.100	0.250	2.950	15.5
1987	2.200/ 0.361*	1.040	0.280	3.520	20.3
1991	3.000/ 0.417*	1.830	0.140	4.970	34.7
1992	4.200/ 0.310*	1.100	0.060	5.360	30.6
1993	4.100/ 0.225*	1.980	0.130	6.210	27.1

* - the total abundance (1-33 years old) is indicated in the numerator and those of exploited stock (14-33 years old) - in the denominator.

Russian sturgeon from the **Danube stock** are caught in the Danube river and the western part of the Black Sea. The spawning biomass includes only specimens older than 13 years, but the exploited biomass includes the species older than 10 years. Hence the exploited biomass includes also 10-12 years old fish. Some of these are immature but are subject to the commercial fishery, and therefore the biomass of the 10-12 year old fishes were added to those of the mature fishes (spawning biomass). They do not include fish raised in hatchery in the Azov Sea.

A continuous set of data on the age composition of catches of the three species in question is available only for the Russian sturgeon. The stock assessment of this species, *Acipencer guldanstadti* was carried out using the software package ANACO (Mesnil, 1989) which permits tuning of VPA by doing multiple of iterations to eliminate the bias when determining the initial value of fishing mortality coefficient (F_{st}). The natural mortality rate adopted is 0.05, and the mean weight by ages is obtained from the von Bertalanffy's equation (Domashenko and Akselev, 1993): $k = 0.059$; $t_o = -0.722$; $W_{oo} = 69.8$ kg. These assessments showed that the choice of F_{st} value has almost no influence on the final results for the sturgeon's biomass from the Danube population, as the share of the Dnieper population is insignificant. Nevertheless it comprises 20-24% of fish concentrations on the overwintering grounds (Shlyakhov, 1994) (**Tables 26, 27** and **Figure 4)**.

TABLE 26. Stock assessment (x 10^{-6} specimens and 10^{-3} tonnes) of Russian sturgeon from the Danube stock caught in Danube and Western Black Sea during 1963-1992

Year	10	11	12	13	14	15	16	17	18	19
1963	5.610	4.973	4.569	3.336	2.933	2.312	1.729	1.279	0.937	0.722
1964	6.137	5.313	4.567	4.084	2.976	2.542	1.882	1.547	1.056	0.790
1965	6.144	5.808	4.830	3.986	3.616	2.493	1.982	1.579	1.253	0.863
1966	6.038	5.815	5.318	4.263	3.542	3.124	1.968	1.691	1.298	1.061
1967	5.092	5.665	4.964	4.147	3.371	2.508	1.871	1.337	1.048	0.877
1968	7.666	4.820	5.218	4.410	3.687	2.894	2.053	1.619	1.103	0.890
1969	6.317	7.260	4.357	4.599	3.921	3.162	2.309	1.738	1.316	0.905
1970	7.630	5.982	6.717	3.843	4.148	3.445	2.641	2.018	1.486	1.134
1971	15.716	7.224	5.451	6.006	3.368	3.583	2.325	2.288	1.685	1.245
1972	11.662	14.918	6.639	4.812	5.432	2.851	2.954	1.992	1.946	1.455
1973	13.407	11.061	13.998	6.004	4.343	4.873	2.335	2.629	1.705	1.729
1974	22.158	12.707	10.186	12.778	5.307	3.623	3.981	1.905	2.170	1.409
1975	9.795	21.034	11.776	9.189	11.778	4.574	2.837	3,492	1.505	1.867
1976	12.293	9.285	19.772	10.823	8.455	10.845	3.891	2.476	3.089	1.282
1977	9.172	11.609	8.214	17.816	9.549	7.105	9.107	3.119	1.747	2.548
1978	12.289	8.642	10.434	6.836	16.212	8.158	5.570	8.088	2.366	1.277
1979	5.888	11.635	7.683	9.062	6.018	14.810	6.975	4.920	7.296	1.996
1980	15.259	5.518	10.438	6.279	7.846	4.804	12.836	6.030	4.052	6.535
1981	13.859	14.493	5.092	9.619	5.664	6.927	3.825	11.779	5.048	3.284
1982	17.517	13.168	13.728	4.582	8.743	4.461	5.287	3.005	10.563	4.401
1983	10.651	16.564	10.844	11.887	3.494	7.259	2.903	4.431	2.403	9.852
1984	9.501	9.909	14.094	7.981	9.962	2.445	6.005	2.390	3.978	2.217
1985	14.174	8.403	8.819	12.211	6.957	9.314	2.000	5.521	2.034	3.475
1986	28.758	12.602	7.614	8.028	10.902	6.238	8.764	1.712	5.140	1.797
1987	14.384	25.927	10.934	6.790	7.206	9.532	5.486	8.225	1.404	4.754
1988	21.975	13.486	23.967	9.916	6.277	6.647	8.678	4.992	7.706	1.245
1989	34.493	20.523	12.648	22.165	8.988	5.812	6.136	7.899	4.544	7.111
1990	36.652	32.279	19.010	11.791	20.230	7.951	5.316	5.587	7.038	4.050
1991	79.092	34.396	30.247	17.705	11.040	18.613	7.130	4.493	5.133	6.350
1992	96.578	74.149	31.792	27.051	15.915	9.706	16.328	5.697	4.028	4.643

Table 26 - continued

Year	20	21	22	23	24	25	26	27	28	29+
1963	0.580	0.492	0.411	0.365	0.304	0.264	0.133	0.184	0.142	0.411
1964	0.627	0.526	0.446	0.373	0.331	0.276	0.238	0.113	0.162	0.473
1965	0.669	0.561	0.471	0.401	0.331	0.296	0.244	0.208	0.089	0.502
1966	0.744	0.603	0.507	0.426	0.360	0.299	0.266	0.216	0.182	0.557
1967	0.799	0.617	0.499	0.422	0.346	0.298	0.239	0.208	0.161	0.501
1968	0.771	0.732	0.565	0.456	0.384	0.315	0.270	0.214	0.184	0.511
1969	0.763	0.698	0.667	0.513	0.411	0.347	0.281	0.238	0.185	0.536
1970	0.792	0.695	0.639	0.614	0.469	0.376	0.315	0.253	0.212	0.651
1971	0.990	0.715	0.629	0.583	0.558	0.427	0.338	0.281	0.222	0.740
1972	1.105	0.906	0.650	0.574	0.530	0.513	0.387	0.303	0.249	0.773
1973	1.312	1.021	0.837	0.599	0.527	0.489	0.472	0.353	0.273	0.834
1974	1.520	1.194	0.928	0.761	0.534	0.474	0.438	0.423	0.309	1.091
1975	1.225	1.396	1.095	0.849	0.690	0.479	0.421	0.387	0.373	0.955
1976	1.689	1.128	1.297	1.016	0.783	0.638	0.437	0.382	0.350	1.038
1977	0.991	1.492	0.992	1.168	0.902	0.696	0.558	0.367	0.315	0.994
1978	2.199	0.847	1.339	0.879	1.047	0.809	0.614	0.482	0.300	0.901
1979	1.065	2.028	0.752	1.217	0.779	0.965	0.738	0.553	0.428	1.333
1980	1.661	0.911	1.844	0.647	1.091	0.691	0.867	0.652	0.475	1.416
1981	5.896	1.430	0.742	1.655	0.516	0.963	0.583	0.751	0.546	1.653
1982	2.888	5.508	1.278	0.638	1.507	0.440	0.866	0.505	0.664	2.159
1983	4.060	2.703	5.203	1.186	0.578	1.411	0.396	0.801	0.458	1.602
1984	9.322	3.850	2.560	4.942	1.120	0.543	1.335	0.370	0.000	0.000
1985	1.857	8.760	3.485	2.198	4.553	0.950	0.458	1.183	0.331	0.000
1986	3.125	1.619	8.281	3.212	1.953	4.245	0.833	0.400	1.074	0.341
1987	1.547	2.760	1.369	7.816	2.934	1.695	3.937	0.712	0.340	2.344
1988	4.350	1.390	2.525	1.139	7.353	2.681	1.541	3.591	0.640	2.428
1989	1.161	3.981	1.249	2.310	0.935	6.921	2.452	1.400	3.274	2.475
1990	6.670	0.996	3.565	1.089	2.073	0.696	6.485	2.201	1.242	4.216
1991	3.650	6.241	0.867	3.240	0.962	1.882	0.522	6.096	1.998	6.031
1992	5.723	3.049	5.778	0.798	2.950	0.835	1.685	0.391	5.693	8.694

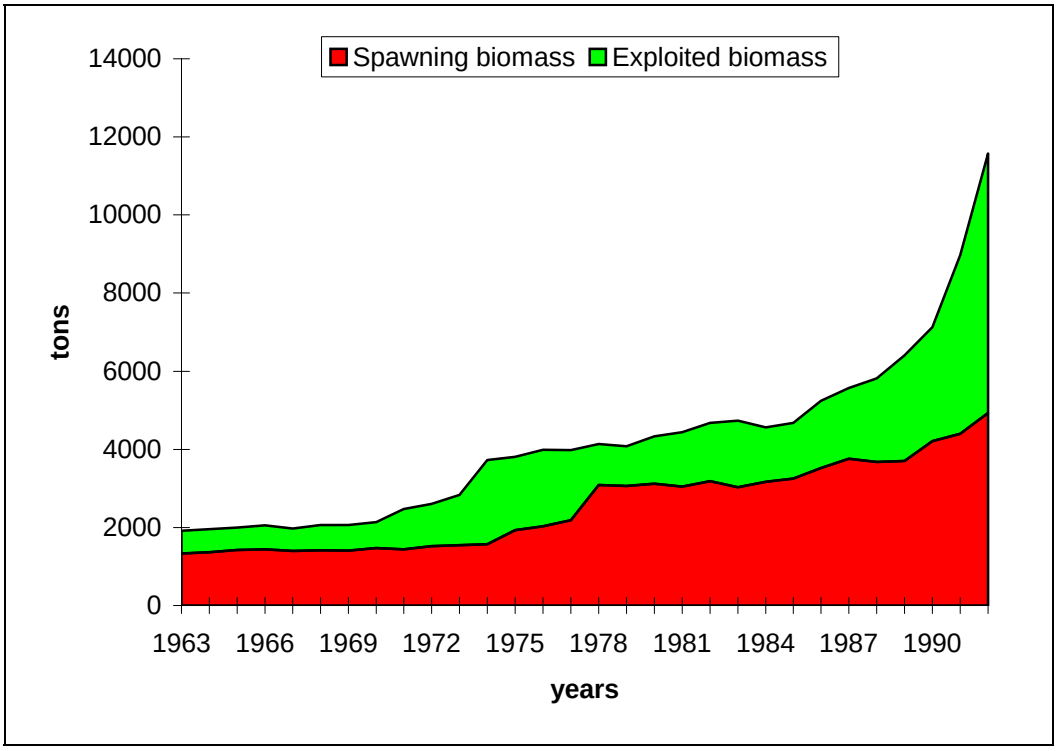

FIGURE 4. Spawning and exploited biomasses (in tonnes) of Russian sturgeon from the Danube stock during 1967-1992

TABLE 27. Fishing mortality rate (by ages) of the Russian sturgeon from the Danube stock during the period 1963-1992

Year	10	11	12	13	14	15	16	17	18	19
1963	0.004	0.035	0.062	0.064	0.093	0.156	0.095	0.142	0.123	0.091
1964	0.005	0.045	0.086	0.072	0.127	0.199	0.125	0.161	0.152	0.117
1965	0.005	0.038	0.075	0.068	0.096	0.186	0.109	0.146	0.116	0.099
1966	0.014	0.108	0.199	0.185	0.295	0.463	0.336	0.428	0.343	0.234
1967	0.005	0.032	0.068	0.068	0.103	0.150	0.095	0.142	0.114	0.079
1968	0.004	0.051	0.076	0.068	0.104	0.176	0.116	0.157	0.148	0.104
1969	0.004	0.028	0.075	0.053	0.079	0.130	0.085	0.119	0.099	0.084
1970	0.005	0.043	0.062	0.082	0.096	0.343	0.094	0.131	0.115	0.085
1971	0.002	0.035	0.085	0.051	0.117	0.143	0.104	0.112	0.096	0.069
1972	0.003	0.014	0.051	0.052	0.058	0.149	0.067	0.106	0.068	0.054
1973	0.004	0.032	0.041	0.083	0.131	0.152	0.153	0.142	0.141	0.079
1974	0.002	0.026	0.053	0.031	0.099	0.195	0.081	0.186	0.100	0.090
1975	0.003	0.012	0.034	0.033	0.033	0.112	0.086	0.073	0.110	0.050
1976	0.007	0.073	0.054	0.075	0.124	0.125	0.171	0.299	0.142	0.208
1977	0.010	0.057	0.134	0.044	0.107	0.193	0.069	0.226	0.263	0.098
1978	0.005	0.068	0.091	0.077	0.040	0.107	0.084	0.053	0.120	0.131
1979	0.015	0.059	0.152	0.094	0.175	0.093	0.096	0.144	0.060	0.133
1980	0.001	0.030	0.032	0.053	0.075	0.178	0.036	0.128	0.160	0.053
1981	0.001	0.004	0.055	0.045	0.189	0.220	0.191	0.059	0.087	0.079
1982	0.006	0.144	0.094	0.221	0.136	0.380	0.127	0.173	0.020	0.031
1983	0.022	0.111	0.257	0.127	0.307	0.140	0.145	0.058	0.031	0.005
1984	0.073	0.067	0.093	0.087	0.017	0.151	0.034	0.111	0.085	0.127
1985	0.068	0.049	0.044	0.063	0.059	0.011	0.105	0.022	0.074	0.056
1986	0.054	0.092	0.065	0.058	0.084	0.078	0.014	0.148	0.028	0.028
1987	0.014	0.029	0.048	0.028	0.031	0.044	0.044	0.015	0.070	0.070
1988	0.018	0.014	0.218	0.048	0.027	0.030	0.044	0.044	0.030	0.020
1989	0.016	0.027	0.020	0.041	0.083	0.039	0.044	0.065	0.065	0.014
1990	0.014	0.015	0.021	0.016	0.033	0.059	0.031	0.035	0.053	0.054
1991	0.015	0.029	0.062	0.057	0.079	0.081	0.174	0.147	0.050	0.054
1992	0.029	0.060	0.080	0.082	0.103	0.138	0.083	0.085	0.066	0.057

Table 27 - continued

Year	20	21	22	23	24	25	26	27	28	29+
1963	0.047	0.047	0.046	0.049	0.048	0.056	0.115	0.081	0.067	0.067
1964	0.061	0.060	0.057	0.068	0.061	0.073	0.086	0.190	0.086	0.086
1965	0.054	0.052	0.051	0.058	0.054	0.057	0.070	0.082	0.072	0.072
1966	0.137	0.138	0.132	0.159	0.140	0.172	0.195	0.246	0.192	0.192
1967	0.037	0.037	0.040	0.045	0.042	0.049	0.062	0.071	0.059	0.059
1968	0.49	0.044	0.046	0.055	0.052	0.064	0.075	0.095	0.075	0.075
1969	0.043	0.037	0.033	0.041	0.038	0.045	0.056	0.067	0.057	0.057
1970	0.052	0.050	0.043	0.044	0.045	0.056	0.064	0.080	0.065	0.065
1971	0.039	0.045	0.042	0.045	0.036	0.047	0.059	0.072	0.057	0.057
1972	0.029	0.030	0.032	0.036	0.031	0.033	0.043	0.056	0.042	0.042
1973	0.044	0.046	0.045	0.064	0.056	0.061	0.060	0.082	0.070	0.070
1974	0.035	0.037	0.038	0.047	0.059	0.067	0.073	0.076	0.058	0.058
1975	0.032	0.024	0.025	0.031	0.029	0.041	0.047	0.052	0.045	0.045
1976	0074	0.079	0.054	0.070	0.068	0.084	0.125	0.114	0.105	0.105
1977	0.107	0.058	0.071	0.060	0.059	0.076	0.096	0.150	0.110	0.110
1978	0.031	0.069	0.045	0.070	0.032	0.041	0.055	0.070	0.078	0.078
1979	0.107	0.045	0.100	0.060	0.071	0.057	0.075	0.101	0.085	0.085
1980	0.100	0.155	0.058	0.176	0.074	0.120	0.094	0.127	0.119	0.119
1981	0.018	0.063	0.100	0.044	0.109	0.057	0.094	0.072	0.066	0.066
1982	0.016	0.007	0.024	0.049	0.016	0.055	0.028	0.048	0.025	0.025
1983	0.003	0.004	0.002	0.007	0.012	0.005	0.018	0.009	0.009	0.009
1984	0.012	0.049	0.102	0.032	0.115	0.120	0.071	0.060	0.000	0.000
1985	0.087	0.006	0.032	0.069	0.020	0.081	0.084	0.047	0.054	0.000
1986	0.074	0.118	0.008	0.041	0.091	0.025	0.108	0.114	0.062	0.062
1987	0.057	0.039	0.134	0.011	0.040	0.046	0.042	0.056	0.059	0.059
1988	0.057	0.057	0.039	0.147	0.011	0.039	0.046	0.043	0.056	0.056
1989	0.060	0.060	0.087	0.058	0.246	0.015	0.058	0.070	0.065	0.065
1990	0.089	0.089	0.046	0.073	0.047	0.238	0.012	0.047	0.056	0.056
1991	0.027	0.027	0.032	0.044	0.091	0.061	0.238	0.018	0.057	0.057
1992	0.056	0.056	0.056	0.065	0.055	0.062	0.066	0.065	0.058	0.058

When comparing the assessment of sturgeon abundance by trawl surveys with that obtained using VPA, and taking into account the poacher's catches, one can see that they are very close, 310 x 10-3 and 259 x 103 (numbers), respectively - for fish over 14 years old. The difference is higher during the period 1981-1991, but the assessments have the same increasing trend . Probably the difference in estimates is due to the lack of precise determination of the poacher's catches by Ukraine and Russia, which is not determined at all in Bulgaria and Romania. As was stated the trawl surveys are carried out in February-March; i.e. their estimates include fish from the Dnieper population (about 20-24% of the numbers on the wintering grounds). Irrespective of the differences in estimates pointed to, the results from VPA, comprising also poacher's catches, and confirm the conclusions of different authors (Ambroz and Kiriljuk, 1969; Domashenko and Akselev, 1990) in accounting for increase in sturgeon abundance after 1970. Moreover the assessments show unambiguously the great importance of correct fishery statistics data, since without an account of poacher's catches, the size of exploited and spawning biomasses are considerably underestimated, particularly during the period 1991-1992. The underestimates are 26.6 to 41.6 times for the exploited stock, and 22.0 to 36.2 times for the spawning biomass.

According to Domashenko and Akselev (1990) , the exploited stock includes fish older than 10-11 years, since males attain sexual maturity at age 8-11 years, and females at age 13-15 years. Therefore, the spawning stock includes fish older than 13 years. Following the authors mentioned the exploited biomasses (B10+) in 1984-1987 were 5.0 and 8.6 thousand tonnes respectively, averaging 6.8 thousand tonnes. Our results for the same years are 4.6 and 5.6 thousand tonnes, respectively, averaging 5.1 thousand tonnes i.e. 25% lower than those obtained by Domashenko and Akselev (1990). Concerning the year 1992, the differences are still smaller - 6.1 and 4.9 thousand tonnes, respectively (19.7%). The first value is based on Shlyakhov's data, from trawl surveys carried in 1992.

The lower estimate (20-25%) of the sturgeon biomass from the Danube population (by VPA method) probably is due to the above mentioned fact, that trawl surveys are conducted through the winter months when the percentage of the fish from Dnieper population is only around 20-24%.

For the purpose of forecasting the future state of the sturgeon stock in the Black Sea it is necessary to consider in more detail its reproduction under natural and artificial conditions. After construction of Kahov's water-power system (a dam and network of canals) on the Dnieper, the length of the Russian sturgeon spawning ground (the starred sturgeon and the great sturgeon spawn mainly in the Danube) was reduced with about 75 km. The chief spawning grounds became inaccessible for mature fish and the Dnieper lost its previous importance as place for natural reproduction of sturgeons. Under these conditions the Danube remained the only big river where this fish species continues to spawn.

Basing on the data of the Odessa branch of YugNIRO which carries out permanent monitoring of the new year class abundance, it is concluded that the sturgeon's natural reproduction in the 1980s has been more successful than during the period 1966-1980 (**Table 28**).

Comparing the density of the down stream dispersal of young sturgeon during the period 1966-1982, (which provides an index of the strength of the corresponding year classes) with the abundance of 10 - year - old fish during the period 1976 - 1992 (by VPA data) a common trend is apparent in their dynamics. Therefore there are good reasons to suppose that in the mid - 1990s the sturgeon stock will be recruited by strong year classes. In the beginning of the XXIth century, the species biomass will increase still more on account of additional reproduction of sturgeon at the Dnieper fish-farm. These optimistic forecasts would come true only on condition that fundamental measures against the poacher's catches in all Black Sea countries are undertaken however. In this respect the main responsibility falls on the corresponding institutions in Ukraine, as it is in its waters that the main nursery and wintering grounds of Russian sturgeon and starred sturgeon are situated. Another important problem are conditions provoking mass mortality of benthic organisms, since the sturgeon feeds on molluscs (42.6 to 94.6%), worms (0.0 to 29.6%) and crustaceans (0.0 to 33.2%). The percentages shown in brackets of the different prey items in the sturgeon diet vary with the size of the fish. The most affected from these groups of organisms are the molluscs and the crustaceans, which lead to a decline in the food level of these fish species. The starred sturgeon forages primarily on worms (from 31.6 to 78.8%), and crustaceans (ranging from 17.2 to 51.2% of its diet depending on fish size); the great sturgeon feeds on fish (4.8 to 100.0%) and crustaceans (0.0 to 95.2%), also depending on the fish size. Therefore the negative changes in any of the links in the ecosystem inevitably affect one way or another all living organisms inhabiting the relevant basin. This fact is verified by investigations carried out in 1992 (Shlyakhov's data - YugNIRO) showing that presently only 4 invertebrate species are found in the sturgeon diet - 2 polychaete , 1 crustacean and 1 mussel species, while previously 18 species of macrobenthos contributed to the sturgeon diet.

TABLE 28. Indices for natural (the Danube river) and artificial (the Dnieper river, Dnieper sturgeon fish-farm) reproduction of sturgeon in the north-western part of the Black Sea

Year	Natural reproduction (specimens/hectare)			Artificial reproduction ($\times 10^{-6}$ specimens)
	Russian sturgeon	starred sturgeon	great sturgeon	
1966	0.51	0.86	2.28	-
1967	4.28	5.94	2.04	-
1968	0.25	3.89	0.20	-
1969	1.18	4.59	0.37	-
1970	0.31	4.08	0.17	-
1971	0.05	0.15	0.05	-
1972	8.50	3.04	0.99	-
1973	1.28	2.96	0.41	-
1974	1.10	4.06	-	-
1975	2.10	4.33	-	-
1976	1.91	3.48	-	-
1977	5.51	9.36	2.63	-
1978	2.05	4.32	0.49	-
1979	1.20	0.60	5.10	-
1980	1.65	5.03	1.15	-
1981	3.69	9.84	1.64	-
1982	5.53	10.25	1.03	-
1984	12.85	2.38	8.57	-
1985	9.33	15.18	14.75	1.747
1986	7.14	6.72	13.86	2.288
1987	14.49	15.00	3.48	2.513
1988	15.49	16.01	14.49	1.958
1989	no data	no data	no data	1.044
1990	no data	no data	no data	1.884
1991	no data	no data	no data	1.839