STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-3

Study No.: 488 **Title:** Status of the Lake St. Clair fish community and sport fishery

Period Covered: October 1, 2001 to September 30, 2002

Study Objectives: The objectives of this study are (1) to measure the abundance of yellow perch, juvenile gamefish, and various forage species in Lake St. Clair, (2) to monitor abundance of adult gamefish species, (3) to document the abundance and distribution of aquatic plants in Lake St. Clair with sidescan sonar and hydroacoustic technology, and (4) to monitor trends in sport fish catch rates for the Lake St. Clair fishery.

Summary: Fish populations were sampled with 10 m headrope bottom trawls during 2001. Both bottom trawls and trap nets were used to sample fish in 2002. Data entry and analysis for all 2001 trawls are complete. Yellow perch and spottail shiner dominated the trawl catches. Predator fish populations were surveyed with trap nets in Anchor Bay in 2002. A total of 64 net lifts captured 120 northern pike, 41 muskellunge, 400 smallmouth bass, and 243 walleye. A total of 399 walleye and 272 smallmouth bass were tagged. Anglers reported capturing 27 tagged walleye and 12 tagged smallmouth bass through October 2002. On average, walleye tag recoveries were more widely dispersed from the tag site than smallmouth bass tag recoveries. Sport fishing catch and effort information was collected with a voluntary angler diary program in 2000 and 2001. Data entry and analysis for all 2001 sport diaries are complete. Catch rates for walleye and muskellunge were the highest since 1996, while catch rates for smallmouth bass and yellow perch remained within the range of catch rates observed for these species in prior years. Sport diaries were distributed to cooperators in April 2002 for the 2002 fishing season. Yellow perch recruitment in Lake St. Clair was highly variable between years. The 1992, 1997, 1999, and 2000 year classes appeared weak, while the 1993, 1994, 1996, and 1998 year classes were comparatively strong. Four weeks of survey time were devoted to developing effective and efficient aquatic plant survey techniques. Hydroacoustic techniques were used along with intensive plant and sediment sampling at three inland sites. Analysis of the data collected will aid in formulating sampling protocols for monitoring the plant community in Lake St. Clair.

Findings: Jobs 1, 3, 5, 6, 7, 9, 10, and 11 were scheduled for 2001-02, and progress is reported below.

Job 1. Title: **Sample yellow perch and forage with index trawls.**–During 2001 fish were collected at the Anchor Bay index site with a 10 m headrope bottom trawl with 7 tows in June and 8 tows in September. In June, yellow perch, rainbow smelt, rock bass, and mimic shiner were most abundant. During September spottail shiner, yellow perch, bluntnose minnow, and rock bass were most abundant. Comparison of spring and fall densities for Anchor Bay since 1996 revealed some interesting seasonal patterns (Table 1). Rainbow smelt were abundant in June but decreased to low abundance in September, probably a result of the warmer water conditions found in Lake St. Clair during July and August. Similarly, yellow perch density was consistently higher during June than during the fall sampling period. We suspect that yellow perch catch rates were low in September due to yellow perch distribution in macrophyte beds, which were abundant by September. Unfortunately, we were unable to effectively trawl in heavily vegetated areas of the lake. Conversely, alewife and smallmouth bass abundances were generally higher in the fall sampling. This increase may be related to recruitment of age 0 fish to the trawl gear by September.

While few trends in catch rates across the time period 1996-2001 were evident, several species appear to have lower catch rates in recent years. Logperch, trout-perch, and johnny darter have all exhibited lower catch rates since 1998. We believe that the observed declines in these three species is evidence that round gobies are negatively impacting the abundance of benthic species in Lake St. Clair.

Sampling has continued on schedule in 2002.

Job 3. Title: Collect catch and effort data for the sport fishery with angler diaries.–A voluntary angler diary program was used to collect catch and effort data for recreational fishing on Lake St. Clair. The program was initiated by the Ontario Ministry of Natural Resources (OMNR) in 1985 to monitor trends in the muskellunge catch rate for Lake St. Clair. Five years later the program was expanded to include other species. The Michigan Department of Natural Resources (MDNR) became involved in the program in 1993. Since that time, the program has been a cooperative effort between the OMNR and MDNR. In 2001, the MDNR distributed 66 angler diaries to Michigan resident sport anglers interested in participating in the diary program. A total of 47 diaries were returned by cooperating anglers during fall and early winter.

The Lake St. Clair Angler Diary Program provides annual estimates of catch rates for the major sport fish species in the lake. Ontario and Michigan angler diary data were pooled to produce the 2001 estimates (Table 2). Walleye and muskellunge catch rates in 2001 were the highest recorded since 1996. Catch rates for yellow perch and smallmouth bass remained within the range observed in previous years. Fishing effort for all species was the lowest observed for the period. Increased angler participation is needed if this program is to continue to provide reasonable estimates of catch rates for sport fish in Lake St. Clair.

New angler diaries were distributed in April 2002 and will be recalled in November 2002. An on-site MDNR creel survey on Lake St. Clair was used to distribute additional diaries to avid anglers in 2002.

Job 5. Title: Analyze data and estimate growth rates for yellow perch.–Processing of yellow perch scale samples collected in 2001, and diet samples collected in 2000, was completed. Processing of scale samples collected in 2002 is underway. Although the data set covers only a six year time span, it appears that growth rates, based on mean length at age, have declined and are now below state average (Table 3). The causative factor in this decline is not clear.

Evaluation of catch rates by age indicated the presence of strong and weak year classes in the population (Table 4). The 1992, 1997, 1999, and 2000 year classes appeared weak, while the 1991, 1993, 1994, 1995, 1996, and 1998 year classes were comparatively strong. Variable recruitment is characteristic of yellow perch populations throughout the Great Lakes. The apparent decline in growth for recent years could be related to higher yellow perch densities due to the strength of the 1993, 1994, 1996, and 1998 year classes.

Job 6. Title: Prepare annual performance reports.–In addition to this study performance report, findings of work conducted under this study were summarized in the annual fisheries status report, listed below, prepared for the Lake Erie Committee of the Great Lakes Fisheries Commission.

Michigan Department of Natural Resources. 2002. Status of the fisheries in Michigan waters of Lake Erie and Lake St. Clair 2001. Mt. Clemens Fishery Research Station Report to the Great Lakes Fishery Commission, Lake Erie Committee Meeting, Buffalo, NY.

Job 7. Title: Prepare final report covering sampling through 2001.–Results covering the first five years of this study are given in the following report, which will be published during 2002-03, and submitted in December 2003.

Thomas, M. V., and R. C. Haas. In press. Status of the Lake St. Clair fish community and sport fishery, 1996-2001. Michigan Department of Natural Resources, Fisheries Research Report draft, Ann Arbor.

Job 9. Title: Sample fish community with trap nets and tag predator species.–Trap nets were fished in Anchor Bay of Lake St. Clair during May to capture predator fish species and collect biological data on their populations. A total of 64 net lifts captured 120 northern pike, 41 muskellunge, 400 smallmouth bass, 23 largemouth bass, and 243 walleye. The mean total lengths for these species were: 722 mm for northern pike, 1,043 mm for muskellunge, 364mm for smallmouth bass, 313 mm for largemouth bass, and 497 mm for walleye. The mean weights for these species were: 2.34 kg for northern pike, 7.82 kg for muskellunge, 0.79 kg for smallmouth bass, 0.52 kg for largemouth bass, and 1.16 kg for walleye. All but one of the walleye and 272 of the smallmouth bass were tagged with monel metal jaw tags and released at the site of capture. Age (scale) samples were collected from all predator species but their processing will not be completed until March, 2003.

Job 10. Title: Collect, summarize, and analyze tag recovery data.–Tagging data on individual walleye and smallmouth bass were put into computer and added the MDNR tagging database.

A total of 27 walleye tags and 12 smallmouth bass tags have been recovered by anglers and reported to MDNR. Recovery data were collected from anglers, capture locations were converted to geographic coordinates, and combined with appropriate tagging data. Information letters and shoulder patches were sent to each angler to thank them for their cooperation. All pertinent tag recovery data were placed in the Lake St. Clair tag recovery database.

A map showing the geographical distribution of walleye and smallmouth bass tag recoveries is presented in Figure 1. On average, recaptured walleyes had traveled 20.3 km from the Anchor Bay tag site, while smallmouth bass had traveled 15.9 km. The tagged fish of both species recovered by anglers averaged slightly smaller in total length at tagging compared to the tagged population. This difference suggests that the largest individuals of both species were either subject to slightly higher natural mortality or were less vulnerable to capture. The seasonal pattern of tag recoveries differed for the two species (Figure 2). For walleye, the months of June and August produced the majority of recaptures with most August fish being taken in the St. Clair River. Most of the smallmouth bass tags were recovered in July and only one was recovered in the St. Clair River.

There was a large difference in tag reporting rate between walleye (11.2%) and smallmouth bass (4.4%). We think this is substantial evidence that angler exploitation was significantly higher on walleye. However, it is too early in the tagging portion of the study to evaluate how important variation in angler response was between the two species. We know that catch-and-release fishing for smallmouth bass was very common and may have accounted for a portion of the lower tag detection and/or reporting.

Job 11. Title: Survey aquatic plant community.–Four weeks of survey time were devoted to developing survey techniques to facilitate sampling of plants with new remote sensing (hydroacoustic) survey equipment and computer software. This equipment and software were purchased with funds from outside sources. Two inland lakes (Nichols Lake, Newaygo Co. and Clifford Lake, Montmorency Co.) and one Great Lakes rocky reef (Mischley Reef, Thunder Bay, Lake Huron) were selected for initial development of these techniques. These sites were selected

because they offered a unique combination of protection from weather and abundant "ground truth" sampling from concurrent (outside) studies.

A series of transects separated by 50 m of shoreline were set up on each of the two inland lakes. A Biosonics© DE6000 echosounder and a MarineSonics© sidescan sonar were used to collect hydroacoustic data along each transect. At the same time, the plant community was sampled, under an independent study, with replicated tosses of a plant hook at depths of 0.25m, 0.5m, 1.0m. and at 1 meter intervals out to a depth of 1.meter beyond presence of rooted vegetation. Plants collected with the rake were sorted to species at the sample site and weighed. A petite ponar was used to collect sediment samples from a subset of transects for eventual determination of bottom type. The remote sensing data will be analyzed to produce areal estimates of plant height, and coverage, and bottom substrate type. During the winter of 2002-2003, these results will be compared to the actual plant and substrate samples collected with the plant hook, and ponar, to determine the most reasonable sampling protocol for monitoring the plant community of Lake St. Clair. The new sampling protocols will be adopted for the Lake St. Clair study during the late spring and summer of 2003. Preliminary analyses on a subset of the data indicate that the Biosonics equipment in conjunction with underwater video and a modest amount of "ground truth" sampling with plant hooks and ponar will produce effective and efficient results.

Prepared by: Michael V. Thomas and Robert C. Haas
Date: September 30, 2002

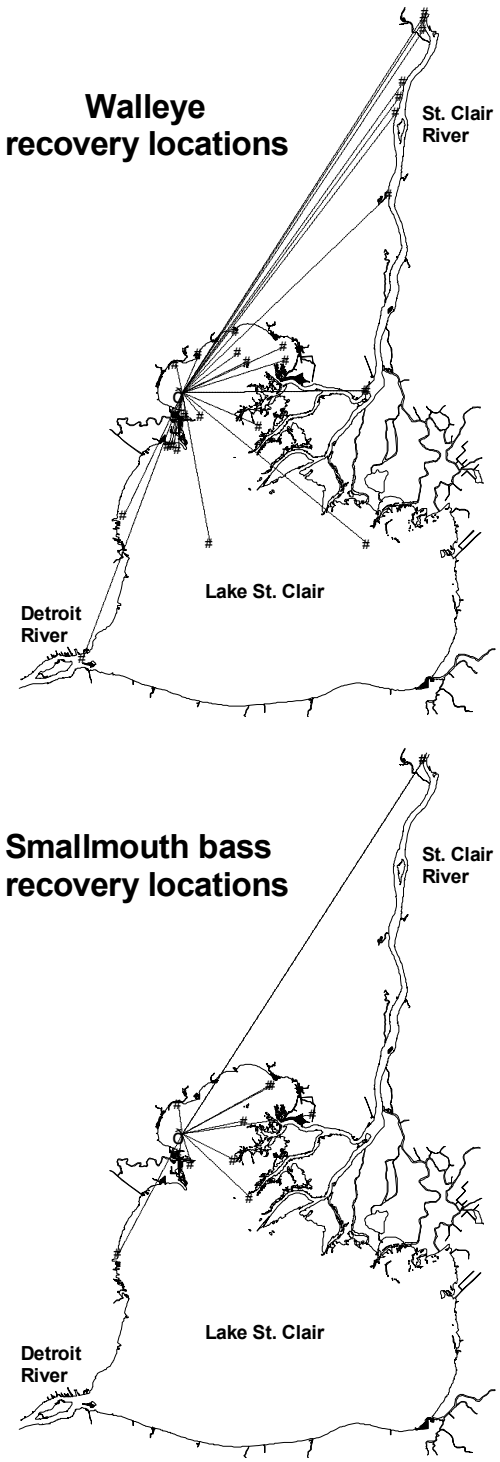

Figure 1.–Geographical distribution of 27 walleye and 12 smallmouth bass tags recovered by anglers fishing in Lake St. Clair and the St. Clair River during the 2002 season.

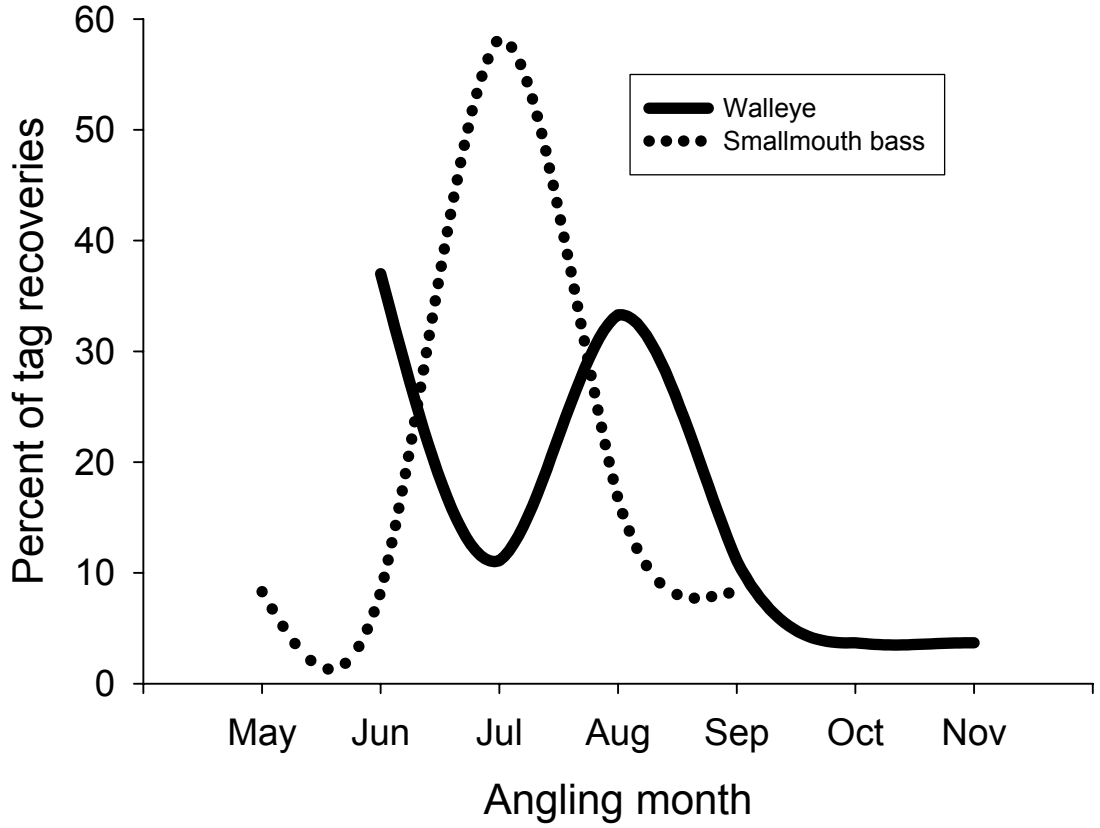

Figure 2.–Monthly distribution of 27 walleye and 12 smallmouth bass tags recovered by anglers fishing in Lake St. Clair and the St. Clair River during the 2002 season.

Table 1.–Mean density (number per hectare) for all fish species caught during spring (June) and fall (September or October) with 10 m headrope index trawls in Anchor Bay, Lake St. Clair.

	Spring						Fall					
Species	1996	1997	1998	1999	2000	2001	1996	1997	1998	1999	2000	2001
Alewife	29.2	10.6	2.5	1.9	3.9	2.9	28.3	30.7	11.5	1.6	2.8	32.3
Bluntnose minnow	0.7	0.0	0.2	0.0	11.1	10.0	0.0	33.5	0.2	9.4	14.8	53.8
Common carp	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.9	0.0	0.1	0.0	1.1
Emerald shiner	0.7	0.2	0.0	0.0	5.1	0.0	3.8	1.1	7.5	0.0	0.0	0.0
Freshwater drum	6.6	12.5	5.0	2.3	0.7	4.5	1.1	0.6	0.2	1.4	1.0	2.3
Johnny darter	21.7	2.8	7.0	0.0	0.2	0.3	17.7	4.0	0.0	0.0	0.10	0.0
Lake sturgeon	2.3	0.4	0.0	0.1	0.2	0.0	1.8	0.0	1.4	0.0	0.1	0.0
Largemouth bass	0.0	0.0	0.0	0.0	0.1	0.6	0.0	0.0	0.0	3.0	1.8	16.4
Logperch	8.8	75.6	83.3	7.6	0.2	1.6	32.4	40.0	20.6	1.3	5.2	17.5
Mimic shiner	17.2	26.3	1.6	0.0	13.5	20.4	267.6	1094.9	0.2	29.8	14.8	9.6
Muskellunge	0.0	0.2	0.0	0.1	0.0	0.6	0.2	0.2	0.0	0.0	0.1	1.1
Northern pike	0.0	0.4	0.2	0.0	0.1	1.3	0.0	0.4	0.0	0.1	0.3	0.6
North. shorthead redhorse	7.7	6.7	0.7	6.9	2.5	3.6	0.2	0.4	0.2	0.4	0.7	2.3
Pumpkinseed	0.0	0.6	0.0	0.0	0.0	1.9	0.2	4.0	0.0	1.6	0.4	5.1
Quillback	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.1	1.1	0.0	0.7	0.0
Rainbow smelt	593.0	656.1	4.3	4.0	3.8	61.1	0.9	16.5	0.2	0.0	1.0	0.0
Rock bass	43.0	17.5	5.4	1.0	12.8	29.8	18.3	81.5	0.9	89.0	92.8	39.6
Round goby	4.8	14.3	28.1	6.0	10.8	1.3	65.7	9.7	22.2	9.6	10.0	10.2
Silver lamprey	0.0	0.2	0.0	0.9	0.3	0.0	0.5	0.0	0.0	0.2	0.0	0.3
Silver redhorse	0.7	2.3	0.2	0.4	0.9	0.0	4.5	0.9	0.7	0.0	0.4	1.1
Smallmouth bass	0.2	3.2	0.5	0.0	0.8	2.9	13.6	10.6	24.5	10.7	6.1	0.0
Spottail shiner	178.2	122.6	8.2	68.9	935.4	7.4	17.0	487.2	45.3	200.0	50.5	878.5
Trout-perch	231.2	345.9	98.5	154.0	34.3	11.0	775.7	92.3	25.8	2.9	0.2	0.0
Walleye	4.5	10.4	0.9	1.7	1.2	0.6	7.2	1.3	2.7	0.9	0.8	0.0
White perch	1.4	0.7	0.0	0.4	13.3	0.6	16.1	11.7	7.5	0.1	0.1	0.0
White sucker	5.4	3.7	3.6	0.0	2.5	1.3	0.5	2.3	0.0	0.3	1.0	0.6
Yellow perch	1184.1	560.3	249.7	866.9	157.8	1131.7	34.2	26.8	68.8	21.7	40.9	113.8

Table 2.–Angler effort, catch, and catch rates for the Lake St. Clair sport fishing diary program.

Year	Trips seeking	Effort (rod-hours)	Number caught	Number kept	Catch per rod-hour
Walleye					
1996	484	6,102	1,906	1,685	0.31
1997	408	4,681	1,479	1,311	0.32
1998	510	5,599	2,481	1,947	0.44
1999	625	5,850	2,610	2,239	0.44
2000	444	4,672	1,753	1,646	0.37
2001	342	4,051	1,893	1,681	0.47
Yellow perch					
1996	265	3,462	10,654	5,846	3.08
1997	252	2,701	9,661	5,773	3.58
1998	305	3,520	7,134	5,048	2.03
1999	226	2,087	6,142	3,654	2.94
2000	235	2,892	10,436	5,660	3.61
2001	164	2,047	5,862	4,350	2.86
Smallmouth bass					
1996	153	1,537	545	190	0.35
1997	143	1,375	687	148	0.50
1998	127	1,248	495	94	0.40
1999	222	1,841	1,112	204	0.60
2000	190	1,126	1,484	126	1.22
2001	74	512	280	48	0.55
Muskellunge					
1996	494	15,629	1,458	12	0.093
1997	425	15,199	1,573	11	0.103
1998	383	11,336	1,075	8	0.094
1999	318	9,370	645	5	0.069
2000	269	8,874	749	16	0.084
2001	241	7,248	851	2	0.117

Table 3.–Mean length at age (mm) for yellow perch from Lake St. Clair trawls in June. Sample size in parentheses. SWAVg is the Michigan statewide average growth value.

Age	1996	1997	1998	1999	2000	2001	SWAVg
Males							
1	94 (33)	87 (33)	102 (4)	102 (59)	109 (6)	109 (3)	
2	126 (106)	126 (32)	132 (104)	140 (48)	129 (110)	127 (11)	
3	167 (122)	147 (172)	162 (39)	158 (64)	158 (17)	144 (56)	
4	198 (9)	181 (74)	171 (111)	179 (45)	171 (60)	179 (13)	
5	212 (56)	206 (11)	187 (43)	186 (70)	189 (57)	196 (19)	
6	226 (15)	213 (24)	209 (12)	193 (43)	200 (47)	206 (18)	
7	237 (5)	225 (3)	238 (4)	218 (4)	209 (4)	207 (6)	
Females							
1	97 (20)	90 (23)	101 (5)	106 (94)	108 (2)	114 (2)	
2	130 (119)	136 (20)	141 (70)	139 (38)	138 (147)	132 (2)	
3	177 (119)	160 (136)	167 (11	170 (43)	171 (18)	164 (69)	
4	190 (20)	195 (56)	186 (54)	181 (29)	194 (35)	180 (14)	
5	236 (26)	211 (8)	196 (47)	209 (42)	206 (46)	230 (25)	
6	246 (16)	245 (4)	226 (17)	223 (45)	229 (24)	241 (15)	
7	237 (2)	– –	253 (2)	247 (4)	234 (14)	263 (12)	
Sexes combined							
1	94 (62)	88 (61)	102 (9)	103 (163)	109 (8)	111 (5)	102
2	128 (227)	130 (52)	135 (174)	139 (86)	134 (257)	127 (13)	145
3	171 (241)	152 (308)	163 (50)	163 (107)	164 (35)	155 (125)	173
4	192 (29)	187 (130)	176 (165)	180 (74)	180 (95)	180 (27)	198
5	219 (82)	208 (19)	192 (90)	195 (112)	197 (103)	215 (44)	221
6	236 (31)	218 (28)	219 (29)	208 (88)	210 (71)	221 (33)	246
7	239 (7)	229 (4)	243 (6)	233 (8)	228 (18)	245 (18)	267

Table 4.–Catch rate by age for yellow perch in June index trawl tows on Lake St. Clair.

Year class	Total CPUE	Survey year								
		1993[1]	1994[1]	1995[1]	1996	1997	1998	1999	2000	2001
1984	0.4	0.1	0.1	0.3	–	–	–	–	–	–
1985	0.2	0.0	0.2	0.0	–	–	–	–	–	–
1986	0.3	0.2	0.1	0.0	–	–	–	–	–	–
1987	1.0	0.0	0.6	0.3	0.1	–	–	–	–	–
1988	4.1	0.9	1.6	0.9	0.3	0.3	–	–	–	–
1989	10.2	2.8	3.7	2.2	1.2	0.3	–	–	–	–
1990	30.4	6.1	4.1	13.4	5.2	1.3	0.3	–	–	–
1991	164.4	51.3	47.0	32.1	18.7	12.9	1.8	0.6	–	–
1992	43.3	1.0	3.4	5.8	11.5	9.6	10.4	1.1	0.1	0.5
1993	569.2	–	56.3	125.8	171.4	113.7	43.0	54.3	1.5	3.3
1994	935.1	–	–	166.2	293.2	348.2	88.1	20.6	8.3	10.6
1995	154.1	–	–	–	21.4	40.7	26.4	32.2	12.3	21.1
1996	226.0	–	–	–	–	33.3	77.1	70.3	11.3	34.1
1997	95.8	–	–	–	–	–	2.7	37.6	5.5	50.0
1998	1,114.8	–	–	–	–	–	–	650.2	114.1	350.5
1999	31.8	–	–	–	–	–	–	–	4.8	27.0
2000	2.7	–	–	–	–	–	–	–	–	2.7