STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-53-R-15

Study No.: 451 **Title:** Evaluation of lake trout stocks in Lake Huron

Period Covered: April 1, 1998 to September 30, 1999

Study Objective: To determine stock parameters for lake trout in Lake Huron from index sampling.

Summary: During the spring of 1998 and 1999, index sampling for lake trout in U.S. waters of Lake Huron was conducted with graded, large-mesh gill nets at 10 sites. Four of these index sites have been sampled annually since the mid-1970's. The project design was modified in 1995 to accommodate more stations, as required for the Lake Huron Technical Committee's (LHTC) movement studies. Annual mortality estimates from the 1998 spring assessment catch curves were: 78% at MH-1 (9-Mile Point and Adams Point); 56% at MH-2 (Thunder Bay); 44% at MH-3 (Au Sable Point and Sturgeon Point); and 46% at MH-4,5 ("Thumb" area of south-central Lake Huron). Excessive mortality rates in northern and north-central Lake Huron appear to preclude lake trout rehabilitation there. Mortality rates in the southern two statistical districts, on the other hand, were very near or below the 45% target level set by the LHTC. Currently, sea lamprey predation and commercial fishing are the leading causes of mortality, especially in the north, but recreational fishing harvest has been on the rise since 1993. Annual mortality attributable to sea lampreys for fish over 630 mm was estimated to range from 32% to 65%. Weight-length regressions and lake trout body condition were similar across statistical districts. Smelt and alewives have consistently made up over 95% of the spring diet, but other fish species have begun to increase recently.

Job 1. Title: Fish graded-mesh experimental gill nets at assessment stations.

Findings: Six assessment stations were added to the study design in 1995. Therefore, a total of 10 assessment stations were sampled in 1998 and 1999. Lake trout marked with coded wire tags are being stocked at each of four sites along the Michigan coastline; returns of the coded wire tags will be used by the LHTC to document movement and will become the basis for delineation of lake trout management unit boundaries. The locations of assessment stations were designed to document distribution of these marked lake trout at and between the four stocking sites. The data from all assessment sites within each statistical district were combined for the purpose of estimating area stock parameters.

Survival–Age-specific catch per 305 m of gill net from the 1998 spring assessment, adjusted for stocking rate, was calculated for each of four statistical districts (Table 1). Mortality rates were estimated using the methods of Robson and Chapman (1961) for catch-at-age data (Table 2).

The assessment stations in MH-1 (northern Lake Huron) were Nine-Mile Point and Adams Point. Catch of lake trout older than age three in MH-1 increased from 1997, but catch adjusted for stocking rates declined sharply from ages 5-8 suggesting few fish reach maturity (Table 1). The

mortality estimate for MH-1 was 78% (Table 2). This is far above the LHTC target level of 45%. This area, which includes waters deferred from lake trout rehabilitation by the 1985 consent decree, supports a tribal commercial fishery that averaged 150,000 pounds of lake trout landings per year from 1985 to 1998. Tribal commercial harvest of lake trout has declined by more than 50% from 1996 to 1998 likely due to the cessation of lake trout stocking north of the 45th parallel, but tribal commercial fishing remains a significant source of mortality in MH-1. Commercial fishing, along with high levels of sea lamprey predation, has nearly eliminated mature lake trout in MH-1.

Three stations were netted in MH-2 (north-central Lake Huron): Presque Isle, Nordmeer, and South Point of Thunder Bay. The 1992, 1993, and 1994 lake trout year classes were strong in 1998 (Table 1). However, catch and adjusted catch rates drop dramatically after age 6 (Table 1). Swink (1990; 1991) reported that vulnerability of lake trout to sea lamprey attack increases sharply at about 635 mm in length. In 1998, lake trout from MH-2 averaged 620 mm at age 7 and 697 mm at age 8. Thus, the high losses of lake trout after age 6 in Thunder Bay may be partly due to size-specific lamprey effects. Annual mortality since 1988 has ranged near or above LHTC guidelines (Table 2). There is no commercial fishery for lake trout in MH-2. The sport harvest in 1993 (Study 427) was less than 1,000 lake trout at Alpena and Rockport combined, but rose steadily to 2,091 in 1994, 4,893 in 1995, 10,958 in 1996, 12,942 in 1997, and 12,370 in 1998. Until recently, lamprey-induced mortality has been the chief cause of the high mortality rates in MH-2, but sport harvest is now a significant if not equal source of mortality, especially on the older, mature fish that are targeted by the sport fishery. Average lakewide age of mature, female lake trout has been steadily declining since 1993, and is now at or below the age of first maturity for female lake trout. This lack of spawners will preclude lake trout rehabilitation.

Two assessment sites were used to represent MH-3: Sturgeon Point and Au Sable Point. Mortality was lower than in the more northerly stations (Table 2). Like MH-2, there was a sharp decline in catch rate for fish older than age 6 (Table 1).

Assessment sites in MH-4,5 ("Thumb" area) were at Grindstone City, Harbor Beach north, and Harbor Beach south. Survey catch rates and number of age groups sampled here have consistently been higher than in the north and, therefore, have allowed more accurate estimation of survival. The mortality rates for this area have remained much lower than in the north. In 1998, the mortality estimate was near target at 46% (Table 2).

Offshore stocking began at all sites in 1989 and 1990, and this may have increased survival of more recent year classes, which in turn, would increase apparent mortality (by violating the assumption of equal recruitment rates over time).

Sea lamprey control began in 1998 on the St. Marys River and will be nearly complete by year 2000. Because most sea lampreys are believed to originate there, the St. Marys treatment is expected to significantly enhance lake trout survival, particularly in northern Lake Huron. In anticipation of this effect, the Lake Huron Committee resumed stocking lake trout in the northern grids of Lake Huron in 1999. With increasing recreational and commercial harvest, further regulation of fishing may be required to attain target survival levels.

Movement–In 1992, the Lake Huron Technical Committee initiated a lake trout movement study with the stocking of 60,000 coded-wire-tagged lake trout at each of 4 sites: Adams Point, Middle Island, Sturgeon Point, and Point aux Barques. Sixty thousand coded-wire-tagged lake trout were subsequently planted at each of the four sites in 1994, 1996, and 1998. In addition, coded-wire-tagged lake trout have been stocked at Drummond Island and 6-Fathom Bank since 1985.

To capture information on distribution of these marked fish, we increased the number of stations along the Michigan shore of Lake Huron such that one station was on each stocking site and other stations were located equal distances between them.

Tagged Lake trout originating from all research stocking sites were represented in each year's samples from 1995 through 1998 (Table 3). Although some lake trout had moved considerable distances, there was a tendency for those lots stocked from Sturgeon Pt. south to be sampled in the south and those stocked north of Sturgeon Pt. to be found at the northern stations (Table 3). A total of 484 coded-wire tagged lake trout have been taken in this assessment since 1995 (Table 3). This sample size indicates the number of marked fish and the survey effort deployed are both adequate to meet study objectives. One hundred twenty one lake trout stocked at 6-Fathom Bank were taken at the near-shore sites (39 in 1995, 42 in 1996, 19 in 1997, and 21 in 1998), and they appeared at all 10 stations (Tables 3 and 4). Stockings at 6-Fathom have been equally divided between three lake trout strains. However, for fish age 7 and older, nearly two times as many Seneca strain were taken at the near-shore sites than the other two strains combined (Table 4). Assessment nettings by the National Biological Survey on 6-Fathom Bank have likewise found that Seneca strain composes the majority of older fish on this mid-lake reef.

A more in-depth analysis of lake trout movement based on coded-wire-tag data is currently being conducted. In 1998, the LHTC designed a common lake trout coded-wire-tag data base for Lake Huron that contained data from Michigan Department of Natural Resources (MDNR), United States Fish and Wildlife Service (USFWS), United States Geological Service Biological Resource Division (BRD), Chippewa/Ottawa Treaty Fishery Management Authority (COTFMA) and Ontario Ministry of Resources (OMNR). I am working with the USFWS to analyze the common database and determine the extent of lakewide lake trout movement. This movement data will be part of the stock assessment model being developed by the modeling subgroup of the Technical Fisheries Review Committee (TFRC) as part of the treaty negotiations between the state of Michigan and the Native American tribes of northern-Michigan.

Lamprey wounding–Lamprey-induced mortality was estimated using rates of A1-A3 wounds (King and Edsall 1979) from spring assessment netting, survival rates from laboratory studies by Swink (1990), and the equation (Koonce and Pycha unpublished):

$$ZL=W(1-P)/P$$

where ZL = instantaneous lamprey-induced mortality, W = the number of A1-A3 type wounds per lake trout, and P = probability of surviving a single lamprey attack.

The annual mortality rate for lake trout attributable to lamprey ranged from 32% to 65% for lake trout over 630 mm in 1998 (Table 5). Indexing of lamprey wounding on lake trout requires large samples of fish larger than 535 mm. Unfortunately, few lake trout of larger size groups were available from spring assessments at MH-1. The high loss to lampreys, in combination with natural mortality, leaves little, if any, surplus production for harvest in any of the Lake Huron statistical districts. Wounding generally increased with host size and was most pronounced in fish over 630 mm (Table 5). This pattern is consistent with laboratory observations of Swink (1991).

Growth–Parameters of weight-length regressions and condition factors for the assessment stations were fairly similar across statistical districts in 1998 (Table 6), suggesting uniform lake trout growth across statistical districts. Average total length at age five followed a north-south

gradient for the Michigan assessment stations (Table 7), likely reflecting the colder, less productive conditions of northern Lake Huron.

Food habits–The stomach contents of all gill-netted lake trout were examined, and a sub-sample of stomach contents was brought back to the lab to obtain lengths and weights of individual prey items. A summary of stomach contents from 1998 spring index netting is given in Table 8. As with past years, smelt and alewives comprised the majority (96.8%) of the diet lakewide. Alewife were the dominant prey in all statistical districts except MH-1, where smelt were the dominant prey. Average weights of prey items are also given (where possible) in Table 8. Sample sizes of measured prey are small and preclude meaningful analysis. A larger number of stomach samples was collected in the 1999 field season to allow for a more complete analysis of lake trout diet. A large proportion (27.7%) of the lake trout sampled in 1998 had void stomachs (Table 8). Previous to 1998, the average void rate for lake trout in the assessment study was 12.7%. This sudden increase may indicate a drop in the Lake Huron forage base.

Job 2. Title: Net for adults on spawning reefs.

Findings: We sampled Mischleys Reef in Thunder Bay to index the incidence of wild spawning lake trout there. We also sampled at Rockport and Middle Island in search of wild spawners. In 1998, 57 lake trout (32 wild and 25 hatchery) were captured in 2 lifts at Mischley's Reef, and no wild lake trout were captured at Rockport or Middle Island. The average CPE of wild lake trout on Mischley's Reef was 26.7 per 305 m. This is higher than the 1997 fall catch rage of 21.7, but lower than the 1993 average of 37.7. All fish caught were tagged and released.

Job 3. Title: Analyze field data and coordinate with other agencies. Participate in interagency planning and management of lake trout.

Findings: I designed a new lake trout database for the Alpena Station. The database is relational (MicroSoft ACCESS) and includes all spring gill-netting data from 1970 to 1998. Formats of all fields have been standardized and made uniform over the entire time series. I also added lake trout coded-wire-tag stocking data so that lake trout movement could be more easily assessed. Most data were also converted to ArcView format for GIS analysis. Fall gill-netting data are being entered and proofed in the new format. Fall data are currently available in ACCESS format from 1986 to 1998. I prepared analyses for the coordinated interagency studies of the LHTC, presented lake trout status reports at the annual Upper Lakes meetings, presented a rehabilitation status report to the Great Lakes Fishery Commission Board of Technical Experts task area meeting, and presented lake trout population dynamics to the Lake Huron Fisheries Advisory Committee. I also attended the summer and winter Lake Huron Technical Committee meetings where updates on lake trout progress and technical reports were presented. I am also a member of the TFRC Modeling Technical Subcommittee and am charged with compiling Lake Huron lake trout biological data, coded wire tag movement data, and lake trout stock assessment model development.

Job 4. Title: Write annual and final reports.

Findings: The required reports and documents were completed as scheduled.

Job 5. Title: Trawl for age-0 wild lake trout in Thunder Bay and monitor other evidence of lake trout reproduction.

Findings: Trawling was completed as scheduled at the annual index station near North Point of Thunder Bay. A semi-balloon otter trawl with a 23-m bridle, 11-m foot rope, and 13-mm mesh (stretch measure) cod-end liner was used to sample age-0 lake trout. Age-0 wild lake trout were taken in bottom trawls every year at the North Point station from 1986 through 1999, but the catch decreased to the lowest levels of the study in 1995 to 1999 (Table 9).

The number of unclipped lake trout at spring assessment stations has been used as another index of reproduction. The contribution of unclipped, potentially wild, lake trout to the assessment catch in MH-2 was 10-18% for the 1984, 1985, and 1986 year classes (Johnson and VanAmberg 1995). In 1998, however, the contribution of unclipped fish, averaged over all year classes, was only 5.8%, 1.5%, 0.0%, and 1.4% for MH-1, 2, 3, and 4,5 respectively. There was no evidence that unclipped fish composed a larger than expected proportion of any one year class. Although reproduction continues, its contribution to the fishery is almost too weak to be measurable.

Literature Cited:

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Robson, D. S. and D. G. Chapman. 1961. Catch curves and mortality rates. Transactions of the American Fisheries Society 90:181-189.

Swink, W. D. 1991. Host size selection by parasitic sea lampreys. Transactions of the American Fisheries Society 120:637-643.

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Table 1.–Annual age-specific lake trout catch, adjusted for stocking and effort (per 305 m of net), by statistical district, Michigan waters of Lake Huron, 1998.

Age	Year class	Effective # stocked	Stocking adjustment factor[1]	Count	Catch per 305 m	Adjusted CPE[2]
MH-1: Effort=5,486 m						
2	1996	135,300	3.70	1	0.06	0.21
3	1995	190,900	2.62	8	0.44	1.16
4	1994	128,680	3.89	29	1.61	6.26
5	1993	59,400	8.42	28	1.56	13.10
6	1992	234,200	2.13	23	1.28	2.73
7	1991	479,500	1.04	10	0.56	0.58
8	1990	462,745	1.08	3	0.17	0.18
MH-2: Effort=4,390 m						
2	1996	366,343	1.36	5	0.35	0.47
3	1995	291,414	1.72	16	1.11	1.91
4	1994	298,367	1.68	129	8.96	15.02
5	1993	428,000	1.16	189	13.13	15.34
6	1992	421,964	1.18	172	11.95	14.16
7	1991	536,405	0.93	82	5.70	5.31
8	1990	542,217	0.92	10	0.69	0.64
MH-3: Effort=3,292 m						
2	1996	218,243	2.29	3	0.28	0.64
3	1995	157,524	3.17	1	0.09	0.29
4	1994	341,972	1.46	36	3.34	4.88
5	1993	240,000	2.08	46	4.26	8.86
6	1992	364,148	1.37	38	3.52	4.83
7	1991	193,605	2.58	15	1.39	3.59
8	1990	186,017	2.69	4	0.37	1.00
9	1989	163,669	3.05	5	0.46	1.42
10	1988	316,893	1.58	3	0.28	0.44
11	1987	160,029	3.12	1	0.09	0.29
MH-4, 5: Effort=4,390 m						
3	1995	378,624	1.32	7	0.49	0.64
4	1994	358,992	1.39	25	1.74	2.42
5	1993	529,364	0.94	104	7.23	6.82
6	1992	392,464	1.27	87	6.04	7.70
7	1991	427,505	1.17	47	3.27	3.82
8	1990	423,017	1.18	4	0.28	0.33
9	1989	304,119	1.64	2	0.14	0.23
10	1988	403,243	1.24	2	0.14	0.17
11	1987	230,029	2.17	2	0.14	0.30
12	1986	217,764	2.30	2	0.14	0.32

[1] Adj. factor = 500,000/no. stocked.

[2] Adj. CPE = catch/305m x adj. factor

Table 2.–Mortality rates (%) by station and agency, from spring gill-net assessments, Michigan waters of Lake Huron.

Year	North (MH-1) MDNR & BRD	N. Central (MH-2) MDNR	Central (MH-3) MDNR	"Thumb" (MH-4,5) MDNR
1982-86 (average)	76	49	42	28
1986-87	87	NA	NA	36
1987-88	76	NA	43	40
1988-89	89	52	43	37
1989-90	NA	52	47	46
1990-91	>70	35	43	31
1991-92	>70	42	48	27
1992-93	>70	69	62	28
1993-94	>70	55	51	32
1994-95	74	52	49	37
1995-96	81	55	54	53
1996-97	>80	68	45	37
1997-98	78	56	44	46

Table 3.–Total gill net catch and catch per effort (number per 3,050 m of net) of coded-wire-tagged lake trout at 10 near-shore Michigan stations, spring gill-netting, 1995-1998.

	Survey station and effort (combined 1995-1998 m of net in parenthesis)										
	S. Harbor Beach (5,487)	N. Harbor Beach (6,036)	Grindstone (4,391)	AuSable Pt. (6,310)	Sturgeon Pt. (6,584)	Thunder Bay (6,310)	Nordmeer (6,036)	Presque Isle (6,036)	Adams Pt. (6,340)	Nine-mile Pt. (19,752)	Total by stocking site
Catch by stocking site:											
Drummond Island	0	0	0	0	1	1	5	4	6	5	22
Adams Pt.	1	1	4	3	0	10	13	16	31	22	101
Middle Island	0	0	2	5	5	10	25	26	10	9	92
Six-Fathom	8	10	22	9	15	6	36	5	7	4	122
Sturgeon Pt.	6	2	10	13	16	12	13	5	1	2	80
Pt. Aux Barques	6	15	26	7	5	1	4	3	0	0	67
Total by station	21	28	64	37	42	40	96	59	55	42	484
Catch/3050 m by stocksite:											
Drummond Island	0.00	0.00	0.00	0.00	0.46	0.48	2.53	2.02	2.89	0.77	9.15
Adams Pt.	0.56	0.51	2.78	1.45	0.00	4.83	6.57	8.08	14.91	3.40	43.09
Middle Island	0.00	0.00	1.39	2.42	2.32	4.83	12.63	13.14	4.81	1.39	42.93
Six-Fathom	4.45	5.05	15.28	4.35	6.95	2.90	18.19	2.53	3.37	0.62	63.68
Sturgeon Pt.	3.34	1.01	6.95	6.28	7.41	5.80	6.57	2.53	0.48	0.31	40.67
Pt. Aux Barques	3.34	7.58	18.06	3.38	2.32	0.48	2.02	1.52	0.00	0.00	38.69
Total	11.67	14.15	44.45	17.88	19.46	19.33	48.51	29.81	26.46	6.49	

Table 4.–Age composition, by strain, of coded-wire-tagged lake trout stocked on 6-Fathom Bank and sampled at 10 nearshore stations, 1995, 1996, 1997, and 1998 spring gill-netting.

	Strain											
	Seneca/Ontario				Marquette				Jenny/Lewis			
Age	1995	1996	1997	1998	1995	1996	1997	1998	1995	1996	1997	1998
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	1	0	0	0	0	1	1
4	1	1	0	0	4	3	0	1	5	1	1	0
5	2	3	3	1	2	3	1	1	1	4	2	3
6	6	2	1	2	3	5	0	1	0	3	1	4
7	0	2	0	1	1	1	1	2	0	2	0	0
8	5	1	3	0	1	0	0	0	0	0	0	1
9	6	5	0	0	0	2	1	1	1	0	0	0
10	1	0	0	0	0	1	0	0	0	0	0	0
11	0	2	3	1	0	0	0	0	0	0	0	0
12	0	0	1	1	0	0	0	0	0	0	0	0
Totals	21	16	11	6	11	16	3	6	7	10	5	9
Age >= 7	12	10	7	3	2	4	2	3	1	2	0	1

Table 5.–Estimated mortality attributable to sea lamprey attacks, Lake Huron, 1997-98, based on wounding rates measured in 1998.

Length group (mm)	Probability of survival	Marks per fish (M)	Sample size (N)	Lamprey instantaneous (ZL)	Annual lamprey (AZ)
MH-1: Drummond Island to Rogers City (combined DNR, BRD & COTFMA)					
430-529	0.35	0.089	124	0.17	0.152
530-629	0.45	0.247	73	0.30	0.261
630-734	0.45	0.857	7	1.05	0.649
735+	0.55	0.000	1	---	---
MH-2: North-Central					
430-529	0.35	0.057	264	0.11	0.100
530-629	0.45	0.282	202	0.34	0.292
630-734	0.45	0.320	64	0.39	0.324
735+	0.55	1.500	2	---	---
MH-3,4,5: "Thumb" & Central					
430-529	0.35	0.047	127	0.09	0.084
530-629	0.45	0.199	216	0.24	0.216
630-734	0.45	0.318	66	0.39	0.322
735+	0.55	0.429	7	0.35	0.296

Table 6.–Condition factors, weight-length regressions at assessment stations, and estimated weight (g) at 600 mm total length from 1998 index netting in Michigan waters of Lake Huron.

Statistical District	Area	Ktl @600 mm	a intercept	b slope	R squared	Wt (gm) @600 mm
MH-1	North	1.014	6.5E-06	3.069	0.984	2191
MH-2	North Central	0.976	7.3E-06	3.046	0.966	2109
MH-3	Central	0.988	5.5E-06	3.092	0.972	2135
MH-4,5	"Thumb"	1.006	5.1E-06	3.107	0.922	2174

$Ktl=(W/L^3)*10^5$
Length-weight regression: $W=aL^b$

Table 7.–Mean total lengths (mm) at age-5 of lake trout sampled from 5 statistical districts of Lake Huron, 1998.

Statistical district	Mean	Standard deviation	N
MH-1	516	50	28
MH-2	504	57	189
MH-3	515	54	46
MH-4,5	541	45	104

Table 8.–Lake trout stomach contents (number consumed, % of total identifiable prey, and average weight of prey and sample size) by statistical district from MDNR 1998 assessments.

	MH-1			MH-2			MH-3			MH-4, 5			Total		
Prey	No.	%	Avg. weight (g)	No.	%	Avg. weight (g)	No.	%	Avg. weight (g)	No.	%	Avg. weight (g)	No.	%	Avg. weight (g)
Alewife	84	29.7	6.2 (20)	463	70.8	5.0 (17)	439	77.6	4.6 (67)	1844	96.4	6.2 (194)	2830	82.9	5.8 (298)
Smelt	129	45.6	5.7 (17)	158	24.2	6.3 (9)	123	21.7	5.1 (28)	66	3.5	2.8 (12)	476	13.9	5.0 (66)
Slimy sculpin	13	4.6	2.0 (7)	4	0.6	---	0	0.0	---	1	0.1	4.6 (1)	18	0.5	2.3 (8)
9-spine stickleback	57	20.1	1.4 (2)	23	3.5	---	3	0.5	2.3 (1)	0	0.0	---	83	2.4	1.7 (3)
Lake whitefish	0	0.0	---	4	0.6	---	0	0.0	---	0	0.0	---	4	0.1	---
Chinook salmon	0	0.0	---	1	0.2	---	0	0.0	---	0	0.0	---	1	0.03	---
Brown trout	0	0.0	---	1	0.2	---	0	0.0	---	0	0.0	---	1	0.03	---
Trout perch	0	0.0	---	0	0.0	---	1	0.2	---	0	0.0	---	1	0.03	---
Zebra mussels	0	0.0	---	0	0.0	---	0	0.0	---	1	0.1	---	1	0.03	---
Total identifiable	283	100		654	100		566	100		1912	100		3415	100	
Unidentifiable fish	60	---		319	---		136	---		93	---		608	---	
Void	16	15.7		226	37.5		23	15.2		44	16.9		309	27.7	
Number examined	102			602			151			260			1115		

Table 9.–Trawl catch of age-0 lake trout from Thunder Bay, 1984-99.

	North Point			Mischley Reef			Black River		
Year	Tows	Catch	CPE	Tows	Catch	CPE	Tows	Catch	CPE
1984	0	---	---	0	---	---	13	9	0.69
1985	8	0	0.00	0	---	---	2	2	1.00
1986	19	41	2.16	0	---	---	0	---	---
1987	23	19	0.83	0	---	---	0	---	---
1988	33	43	1.30	0	---	---	0	---	---
1989	63	39	0.62	0	---	---	0	---	---
1990	54	44	0.81	0	---	---	24	0	0.00
1991	39	6	0.15	0	---	---	0	---	---
1992	36	7	0.19	6	1	0.17	0	---	---
1993	35	13	0.37	11	1	0.09	0	---	---
1994	36	21	0.81	4	2	0.50	3	0	0.00
1995	36	4	0.11	0	---	---	0	---	---
1996	36	2	0.06	0	---	---	0	---	---
1997	48	5	0.10	0	---	---	0	---	---
1998	40	3	0.08	0	---	---	0	---	---
1999	38	2	0.05	0	---	---	0	---	---