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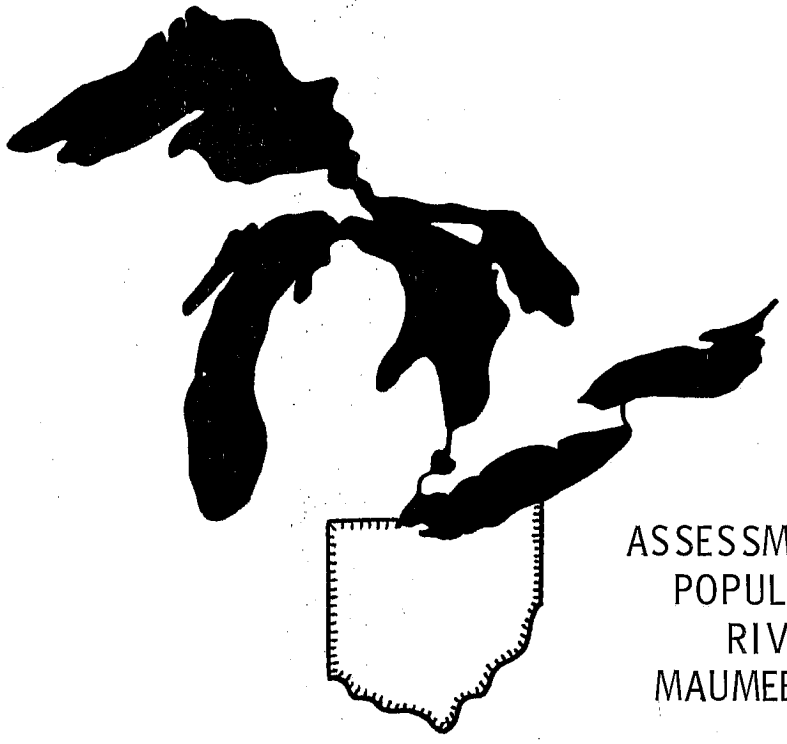

ASSESSMENT OF THE LARVAL FISH POPULATIONS IN MAUMEE RIVER ESTUARY AND MAUMEE BAY OF LAKE ERIE

Prepared by

Charles E. Herdendorf

with the assistance of
C.L. Cooper, J.M. Reutter and G.W. Sturm

Prepared for

White Brothers Sand, Inc.
Toledo, Ohio

THE OHIO STATE UNIVERSITY
CENTER FOR LAKE ERIE AREA RESEARCH
COLUMBUS, OHIO

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LIST OF PROJECT PERSONNEL

Principal Investigators

Charles E. Herdendorf
C. Lawrence Cooper
Jeffrey M. Reutter

Statistical/Computer Analysis

George W. Sturm
David W. Lowery

Research Technicians

Terry Karpinecz
John Mizera
Larry Saunders
William Bartholomew
Roger Thoma
James Haub
Harry Schutte
Martha Schutte
Don Breier
Lynwood MacLean
John Hansley
Charles Bowen
John Hageman
Rita Apanius

Manuscript Editing and Typing

Pam Wertenbach
Laurie Fletcher
Jo Ann Franks
Dee Adair

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INTRODUCTION

In 1975, the Center for Lake Erie Area Research (CLEAR) conducted a study of larval fish populations in the Maumee River estuary and Maumee Bay as part of an assessment of the environmental impact of commercial sand and gravel dredging (Herdendorf and Cooper, 1975). Because this was not initiated until June, it was not possible to comment on predicted impact of such dredging operations on fish populations during the spring spawning seasons of several important species in the area. In order to complete the assessment, a second ichthyoplankton survey was conducted in 1976, during the period April-June (Herdendorf and Cooper, 1976).

Based on the results of these assessments (CLEAR Technical Reports 41 and 49), the U.S. Army Corps of Engineers issued permits to White Brothers Sand, Inc. to dredge 150,000 cubic yards of sand and gravel from areas "1," "2," and "3" of Maumee River and 100,000 cubic yards of sand and gravel from areas "A," "B," and "C" of Maumee Bay during the period 1 January 1977 to 31 December 1980 (appendixes A and B). The permits also contained the following special condition:

> "The permittee will monitor the fisheries between 15 March and 15 June of each year in accordance with procedures of CLEAR Technical Report No. 49 or the latest technology available. Data will be submitted to the District Engineer no later than 31 December of the same year it is obtained."

In accordance with this condition, a third survey of the larval fish in the lower Maumee River and Maumee Bay was conducted in Spring 1977. The results of this survey are contained in the following report.

STUDY AREA

Maumee River Estuary

The Maumee River is a large, warm-water, low gradient stream draining relatively flat farmland in north-western Ohio. The soils in the drainage basin are formed primarily from glacial till and lacustrine deposits left from earlier stages of Lake Erie. The underlying bedrock is mostly Silurian and Devonian dolomites and limestone; less prevalent bedrocks are sandstone and shale (Herdendorf and Cooper, 1975).

The Maumee River originates in Fort Wayne, Indiana by the merging of the St. Marys River and the St. Joseph River. Flowing northeastward, the Maumee runs through Defiance, Ohio to Toledo, where it enters Lake Erie at Maumee Bay. The entire drainage basin of the Maumee River covers

17,058 km^2, of which 12,577 are in Ohio, 3,263 are in Indiana, and 1,217 are in Michigan. The length of the Maumee to the Ohio border is 170 km. The average gradient of the Maumee is 0.25 m/km (Krolczyk, 1960).

The estuarine section of the Maumee extends upstream to the first set of riffles located at Perrysburg, Ohio, a distance of about 25.4 km. Planimeter measurements from a NOAA navigational chart scaled at 1:15,000 indicate the area of the estuary to be approximately 14.0 km^2. The mean depth of the Maumee River estuary based upon 1,155 soundings appearing on this chart is 2.9 meters. A dredged navigational channel extending from the mouth of Maumee Bay to downtown Toledo is maintained by the U.S. Army Corps of Engineers; about 12.9 km of this channel with a mean depth of 6.8 meters lies within the estuary. In addition, lake levels during 1977 were nearly one meter higher than the depths appearing on the chart which represent levels referenced to low water datum (568.6 ft. above International Great Lakes Datum). By knowing the area and average depth of the Maumee River estuary, the volume of the estuary was calculated to be approximately 5.80 X 10^7 cu meters. The volume of the sampled portion of estuary, from Corbutt Island downstream to the mouth, is 4.21 X 10^7 cu meters and the area is 7.8 sq km.

Although it is not a large river when compared to some of the nation's major rivers, the Maumee is the largest tributary to the Great Lakes. The mean discharge rate of the Maumee River is approximately 133 m^3/sec and ranges from a high of 2662 m^3/sec to a low of 1 m^3/sec (Great Lakes Basin Commission, 1975). The discharge during the study months (1 March to 30 June 1977) ranged between 1574 and 9 m^3/sec, with a mean of 219 m^3/sec. Monthly discharge data of the study period are presented below:

MAUMEE RIVER DISCHARGE DATA
FOR USGS WATERVILLE GAUGE

1977	Maximum	Mean	Minimum
March	960	389	126
April	1574	333	52
May	624	134	16
June	33	18	9

Daily mean flow in cu meters/sec

Maumee Bay of Lake Erie

Maumee Bay proper lies at the western end of Lake Erie, separated from the lake by two spits, Woodtick peninsula extending southerly from the Michigan shoreline and Little Cedar Point extending northwesterly from the Ohio shore. For this study, the northeastern boundary of the study area includes the water off the mouth of Maumee Bay out to the 4-meter contour.

Maumee Bay is a broad, shallow shelf sloping gently lakeward toward the northeast. Maximum depth is approximately 4 meters, except in the navigation channel which crosses the bay northeast-southwest, and is dredged to a depth of 9-10 meters below low water datum. The surface area is 88.3 sq km, and the volume is 1.50×10^8 cu meters. This yields a mean depth of approximately 1.7 meters.

The Maumee River is a major inlet into the bay. The lower 25 km of the river are considered a freshwater estuary because its flow is affected by the lake water mass (Brant and Herdendorf, 1972).

The shoreline of Maumee Bay is composed mainly of clay with small areas of sand on the side of the bay near Little Cedar Point. Offshore material is lacustrine clay overlain by silt except for sand deposits located off Little Cedar Point (Verber, 1954). The sand deposits, lying in a modified spit northward from Little Cedar Point, were deposited by littoral currents coming from the southeast. On either side of the shipping channel are a series of linearly arranged shoals, sandy at the surface, which were formed from spoil banks when the channel was dredged to 8 meters in the 1930's.

Maumee Bay was suspected to be a potential spawning area because of its generally shallow nature and the various sand deposits located in the bay. The bay could also act as a catch basin for larvae produced upriver and therefore could be a nursery ground.

METHODS OF INVESTIGATION

Objectives

Collection of ichthyoplankton (fish eggs and larvae) in the lower Maumee River estuary and in Maumee Bay of Lake Erie began in mid-March and terminated in mid-June. The principal objective of this study was to determine the density of fish larvae populations at 13 stations (Table 1 and figures 1-3) in the study area and thereby estimate the total number of larval fish in the lower part of the river and the bay.

Collections in the Maumee River were made approximately every 4 days, with 19 to 24 visits to each station, for the 101-day period of the investigation (Figure 4). Six stations were established from Corbutt Island (Station 1), through the three dredging areas (Stations 2-4), and the lower portion of river (Station 5) to the river mouth (Station 6). Station 1 serves as an upstream control for the river dredging areas, and Stations 5 and 6 provide information on densities intermediate between the river and bay dredging areas.

Collections in Maumee Bay were made approximately every 10 days when weather and lake conditions permitted sampling. Seven stations were sampled in the bay with visits to individual stations ranging from 4 to 7 times for the 69-day period of the investigation (Figure 4). Stations 7-9 were established in the three bay dredging areas. Station 10 was located

in the nearshore zone of Little Cedar Point, the closest landfall to the dredging areas. Stations 11-13 were established nearer to the river mouth to characterize the inner portion of Maumee Bay.

Procedures

Oceanographic plankton nets were used to collect ichthyoplankton samples in both the river and the bay. Maumee River sampling consisted of a surface water and bottom water net tow at each station. A conical net was towed in a circular fashion for three minutes at each depth. All tows were made during daylight. Night sampling was deemed unnecessary because of the turbid nature of the river. The net used in the river was 75 cm in diameter with 571 micron openings (mesh no. 00), and was fitted with a meter to measure the volume of water which was filtered through the net during each tow. The net was towed at approximately 2-4 knots from a 17-foot outboard motor boat. Water temperature and conductivity measurements were taken at the time of larvae sampling.

Maumee Bay sampling consisted of five replicate oblique tows at each station. A conical net was again towed in a circular fashion for three minutes at 2-4 knots from a 21-foot outboard. Because of the increased water clarity in Maumee Bay and the potential of net avoidance by the larvae, all sampling was done at night. To avoid net clogging by diatoms and zooplankters, a slightly larger mesh opening, 760 microns (mesh no. 0), was used in the bay. The net was also 75 cm in diameter and was fitted with a flow meter.

All specimens collected in the nets were preserved with formalin in the field and then taken to the Center for Lake Erie Area Research mobil laboratory in Toledo or to Franz Theodore Stone Laboratory at Put-in-Bay for identification and enumeration. All specimens were identified to genus and a great majority were identified to species with the use of taxonomic keys developed by Fish (1932), Norden (1961 a and b), and Nelson and Cole (1975). Individuals were enumerated for each of three developmental stages, prolarva, postlarva, and juvenile:

1. prolarva--larvae still bearing yolk;
2. postlarva--larvae following the time of absorption of yolk but before transformation to adult structures;
3. juvenile-- young stage immediately following acquisition of adult characteristics.

Fish larvae densities are expressed in this report as numbers of individuals per 100 cubic meters (m^3). Larval fish populations in the estuary and bay were estimated by multiplying mean larvae concentration by the volume of water in these two bodies of water.

Statistical analyses were performed at The Ohio State University Computer Center. These consisted of larval density plots, segment averaging, and percentage calculations. Computer generated tables and plots utilizing the Statistical Analysis System (SAS) are presented in the report.

RESULTS OF INVESTIGATION

A total of 18 fish taxa were encountered during the 1977 spring study, 16 in Maumee River and 14 in Maumee Bay (Table 2). Two taxa of crappies and two of suckers were only found in Maumee River, whereas, smelt and saugers were collected only in Maumee Bay. The dominant larval species present at 11 of the 13 stations was gizzard shad (Dorosoma cepedianum). This species represents 79.4 percent of the total fish number at all stations during the study period. The second most abundant species was white bass (Morone chrysops) at 10.7 percent, followed by freshwater drum (Aplodinotus grunniens) at 7.2 percent, yellow perch (Perca flavescens) at 1.3 percent, emerald shiner (Notropis atherinoides) at 0.5 percent, and walleye (Stizostedion v. vitreum) at 0.3 percent. These six species accounted for 99.4 percent of larval fish identified from Maumee River and Bay samples. Ichthyoplankton, consisting of either fish eggs or larvae, were first observed in late April (eggs: 25 April; larvae: 18 April) and continued to be present until the end of the study in late June. No eggs or larvae were noted during the first month of the study. The density of fish eggs in Maumee River samples is given in Table 3. The peak density at the river dredging areas occurred in mid-May. The maximum density for the dredging areas was 107 eggs/100 m^3 at Station 6. Eggs taken in April and early May were found near the bottom, those collected after mid-May floated. The floating eggs were suspected to be freshwater drum, while those on the bottom probably were species of Percidae. No fish eggs were recorded for Maumee Bay samples.

Fish larvae identified and enumerated from river (Stations 1-6) and bay (Stations 7-13) samples are listed in Tables 4-12. These tables contain the density (no./100 m^3) of larvae by species at each station for each sampling date and the percent of the total larvae population represented by each species. The total larvae density for each station and five to six major species for all stations are plotted for each sampling date on Figures 5-89.

The average density of fish larvae at all stations for samples taken in April, May, and June are given in Table 13 and the relative abundance of the major fish species at each station are presented in Table 14. In order to ascertain variations in larval density and species composition for various portions of the river and the bay stations were grouped into nine segments:

1) upper river (Stations 1-4)
2) river dredge areas (Stations 2-4)
3) lower river (Stations 5-6)
4) total river (Stations 1-6)
5) inner bay (Stations 11-13)
6) outer bay (Stations 7-10)
7) bay dredge areas (Stations 7-9)
8) total bay (Stations 7-13)
9) total river-bay system (Stations 1-13)

The average density of fish larvae for these segments of the study area are given in Table 15 and the relative abundance of the five dominant species for each segment is listed in Table 16.

The estimated total numbers of larval fish in Maumee River Estuary and Maumee Bay by species and sampling date are presented in Tables 17 and 18, respectively. The maximum abundance of larval fish populations in the river and bay are compared for 1975, 1976, and 1977 in Tables 19 and 20, respectively.

Water quality information was collected at Stations 1-6 in Maumee River. Surface temperature and conductivity measurements are listed in Table 21.

DISCUSSION

No fish eggs or larvae were obtained during the first thirteen sampling dates in Maumee River (Julian days 75-107) and the first two sampling dates in Maumee Bay (103 and 104). Walleye and yellow perch were the first species to be collected in the river (days 108 and 112, respectively) and in the bay (day 111). Walleyes reached a maximum abundance of 42×10^6 in Maumee River (day 112) and 17×10^5 in Maumee Bay (day 120). The average densities of walleyes in the dredging areas were 7/100 m^3 for the river and $\leq$1/100 m^3 for the bay. Yellow perch had a low average density in the river (1/100 m^3) and a high density in the bay 29/100 m^3) dredging areas. The maximum abundance of yellow perch in the river was 18×10^5 (day 158) and 12×10^7 in the bay (day 154). Walleye were most susceptible to river dredging impacts during a short period in mid-April (days 108-112), whereas yellow perch were most susceptible to bay dredging impacts in May (days 120-154).

Following the appearance of these two species, gizzard shad, white bass, and freshwater drum gained dominance in the river in mid-May and in the bay in early June. Peak abundance of gizzard shad was 32×10^8 in the river (day 148) and 28×10^8 in the bay (day 154). The average density of this species in the river dredging area (792/100 m^3) was near the average for the entire estuary (774/100 m^3), whereas the average for the bay dredging areas (341/100 m^3) was less than half of the entire bay average (719/100 m^3). White bass were more abundant in the river (47×10^7 on day 154) than in the bay 12×10^7 on day 163). The average density of this species in the river dredging areas was 206/100 m^3 for the total bay.

Freshwater drum in the river reached a maximum population of 38×10^7 (day 145) and mean density of 106/100 m^3 compared to 87/100 m^3 for the river dredging areas. In the bay this species has a maximum of only 17×10^6 (day 154) with an average density of 4/100 m^3 for the dredging areas and 2/100 m^3 for the entire bay. Gizzard shad appeared to be of about equal susceptibility in both river and bay dredging during June. White bass was most susceptible in the river, particularly in late May and early June. White bass densities at the bay dredging areas were the lowest in the study area. Freshwater drum were most susceptible to dredging in the river in late May. Densities of this species in the bay were low.

The only other species of numerical importance, emerald shiner, was not observed in the river dredging areas. This species reached a maximum density of 29×10^6 (day 163) in the bay with an average density of 7/100 m^3, compared with only 2/100 m^3 in the dredging areas. All of the other 12 fish taxa recorded amounted to only 0.6 percent of the total number of individuals counted.

The populations of larval fish during the period of maximum abundance varied considerably for the three years 1975-1977, but normally the variance was within one order of magnitude. Some of this variation can be explained by three factors:

1) 1975 sampling started in May and ended in August, whereas 1976 and 1977 sampling started in April and ended in June;

2) the 1975 and 1976 stations were not located directly in the river dredging areas, whereas the 1977 stations were in these areas; likewise the bay stations differed somewhat from year to year;

3) meteorological conditions and flow characteristics of the river varied considerably from year to year; for example, in 1976 the river was near 10°F warmer in early April than in 1977.

Because the sampling dates and stations for 1976 and 1977 were similar, the most reliable comparisons can be made for these years. Of the dominant species, gizzard shad, freshwater drum, walleye, logperch, and shiners show very similar maximum population sizes in Maumee River. White bass, carp, and yellow perch populations were considerably larger in 1976. It is suspected that higher population estimates for these species were obtained in 1976 because some of the stations that year were located closer to shore, a habitat preferred by these species. Because the walleye populations in the river for the two years were essentially equal (maximum abundance: 42×10^6), the impact assessment presented in CLEAR Technical Report No. 49 is also valid for 1977. Populations of most of the dominant species in Maumee Bay were nearly equal or one order of magnitude larger in 1977 with the exception of white bass and freshwater drum, which were several orders of magnitude larger in 1977 and walleye which was an order of magnitude smaller in 1977. Therefore, the suspected impact on walleye in Maumee Bay in 1977 would be considerably smaller.

Station 1 in the Maumee River was designed as an upstream control station for the three active river dredging areas (Stations 2-4). The following list shows the mean density of fish larvae (no./100 m^3) at the control station as compared to the stations in the river dredging areas:

	Station 1 (Control)	Stations 2-4 (active dredging areas)
GSHAD	681	535
CARP	2	1
WBASS	129	187
USUN	2	2
PERCH	<1	1
WALLI	2	6
DRUM	57	79

No significant decline in larval densities can be seen between the control and the dredging area stations with the possible exception of gizzard shad, with a continual decline downstream. Most of the species showed an increase from the control to the dredging area station. No fish larval depletion due to dredging activities can be demonstrated by this data.

In Maumee Bay, Station 9 was selected as a control station in an inactive dredging area ("C") for active dredging areas "A" and "B" (Stations 7 and 8). The following list shows the mean density of fish larvae (no./100 m^3) at the control station as compared to stations in the active bay dredging areas:

	Station 9 Bay area "C" (control)	Stations 7 & 8 Bay areas "A" & "B" (active)
GSHAD	213	282
SMELT	3	5
CARP	3	3
ESHIN	2	2
WBASS	3	4
PERCH	11	39
WALLI	<1	1
DRUM	1	6

As in the river, no decline in the larval densities can be seen between the control and the dredging area stations. All of the species are of equal or greater density in the active dredging areas. Again, no fish larvae depletion due to dredging activities can be demonstrated from this data.

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TABLES

TABLE 1

GEOGRAPHIC COORDINATES FOR MAUMEE RIVER AND MAUMEE BAY FISH LARVAE COLLECTION STATIONS

Station No.	Field Notation	Stations CLEAR TR-41, 49	Coordinates Latitude (N)	Coordinates Longitude (W)	Water Depth (m)	Dredging Area
1	D-4	2	41°37.1'	83°34.0'	4-5	
2	D-3	15	41°37.3'	83°33.3'	5	River "3"
3	D-2	14	41°37.4'	83°32.9'	6	River "2"
4	D-1	13	41°37.6'	83°32.2'	4	River "1"
5	R-2(2)	44	41°39.2'	83°31.3'	10 (channel)	
6	R-4(5)	43	41°42.3'	83°26.7'	10 (channel)	
7	A 1/3	40	41°45.0'	83°22.8'	3-4	Bay "A"
8	A 2/1	41	41°43.5'	83°21.8'	3-4	Bay "B"
9	A 2/2	--	41°44.2'	83°20.5'	3-4	Bay "C"
10	A 1/4	42	41°43.1'	83°20.8'	2-3	
11	A 1/1	38	41°43.7'	83°25.7'	2-3	
12	A 1/2	39	41°42.2'	83°24.6'	2-3	
13	A 1/5	--	41°43.0'	83°27.4'	2-3	

TABLE 2

LIST OF LARVAL FISH SPECIES COLLECTED
IN MAUMEE RIVER AND BAY

Computer Code	Common Name	Scientific Name
GSHAD	Gizzard Shad	*Dorosoma cepedianum*
SMELT	Rainbow smelt	*Osmerus mordax*
CARP	Carp	*Cyprinus carpio*
ESHIN	Emerald shiner	*Notropis atherinoides*
SPOT	Spottail shiner	*Notropis hudsonius*
USHIN	Shiner, unidentified	*Notropis sp.*
QUILL	Quillback	*Carpiodes cyprinus*
WSUCK	White sucker	*Catostomus commersoni*
USUCK	Sucker, unidentified	*Catostomus sp.*
WBASS	White bass	*Morone chrysops*
WCRAP	White crappie	*Pomoxis annularis*
UCRAP	Crappie, unidentified	*Pomoxis sp.*
USUN	Sunfish, unidentified	*Lepomis sp.*
PERCH	Yellow perch	*Perca flavescens*
LOGP	Logperch	*Percina caprodes*
SAUGR	Sauger	*Stizostedion canadense*
WALLI	Walleye	*Stizostedion v. vitreum*
DRUM	Freshwater drum	*Aplodinotus grunniens*
UNID	Unidentified species	

TABLE 3

DENSITY OF FISH EGGS IN MAUMEE RIVER SAMPLES

Density in eggs/100 m^3

DAY	STATIONS 1	2	3	4	5	6
115	-	-	-	-	1	1
125	0	0	1	0	-	-
127	-	-	-	-	1	0
131	5	18	0	0	-	-
135	-	-	-	-	4	0
136	7	10	54	45	-	-
145	124	88	107	17	0	64
147	-	-	-	-	23	3451
148	16	25	8	6	-	-
151	-	-	-	-	42	2235
155	-	-	-	-	-	10
162	6	2	15	0	-	-
163	-	-	-	-	0	114
166	21	29	35	80	-	-
167	-	-	-	-	163	413
174	-	-	-	-	3	781

TABLES 4-12

AVERAGE LARVAL DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATIONS 1-13

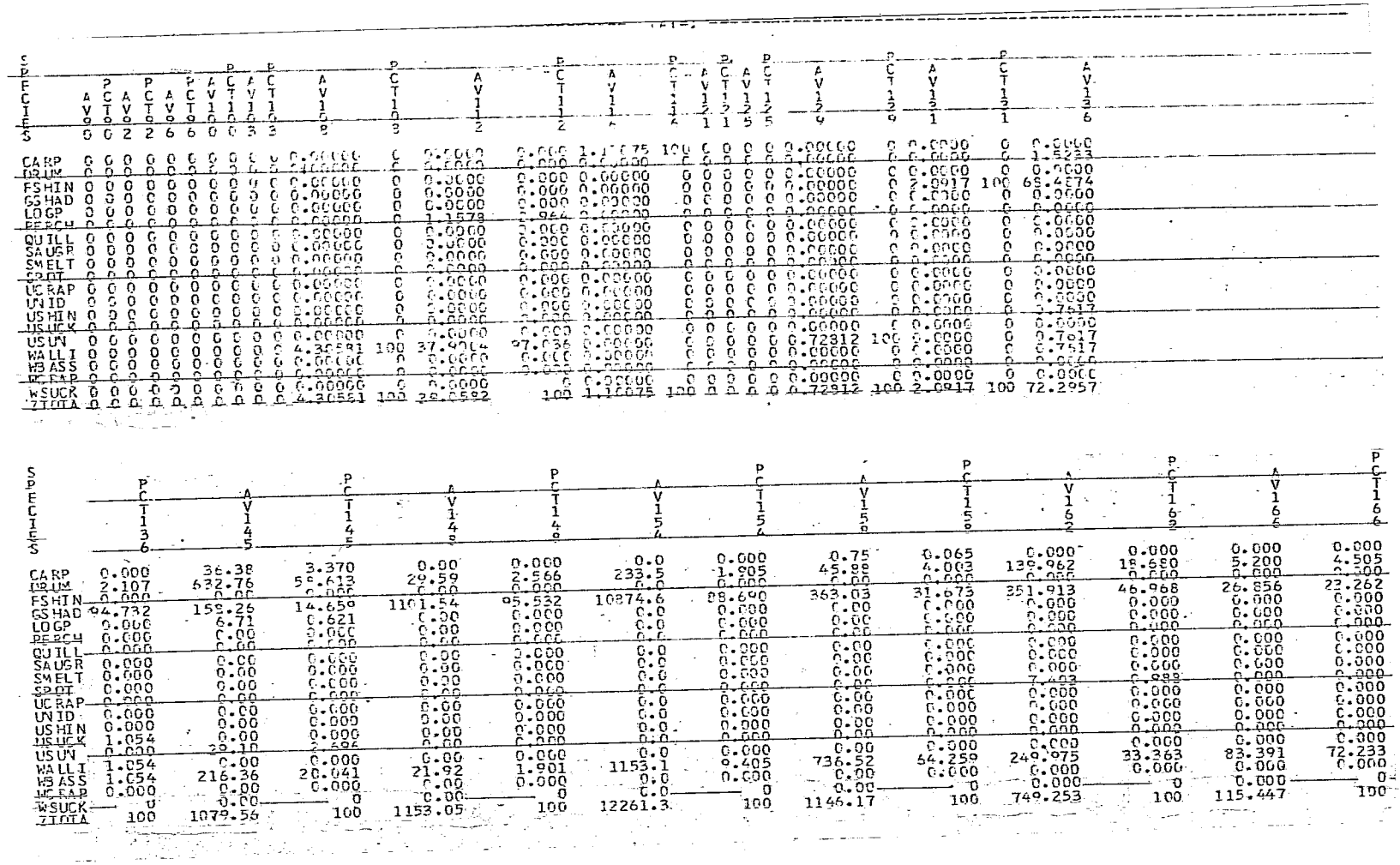
LEGEND

SPECIES = Computer code for larval fish taxa (see Table 2)

AV 90, 92, 96, etc. = Average larval fish density (no./100m^3) at station on sampling date: Julian day 90 (31 March), 92 (2 April), 96 (6 April), etc.

PCT 90, 92, 96, etc. = Percent of total larvae at station on sampling date: Julian day 90, 92, 96, etc.

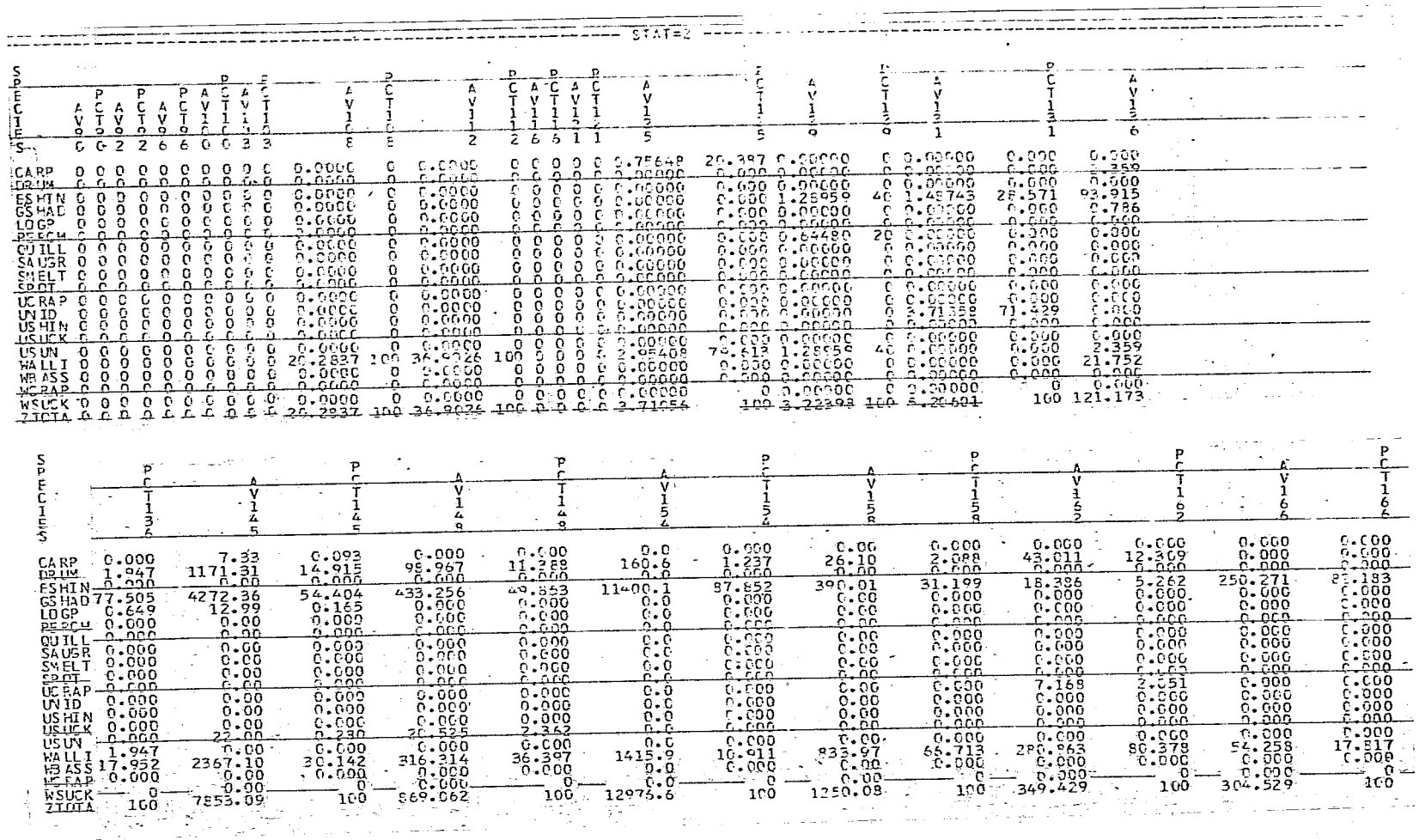
ZTOTA = Total density and percent of larval fish collected at station on each sampling date.



SPECIES	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT
CARP	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	1.10775	100	0	0	0	0.00000	0	0.0000	0	0.0000	0	1.5283	
DRUM	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
FSHIN	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	2.0917	100	68.4874			
GSHAD	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
LOGP	0	0	0	0	0	0	0	0	0.00000	0	1.1579	100	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
PERCH	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
QUILL	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
SAUSR	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
SMELT	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
SPOT	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
UCRAP	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
UNID	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
USHIN	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	1.7517			
USUCK	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
USUN	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.72312	100	0.0000	0	0.7617			
WALLI	0	0	0	0	0	0	0	0	4.30581	100	0.00000	0	37.4004	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.7517			
WBASS	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	1.0000			
WCRAP	0	0	0	0	0	0	0	0	0.00000	0	0.00000	0	0.000	0.000000	0	0	0	0	0.00000	0	0.0000	0	0.0000			
WSUCK	0	0	0	0	0	0	0	0	4.30581	100	29.0592		100	1.10775	100	0	0	0	0.72312	100	2.0917	100	72.2957			
TOTA	0	0	0	0	0	0	0	0																		

SPECIES	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT
	136	145	145	148	148	154	154	158	158	162	162	166	166	166			
CARP	0.000	36.38	3.370	0.00	0.000	0.0	0.000	0.75	0.065	0.000	0.000	0.000	0.000	0.000			
DRUM	2.107	632.76	58.613	29.59	2.566	233.5	1.905	45.88	4.003	139.962	18.680	5.200	4.505				
FSHIN	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
GSHAD	94.732	159.26	14.650	1101.54	95.532	10874.6	88.690	363.03	31.673	351.913	46.968	26.856	23.262				
LOGP	0.000	6.71	0.621	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
PERCH	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
QUILL	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
SAUSR	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
SMELT	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
SPOT	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
UCRAP	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
UNID	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
USHIN	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
USUCK	1.054	6.00	0.596	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
USUN	0.000	28.10	2.646	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
WALLI	1.054	0.00	0.000	0.00	0.000	0.0	0.000	736.52	64.259	249.975	33.363	83.391	72.233				
WBASS	1.054	216.36	20.041	21.92	1.901	1153.1	0.405	0.00	0.000	0.000	0.000	0.000	0.000				
WCRAP	0.000	0.00	0.000	0.00	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000				
WSUCK	0	0.00	0	0.00	0	0.0	0	0.00	0	0.000	0	0.000	0				
TOTA	100	1079.56	100	1153.05	100	12261.3	100	1146.17	100	749.253	100	115.447	100				

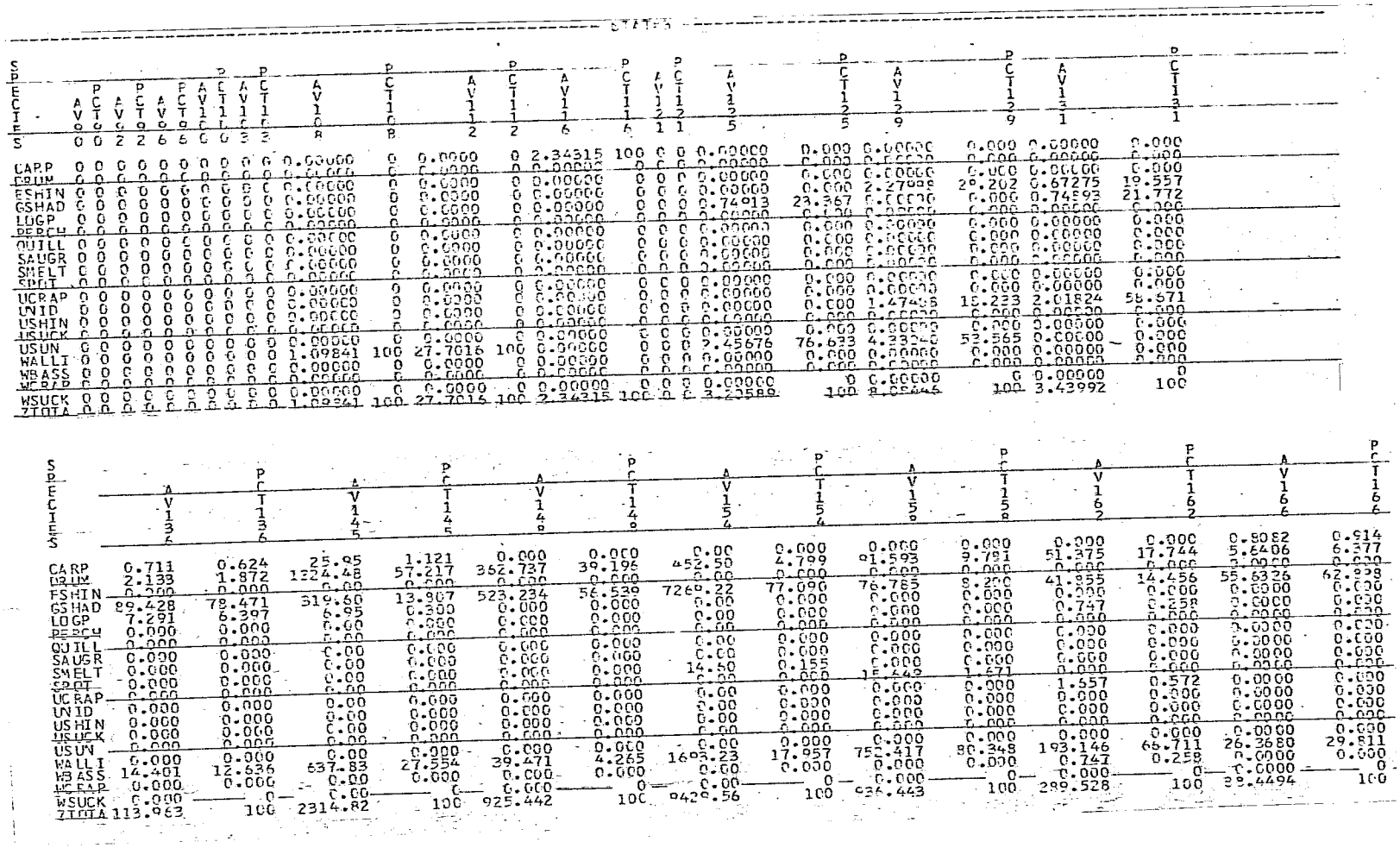
TABLE 4. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATION 1



SPECIES	PCT 0	AV 0	PCT 26	AV 66	PCT 66	AV 00	PCT 00	AV 33	PCT 33	AV 8	PCT 8	AV 2	PCT 11	AV 26	PCT 11	AV 51	PCT 12	AV 25	PCT 15	AV 9	PCT 12	AV 11	PCT 13	AV 31	PCT 13	AV 36
CARP	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.75648	20.387	0.00000	0	0.00000	0.000	0.000		
DRUM	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
ESHIN	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	1.28959	40	1.49743	28.571	93.915		
GSHAD	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.786		
LOGP	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
PEPCH	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.64480	20	0.00000	0.000	0.000		
QUILL	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
SAUGR	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
SMELT	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
SPOT	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
UCRAP	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
UNID	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.71858	71.429	0.860		
USHIN	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
USUCK	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
USUN	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
WALLI	0	0	0	0	0	0	0	0	0	20.2837	100	36.9026	100	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	21.752		
WBASS	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0.000	0.00000	0	0.00000	0.000	0.000		
WCRAP	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	0.00000	0	0.00000	0	0.00000	0	0.000		
WSUCK	0	0	0	0	0	0	0	0	0	0.0000	0	0.0000	0	0	0	0	0	2.71056	100	3.22393	100	2.26601	100	121.173		
ZTOTA	0	0	0	0	0	0	0	0	0	20.2837	100	36.9026	100	0	0	0	0									

SPECIES	PCT 13	AV 45	PCT 14	AV 48	PCT 14	AV 54	PCT 15	AV 52	PCT 15	AV 58	PCT 15	AV 62	PCT 16	AV 66	PCT 16
CARP	0.000	7.33	0.093	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DRUM	1.947	1171.31	14.915	98.967	11.288	160.6	1.237	26.10	2.088	43.011	12.309	0.000	0.000	0.000	0.000
ESHIN	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GSHAD	77.505	4272.36	54.404	433.256	49.353	11400.1	97.852	390.01	31.199	18.386	5.262	250.271	89.183		
LOGP	0.649	12.99	0.165	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PEPCH	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QUILL	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SAUGR	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SMELT	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SPOT	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
UCRAP	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
UNID	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
USHIN	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
USUCK	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
USUN	0.000	22.00	0.280	20.525	2.342	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WALLI	1.947	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WBASS	17.952	2367.10	30.142	316.314	36.097	1415.9	10.911	833.97	66.713	280.963	80.378	54.258	17.817		
WCRAP	0.000	0.00	0.000	0.000	0.000	0.0	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WSUCK	0	0.00	0	0.000	0	0.0	0	0.00	0	0.000	0	0.000	0	0.000	0
ZTOTA	100	7853.09	100	869.062	100	12976.6	100	1250.08	100	349.429	100	304.529	100		

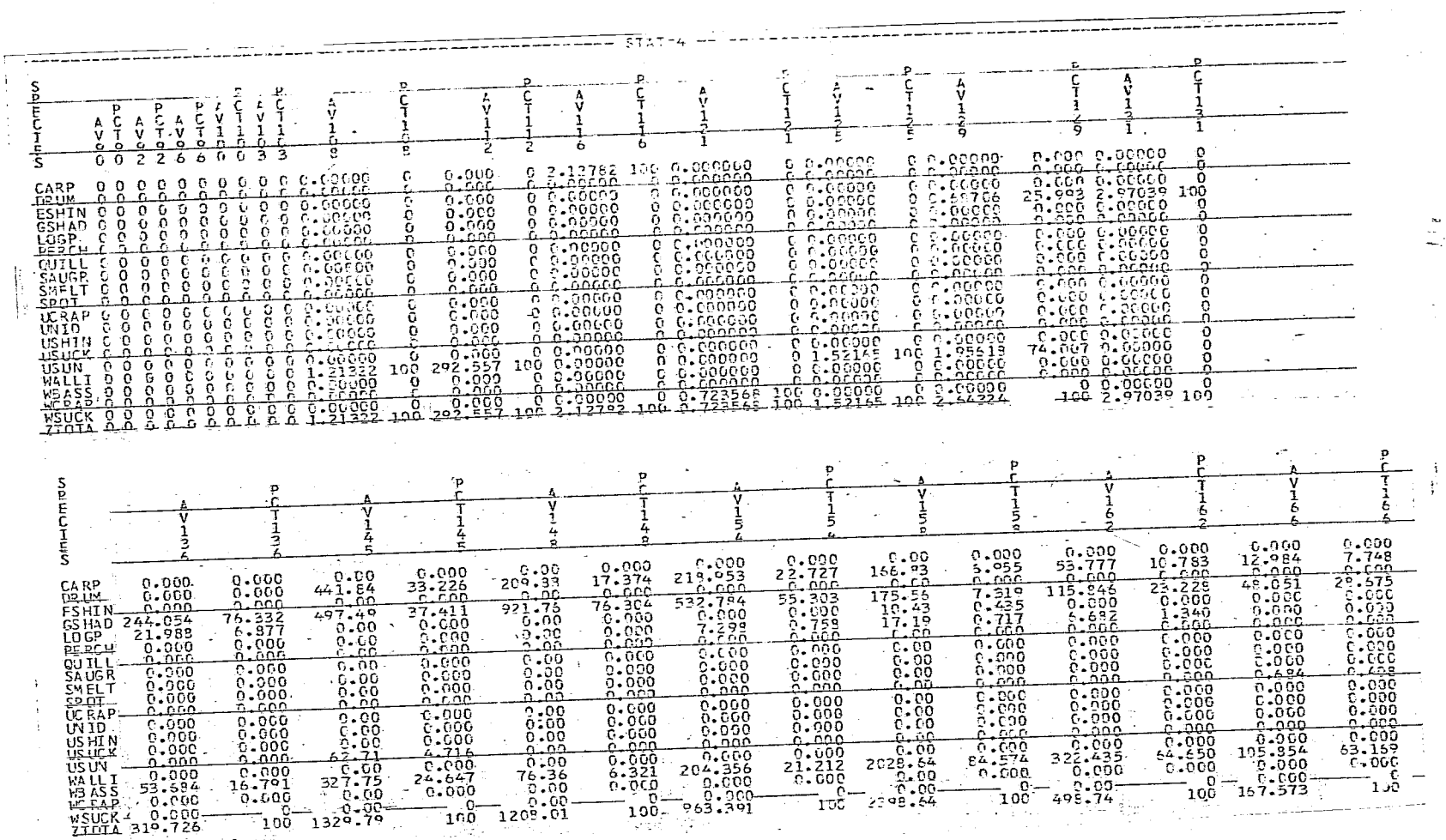
TABLE 5. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATION 2



SPECIES	PCT 02	AV 06	PCT 26	AV 06	PCT 06	AV 10	PCT 10	AV 14	PCT 14	AV 18	PCT 18	AV 22	PCT 22	AV 25	PCT 25	AV 29	PCT 29	AV 31	PCT 31
CARP	0	0.00000	0	0.0000	0	2.34315	100	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
DRUM	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
FSHIN	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	2.27998	20.202	0.67275	19.557				
GSHAD	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.74913	23.367	0.00000	0.000	0.74893	21.772				
LDGP	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
PERCH	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
QUILL	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
SAUGR	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
SMELT	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
SPOT	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
UCRAP	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
UNID	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	1.47496	15.233	2.01824	58.671				
USHIN	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
USUCK	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
USUN	0	0.00000	0	0.0000	0	0.00000	0	0	0	2.45676	76.633	4.23824	52.565	0.00000	0.000				
WALLI	0	1.09841	100	27.7016	100	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
WBASS	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0.000	0.00000	0.000	0.00000	0.000				
WCRAP	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0	0.00000	0	0.00000	0				
WSUCK	0	0.00000	0	0.0000	0	0.00000	0	0	0	0.00000	0	0.00000	0	0.00000	0				
ZTOTA	0	1.09841	100	27.7016	100	2.34315	100	0	0	3.20589	100	8.09446	100	3.43992	100				

SPECIES	AV 34	PCT 36	AV 45	PCT 45	AV 48	PCT 48	AV 54	PCT 54	AV 59	PCT 58	AV 62	PCT 62	AV 66	PCT 66
CARP	0.711	0.624	25.95	1.121	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.8082	0.914
DRUM	2.133	1.872	1224.48	57.217	362.737	39.196	452.50	4.799	91.593	9.791	51.375	17.744	5.6406	6.377
FSHIN	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
GSHAD	89.428	78.471	319.60	13.907	523.234	56.539	7269.22	77.090	76.785	8.209	41.855	14.456	55.6326	62.898
LDGP	7.291	6.397	6.95	0.300	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
PERCH	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.747	0.258	0.0000	0.000
QUILL	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
SAUGR	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
SMELT	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
SPOT	0.000	0.000	0.00	0.000	0.000	0.000	14.50	0.155	0.000	0.000	0.000	0.000	0.0000	0.000
UCRAP	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	1.671	0.577	0.0000	0.000
UNID	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	1.557	0.537	0.0000	0.000
USHIN	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
USUCK	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
USUN	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
WALLI	0.000	0.000	0.00	0.000	0.000	0.000	1605.23	17.057	752.417	80.348	193.146	66.711	26.3680	29.811
WBASS	14.401	12.636	637.83	27.554	39.471	4.265	0.00	0.000	0.000	0.000	0.741	0.258	0.0000	0.000
WCRAP	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
WSUCK	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
ZTOTA	113.963	100	2314.82	100	925.442	100	9429.56	100	926.443	100	289.528	100	89.4494	100

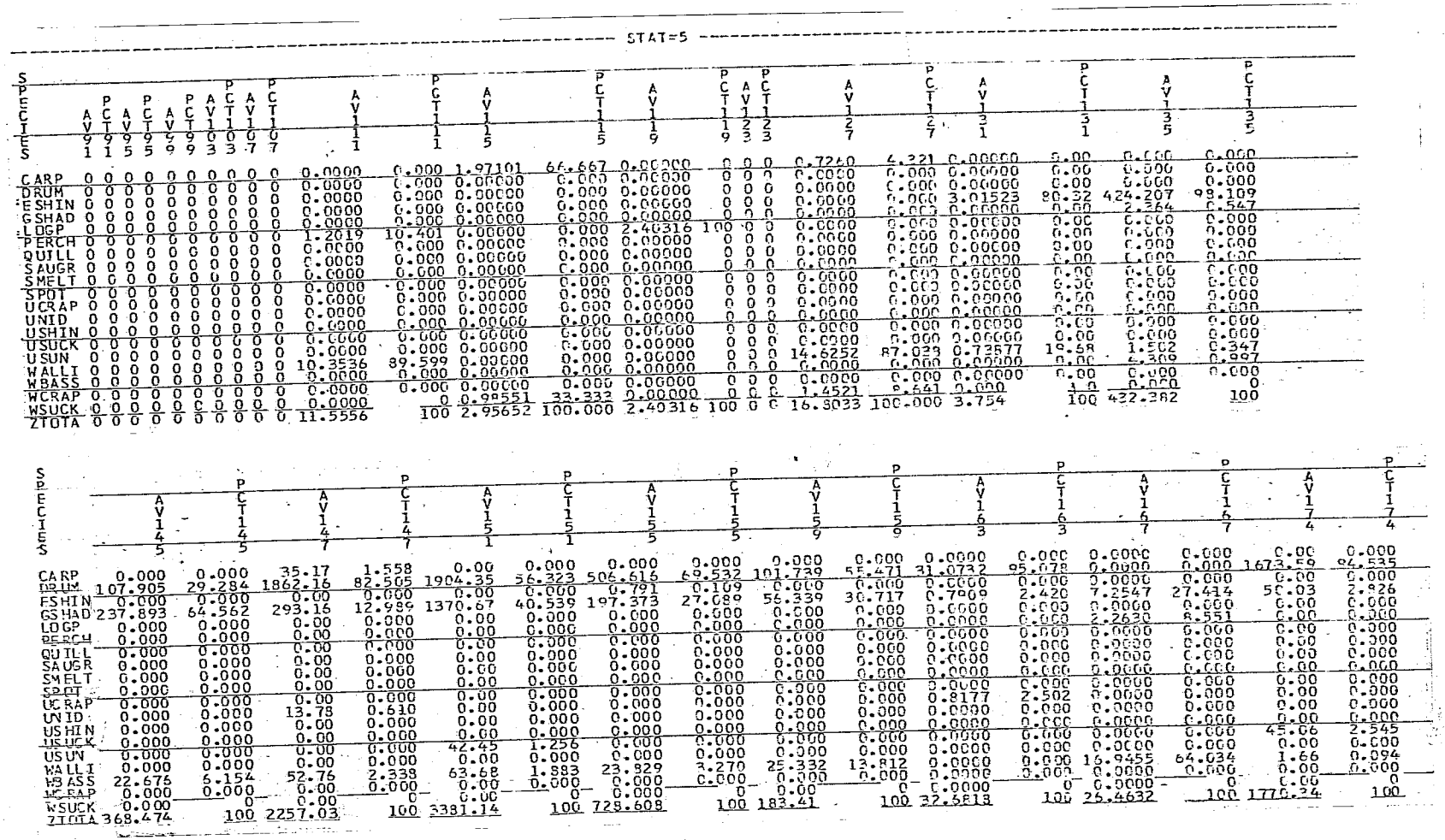
TABLE 6. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATION 3



SPECIES	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT
CARP	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	2.12782	100	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
DRUM	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
ESHIN	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
GSHAD	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
LOGP	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
PERCH	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
QUILL	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
SAUGR	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
SMELT	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
SPOT	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
UCRAP	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
UNID	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
USHIN	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.000	0.00000	0			
USUCK	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	1.52165	10	1.65418	0.00000	0			
USUN	0	0	0	0	0	0	0	0	0	0	1.21352	100	292.557	100	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.00000	0.00000	0			
WALLI	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.00000	0.00000	0			
WBASS	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.000000	0	0.00000	0	0.00000	0	0.00000	0.00000	0			
WCRAP	0	0	0	0	0	0	0	0	0	0	0.00000	0	0.000	0	0.00000	0	0.723568	100	0.00000	0	0.00000	0	0.00000	0.00000	0			
WSUCK	0	0	0	0	0	0	0	0	0	0	1.21352	100	292.557	100	2.12782	100	0.723568	100	1.52165	100	2.44224	100	2.97039	100				

SPECIES	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT	AVG	PCT
CARP	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DRUM	0.000	0.000	441.64	33.226	209.33	17.374	219.953	22.727	166.93	5.955	58.777	10.783	12.984	7.748	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ESHIN	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GSHAD	244.054	76.332	497.49	37.411	921.75	76.304	532.794	55.303	175.56	7.319	115.846	23.228	48.051	28.675	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOGP	21.988	6.877	0.00	0.000	0.00	0.000	0.000	0.000	10.43	0.435	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PERCH	0.000	0.000	0.00	0.000	0.00	0.000	7.299	0.758	17.19	0.717	6.682	1.340	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QUILL	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SAUGR	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SMELT	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SPOT	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
UCRAP	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
UNID	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
USHIN	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
USUCK	0.000	0.000	62.71	4.716	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
USUN	0.000	0.000	0.00	0.000	0.00	0.000	204.356	21.212	2028.64	84.574	322.435	64.650	105.854	63.159	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WALLI	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WBASS	53.584	16.791	327.75	24.647	76.36	6.321	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WCRAP	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WSUCK	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZTOTA	319.726	100	1329.79	100	1208.01	100	963.391	100	2398.64	100	498.74	100	167.573	100										

TABLE 7. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATION 4



STAT=5

SPECIES	AV91	PCT91	AV95	PCT95	AV99	PCT99	AV103	PCT103	AV107	PCT107	AV111	PCT111	AV115	PCT115	AV119	PCT119	AV123	PCT123	AV127	PCT127	AV131	PCT131	AV135	PCT135
CARP	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	1.97101	66.667	0.00000	0	0	0	0.7240	4.321	0.00000	0.00	0.000	0.000
DRUM	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
ESHIN	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0060	0.000	3.01525	80.32	424.207	99.109
GSHAD	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	2.364	0.547
LDGP	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	2.40316	100	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
PERCH	0	0	0	0	0	0	0	0	0	0	1.2019	10.401	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
QUILL	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
SAUGR	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
SMELT	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
SPOT	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
UCRAP	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
UNID	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
USHIN	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
USUCK	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
USUN	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	14.8252	87.033	0.73577	19.68	1.502	0.347
WALLI	0	0	0	0	0	0	0	0	0	0	10.3536	89.599	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	2.306	0.997
WBASS	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	0.0000	0.000	0.00000	0.00	0.000	0.000
WCRAP	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0.000	0.00000	0	0	0	1.4521	8.641	0.000	0.00	0.000	0
WSUCK	0	0	0	0	0	0	0	0	0	0	0.0000	0.000	0	0	0.98551	33.332	0.00000	0	0	0	0	0	0	0
ZTOTA	0	0	0	0	0	0	0	0	0	0	11.5556	100	2.95652	100.000	2.40316	100	0	0	16.8033	100.000	3.754	100	432.382	100

SPECIES	AV145	PCT145	AV147	PCT147	AV151	PCT151	AV155	PCT155	AV159	PCT159	AV163	PCT163	AV167	PCT167	AV174	PCT174
CARP	0.000	0.000	35.17	1.558	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
DRUM	107.905	29.284	1862.16	82.505	1904.35	56.323	506.616	69.532	101.739	55.471	31.0732	95.078	0.0000	0.000	0.00	0.000
ESHIN	0.000	0.000	0.00	0.000	0.00	0.000	0.791	0.109	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
GSHAD	237.893	64.562	293.16	12.989	1370.67	40.539	197.373	27.089	56.339	30.717	0.7909	2.420	7.2547	27.414	56.03	2.826
LDGP	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
PERCH	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	2.2630	8.551	0.00	0.000
QUILL	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
SAUGR	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
SMELT	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
SPOT	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
UCRAP	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
UNID	0.000	0.000	13.78	0.610	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.8177	2.502	0.00	0.000
USHIN	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
USUCK	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
USUN	0.000	0.000	0.00	0.000	42.45	1.256	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
WALLI	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	45.06	2.545
WBASS	22.676	6.154	52.76	2.338	63.68	1.883	23.829	3.270	25.332	13.812	0.0000	0.000	16.9455	64.034	1.66	0.094
WCRAP	0.000	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.0000	0.000	0.00	0.000
WSUCK	0.000	0	0.00	0	0.00	0.000	0.000	0	0.00	0	0.0000	0	0.0000	0	0	0
ZTOTA	368.474	100	2257.03	100	3381.14	100	728.608	100	183.41	100	32.5813	100	26.4632	100	1770.24	100

TABLE 8. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATION 5

STAT=6

SPECIES	PCT 91	AV 91	PCT 95	AV 99	PCT 99	AV 103	PCT 107	AV 111	PCT 111	AV 115	PCT 115	AV 119	PCT 119	PCT 123	AV 123	PCT 127	AV 127	PCT 131	AV 131	PCT 135	AV 135	PCT 145	AV 145
CARP	0	0	0	0	0	0	0	0	0	13.5065	59.595	0.00000	0	0	0.00000	0	0.0000	0.000	1.4604	3.961	0.00	0.000	0.000
DRUM	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	18.99	1.368	0.00
ESHIN	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.00
GSHAD	0	0	0	0	0	0	0	0	0	1.0574	4.666	0.00000	0	0	0.00000	0	12.0917	76.709	9.9645	23.201	1244.33	89.614	4146.60
LOGP	0	0	0	0	0	0	0	0	0	1.8753	8.274	1.08372	100	0	0	0.00000	0	0.7743	4.658	11.2343	26.079	0.00	0.00
PERCH	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
QUILL	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
SAUGR	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
SMELT	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
SPOT	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
UCRAP	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
UNID	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
USHIN	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
USUCK	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	12.31	1.368
USUN	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	2.35007	100	2.9371	19.633	0.7962	1.948	0.00	0.00
WALLI	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	19.3721	44.470	112.91	8.131
WBASS	0	0	0	0	0	0	0	0	0	0.0000	0.000	0.00000	0	0	0	0.00000	0	0.0000	0.000	0.0000	0.000	0.00	0.00
WCRAP	0	0	0	0	0	0	0	0	0	6.2245	27.445	0.00000	0	0	0	0.00000	0	0.0000		0.0000		0.00	0.00
WSUCK	0	0	0	0	0	0	0	0	0	22.6637	100.000	1.08372	100	0	0	2.35007	100	15.7631	100	43.0775	100	1388.54	100
ZTOTA																							

SPECIES	PCT 145	AV 147	PCT 147	AV 151	PCT 151	AV 155	PCT 155	AV 159	PCT 159	AV 163	PCT 163	AV 167	PCT 167	AV 171	PCT 171	AV 174
CARP	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
DRUM	1.368	0.00	0.000	24.95	0.368	30.81	1.899	0.00	0.000	0.000	7.412	3.475	0.0000	0	115.723	39.605
ESHIN	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
GSHAD	89.614	4146.60	82.759	6489.52	95.614	1546.30	95.296	2082.00	87.924	190.525	84.540	75.9398	100	160.211	54.830	0.000
LOGP	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
PERCH	0.000	0.00	0.000	0.00	0.000	10.04	0.619	0.00	0.000	2.370	1.111	0.0000	0	0.000	0.000	0.000
QUILL	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
SAUGR	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
SMELT	0.000	0.00	0.000	0.00	0.000	0.00	0.030	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
SPOT	0.000	0.00	0.000	24.76	0.365	10.04	0.619	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
UCRAP	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
UNID	0.000	14.72	0.294	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
USHIN	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.000
USUCK	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	15.404	5.272	0.000
USUN	0.387	0.00	0.000	24.95	0.368	0.00	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0.293
WALLI	0.000	0.00	0.000	0.00	0.000	0.00	1.568	285.96	12.076	22.978	10.773	0.0006	0	0.856	0.293	0.000
WBASS	8.131	849.12	16.947	223.01	3.286	25.45	0.000	0.00	0.000	0.000	0.000	0.0000	0	0.000	0.000	0
WCRAP	0.000	0.00	0.000	0.00	0.000	0.00	0	0.00	0	0.000	0	0.0000	0	0.000	0	0
WSUCK	0	0.00	0	0.00	0	0.00	0	0.00	0	0.000	0	0.0000	0	0.000	0	0
ZTOTA	100	5010.45	100	6787.18	100	1622.64	100	2367.96	100	213.285	100	75.9898	100	292.193	100	100

TABLE 9. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATION 6

STAT=7

SPECIES	AV111	PCT111	AV120	PCT120	AV132	PCT132	AV154	PCT154	AV163	PCT163	AV172	PCT172
CARP	0.000000	0	0.0000	0.000	0.0000	0.000	8.93	0.547	6.750	0.682	0.00000	0.000
DRUM	0.000000	0	0.0000	0.000	0.0000	0.000	0.50	0.030	4.913	0.496	0.00000	0.000
ESHIN	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.95078	11.922
GSHAD	0.000000	0	0.0000	0.000	0.0000	0.000	1189.73	72.800	939.537	94.918	7.02391	88.078
LOGP	0.000000	0	0.0000	0.000	0.0000	0.000	7.81	0.478	0.000	0.000	0.00000	0.000
PERCH	0.202409	50	50.8952	95.778	10.4522	94.827	377.41	23.094	1.431	0.145	0.00000	0.000
QUILL	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
SAUGR	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
SMELT	0.000000	0	0.0000	0.000	0.0000	0.000	24.04	1.471	32.701	3.304	0.00000	0.000
SPOT	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
UCRAP	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
UNID	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
USHIN	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
USUCK	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
USUN	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
WALLI	0.202409	50	2.2433	4.222	0.2862	2.597	1.34	0.082	0.000	0.000	0.00000	0.000
WBASS	0.000000	0	0.0000	0.000	0.2840	2.576	24.47	1.497	4.504	0.455	0.00000	0.000
WCRAP	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
WSUCK	0.000000	0	0.0000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.00000	0.000
ZTOTA	0.404817	100	53.1385	100.000	11.0224	100.000	1634.23	100.000	989.837	100.000	7.97469	100.000

STAT=8

SPECIES	AV111	PCT111	AV120	PCT120	AV132	PCT132	AV154	PCT154	AV163	PCT163	AV172	PCT172
CARP	0.000000	0.000	0.75908	8.496	0.3706	2.599	4.71	0.469	0.554	0.153	3.3507	7.458
DRUM	0.000000	0.000	0.00000	0.000	0.0000	0.000	62.91	6.263	2.183	0.601	1.3523	3.010
ESHIN	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	19.332	5.324	6.3413	14.114
GSHAD	0.000000	0.000	0.00000	0.000	0.0000	0.000	904.63	90.059	331.659	91.342	32.8246	73.057
LOGP	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.2536	0.564
PERCH	0.223964	53.123	7.20174	82.609	11.3489	79.584	15.70	1.563	0.000	0.000	0.0000	0.000
QUILL	0.000000	0.000	0.37904	4.348	0.0000	0.000	0.00	0.000	0.000	0.000	0.0000	0.000
SAUGR	0.000000	0.000	0.00000	0.000	1.3521	9.482	0.00	0.000	0.000	0.000	0.0000	0.000
SMELT	0.000000	0.000	0.00000	0.000	0.0000	0.000	5.27	0.525	0.000	0.000	0.8074	1.797
SPOT	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.57	0.057	0.000	0.000	0.0000	0.000
UCRAP	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.0000	0.000
UNID	0.000000	0.000	0.00000	0.000	0.2992	2.098	0.00	0.000	0.000	0.000	0.0000	0.000
USHIN	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.0000	0.000
USUCK	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.0000	0.000
USUN	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.0000	0.000
WALLI	0.197628	46.877	0.37904	4.348	0.5984	4.197	0.00	0.000	0.000	0.000	0.0000	0.000
WBASS	0.000000	0.000	0.00000	0.000	0.2910	2.040	10.68	1.064	9.367	2.580	0.0000	0.000
WCRAP	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.0000	0.000
WSUCK	0.000000	0.000	0.00000	0.000	0.0000	0.000	0.00	0.000	0.000	0.000	0.0000	0.000
ZTOTA	0.421593	100.000	8.71790	100.000	14.2602	100.000	1004.48	100.000	363.095	100.000	44.9298	100.000

TABLE 10. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATIONS 7 & 8

STAT=9

SPECIES	AV111	PCT111	AV120	PCT120	AV132	PCT132	AV154	PCT154	AV163	PCT163	AV172	PCT172
CARP	-	0	0.9476	5.319	-	0	8.201	1.997	1.321	0.263	0.0000	0.000
DRUM	-	0	0.0000	0.000	-	0	0.000	0.000	1.290	0.257	0.8590	3.383
ESHIN	-	0	0.0000	0.000	-	0	0.000	0.000	6.157	1.227	3.1361	12.350
GSHAD	-	0	0.0000	0.000	-	0	347.120	84.525	467.870	97.201	15.3186	60.323
LOGP	-	0	0.0000	0.000	-	0	9.617	2.196	0.000	0.000	3.4484	13.579
PERCH	-	0	15.9196	89.362	-	0	29.905	7.282	0.000	0.000	0.0000	0.000
QUILL	-	0	0.3780	2.128	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
SAUGR	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
SMELT	-	0	0.0000	0.000	-	0	5.932	1.444	2.194	0.437	2.6320	10.365
SPOT	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
UCRAP	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
UNID	-	0	0.1295	1.064	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
USHIN	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
USUCK	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
USUN	-	0	0.3780	2.128	-	0	1.427	0.347	0.000	0.000	0.0000	0.000
WALLI	-	0	0.0000	0.000	-	0	9.070	2.209	3.088	0.615	0.0000	0.000
WBASS	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
WCRAP	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
WSUCK	-	0	0.0000	0.000	-	0	0.000	0.000	0.000	0.000	0.0000	0.000
ZTOTA	-	0	17.8148	100.000	-	0	410.674	100.000	501.920	100.000	25.3941	100.000

STAT=10

SPECIES	AV111	PCT111	AV120	PCT120	AV132	PCT132	AV154	PCT154	AV163	PCT163	AV172	PCT172
CARP	0.000000	0	0.0000	0.000	-	0	0.45	0.009	0.000	0.000	0.889	0.144
DRUM	0.000000	0	0.0000	0.000	-	0	0.89	0.018	0.261	0.068	3.606	0.565
ESHIN	0.000000	0	0.0000	0.000	-	0	13.17	0.262	57.070	14.843	50.030	8.115
GSHAD	0.000000	0	0.0000	0.000	-	0	4938.05	98.290	274.636	71.430	557.909	90.496
LOGP	0.000000	0	0.0000	0.000	-	0	0.89	0.018	0.872	0.227	1.359	0.220
PERCH	0.743494	100	9.8601	93.068	-	0	37.82	0.753	0.000	0.000	0.448	0.073
QUILL	0.000000	0	0.3981	3.757	-	0	0.00	0.000	0.000	0.000	0.000	0.000
SAUGR	0.000000	0	0.0000	0.000	-	0	0.90	0.018	0.000	0.000	0.000	0.000
SMELT	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
SPOT	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
UCRAP	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
UNID	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
USHIN	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
USUCK	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
USUN	0.000000	0	0.0000	0.000	-	0	0.89	0.018	0.000	0.000	0.000	0.000
WALLI	0.000000	0	0.3364	3.175	-	0	30.91	0.615	51.645	13.432	2.257	0.366
WBASS	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
WCRAP	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
WSUCK	0.000000	0	0.0000	0.000	-	0	0.00	0.000	0.000	0.000	0.000	0.000
ZTOTA	0.743494	100	10.5946	100.000	-	0	5023.98	100.000	384.485	100.000	616.499	100.000

TABLE 11. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATIONS 9 & 10

STAT=11

SPECIES	AV111	PCT111	AV120	PCT120	AV132	PCT132	AV154	PCT154	AV163	PCT163	AV172	PCT172
CARP	0	0	0.1797	0.423	.	0	6.929	1.413	1.69	0.052	0.0000	0.000
DRUM	0	0	0.0000	0.000	.	0	6.650	1.356	0.00	0.000	0.0000	0.000
ESHIN	0	0	0.0000	0.000	.	0	0.565	0.115	2.26	0.070	0.5483	1.161
GSHAD	0	0	0.0000	0.000	.	0	463.050	94.423	3020.72	93.270	44.1160	95.049
LOGP	0	0	0.0000	0.000	.	0	0.000	0.000	0.56	0.017	0.8943	1.927
PERCH	0	0	38.7097	91.173	.	0	5.719	1.166	23.07	0.712	0.0000	0.000
QUILL	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
SAUGR	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
SMELT	0	0	0.0000	0.000	.	0	1.800	0.367	0.00	0.000	0.0000	0.000
SPOT	0	0	0.0000	0.000	.	0	0.430	0.088	0.00	0.000	0.0000	0.000
UCRAP	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
UNID	0	0	0.0000	0.000	.	0	0.565	0.115	0.00	0.000	0.0000	0.000
USHIN	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.3107	0.669
USUCK	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
USUN	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
WALLI	0	0	3.5680	8.404	.	0	4.691	0.957	190.39	5.879	0.5447	1.174
WBASS	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
WCRAP	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
WSUCK	0	0	0.0000	0.000	.	0	0.000	0.000	0.00	0.000	0.0000	0.000
ZTOTA	0	0	42.4574	100.000	.	0	490.400	100.000	3238.70	100.000	46.4141	100.000

STAT=12

SPECIES	AV111	PCT111	AV120	PCT120	AV132	PCT132	AV154	PCT154	AV163	PCT163	AV172	PCT172
CARP	0.000000	0.000	.	0	.	0	3.37	0.164	0.41	0.016	0.000	0.000
DRUM	0.000000	0.000	.	0	.	0	1.58	0.077	0.00	0.000	0.000	0.000
ESHIN	0.000000	0.000	.	0	.	0	3.03	0.148	47.93	1.891	16.148	9.622
GSHAD	0.000000	0.000	.	0	.	0	1947.87	94.801	2374.96	93.707	151.072	90.013
LOGP	0.000000	0.000	.	0	.	0	3.43	0.167	0.51	0.020	0.000	0.000
PERCH	0.331875	65.861	.	0	.	0	58.23	2.834	1.03	0.041	0.000	0.000
QUILL	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
SAUGR	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
SMELT	0.000000	0.000	.	0	.	0	0.00	0.000	0.41	0.016	0.000	0.000
SPOT	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
UCRAP	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
UNID	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
USHIN	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
USUCK	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
USUN	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
WALLI	0.172028	34.139	.	0	.	0	37.18	1.810	109.20	4.309	0.613	0.365
WBASS	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
WCRAP	0.000000	0.000	.	0	.	0	0.00	0.000	0.00	0.000	0.000	0.000
WSUCK	0.000000	0.000	.	0	.	0	2054.70	100.000	2534.44	100.000	167.833	100.000
ZTOTA	0.503903	100.000	.	0	.	0						

STAT=13

SPECIES	AV111	PCT111	AV120	PCT120	AV132	PCT132	AV154	PCT154	AV163	PCT163	AV172	PCT172
CARP	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
DRUM	0.000000	0.000	0	0	.	0	6.90	0.192	0.00	0.000	2.3779	7.509
ESHIN	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.5861	1.851
GSHAD	0.000000	0.000	0	0	.	0	3253.23	90.663	952.01	82.899	24.6901	78.602
LOGP	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.5381	1.857
PERCH	0.225352	39.009	0	0	.	0	39.32	1.096	0.00	0.000	0.0000	0.000
QUILL	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
SAUGR	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
SMELT	0.000000	0.000	0	0	.	0	5.50	0.153	0.00	0.000	0.2856	0.902
SPOT	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
UCRAP	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
UNID	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
USHIN	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.3025	0.955
USUCK	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
USUN	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.2964	0.936
WALLI	0.352346	60.991	0	0	.	0	293.31	7.896	182.70	16.101	2.2394	7.388
WBASS	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
WCRAP	0.000000	0.000	0	0	.	0	0.00	0.000	0.00	0.000	0.0000	0.000
WSUCK	0.000000	0.000	0	0	.	0	3588.27	100.000	1134.71	100.000	31.6660	100.000
ZTOTA	0.577698	100.000	0	0	.	0						

TABLE 12. AVERAGE DENSITY BY SPECIES AND PERCENT TOTAL POPULATION AT STATIONS 11, 12, & 13

TABLE 13

AVERAGE DENSITY OF FISH LARVAE FOR APRIL-JUNE SAMPLES

Density in no./100 m^3

STATIONS

TAXA	1	2	3	4	5	6	7	8	9	10	11	12	13	Ave
GSHAD	681	887	440	133	132	839	356	212	213	1154	706	1118	846	594
SMELT	0	0	0	0	0	0	9	1	3	0	<1	<1	1	1
CARP	2	<1	2	<1	2	1	3	2	3	<1	2	1	0	1
ESHIN	0	0	0	0	<1	0	<1	4	2	24	1	17	<1	4
SPOT	0	0	1	0	0	2	0	<1	0	0	<1	0	0	<1
USHIN	0	<1	<1	0	0	0	0	0	<1	0	<1	0	<1	<1
QUILL	0	<1	0	0	0	0	0	<1	<1	<1	0	0	0	<1
WSUCK	0	0	0	<1	<1	<1	0	0	0	0	0	0	0	<1
USUCK	<1	0	0	0	0	0	0	0	0	0	0	0	0	<1
WBASS	129	278	177	164	11	81	5	3	3	17	39	37	94	80
WCRAP	0	0	<1	0	0	0	0	0	0	0	0	0	0	<1
UCRAP	0	0	<1	0	0	0	0	0	0	0	0	0	0	<1
USUN	2	2	0	3	4	3	0	0	0	0	0	0	<1	1
PERCH	<1	0	<1	2	<1	1	71	6	11	10	14	15	8	10
LOGP	<1	1	1	2	<1	<1	1	<1	3	1	<1	1	<1	1
SAUGR	0	0	0	0	0	0	0	<1	0	<1	0	0	0	<1
WALLI	2	3	2	16	1	<1	1	<1	<1	<1	1	<1	1	2
DRUM	57	79	120	58	309	10	1	11	1	1	1	<1	2	54
UNID	0	<1	<1	0	1	1	0	<1	0	0	<1	0	0	<1
TOTAL	873	1250	743	378	460	938	447	239	239	1207	764	1189	951	748

TABLE 14

RELATIVE ABUNDANCE OF LARVAL FISH TAXA BY STATIONS

Ranking of species greater than 1/100 m^3

	STATIONS												
TAXA	1	2	3	4	5	6	7	8	9	10	11	12	13
GSHAD	1	1	2	2	1	1	1	1	1	1	1	1	1
SMELT							3	7	5				
CARP	5		5		5	7	5	6	6		4	6	
ESHIN								4	7	2	7	3	
SPOT						5							
WBASS	2	2	2	1	3	2	4	5	4	3	2	2	2
WCRAP			7										
USUN	6	5		5	4	4		3					
PERCH				6		6	2		2	4	3	4	3
LOGP		6	6	7			8		3	6		5	
WALLI	4	4	4	4	6		7				6		
DRUM	3	3	3	3	1	3	6	2	8	5	5		4

TABLE 15

AVERAGE DENSITY OF FISH LARVAE
FOR SEGMENTS OF STUDY AREA

Density in no./100 m^3

Segment	Upper River	River Dredge Areas	Lower River	Total River	Inner Bay	Outer Bay	Bay Dredge Areas	Total Bay	Total System
Stations	(1-4)	(2-4)	(5-6)	(1-6)	(11-13)	(7-10)	(7-9)	(7-13)	(1-13)
GSHAD	535	487	485	518	890	509	294	658	594
SMELT	0	0	0	0	<1	3	4	2	1
CARP	1	1	<1	1	1	2	3	2	1
ESHIN	0	0	<1	<1	6	8	2	7	4
SPOT	<1	<1	1	1	<1	<1	<1	<1	<1
USHIN	<1	<1	0	<1	<1	<1	<1	<1	<1
QUILL	<1	<1	0	<1	<1	<1	0	<1	<1
WSUCK	<1	<1	<1	<1	0	0	0	0	<1
USUCK	<1	0	0	<1	0	0	0	0	<1
WBASS	187	206	46	140	57	7	4	28	80
WCRAP	<1	<1	0	<1	0	0	0	0	<1
UCRAP	<1	<1	0	<1	0	0	0	0	<1
USUN	2	2	4	2	<1	0	0	1	<1
PERCH	1	1	1	1	12	25	29	19	10
LOGP	1	1	<1	1	<1	1	1	1	1
SAUGR	0	0	0	0	0	<1	<1	<1	<1
WALLI	6	7	1	4	<1	<1	<1	<1	2
DRUM	79	87	160	106	1	4	4	2	54
UNID	<1	<1	1	1	<1	<1	<1	<1	<1
TOTAL	812	792	699	774	967	559	341	719	748

TABLE 16

RELATIVE ABUNDANCE OF LARVAL FISH TAXA
BY SEGMENT OF STUDY AREA

	STATIONS								
TAXA	1-4 Upper River	2-4 River Dred.A.	5-6 Lower River	1-6 River Total	11-13 Inner Bay	7-10 Outer Bay	7-9 Bay Dred.A.	7-13 Bay Total	1-13 System Total
GSHAD	1	1	1	1	1	1	1	1	1
SMELT							4		
CARP			5						
ESHIN					4	3		4	5
WBASS	2	2	3	2	2	4	3	2	2
USUN	5	5	4	5					
PERCH					3	2	2	3	4
WALLI	4	4		4					
DRUM	3	3	2	3	5	5	5	5	3

TABLE 17

ESTIMATED NUMBER OF LARVAL FISH IN MAUMEE RIVER ESTUARY

Population in 100 millions (10^7)

	JULIAN DAY															
TAXA	100	103	108	112	116	121	125	129	131	136	145	148	154	158	162	166
GSHAD	0	0	0	0	0	0	0	0.04	0.07	5.22	55.23	31.36	316.56	10.58	5.56	4.01
CARP	0	0	0	0	0.06	0	0.01	0	0	0.01	0.73	0	0	0.01	0	0.01
SPOT	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0
USHIN	0	0	0	0	0	0	0	0.02	0.06	0	0	0	0	0	0	0
QUILL	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0
USUCK	0	0	0	0	0	0.01	0	0	0	0.01	0	0	0	0	0	0
WBASS	0	0	0	0	0	0	0	0	0	0.95	37.35	4.78	47.01	45.8	11.01	2.84
UCRAP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.08	0.01
USUN	0	0	0	0	0	0	0	0	0	0	1.20	0.22	0	0	0	0
PERCH	0	0	0	0.01	0	0	0	0	0	0	0	0	0.08	0.18	0.08	0
LOGP	0	0	0	0	0	0	0.01	0	0.01	0.32	0.28	0	0	0.11	0	0
WALLI	0	0	0.28	4.16	0	0	0.07	0.09	0	0.03	0	0	0	0	0	0
DRUM	0	0	0	0	0	0	0	0	0	0.06	37.58	7.38	11.22	3.48	3.03	0.25

TABLE 18

ESTIMATED NUMBER OF LARVAL FISH IN MAUMEE BAY

Population in 100 millions (10^7)

TAXA \ JULIAN DAY	111	120	132	154	163	172
GSHAD	0	0	0	280.07	179.96	17.89
SMELT	0	0	0	0.91	0.76	0.08
CARP	0	0.05	0.03	0.70	0.23	0.09
ESHIN	0	0	0	0.36	2.85	1.67
SPOT	0	0	0	0.02	0	0
USHIN	0	0.01	0	0	0	0.01
QUILL	0	0.03	0	0	0	0
WBASS	0	0	0.04	8.60	11.83	0.12
USUN	0	0	0	0	0	0.01
PERCH	0.04	3.07	1.63	12.11	0.55	0.01
LOGP	0	0	0	0.45	0.04	0.14
SAUGR	0	0	0.10	0.02	0	0
WALLI	0.02	0.17	0.07	0.08	0	0
DRUM	0	0	0	1.71	0.19	0.18

TABLE 19

MAXIMUM ABUNDANCE OF LARVAL FISH POPULATIONS IN MAUMEE RIVER

SPECIES	1975 5/16-8/25		1976 4/13-6/8		1977 4/18-6/15	
	No.	Date	No.	Date	No.	Date
Gizzard Shad	32×7^{10}	6/25	70×10^8	6/3	32×10^8	6/3
White Bass	15×10^6	6/25	41×10^8	6/1	47×10^7	6/3
Freshwater Drum	49×10^7	6/25	24×10^7	6/8	38×10^7	5/25
Walleye	56×10^5	5/16	42×10^6	4/23	42×10^6	4/22
Sunfish sp.	10×10^4	7/24				
Carp	20×10^4	6/25	34×10^7	5/20	12×10^6	5/25
Logperch			53×10^6	5/20	30×10^5	5/16
Yellow perch	57×10^5	5/16	11×10^7	4/29	20×10^5	6/7
Shiner sp.	20×10^5	8/5	50×10^5	5/27	20×10^5	6/3
Crappie sp.			11×10^6	5/27	20×10^5	6/7
Sucker sp.			49×10^6	4/29	10×10^5	5/1

TABLE 20

MAXIMUM ABUNDANCE OF LARVAL FISH POPULATIONS IN MAUMEE BAY

SPECIES	1975 4/20-7/2		1976 4/21-8/15		1977 4/21-6/21	
	No.	Date	No.	Date	No.	Date
Gizzard Shad	38×10^7	4/20	79×10^6	6/19	28×10^8	6/3
Yellow perch	16×10^6	4/20	12×10^6	4/28	12×10^7	6/3
White bass	12×10^7	4/20	72×10^4	6/7	12×10^7	6/21
Emerald shiner	60×10^6	5/30	27×10^6	8/2	28×10^6	6/21
Freshwater drum	15×10^7	4/30	66×10^4	6/30	17×10^6	6/3
Rainbow smelt	70×10^5	5/10	20×10^5	5/20	91×10^5	6/3
Carp	20×10^5	4/20	70×10^4	7/21	70×10^5	6/3
Logperch	13×10^5	5/20			45×10^5	6/3
Walleye	21×10^5	4/20	31×10^6	4/21	17×10^5	4/30
Sauger					10×10^5	5/12

TABLE 21

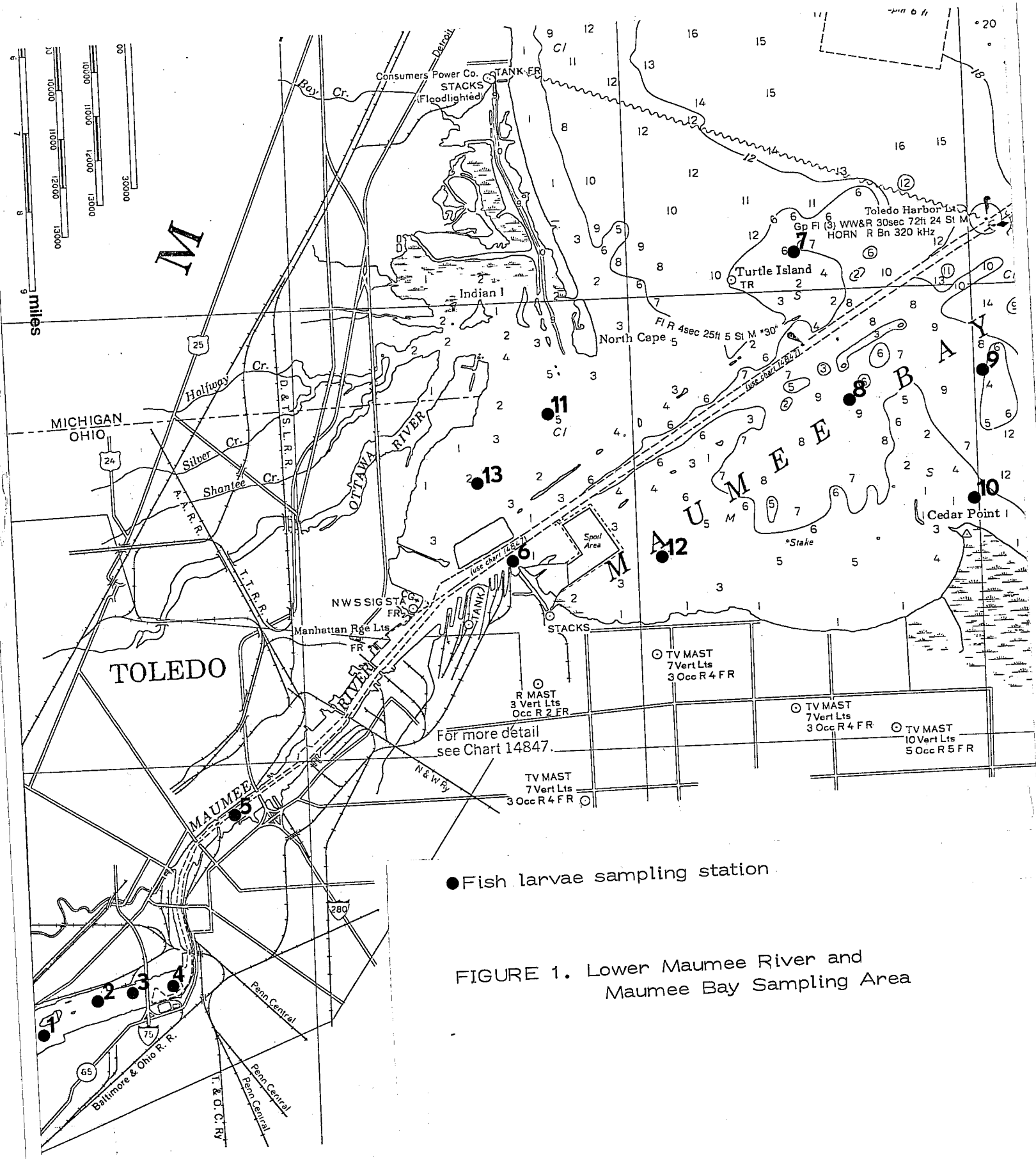
SURFACE TEMPERATURE AND CONDUCTIVITY MEASUREMENTS
FOR MAUMEE RIVER STATIONS

Temperature in ^{o}F

Conductivity in μmhos/cm

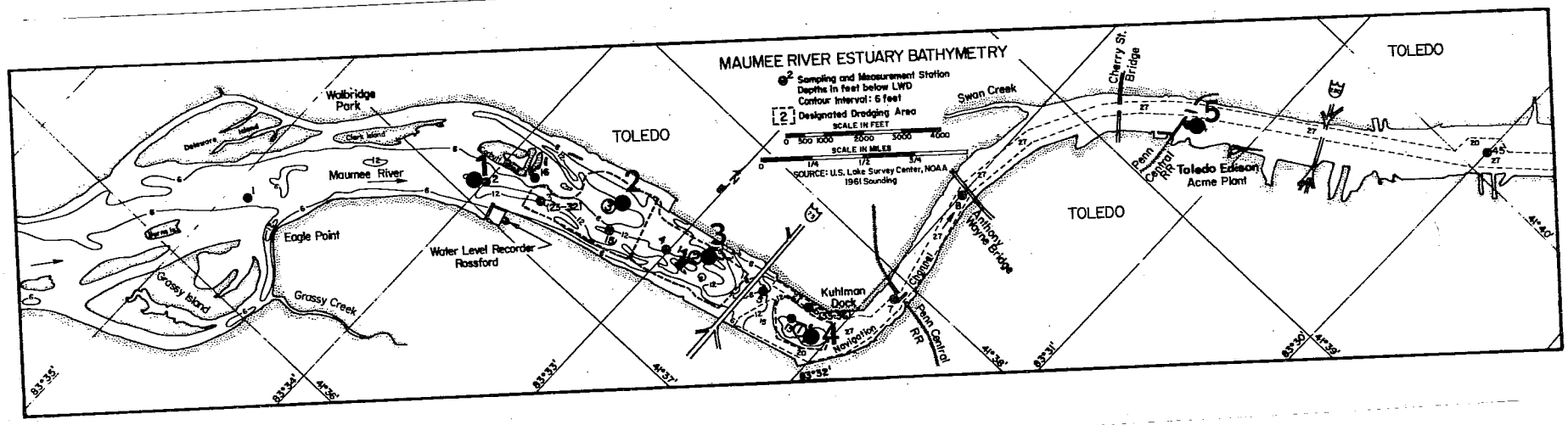
	1		2		3		4		5		6	
DAY	Temp.	Cond.	Temp.	Cond.	Temp.	Cond.	Temp.	Cond.	Temp.	Cond.	Temp.	Cond.
91									50	490		
95									48	590	48	600
96	41	550	42	550	42	600	41	550				
99									45	490	44	500
100	46	475	46	500	46	470	46	480				
103	58	580	58	560	58	570	58	580	53	530	60	400
107									57	530	57	575
108	60	520	62	550	62	590	62	590				
111									60	550	60	525
112	62	600	63	600	62	625	62	625				
116	52	340	51	410	51	340	52	410	52	450	53	450
119												
121	54	460	54	460	54	460	54	500	57	500	57	550
123												
125	57	520	58	540	58	500	58	500	59	475	60	475
127												
129	58	550	59	550	58	550	57	550	58	500	59	500
131	60	525	60	550	60	600	60	610	64	540	62	525
135												
136	64	600	65	625	66	580	69	560				
145	72	400	69	450	69	400	68	400	75	440	70	380
147												
148	72	400	69	400	70	400	69	400	72	425	68	370
151									70	450	64	360
155												
158	65	425	65	400	63	425	63	425	67	450	62	380
159												
162	65	425	64	400	63	400	63	400	65	480	62	425
163									70	450	71	425
167									80	425	75	365
174												

FIGURES



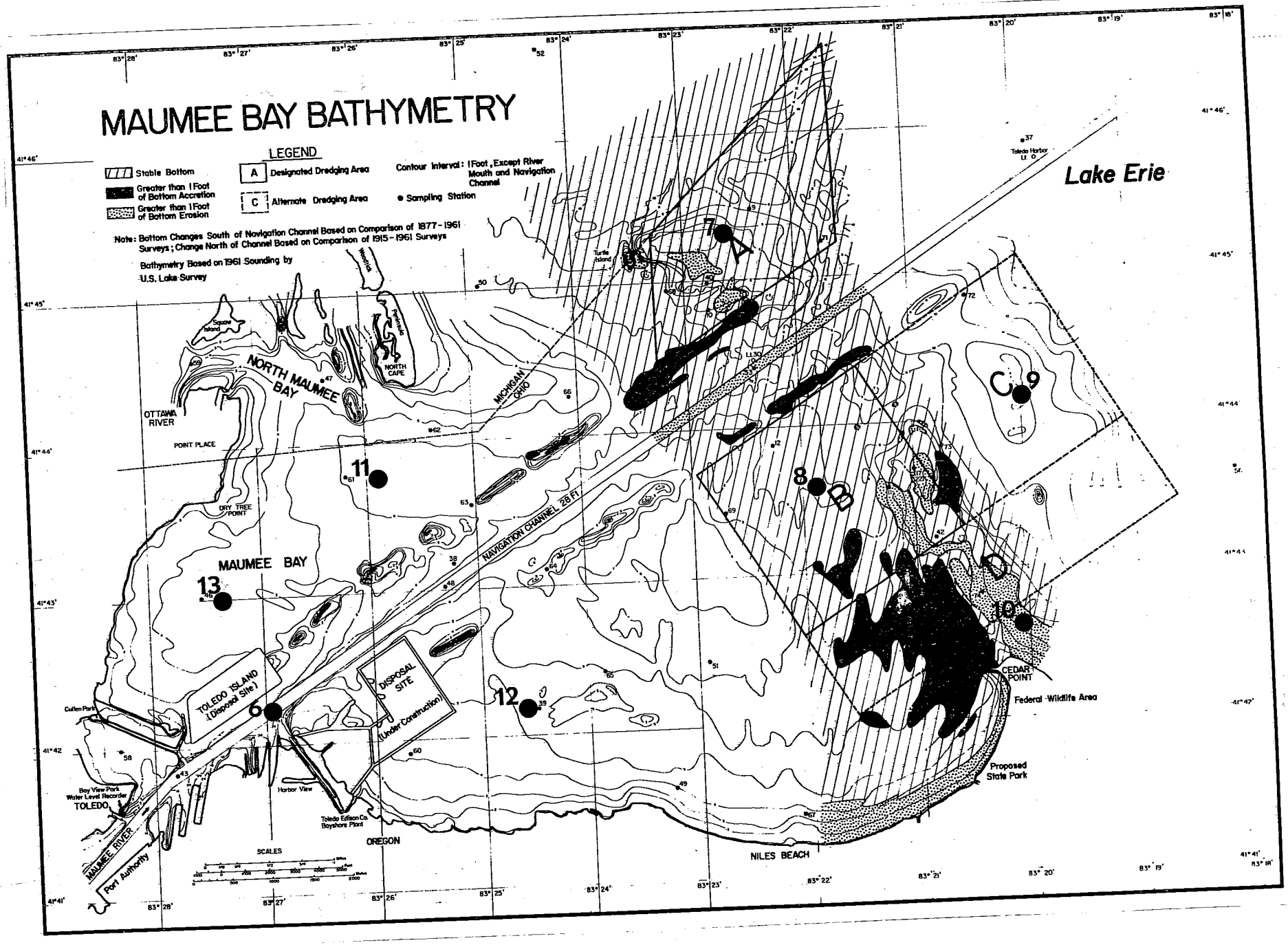
●Fish larvae sampling station

FIGURE 1. Lower Maumee River and Maumee Bay Sampling Area



● Fish larvae sampling station

FIGURE 2. Maumee River Estuary Sampling Stations



● Fish larvae sampling station

FIGURE 3. Maumee Bay Sampling Stations

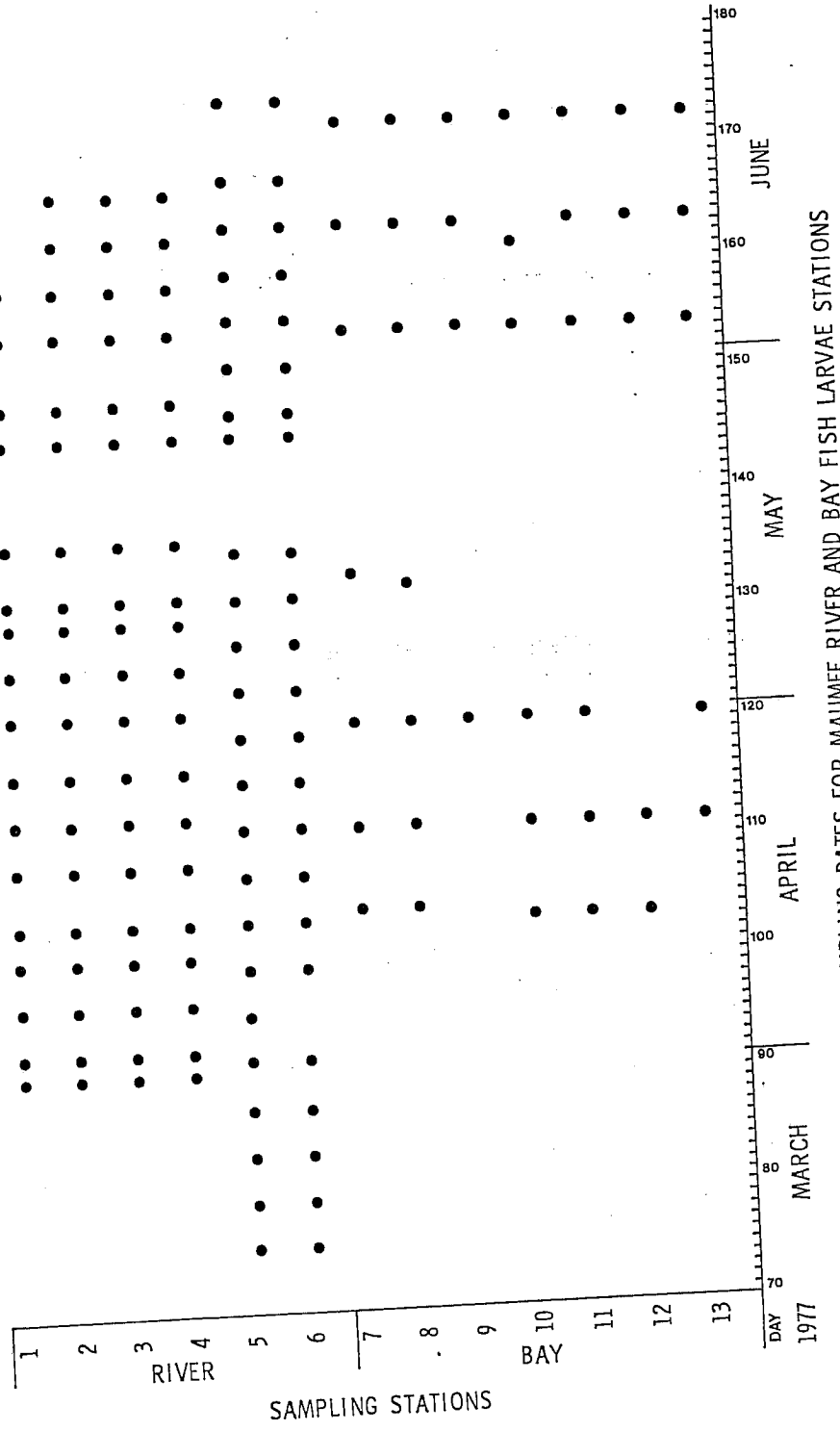


FIGURE 4. SAMPLING DATES FOR MAUMEE RIVER AND BAY FISH LARVAE STATIONS

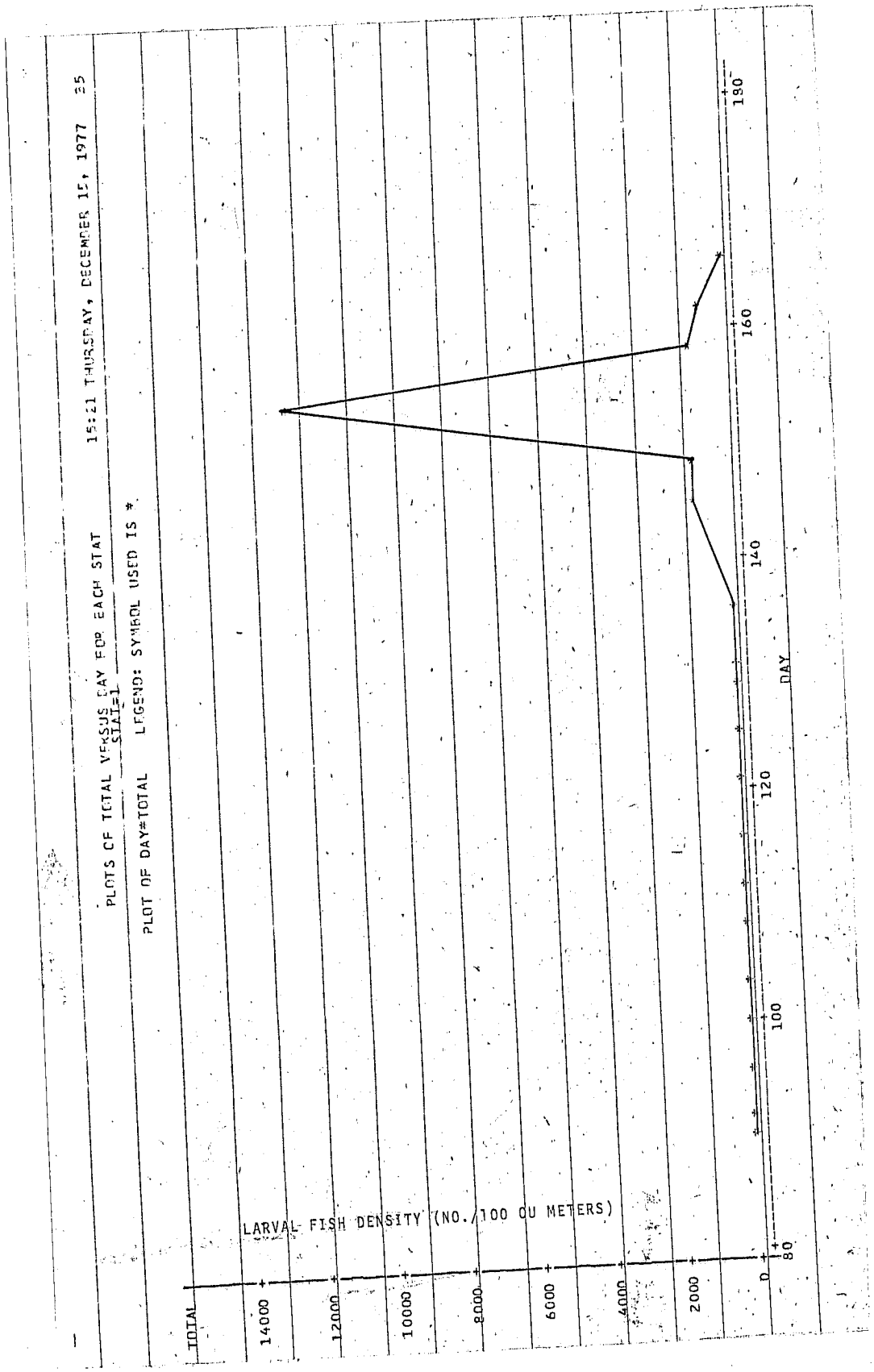


FIGURE 5. TOTAL FISH LARVAE DENSITY AT STATION 1 (1977)

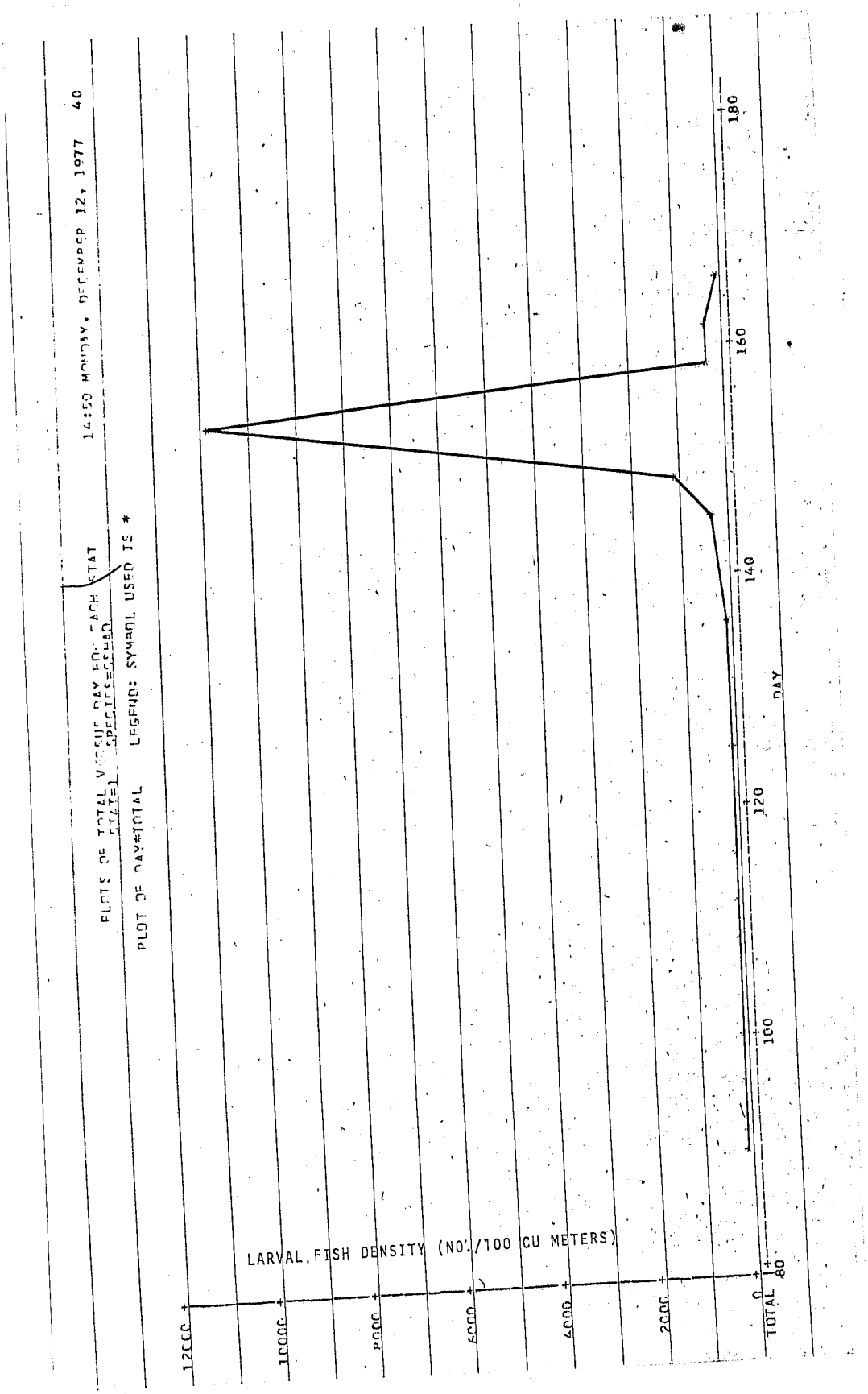


FIGURE 6. GIZZARD SHAD LARVAE DENSITY AT STATION 1 (1977)

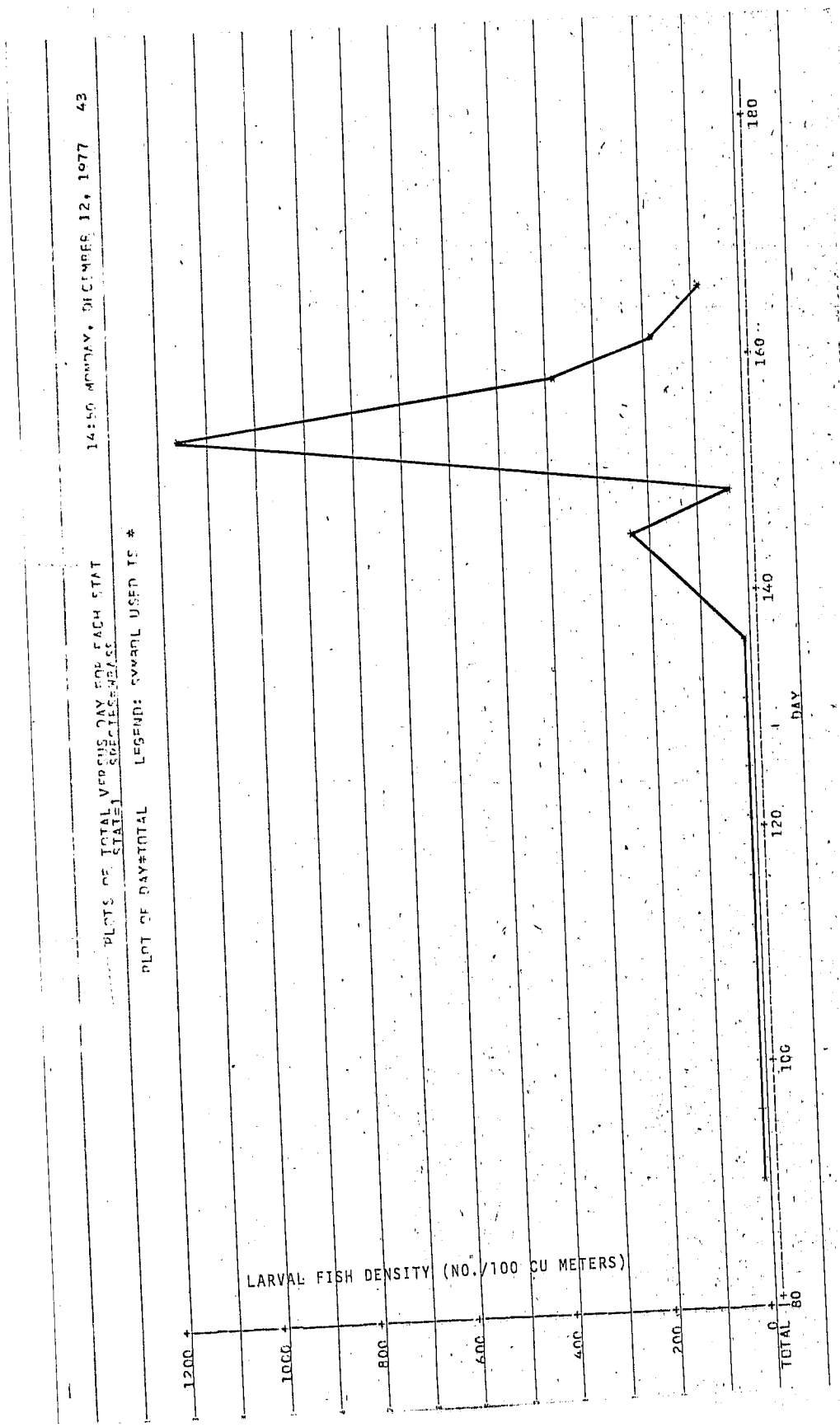


FIGURE 7. WHITE BASS LARVAE DENSITY AT STATION 1 (1977)

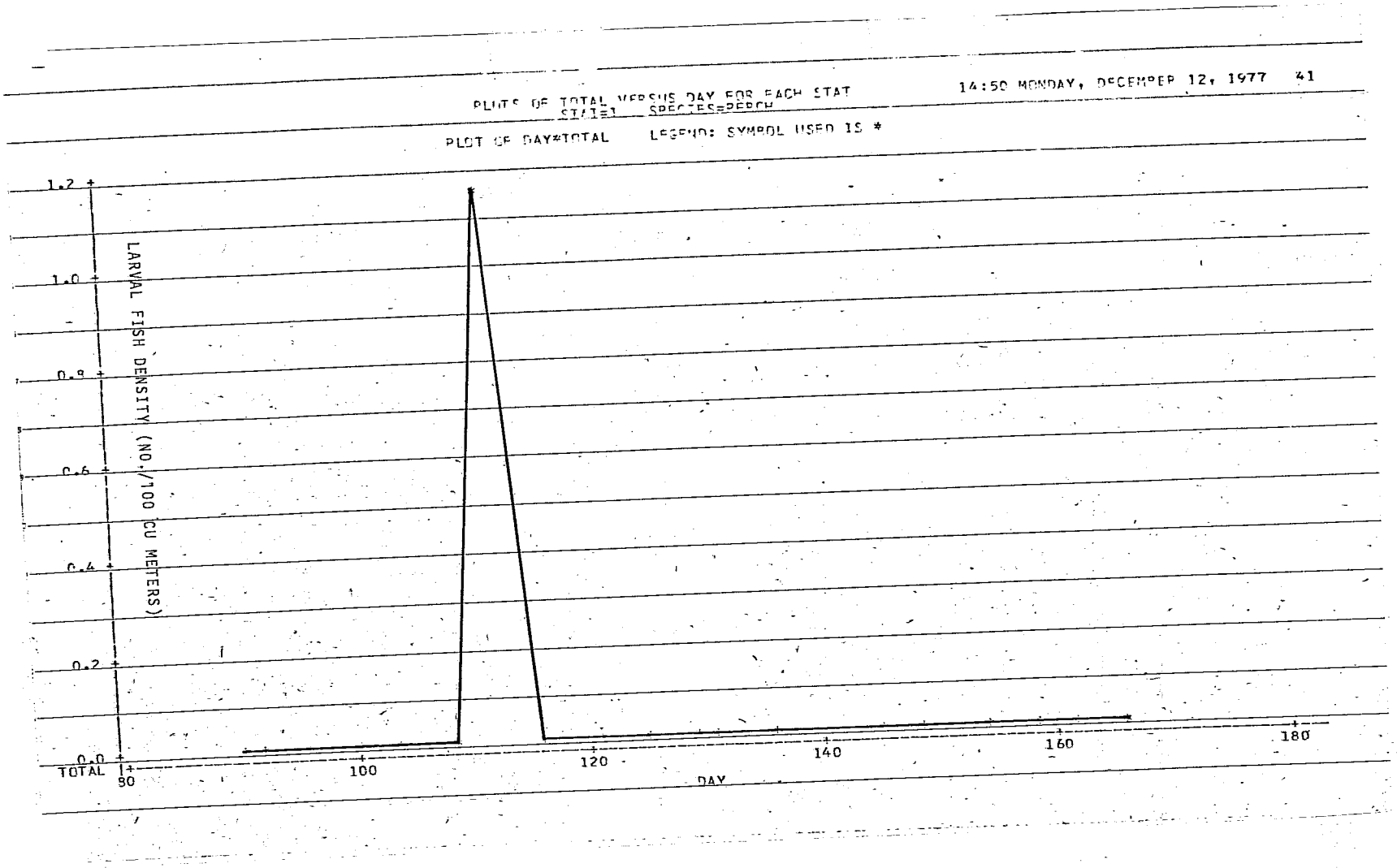


FIGURE 8. YELLOW PERCH LARVAE DENSITY AT STATION 1 (1977)

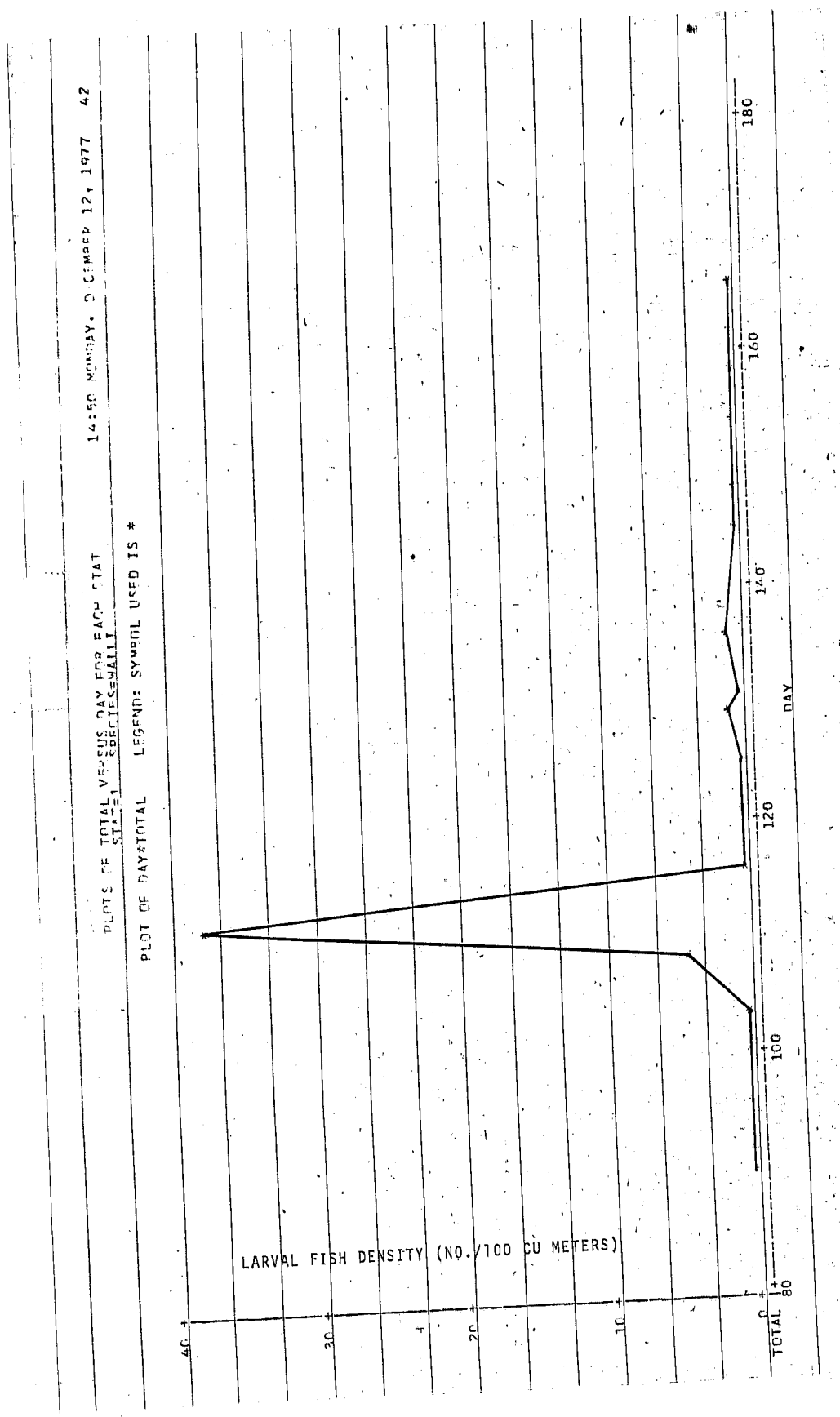


FIGURE 9. WALLEYE LARVAE DENSITY AT STATION 1 (1977)

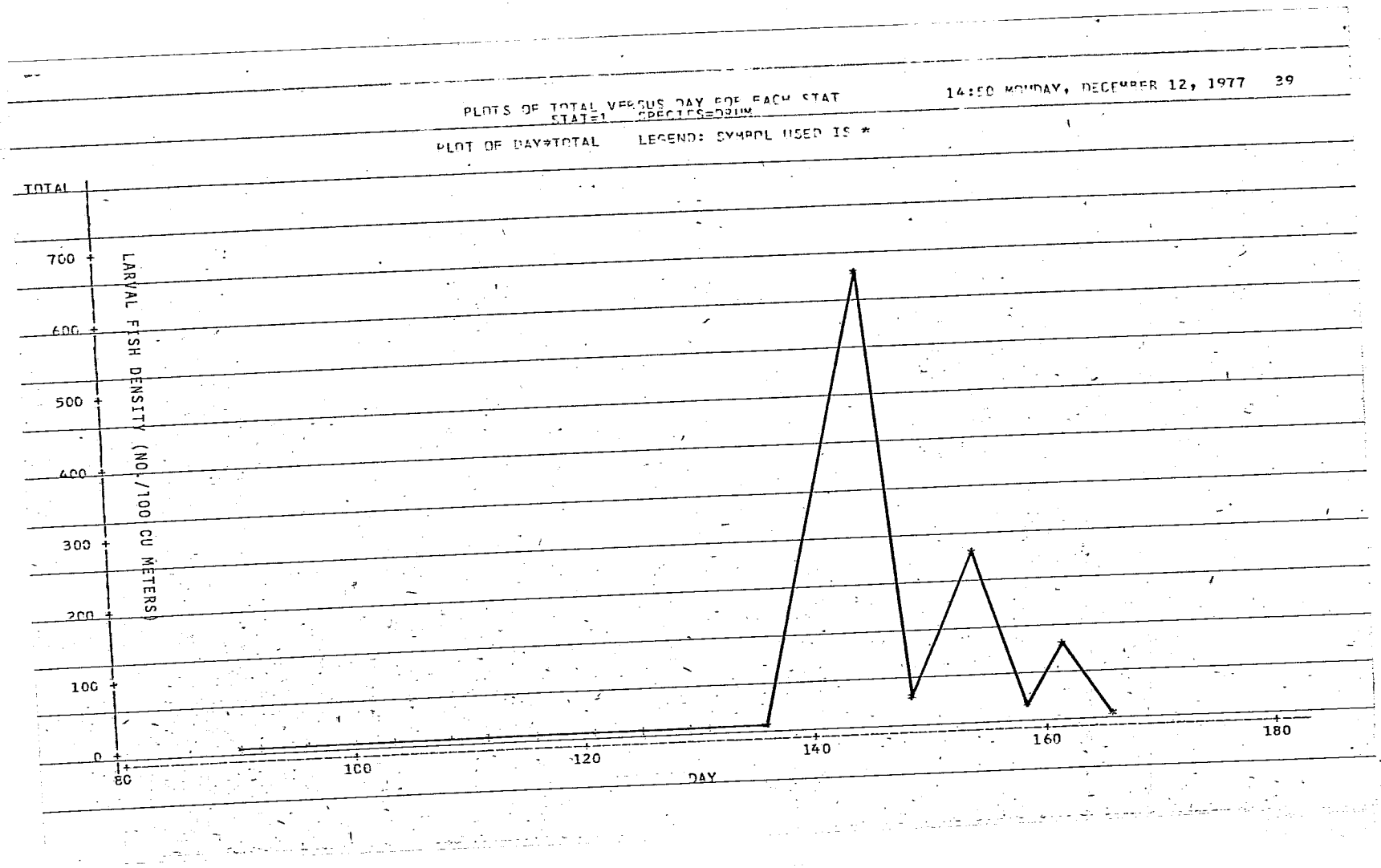


FIGURE 10. FRESHWATER DRUM LARVAE DENSITY AT STATION 1 (1977)

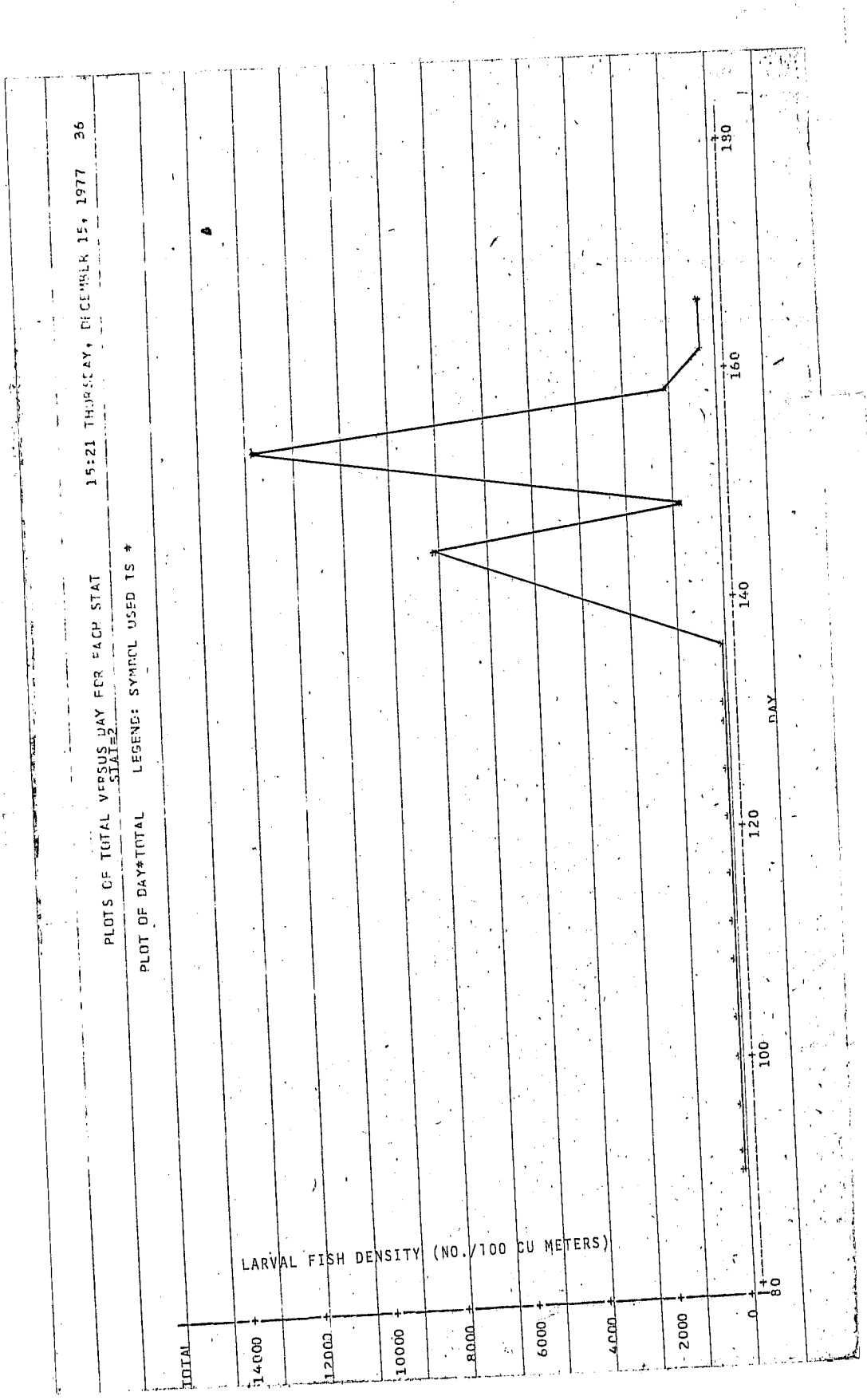


FIGURE 11. TOTAL FISH LARVAE DENSITY AT STATION 2 (1977)

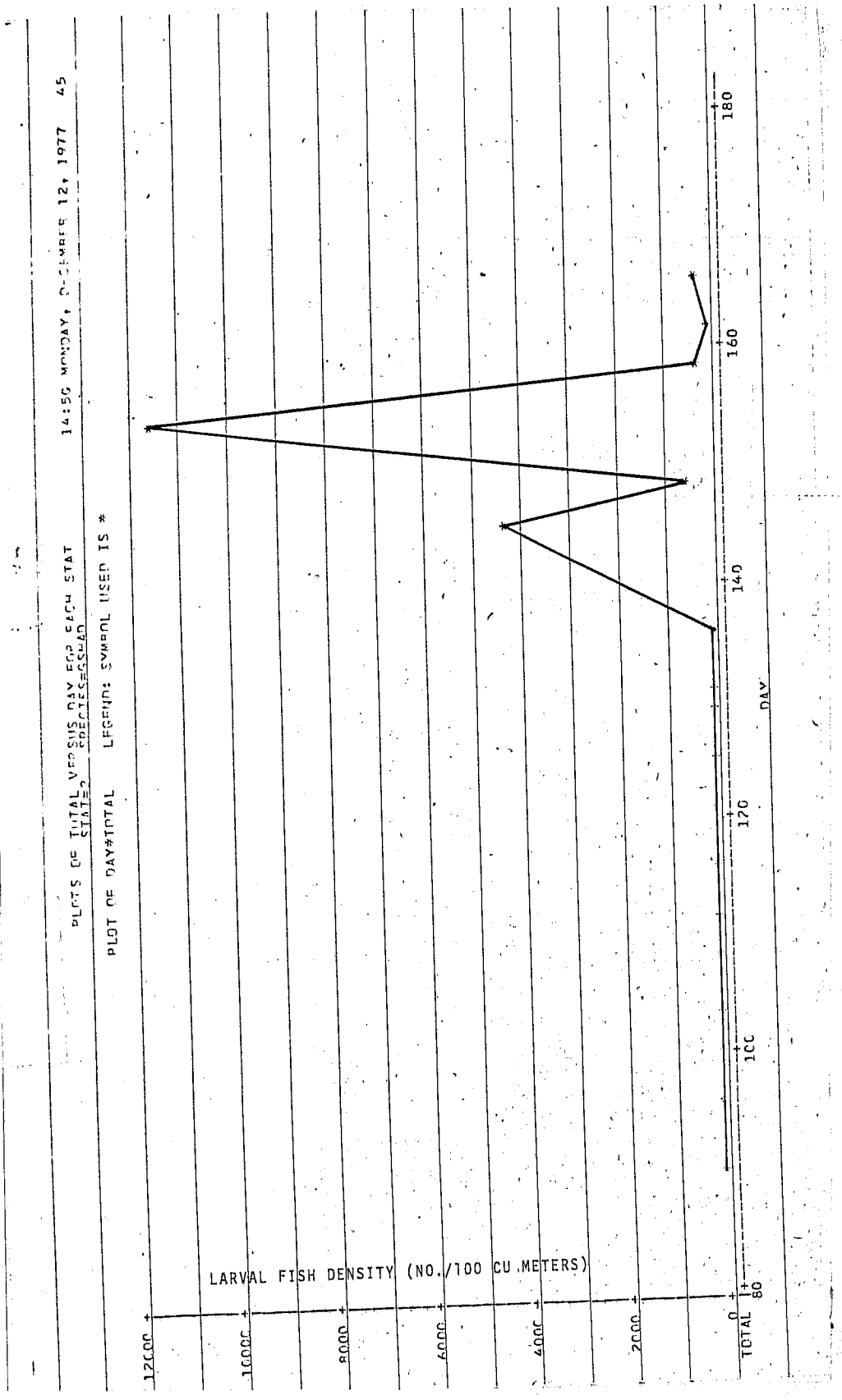


FIGURE 12. GIZZARD SHAD LARVAE DENSITY AT STATION 2 (1977)

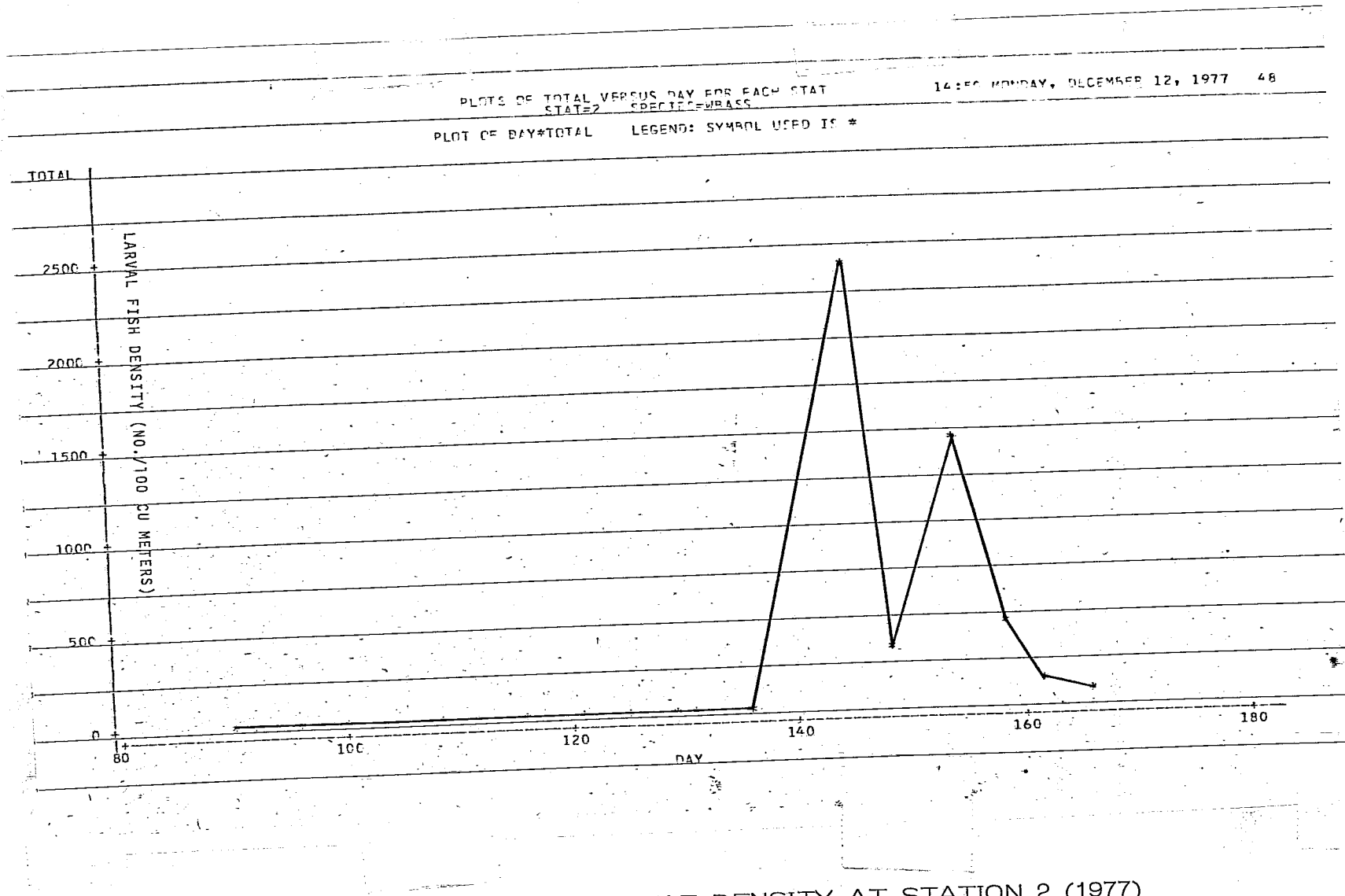


FIGURE 13. WHITE BASS LARVAE DENSITY AT STATION 2 (1977)

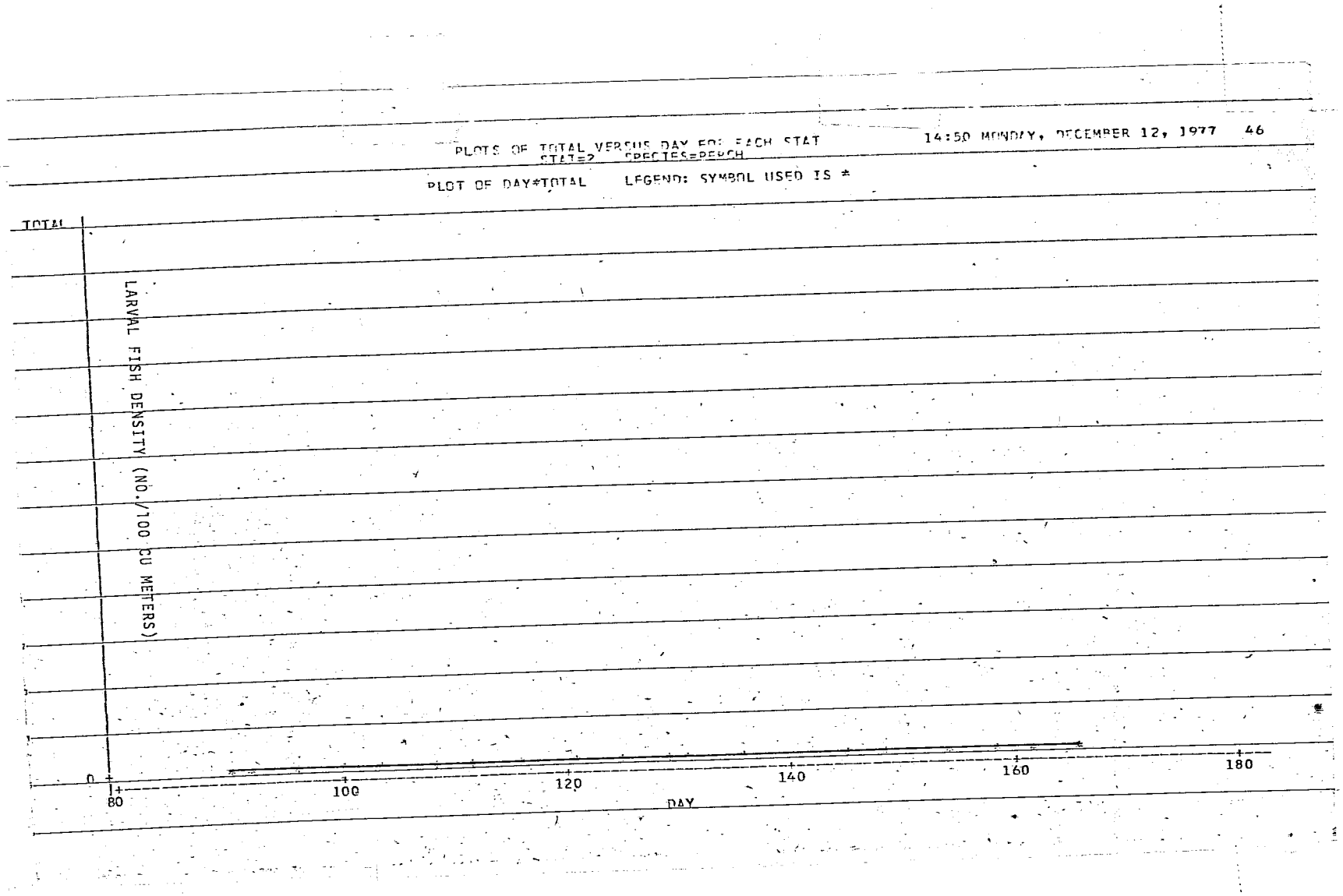


FIGURE 14. YELLOW PERCH LARVAE DENSITY AT STATION 2 (1977)

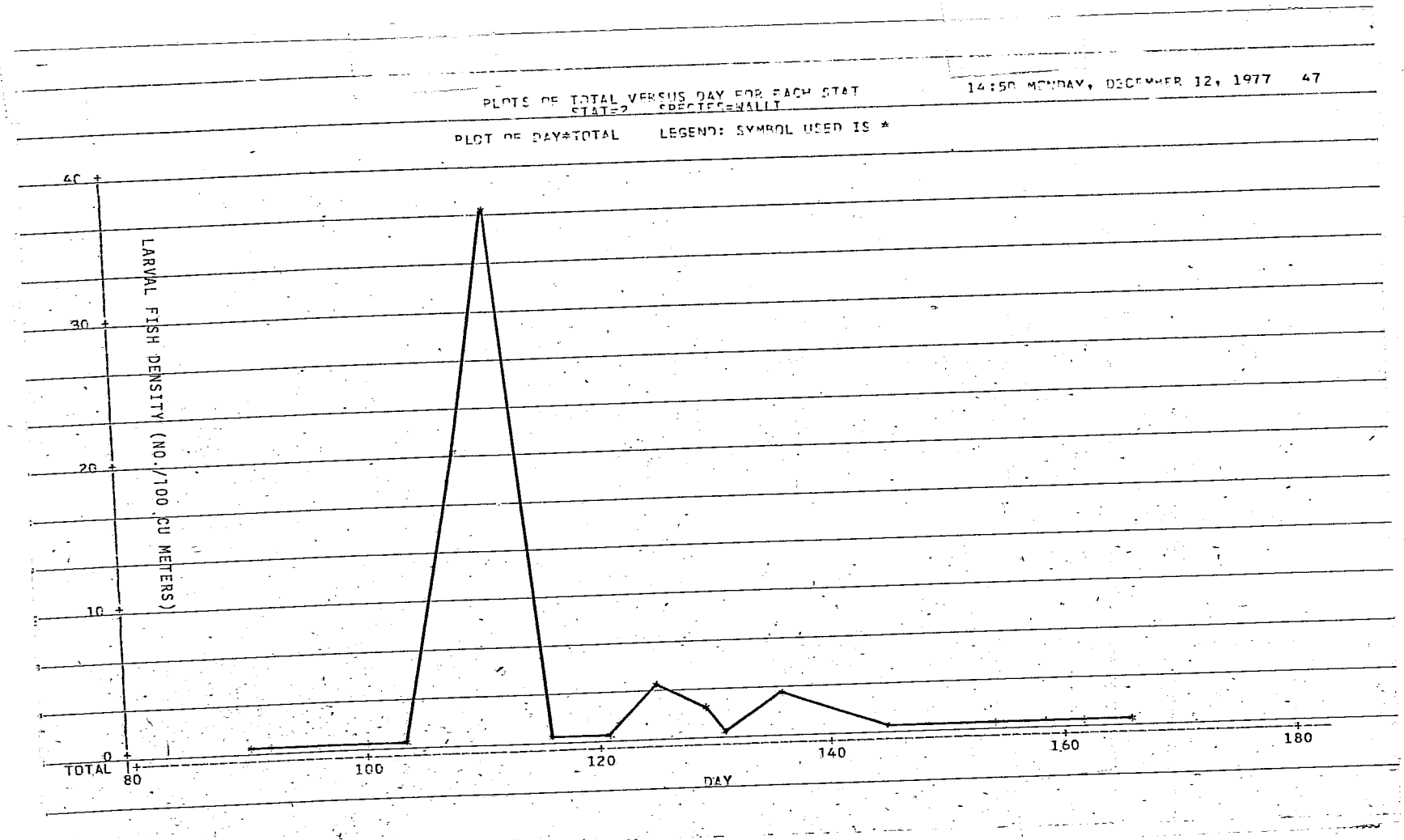


FIGURE 15. WALLEYE LARVAE DENSITY AT STATION 2 (1977)

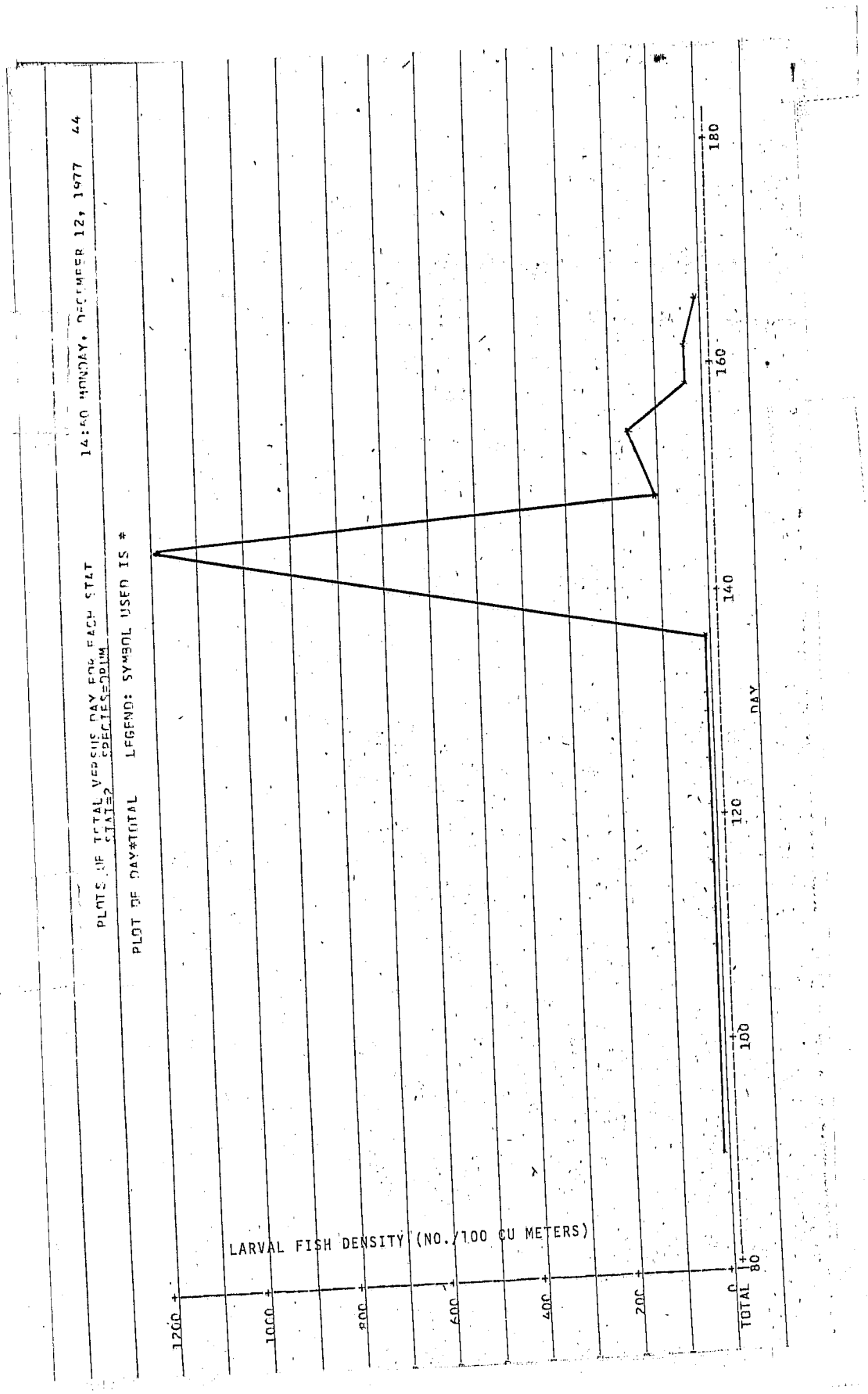


FIGURE 16. FRESHWATER DRUM LARVAE DENSITY AT STATION 2 (1977)

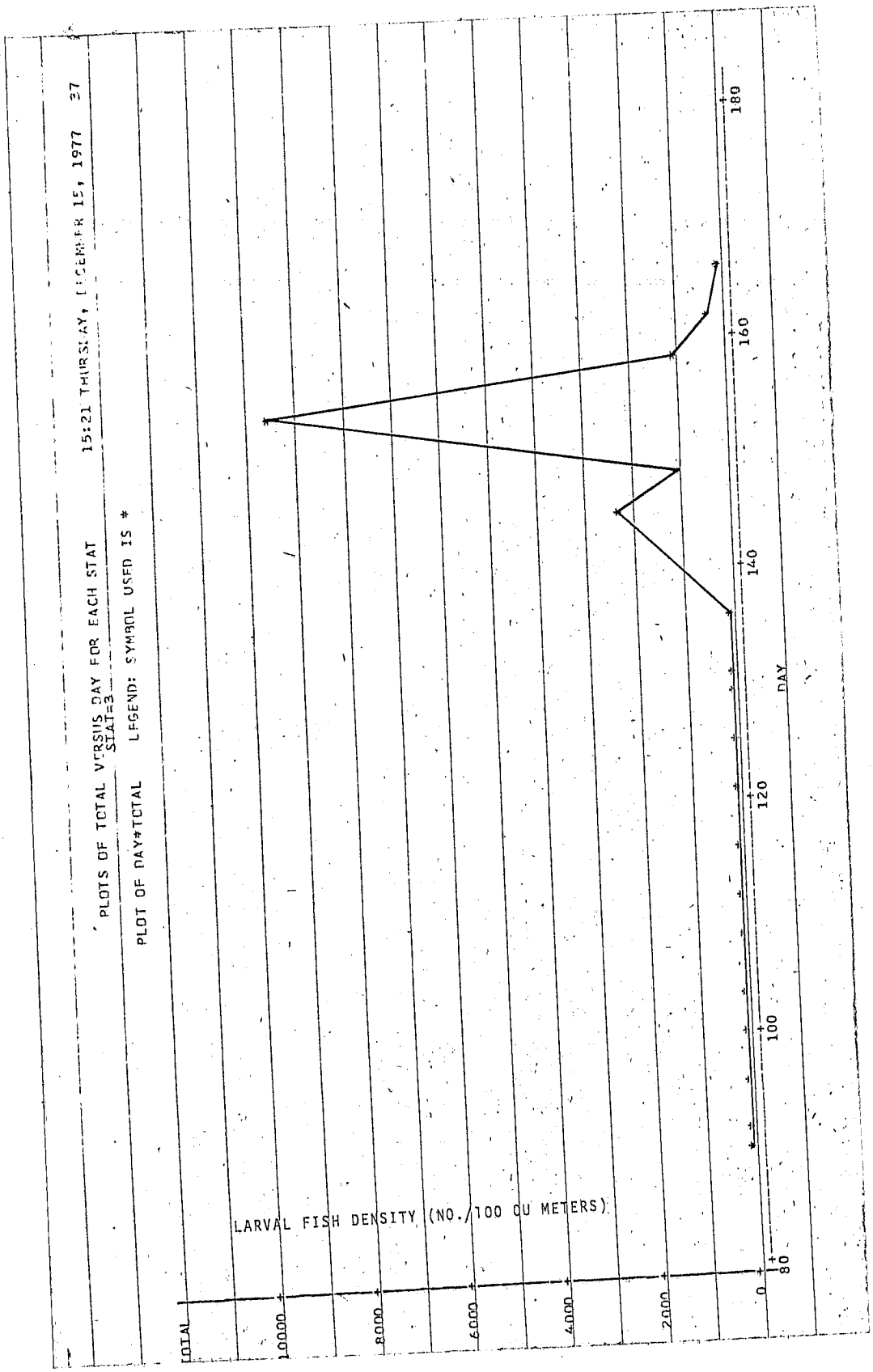


FIGURE 17. TOTAL FISH LARVAE DENSITY AT STATION 3 (1977)

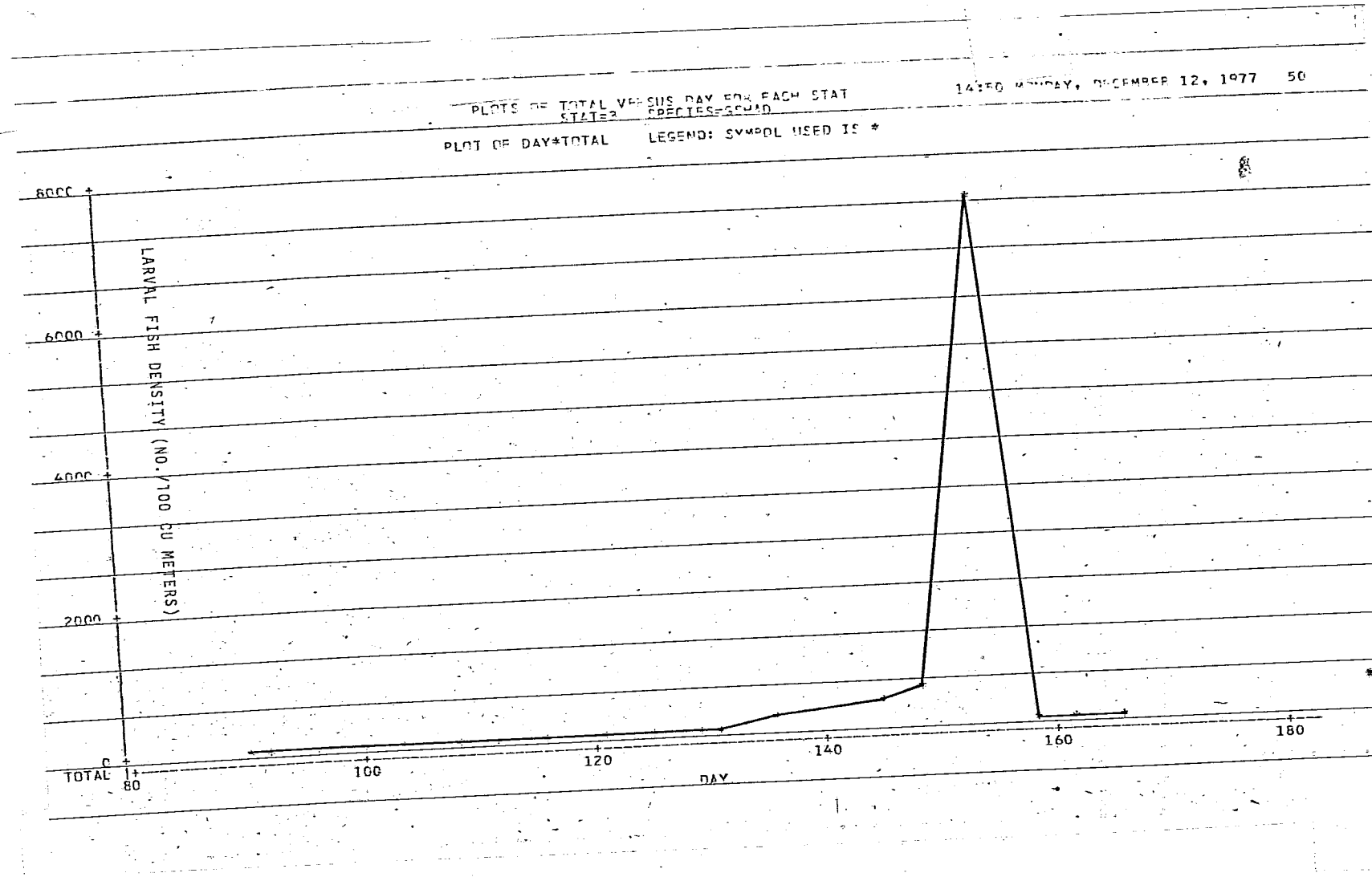


FIGURE 18. GIZZARD SHAD LARVAE DENSITY AT STATION 3 (1977)

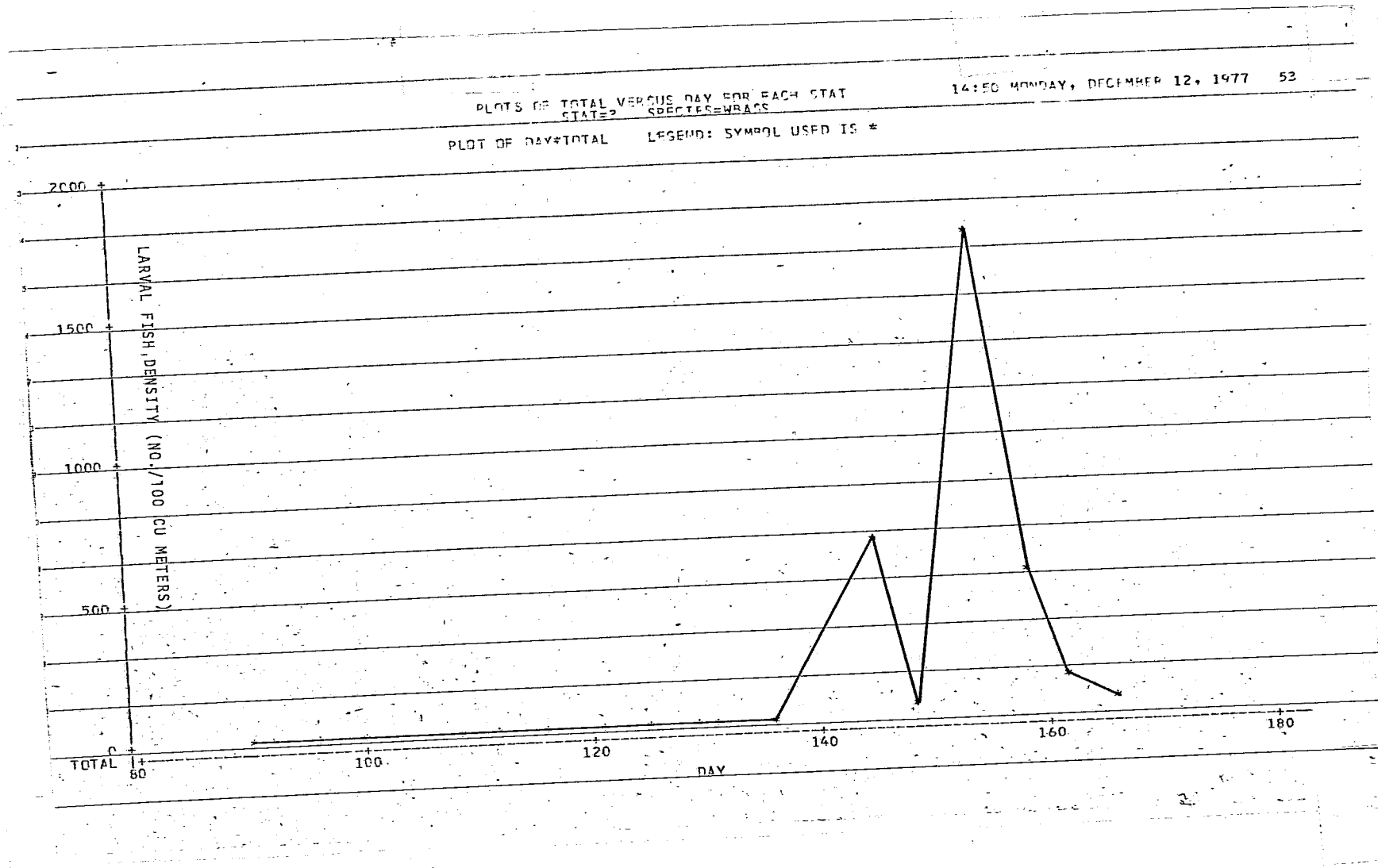


FIGURE 19. WHITE BASS LARVAE DENSITY AT STATION 3 (1977)

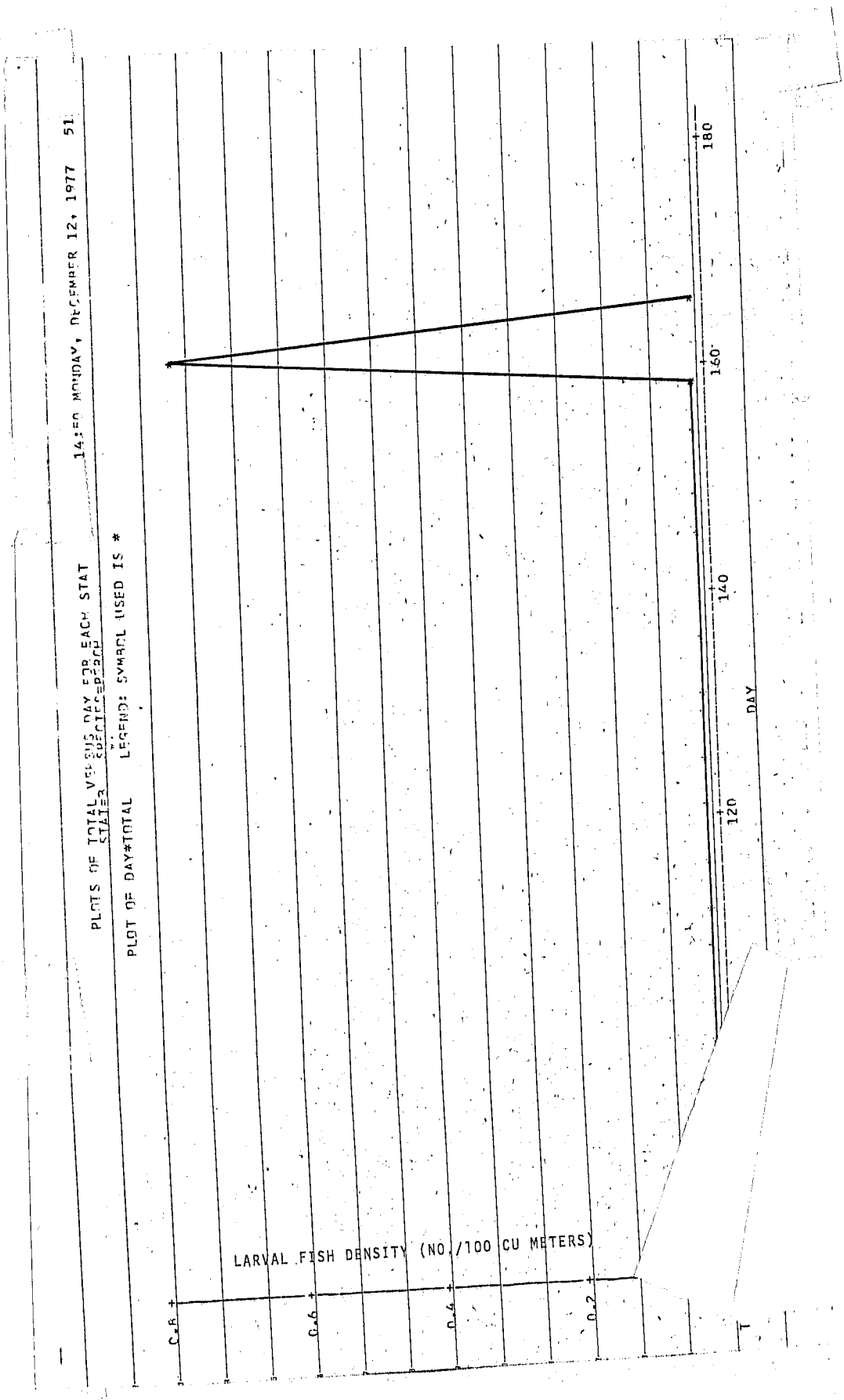


FIGURE 20. YELLOW PERCH LARVAE DENSITY AT STATION 3 (1977)

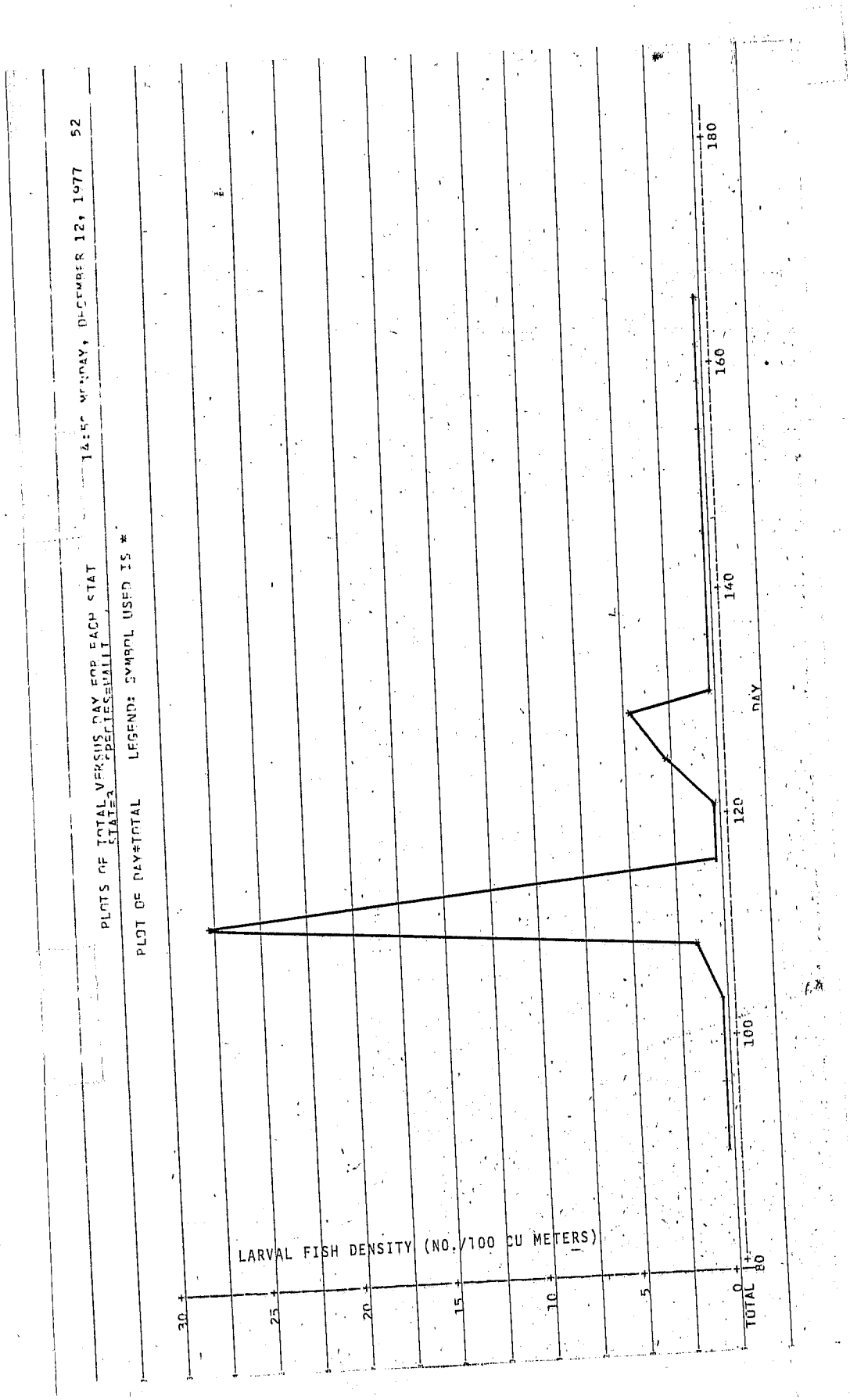


FIGURE 21. WALLEYE LARVAE DENSITY AT STATION 3 (1977)

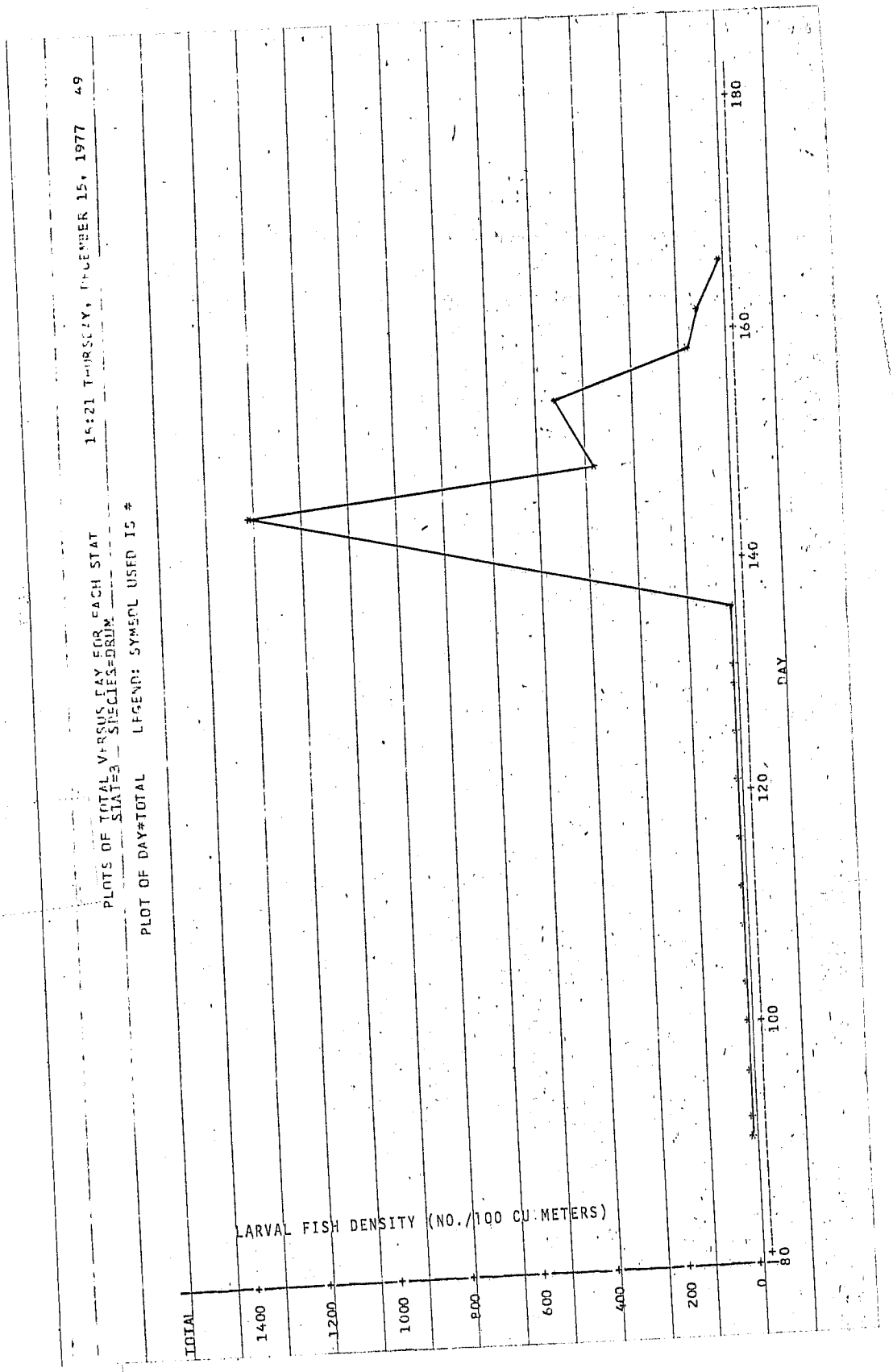


FIGURE 22. FRESHWATER DRUM LARVAE DENSITY AT STATION 3 (1977)

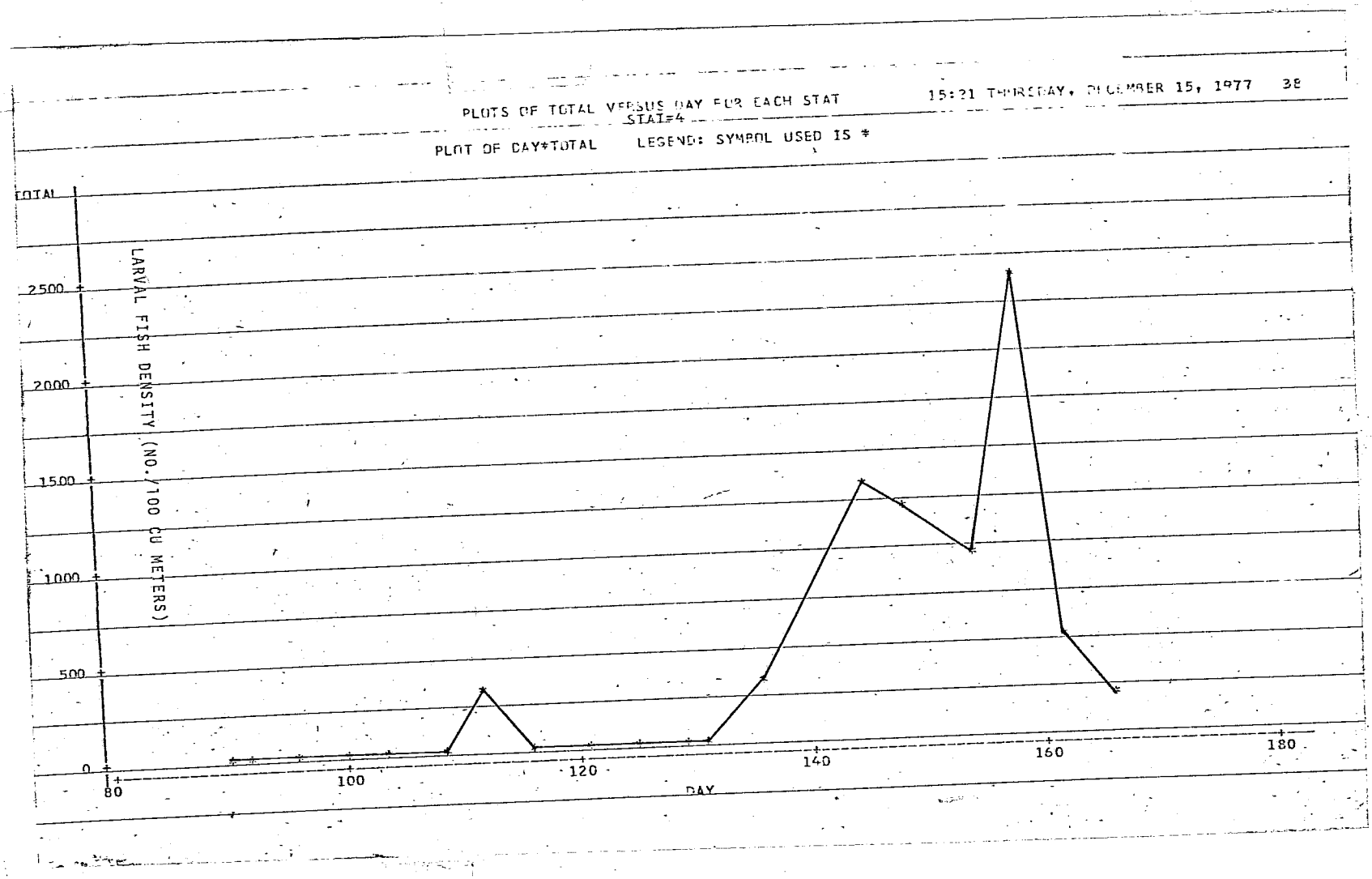


FIGURE 23. TOTAL FISH LARVAE DENSITY AT STATION 4 (1977)

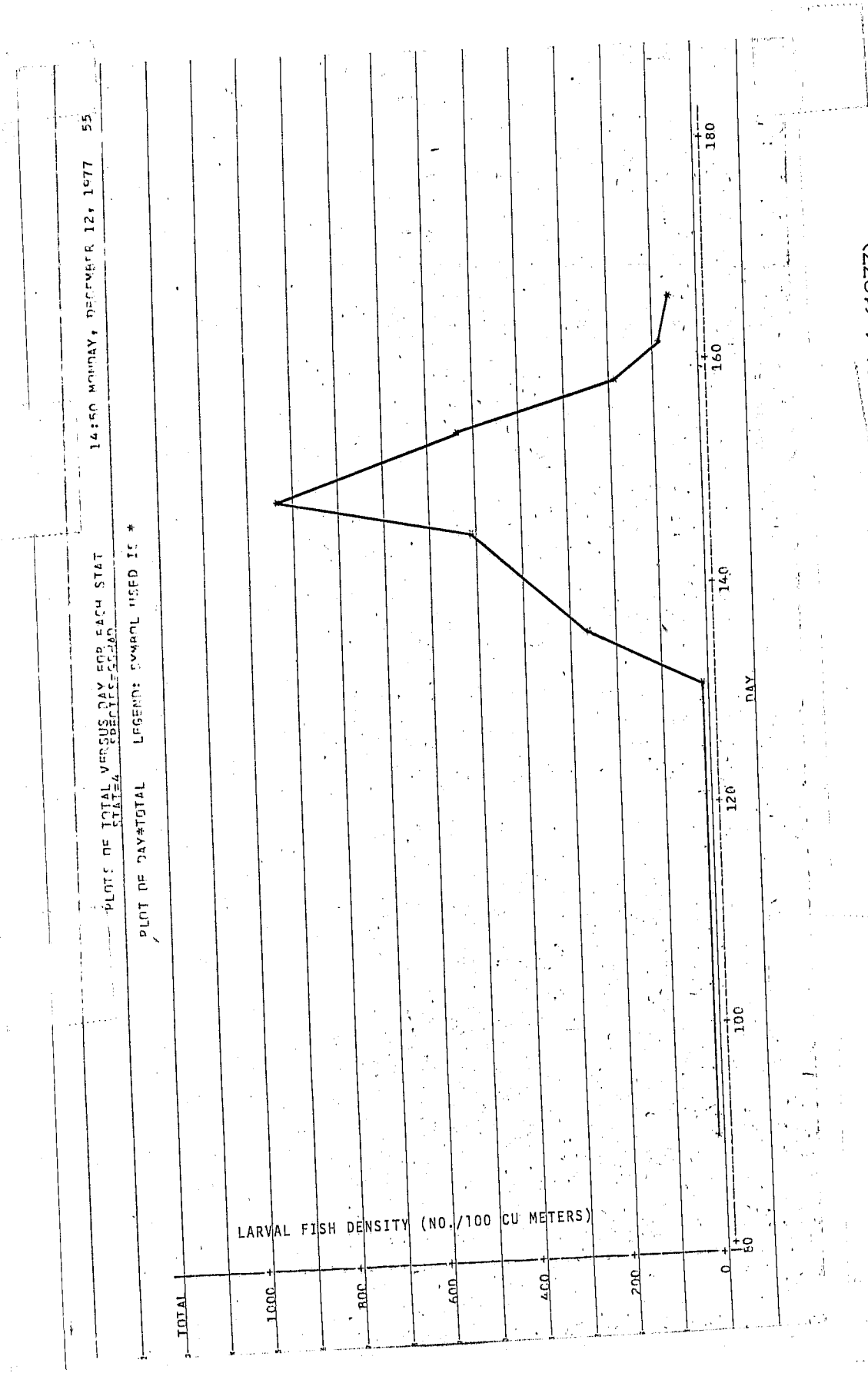


FIGURE 24. GIZZARD SHAD LARVAE DENSITY AT STATION 4 (1977)

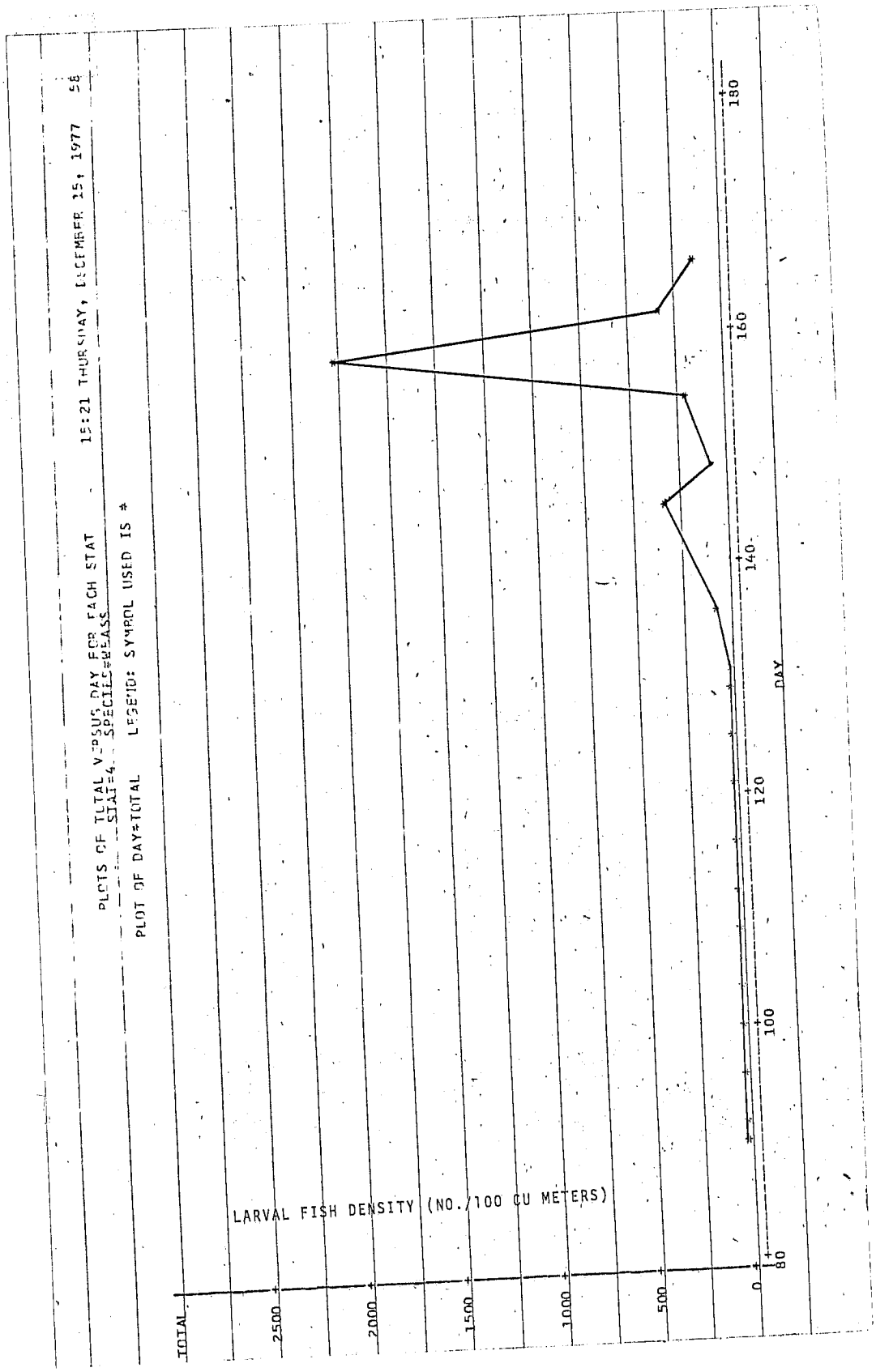


FIGURE 25. WHITE BASS LARVAE DENSITY AT STATION 4 (1977)

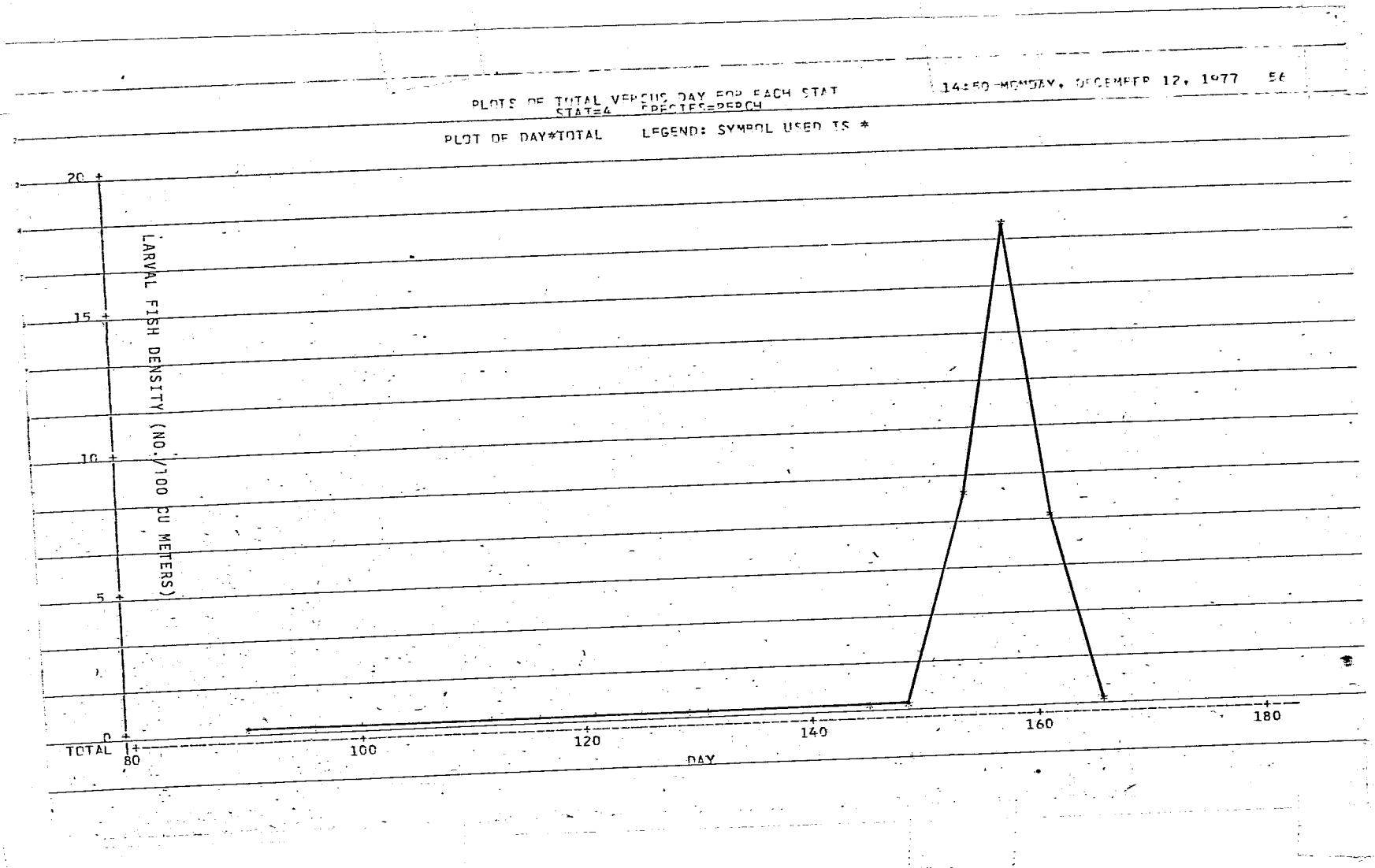


FIGURE 26. YELLOW PERCH LARVAE DENSITY AT STATION 4 (1977)

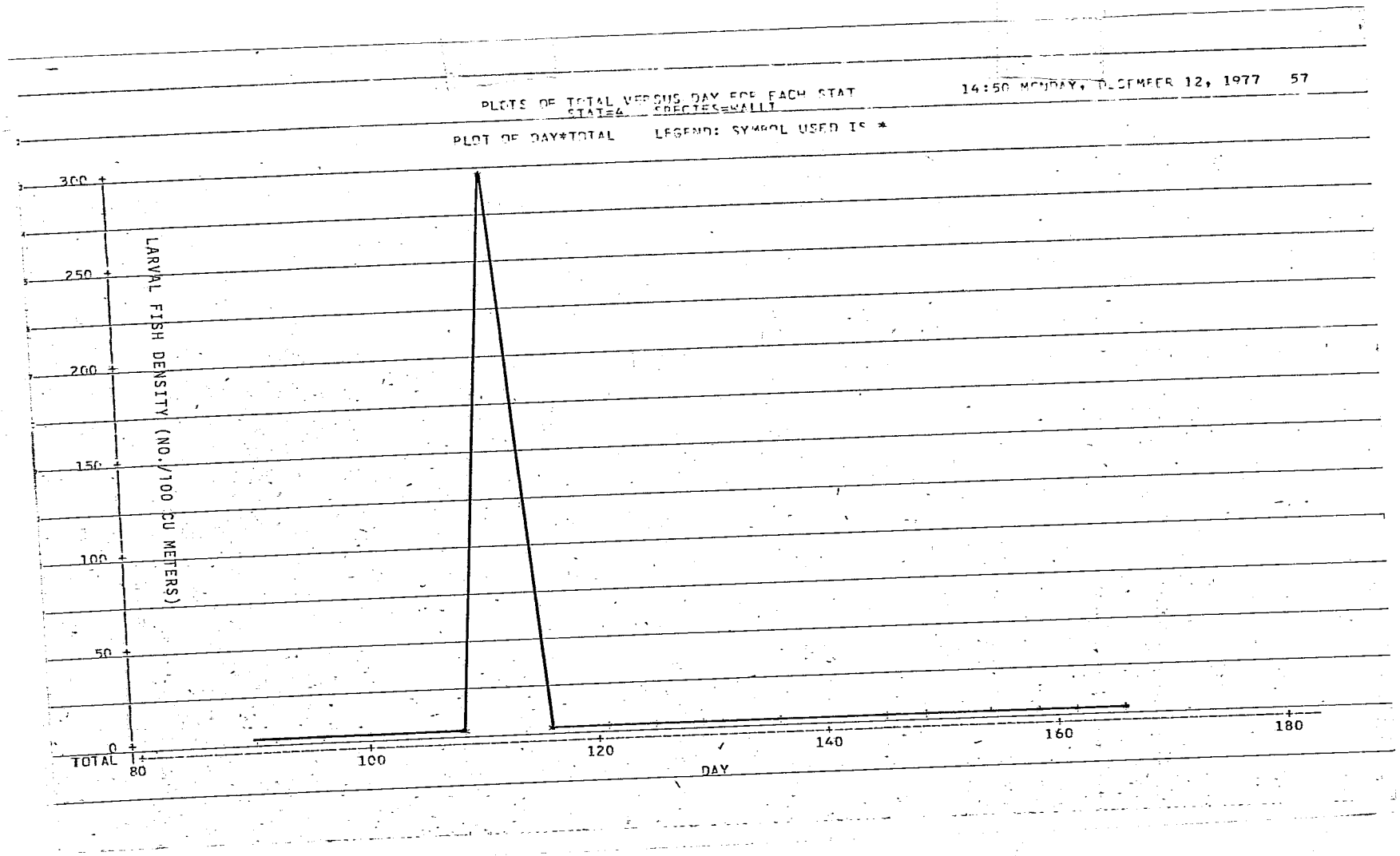


FIGURE 27. WALLEYE LARVAE DENSITY AT STATION 4 (1977)

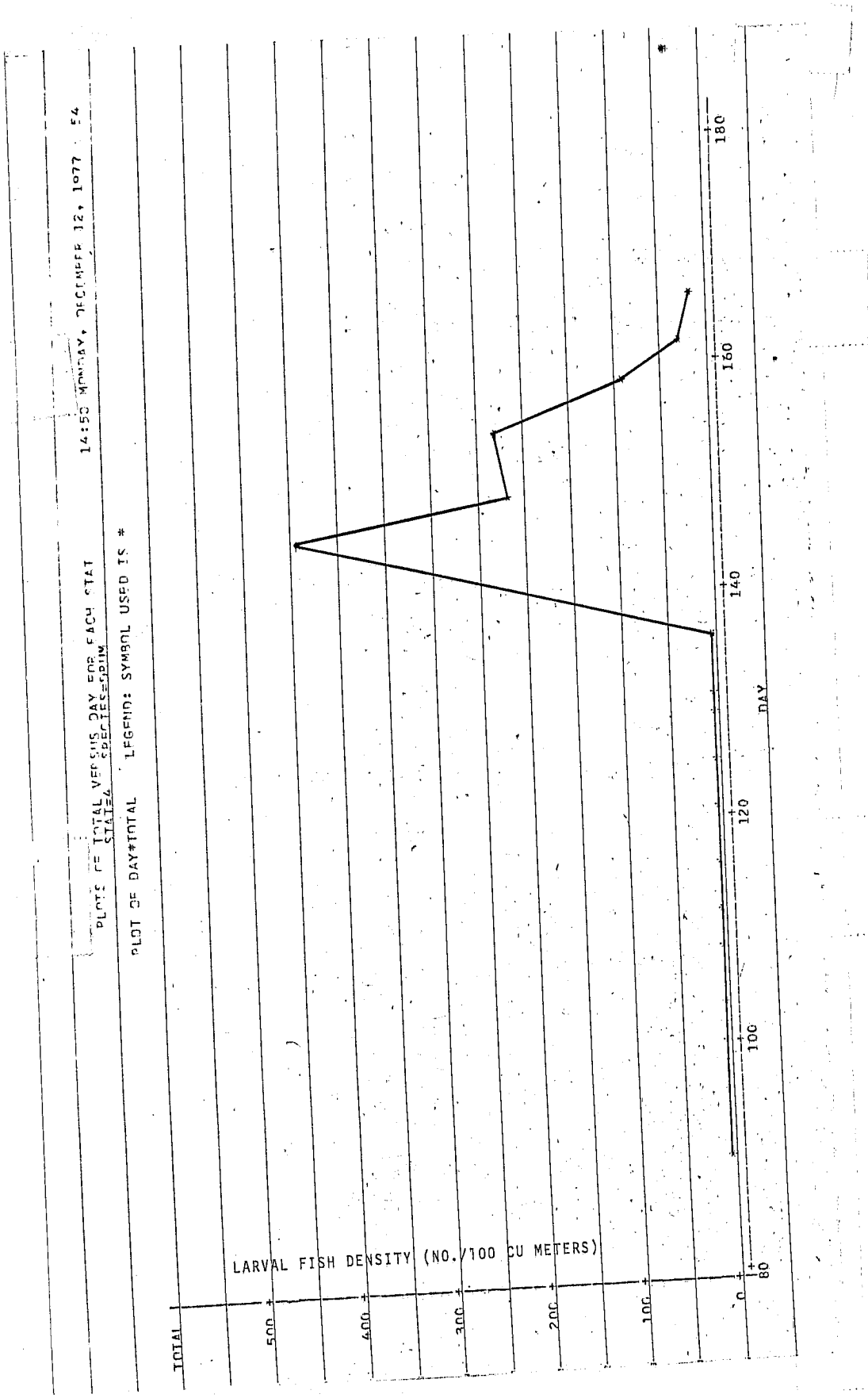


FIGURE 28. FRESHWATER DRUM LARVAE DENSITY AT STATION 4 (1977)

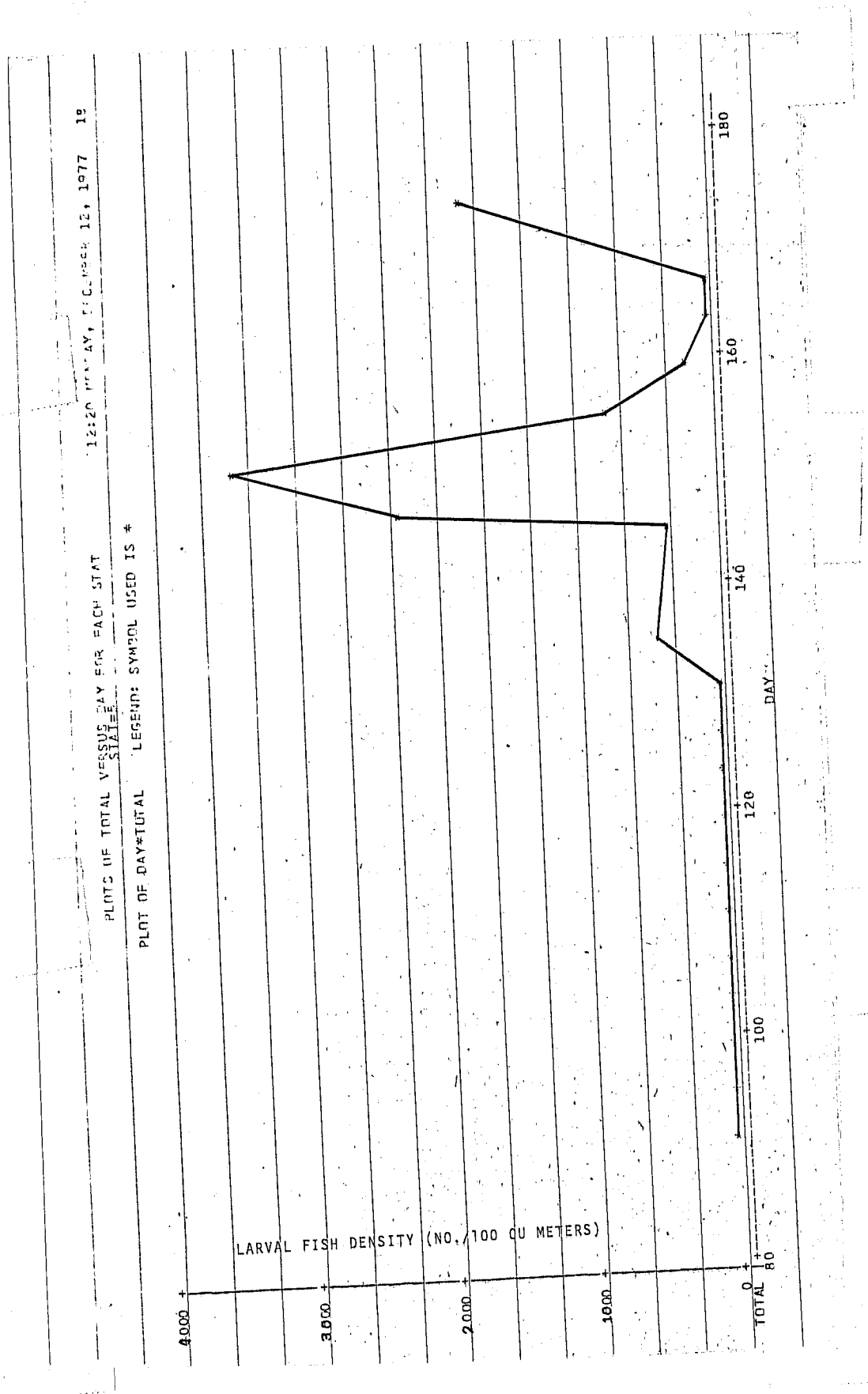


FIGURE 29. TOTAL FISH LARVAE DENSITY AT STATION 5 (1977)

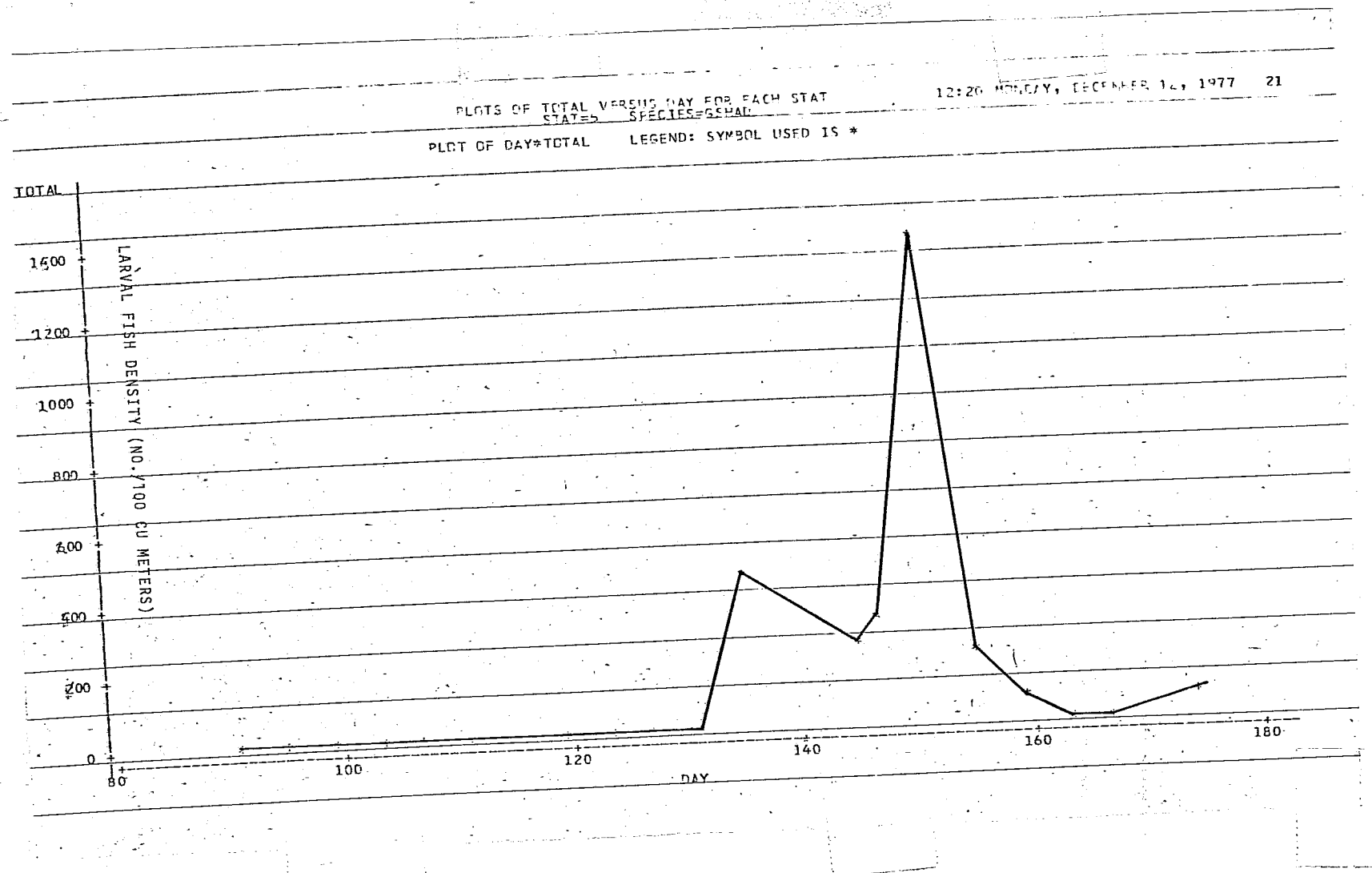


FIGURE 30. GIZZARD SHAD LARVAE DENSITY AT STATION 5 (1977)

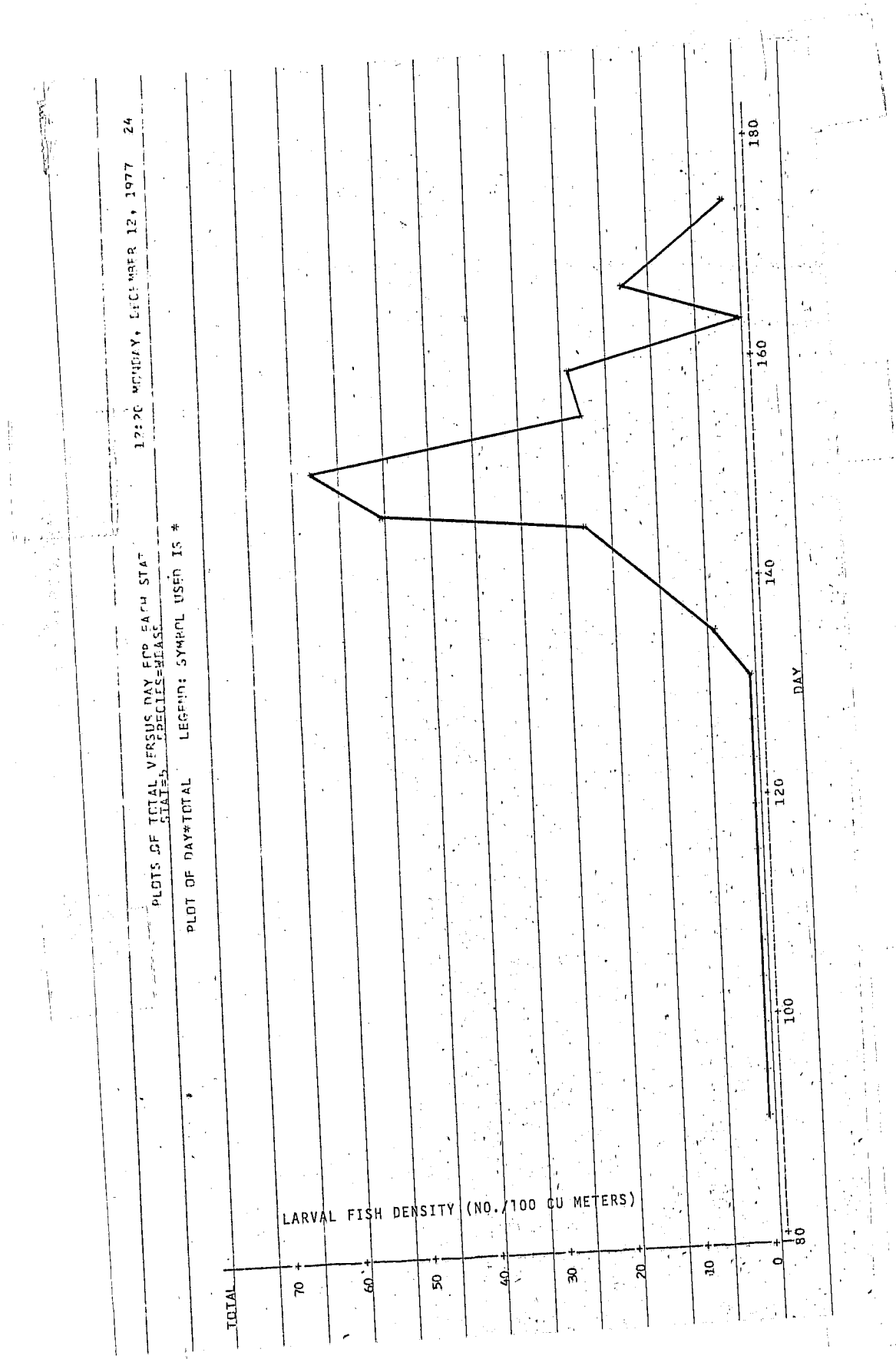


FIGURE 31. WHITE BASS LARVAE DENSITY AT STATION 5 (1977)

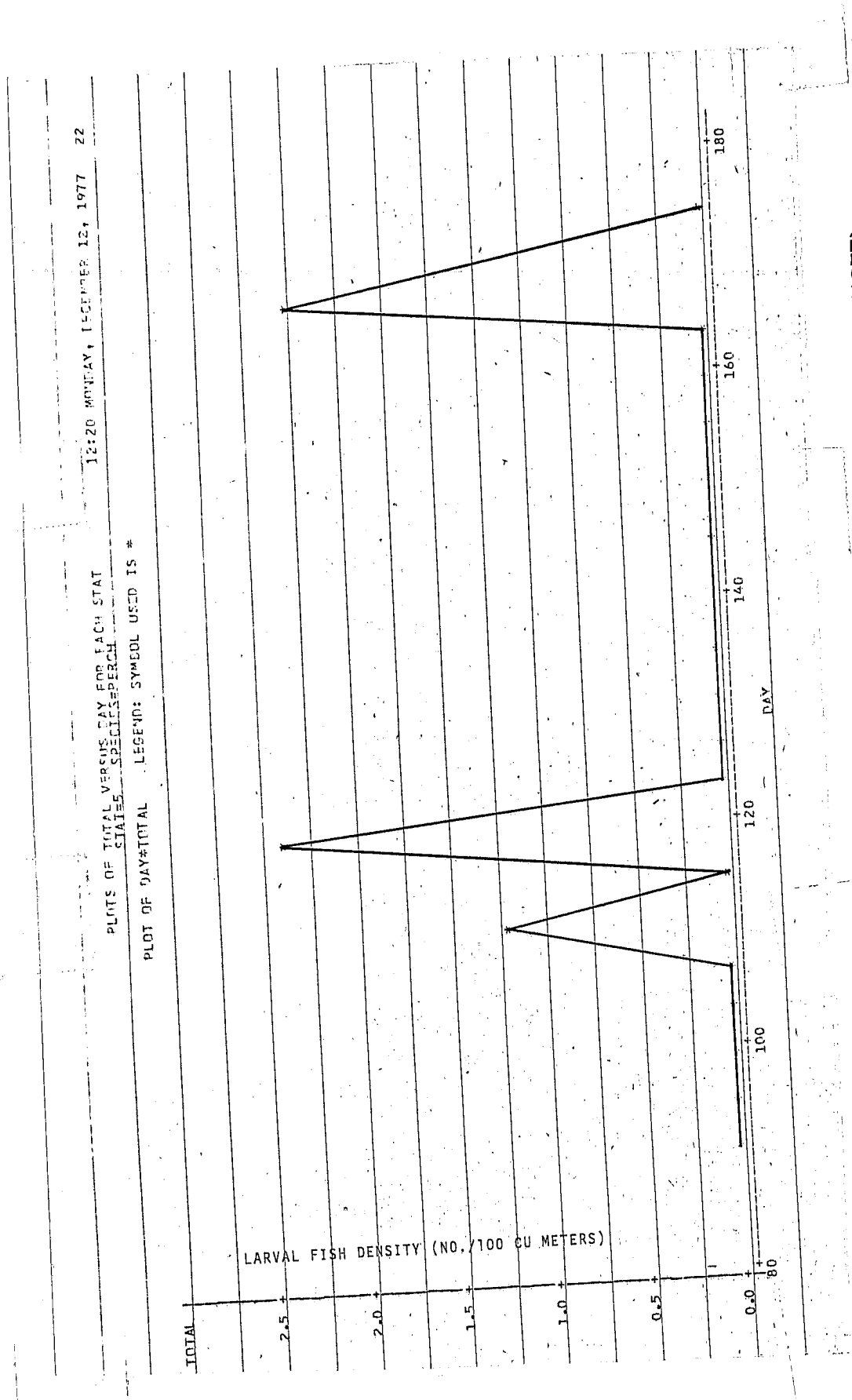


FIGURE 32. YELLOW PERCH LARVAE DENSITY AT STATION 5 (1977)

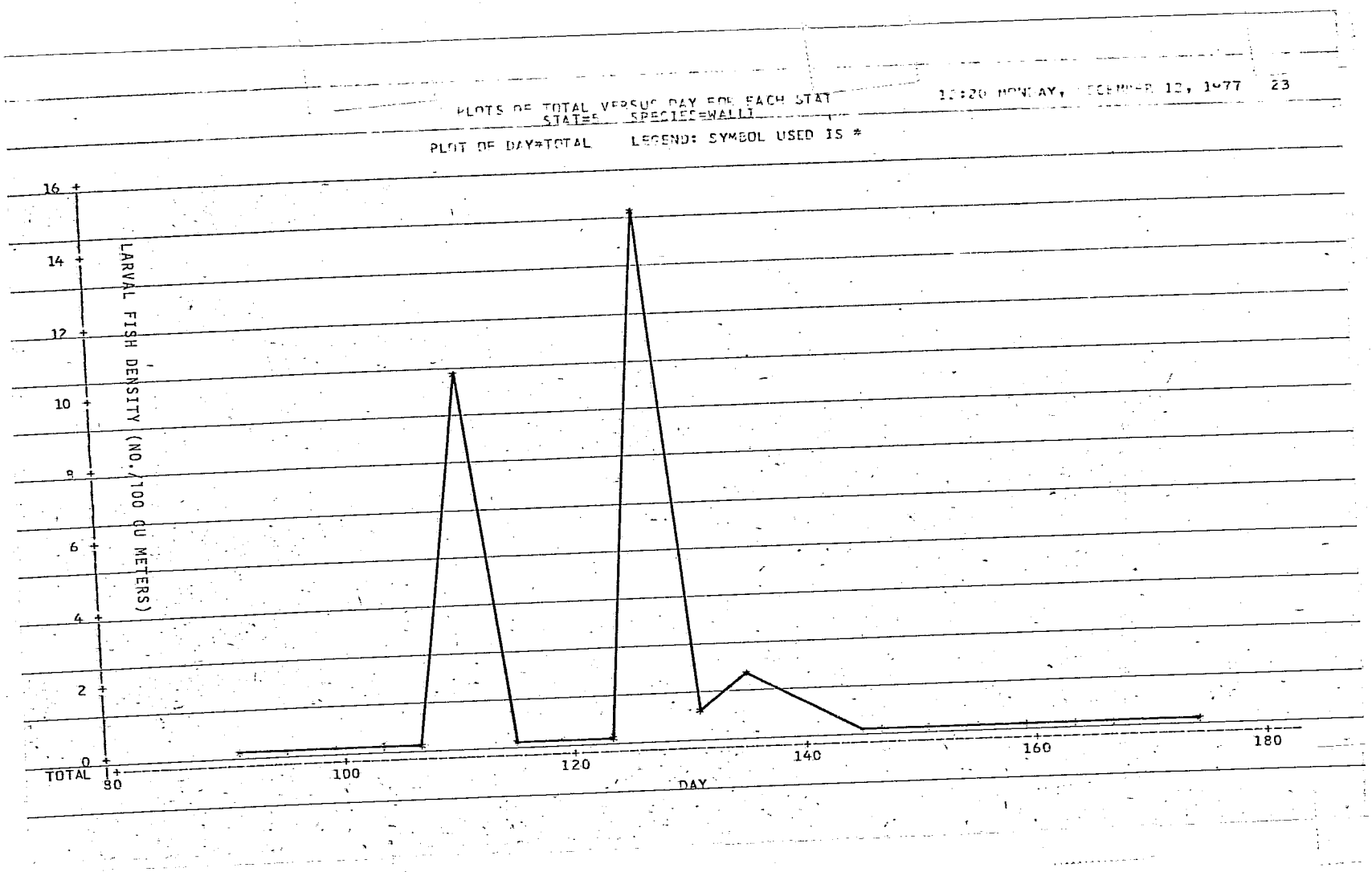


FIGURE 33. WALLEYE LARVAE DENSITY AT STATION 5 (1977)

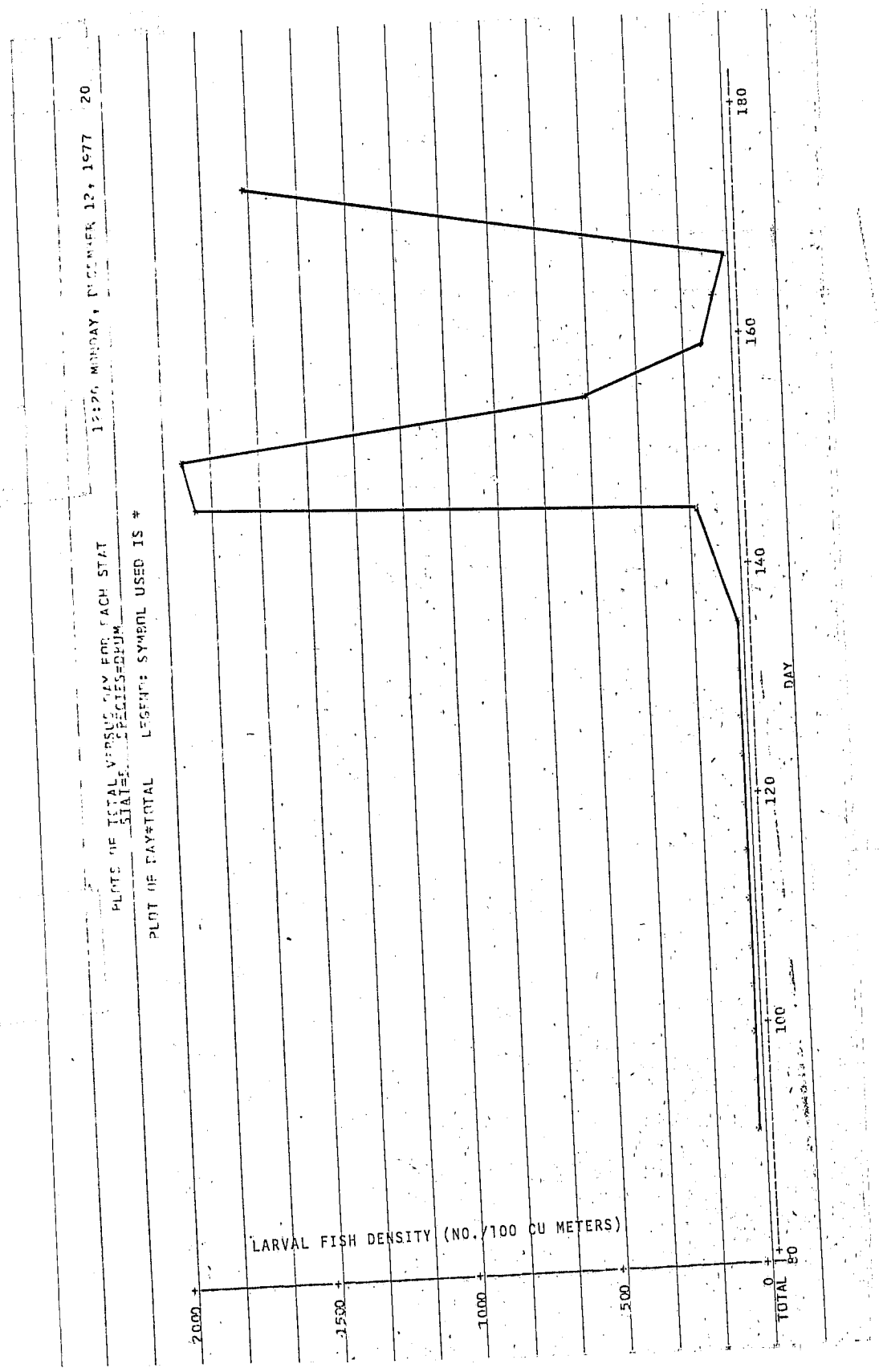


FIGURE 34. FRESHWATER DRUM LARVAE DENSITY AT STATION 5 (1977)

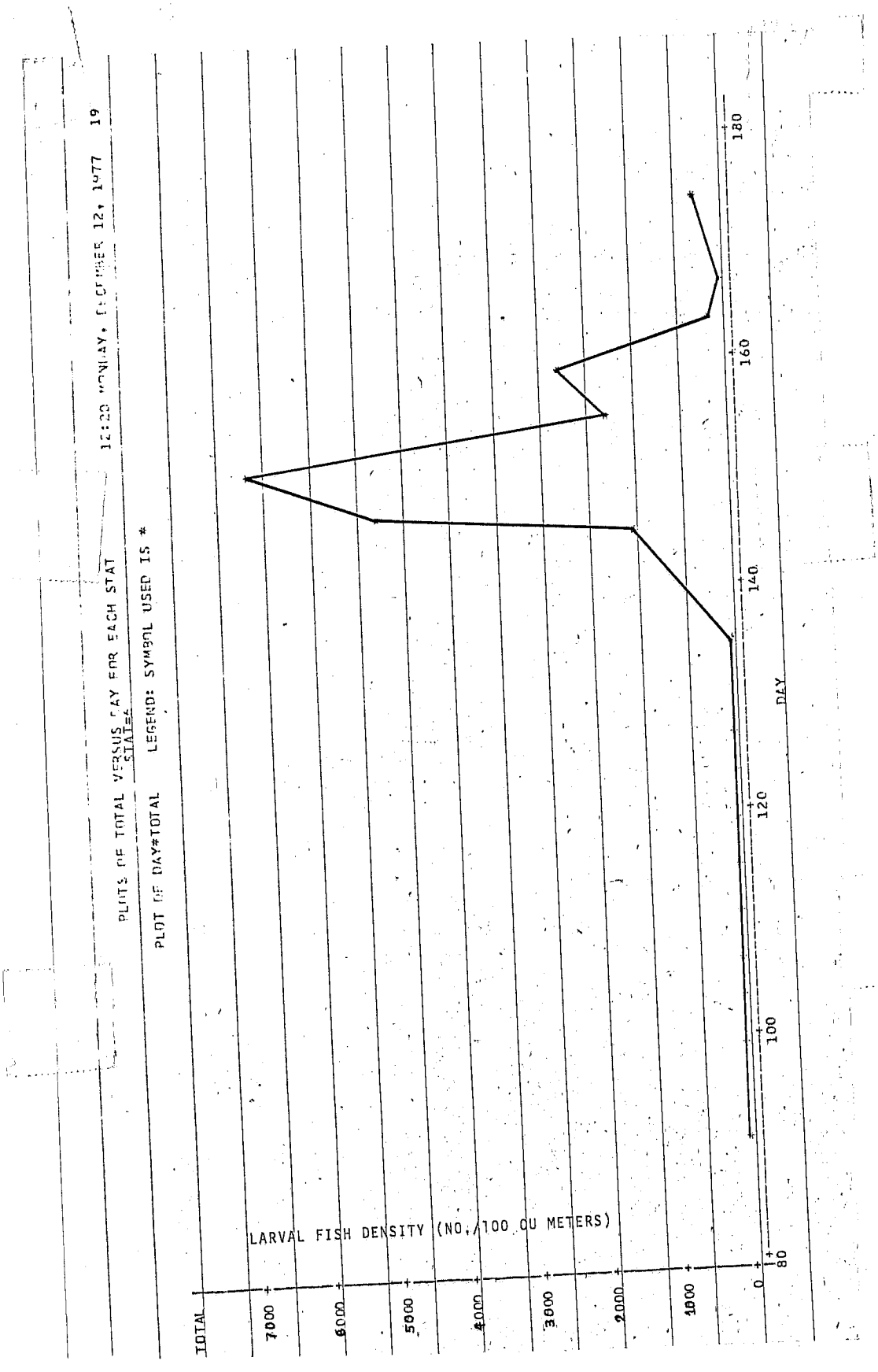


FIGURE 35. TOTAL FISH LARVAE DENSITY AT STATION 6 (1977)

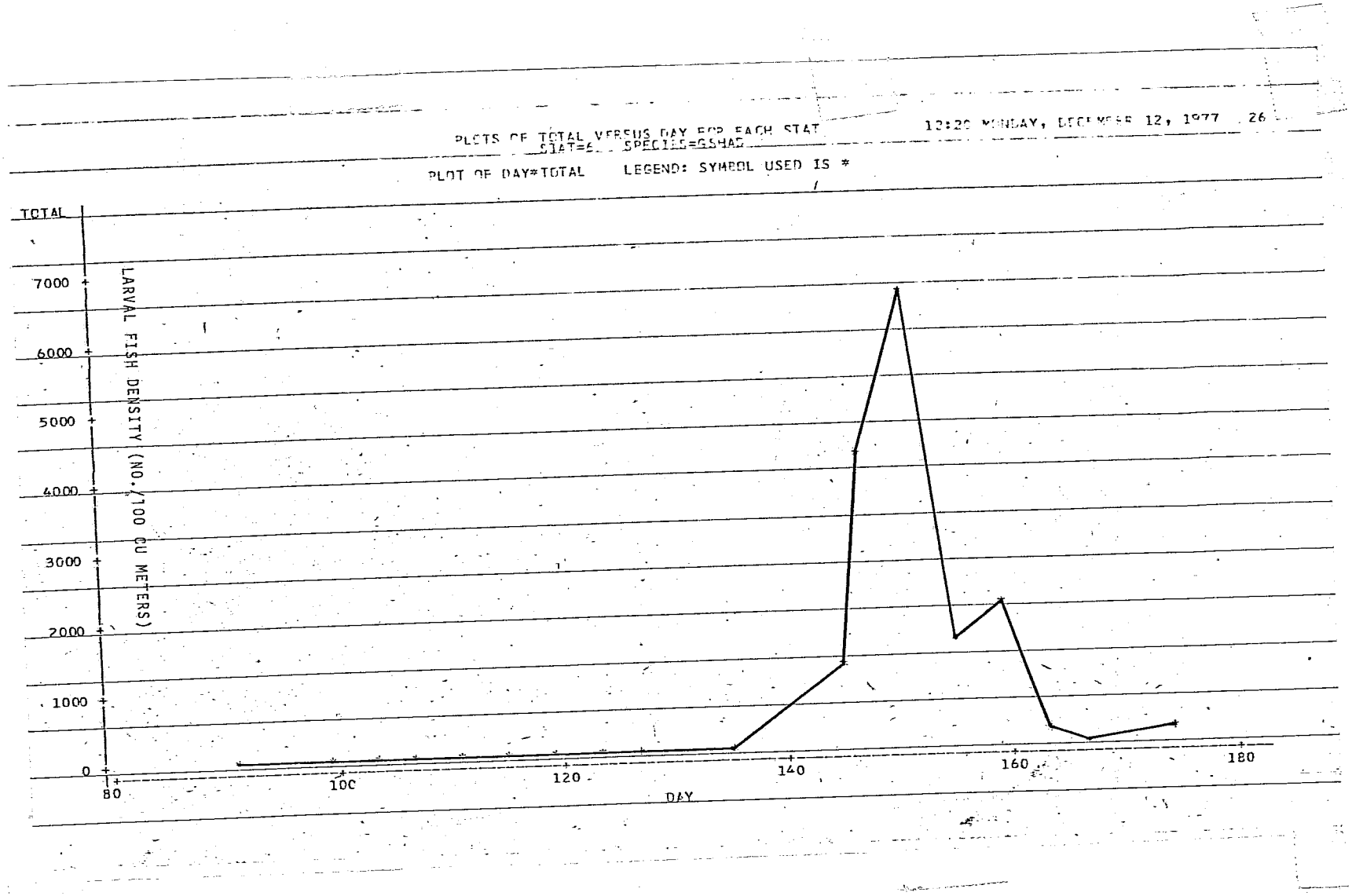


FIGURE 36. GIZZARD SHAD LARVAE DENSITY AT STATION 6 (1977)

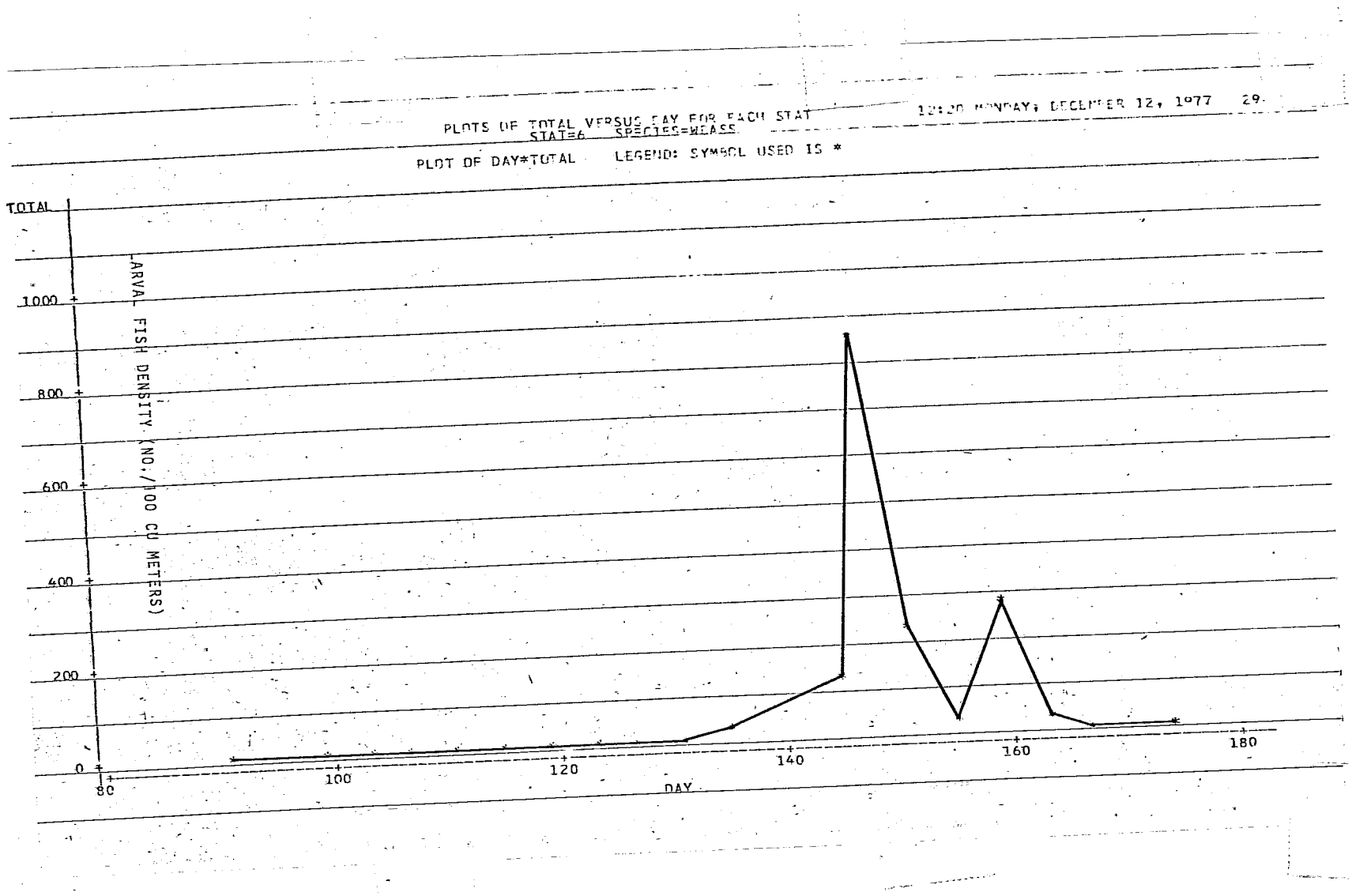


FIGURE 37. WHITE BASS LARVAE DENSITY AT STATION 6 (1977)

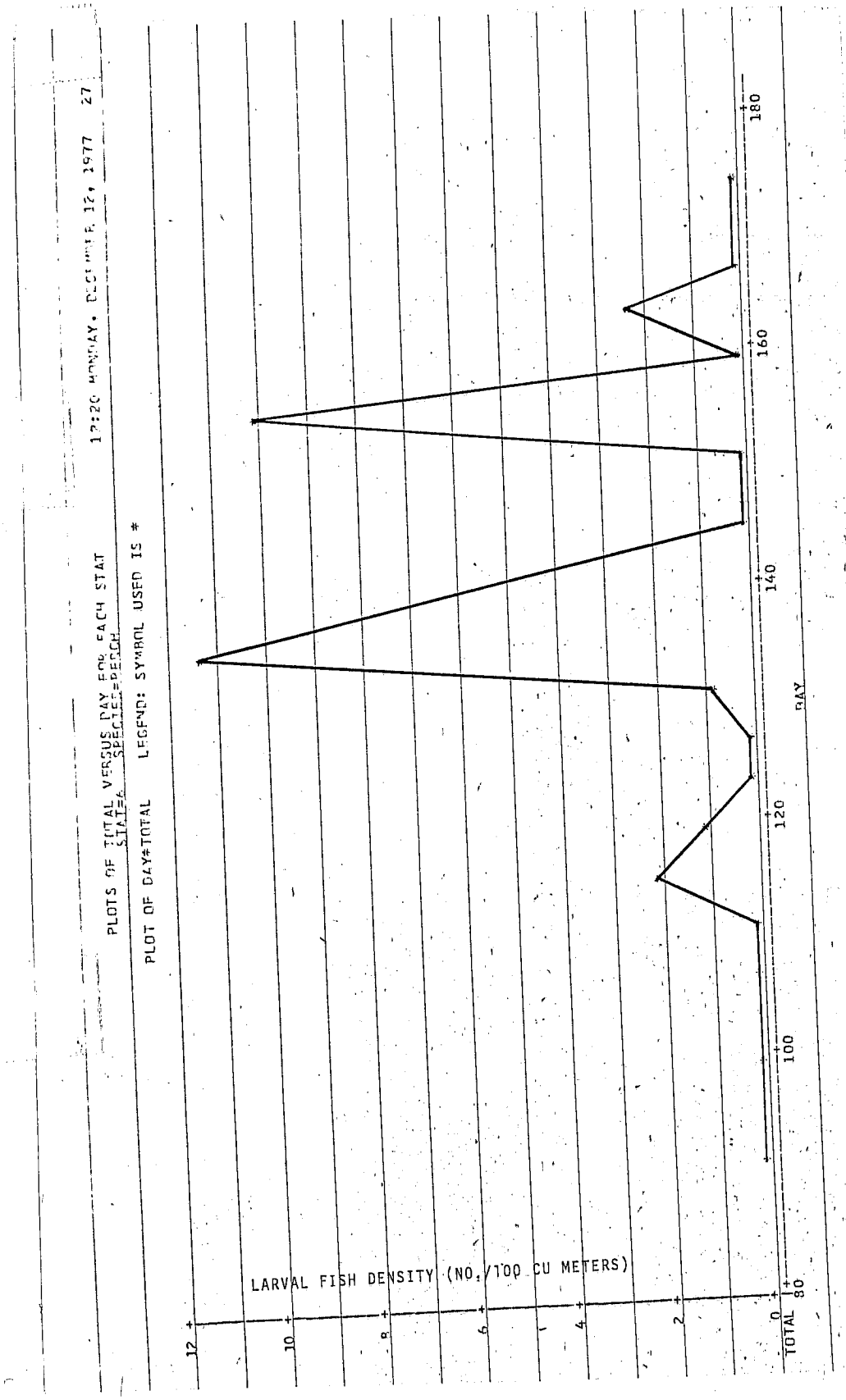


FIGURE 38. YELLOW PERCH LARVAE DENSITY AT STATION 6 (1977)

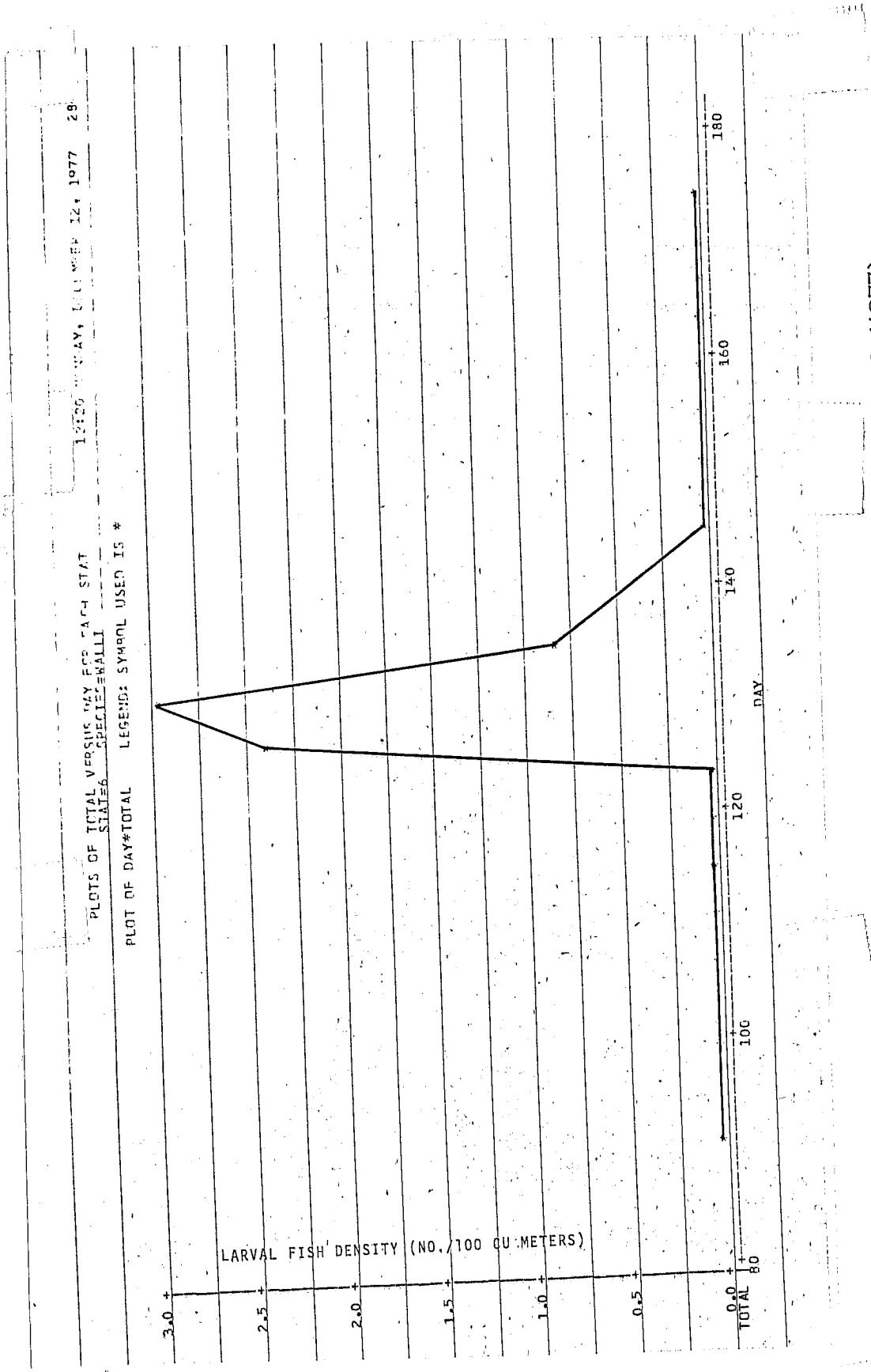


FIGURE 39. WALLEYE LARVAE DENSITY AT STATION 6 (1977)

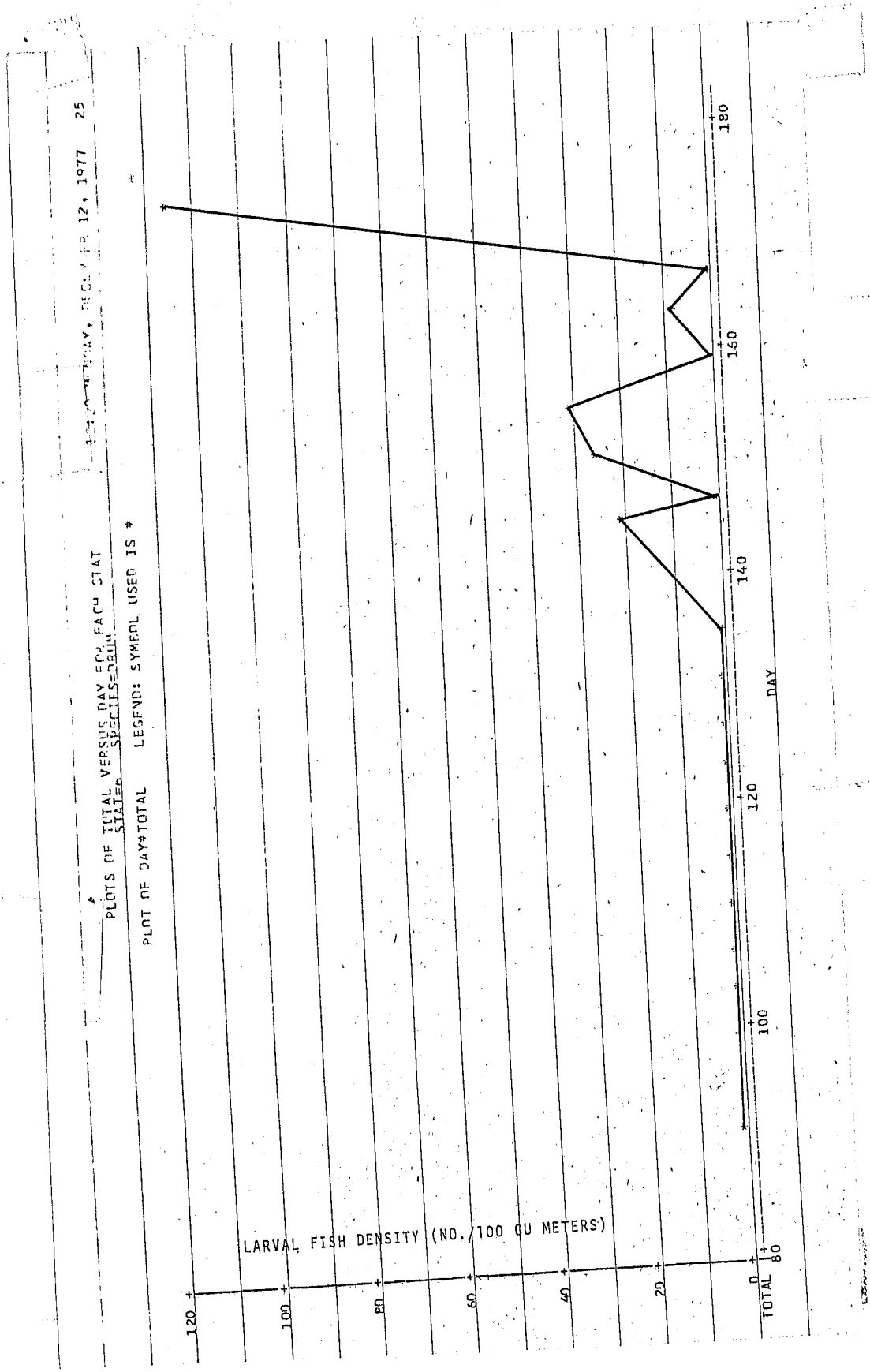


FIGURE 40. FRESHWATER DRUM LARVAE DENSITY AT STATION 6 (1977)

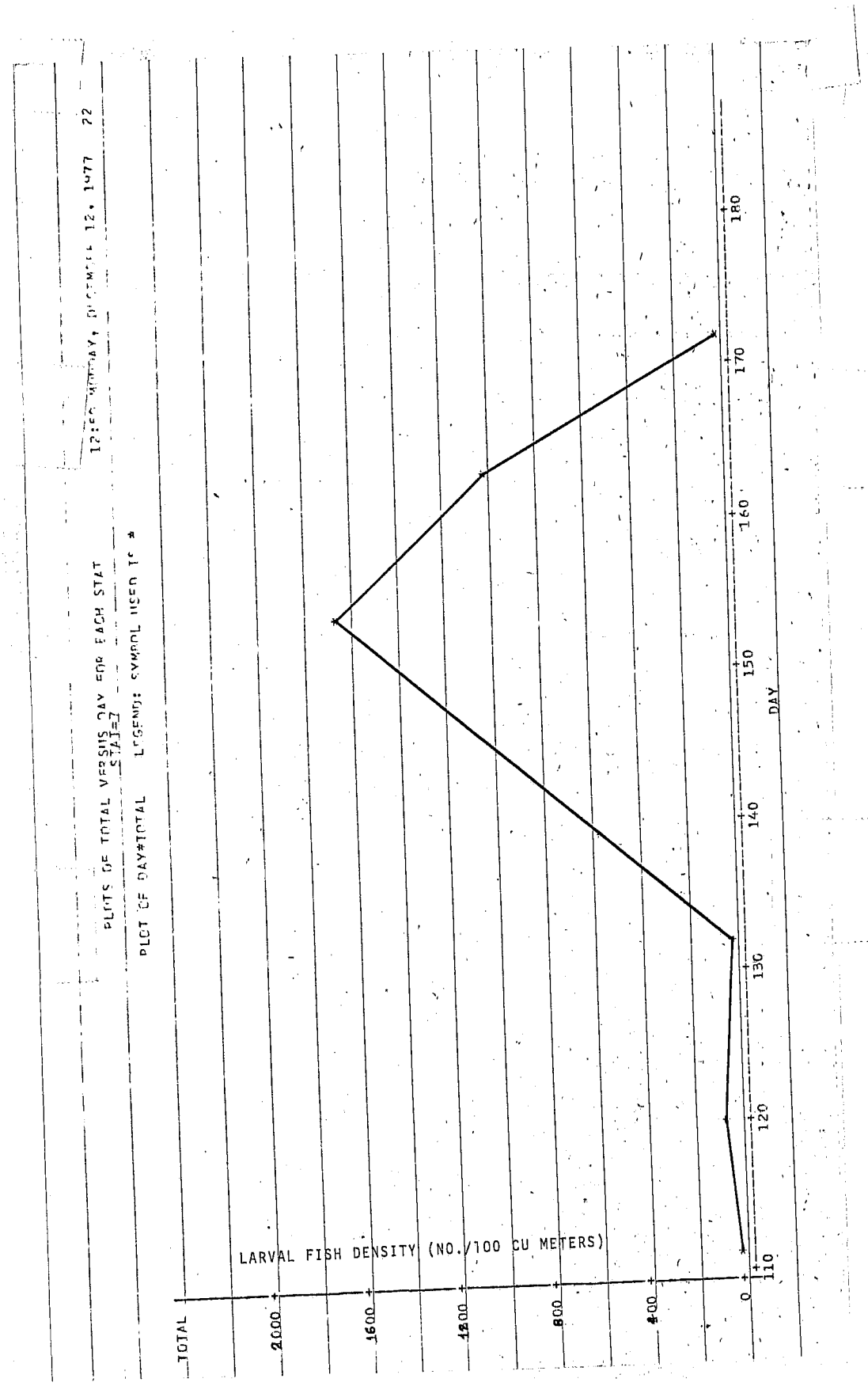


FIGURE 41. TOTAL FISH LARVAE DENSITY AT STATION 7 (1977)

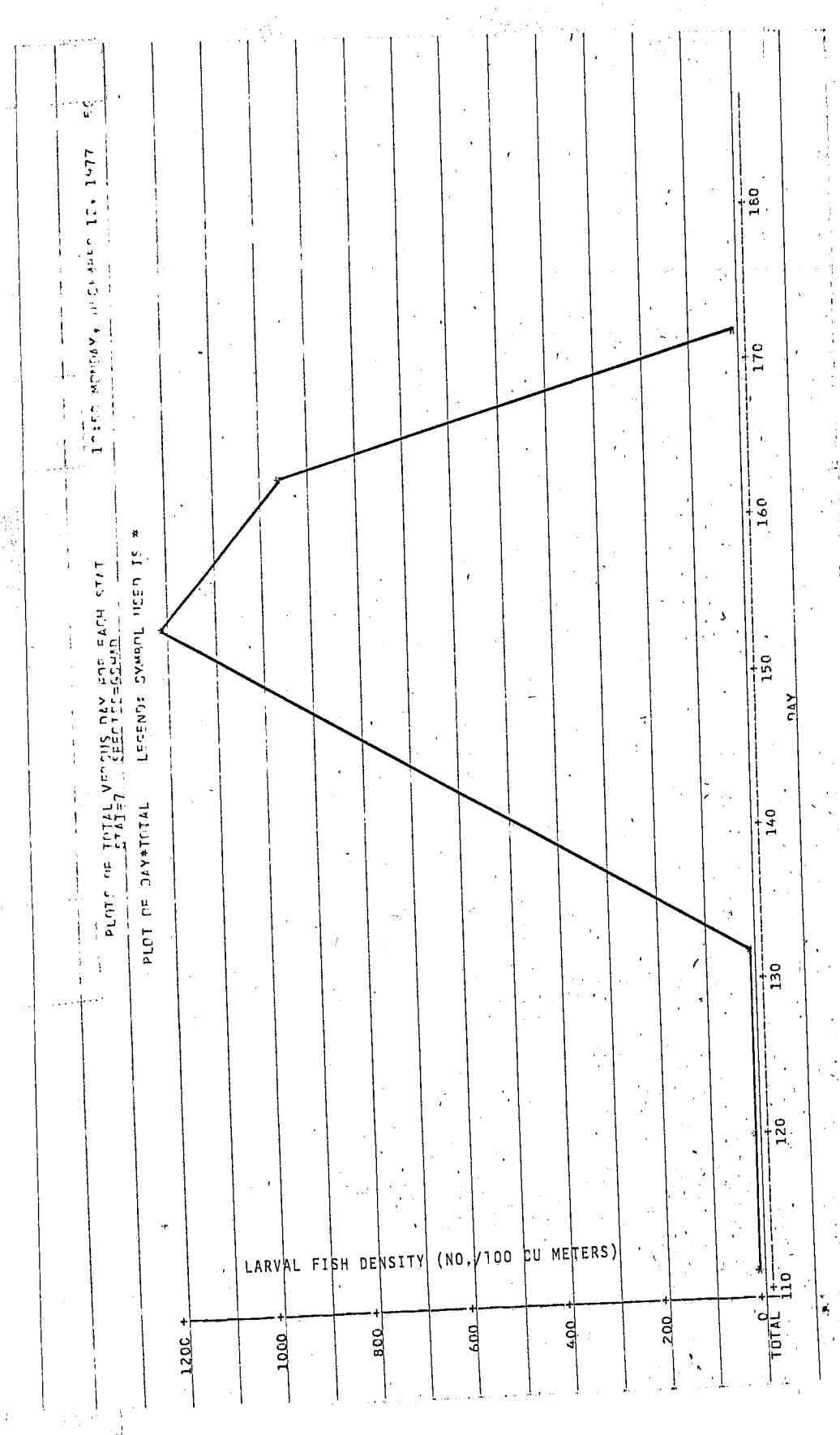


FIGURE 42. GIZZARD SHAD LARVAE DENSITY AT STATION 7 (1977)

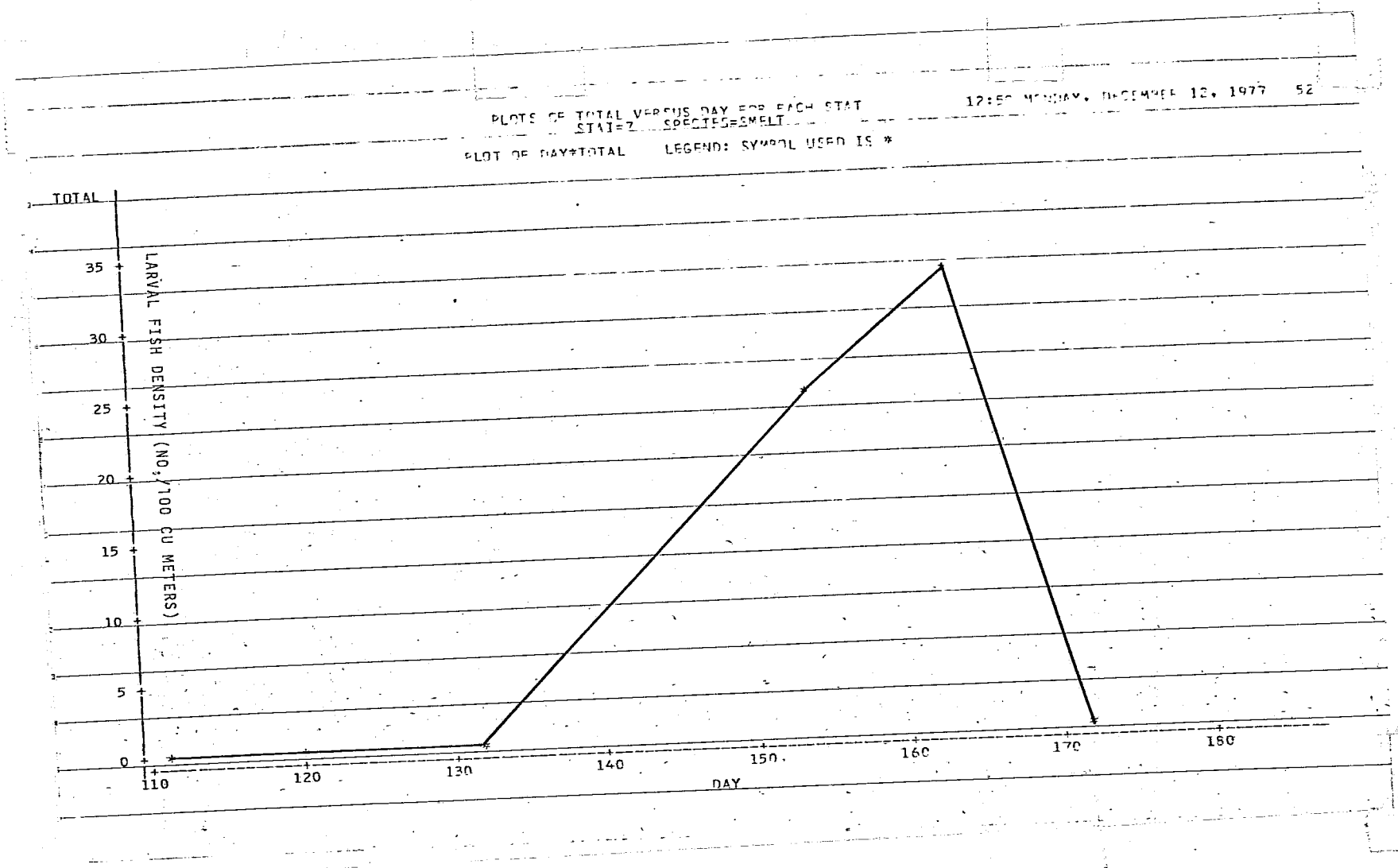


FIGURE 43. RAINBOW SMELT LARVAE DENSITY AT STATION 7 (1977)

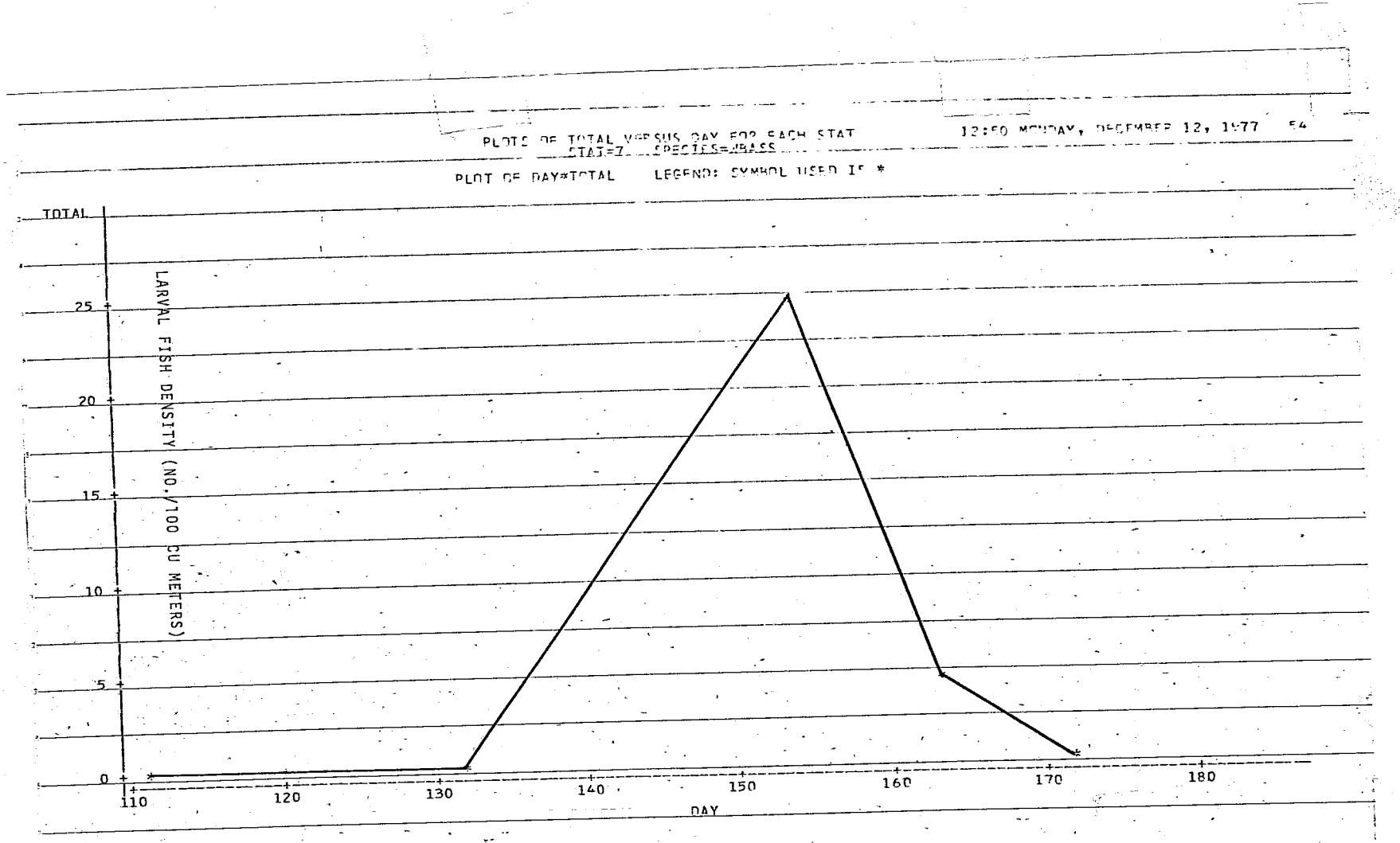


FIGURE 44. WHITE BASS LARVAE DENSITY AT STATION 7 (1977)

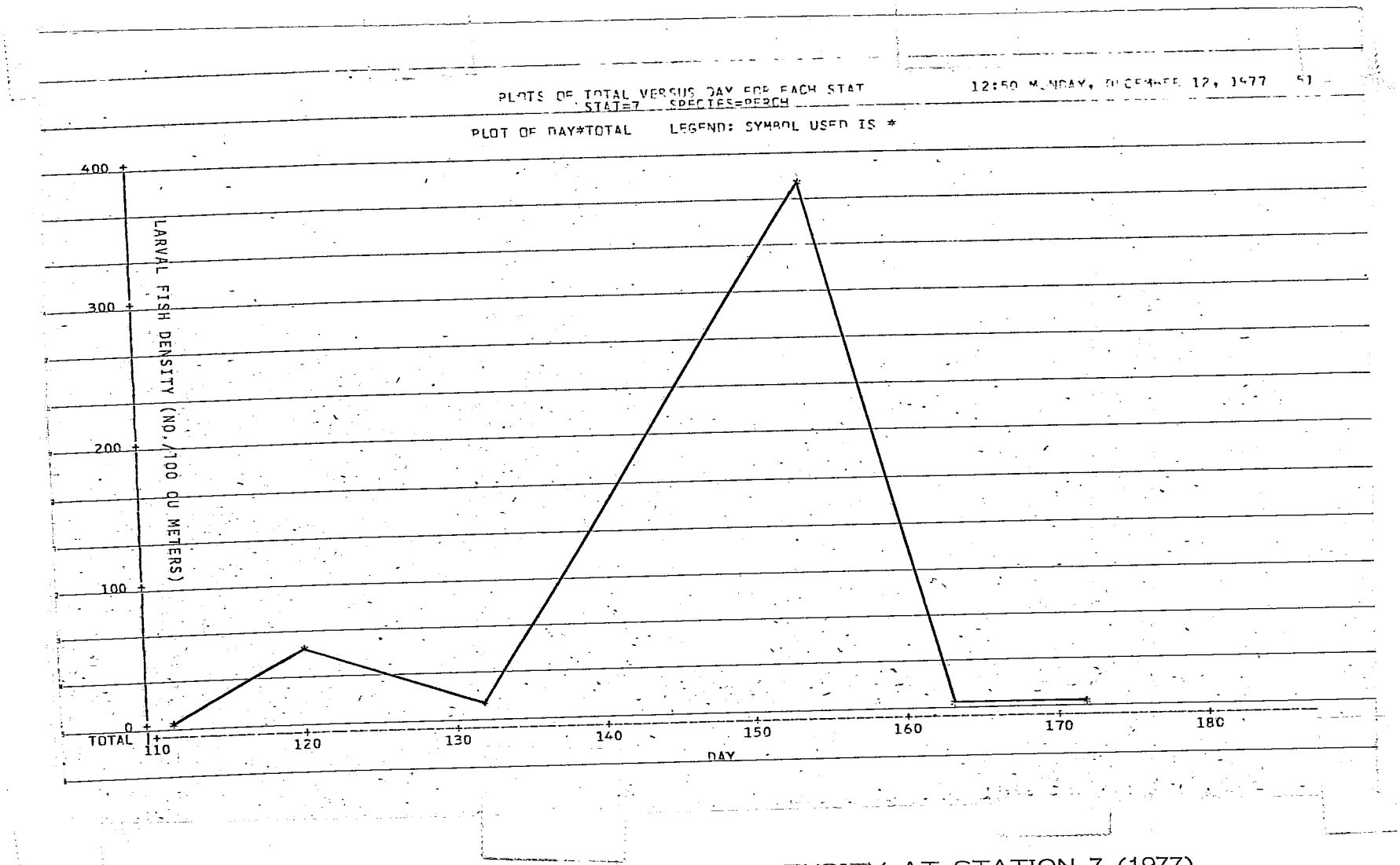


FIGURE 45. YELLOW PERCH LARVAE DENSITY AT STATION 7 (1977)

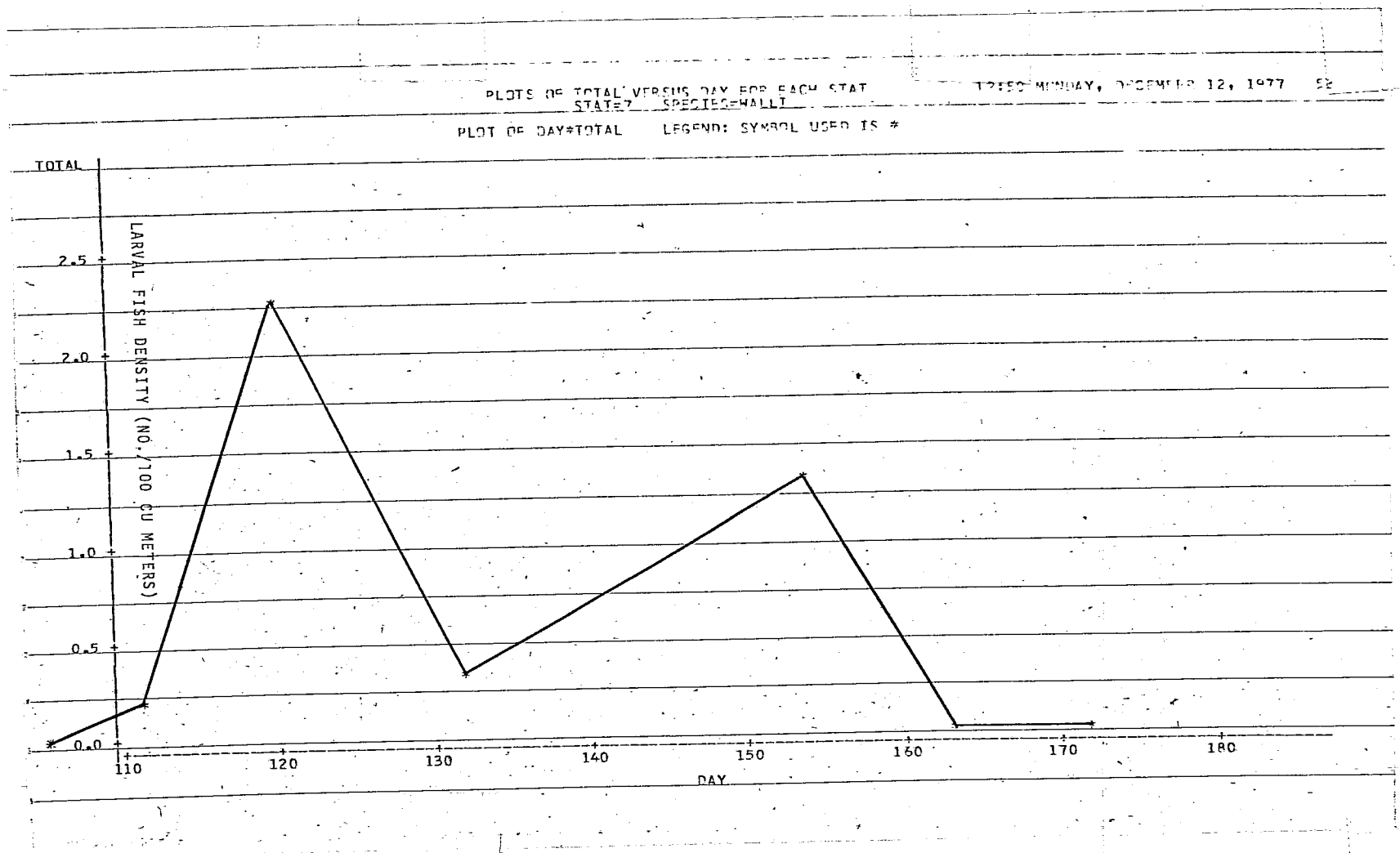


FIGURE 46. WALLEYE LARVAE DENSITY AT STATION 7 (1977)

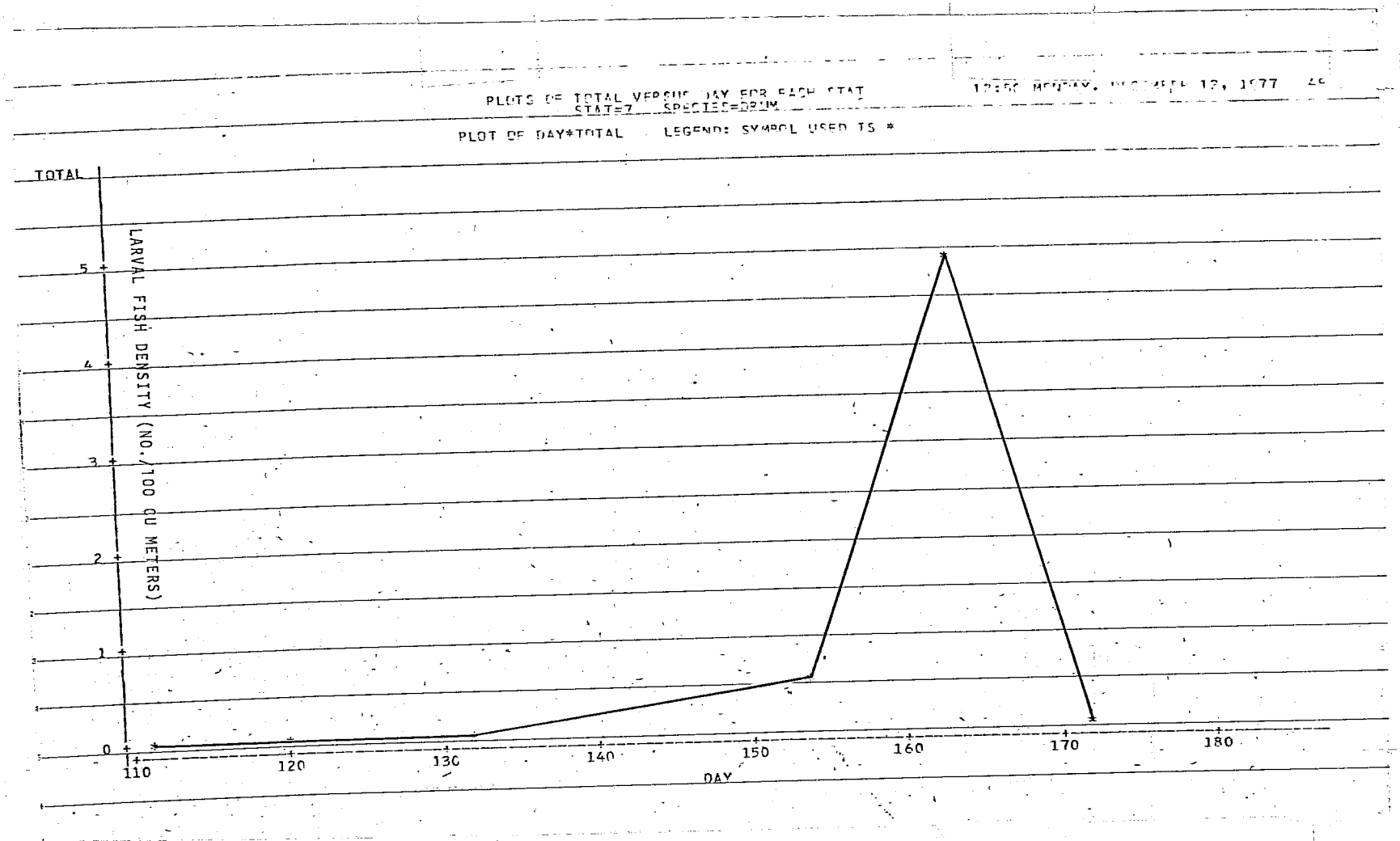


FIGURE 47. FRESHWATER DRUM LARVAE DENSITY AT STATION 7 (1977)

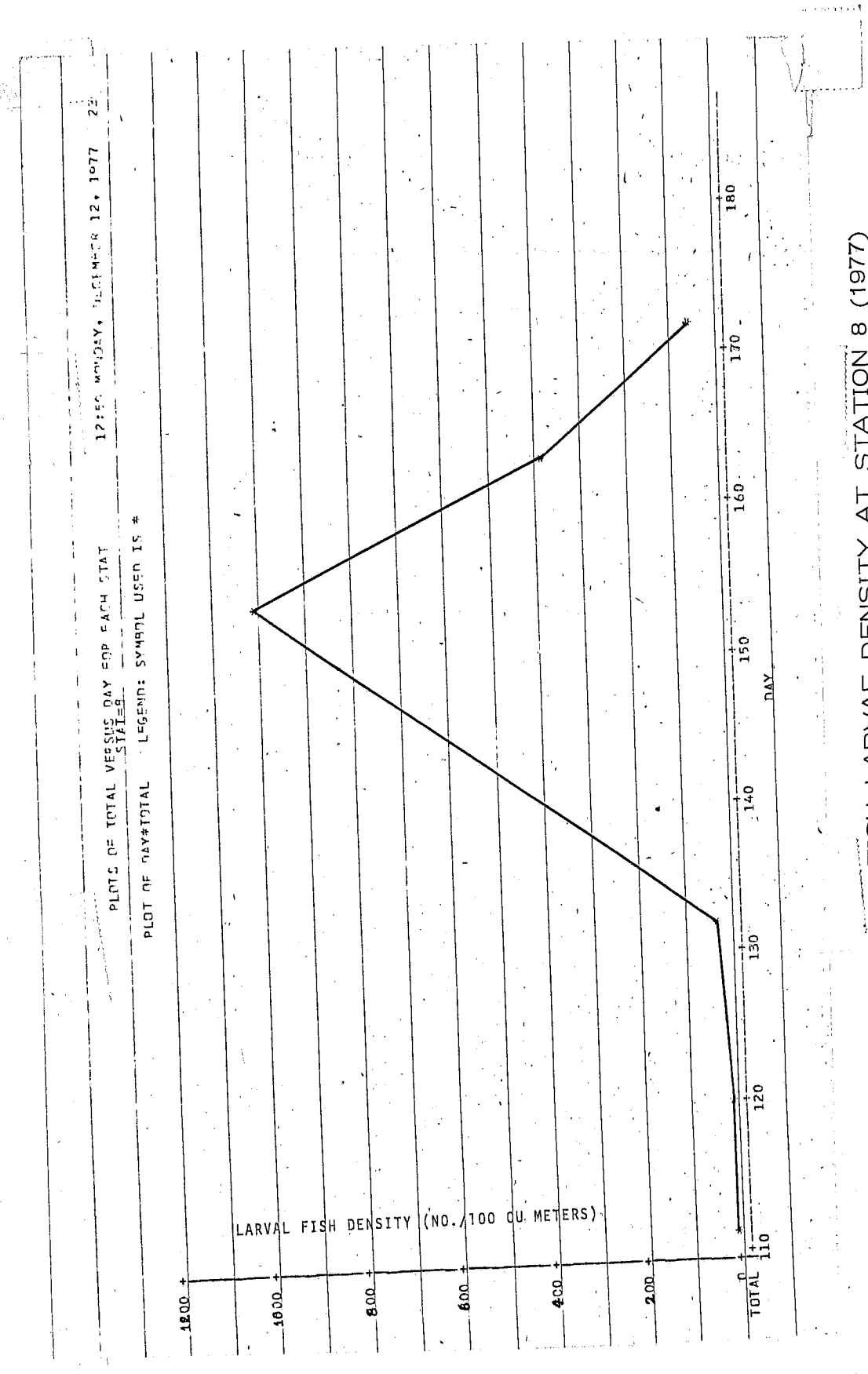


FIGURE 48. TOTAL FISH LARVAE DENSITY AT STATION 8 (1977)

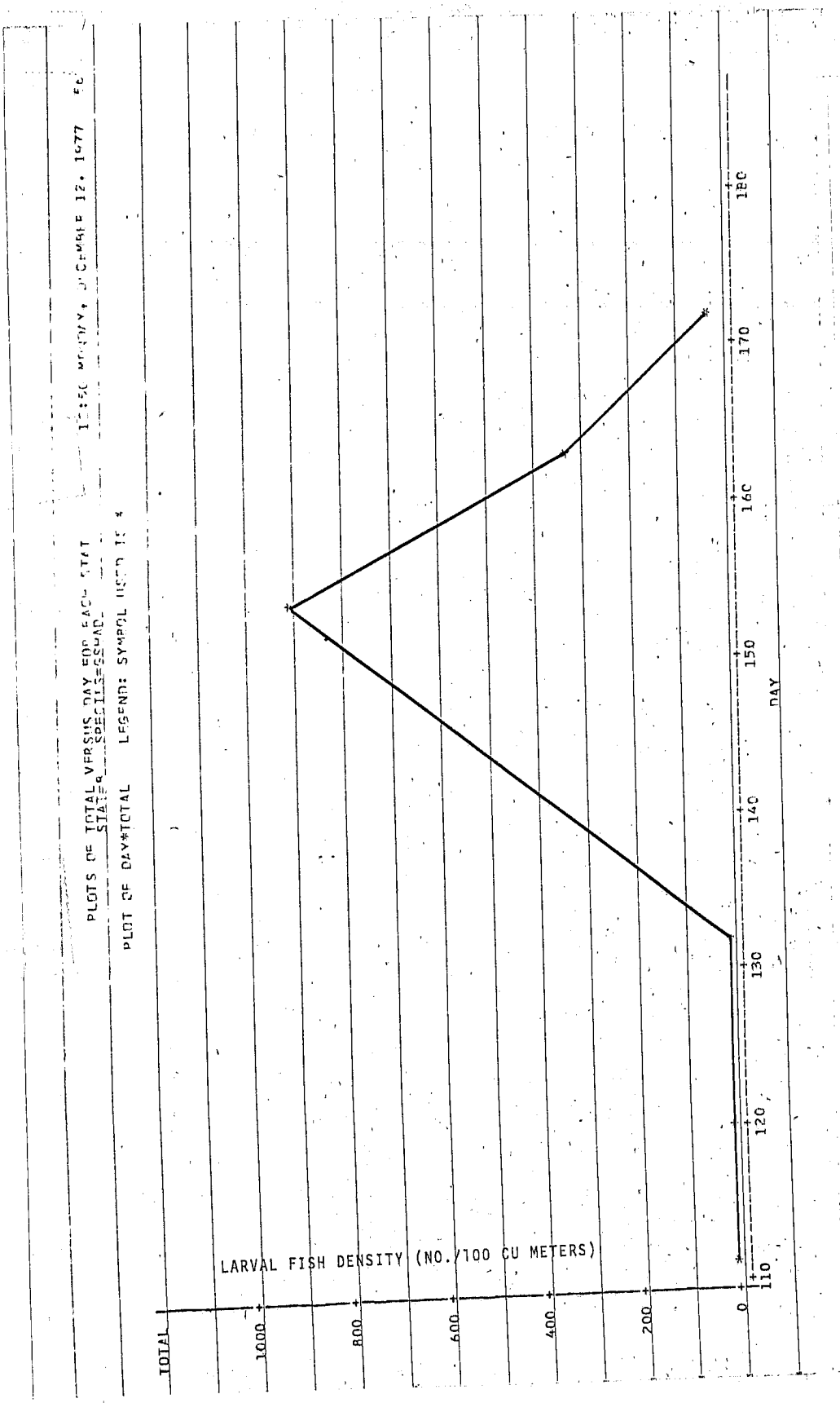


FIGURE 49. GIZZARD SHAD LARVAE DENSITY AT STATION 8 (1977)

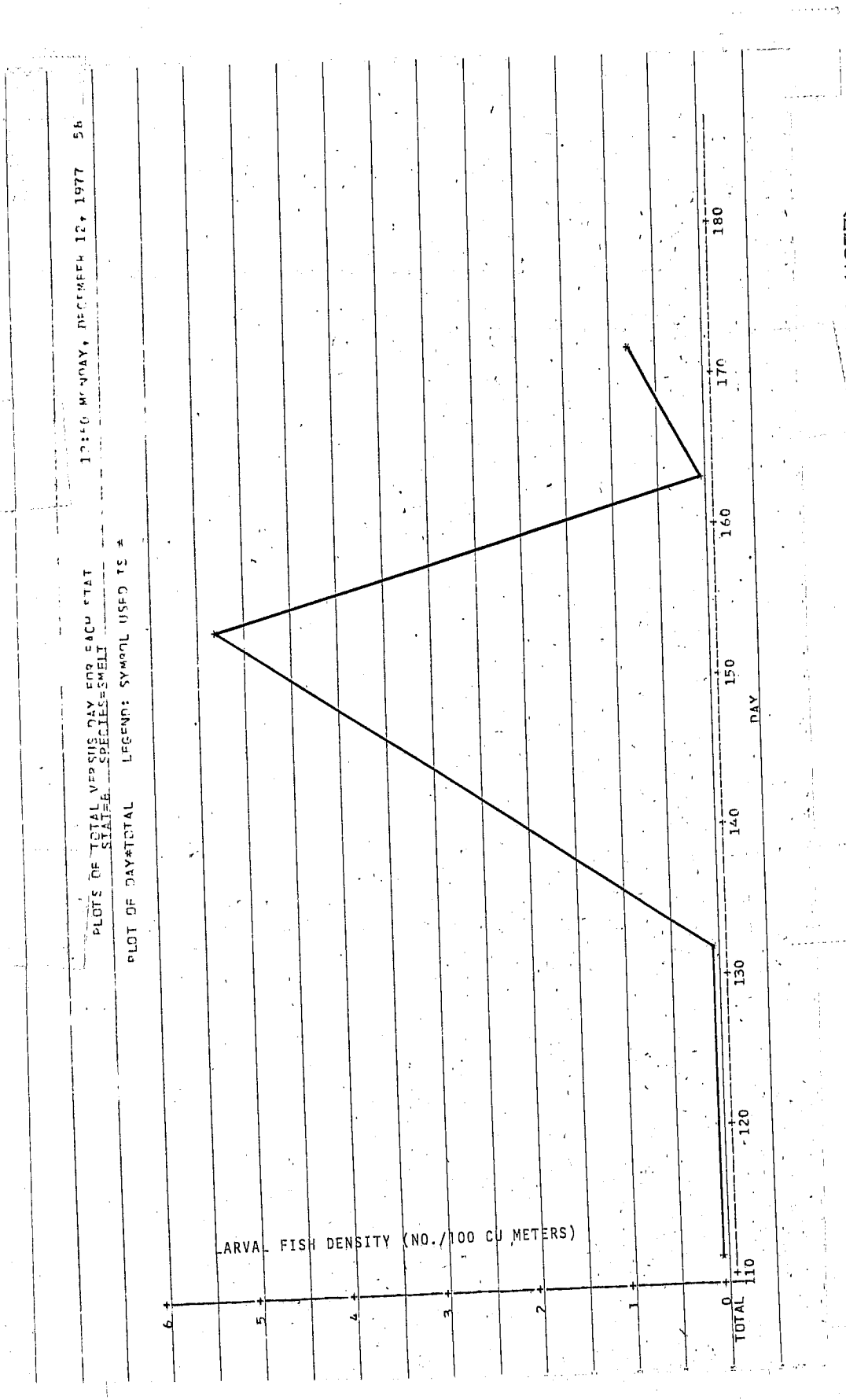


FIGURE 50. RAINBOW SMELT LARVAE DENSITY AT STATION 8 (1977)

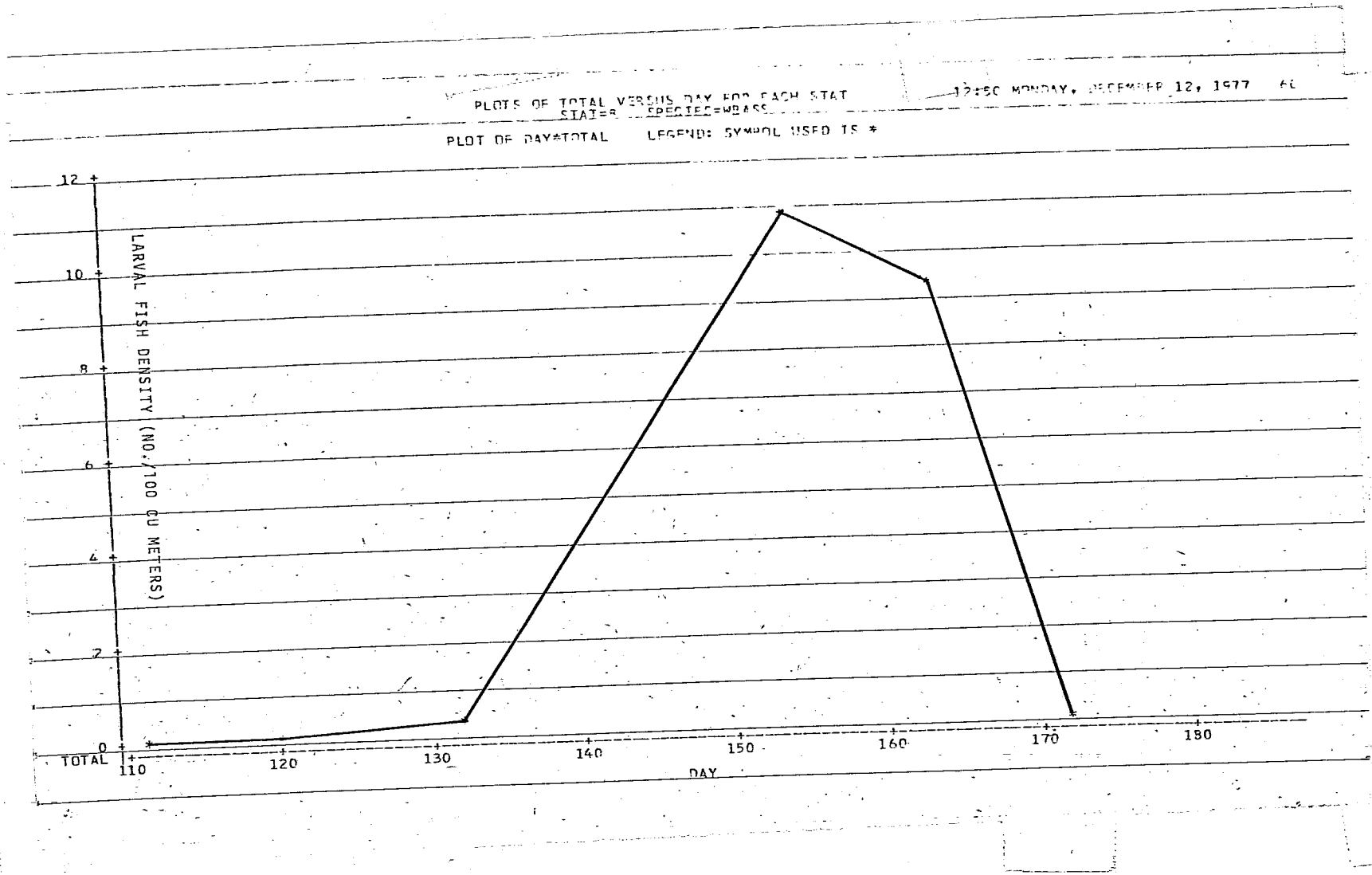


FIGURE 51. WHITE BASS LARVAE DENSITY AT STATION 8 (1977)

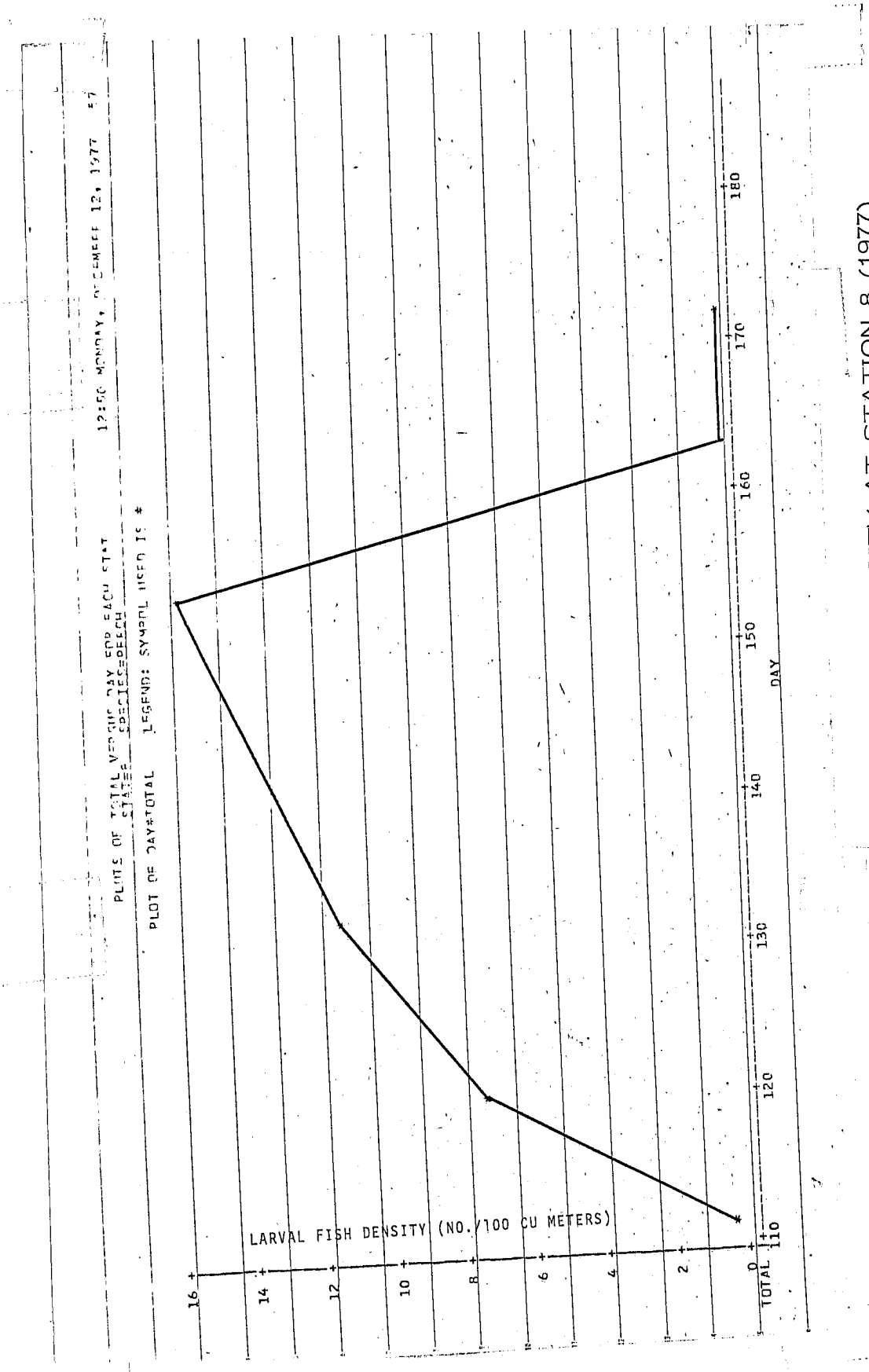


FIGURE 52. YELLOW PERCH LARVAE DENSITY AT STATION 8 (1977)

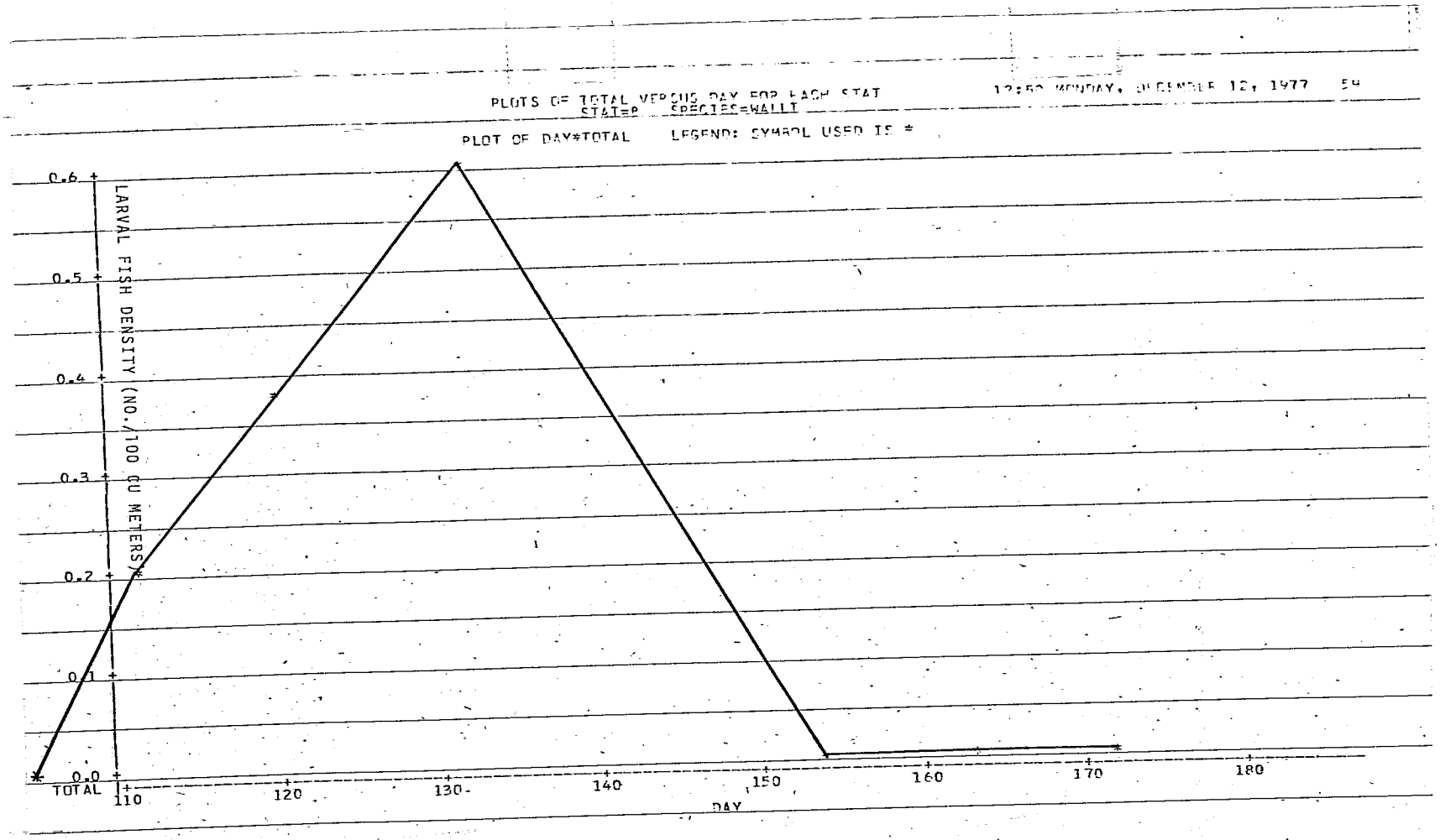


FIGURE 53. WALLEYE LARVAE DENSITY AT STATION 8 (1977)

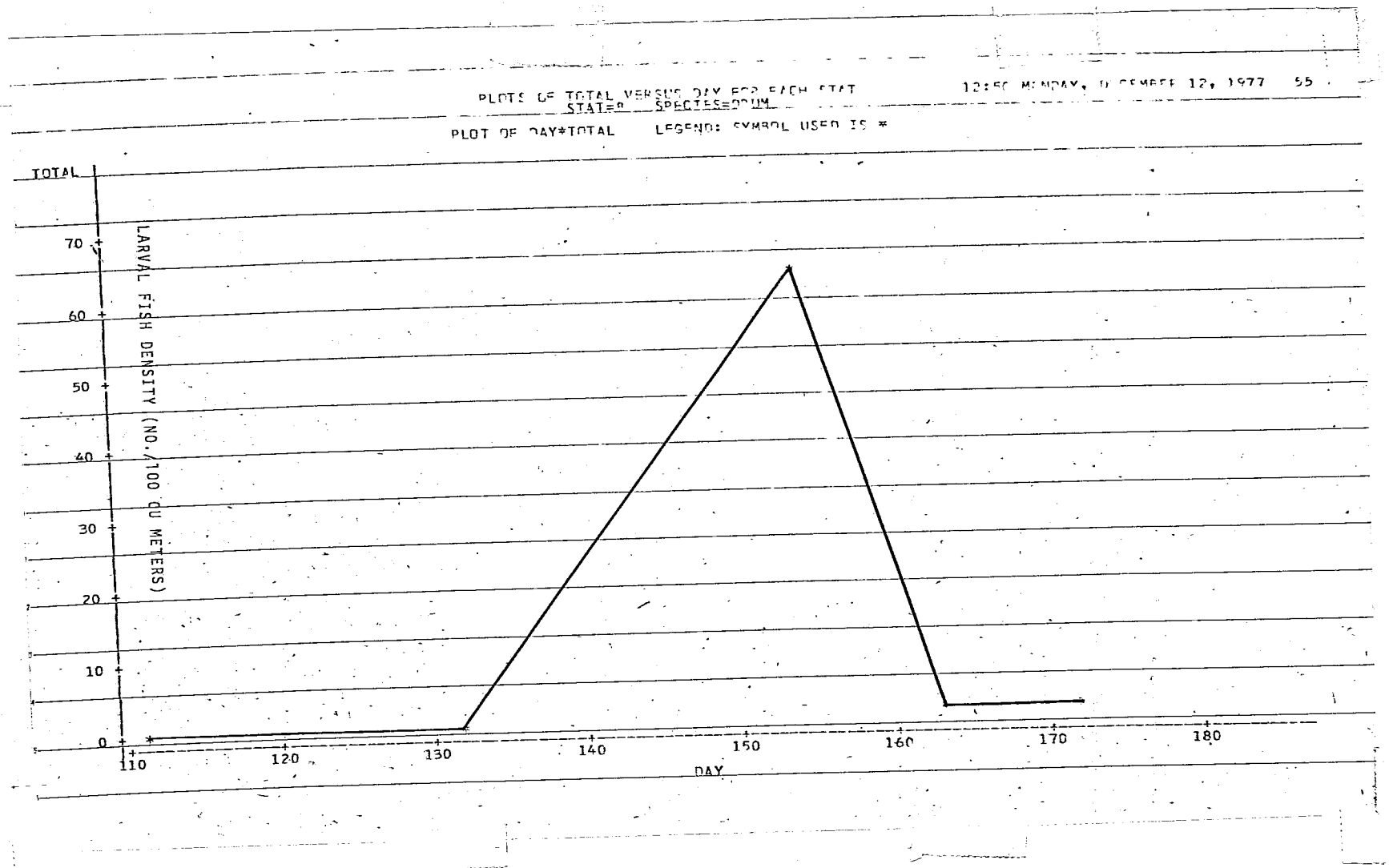


FIGURE 54. FRESHWATER DRUM LARVAE DENSITY AT STATION 8 (1977)

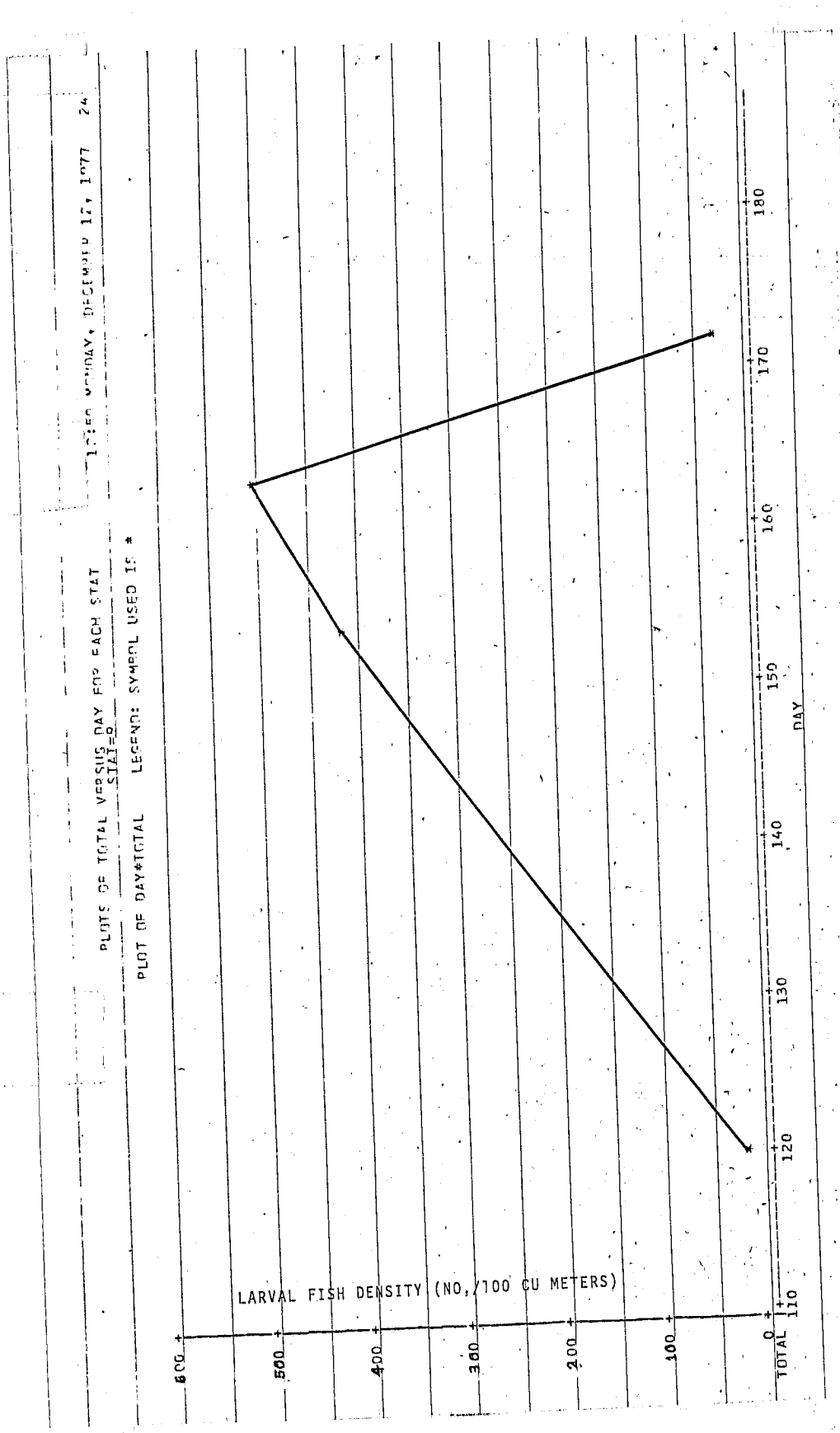


FIGURE 55. TOTAL FISH LARVAE DENSITY AT STATION 9 (1977)

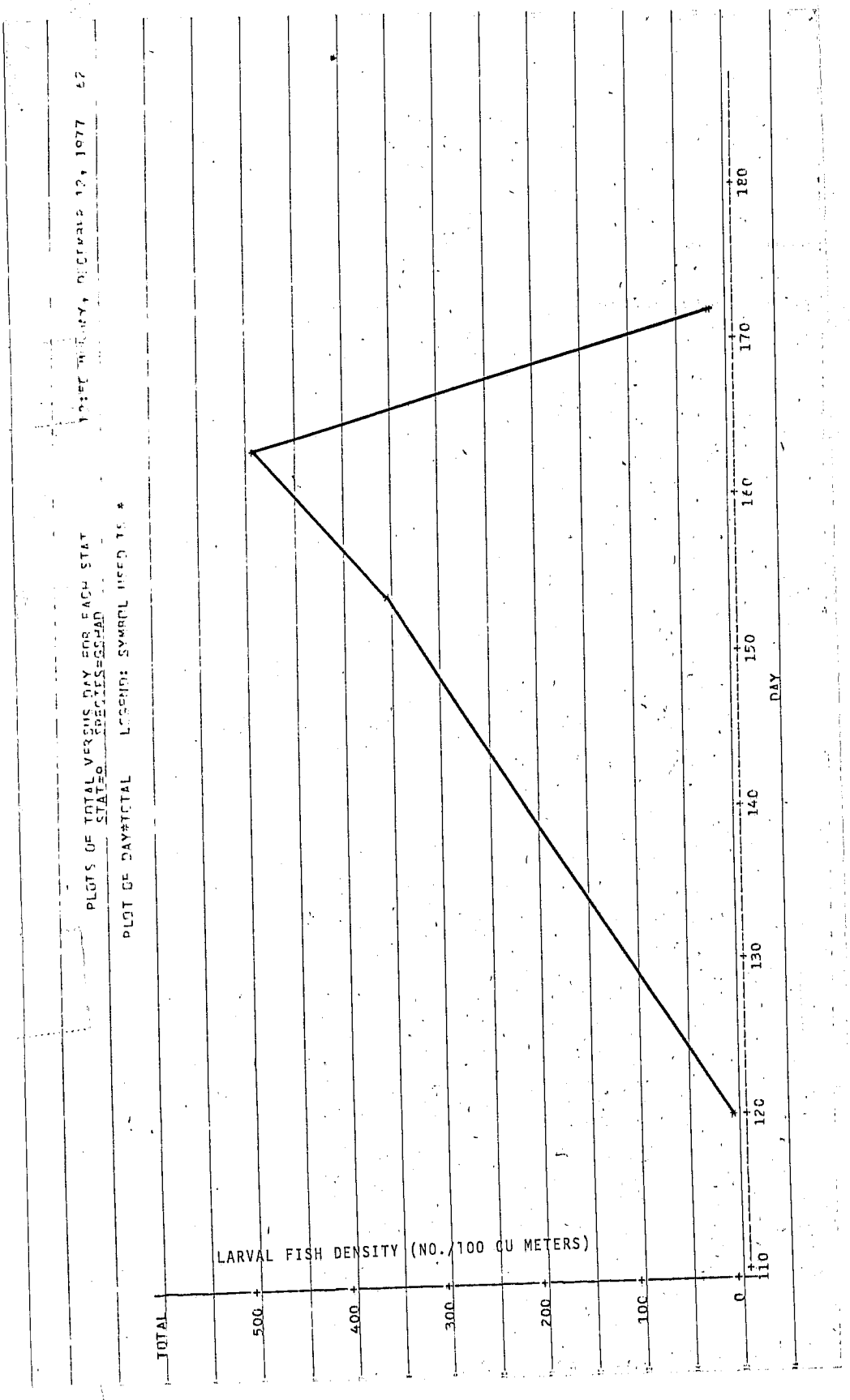


FIGURE 56. GIZZARD SHAD LARVAE DENSITY AT STATION 9 (1977)

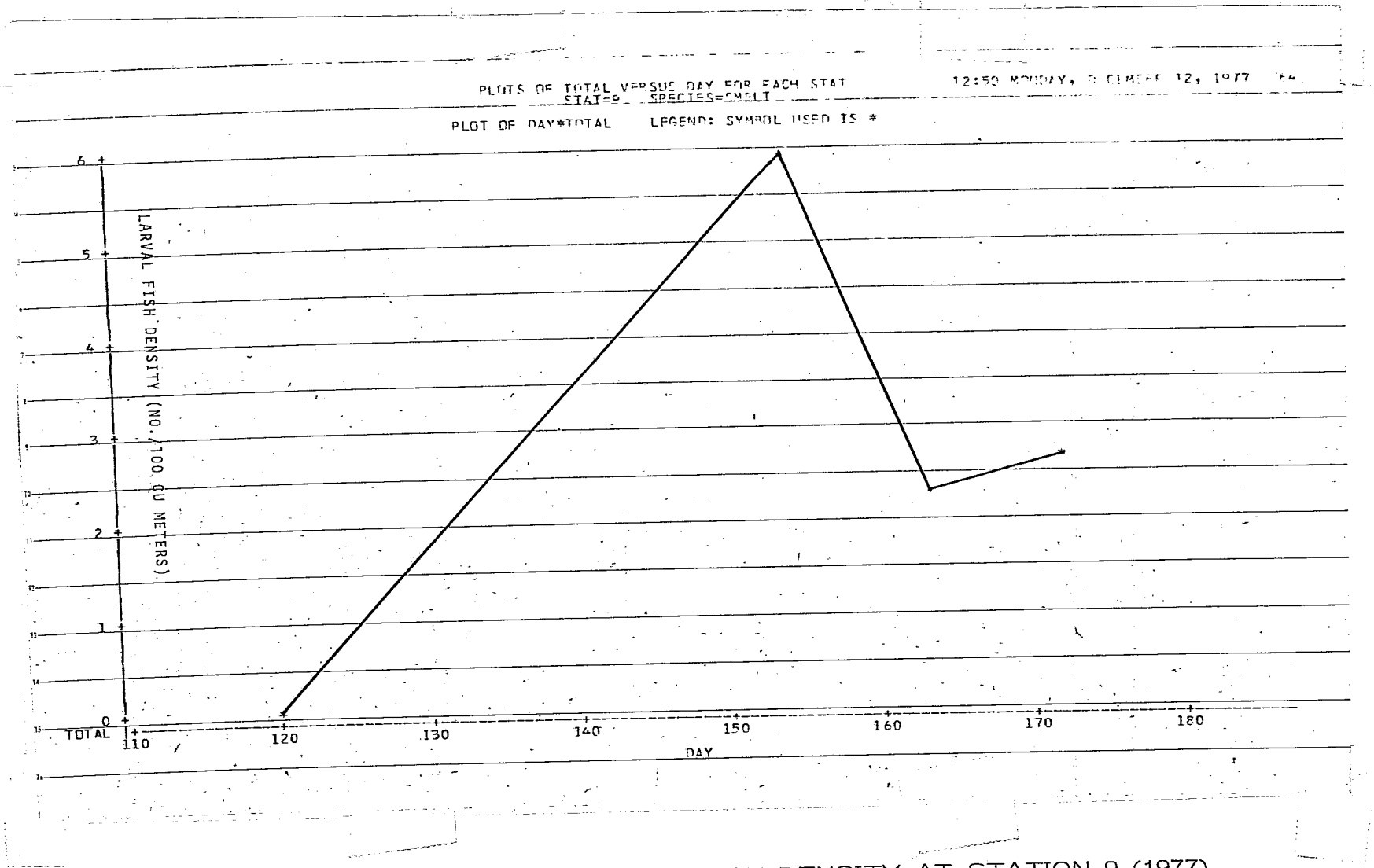


FIGURE 57. RAINBOW SMELT LARVAE DENSITY AT STATION 9 (1977)

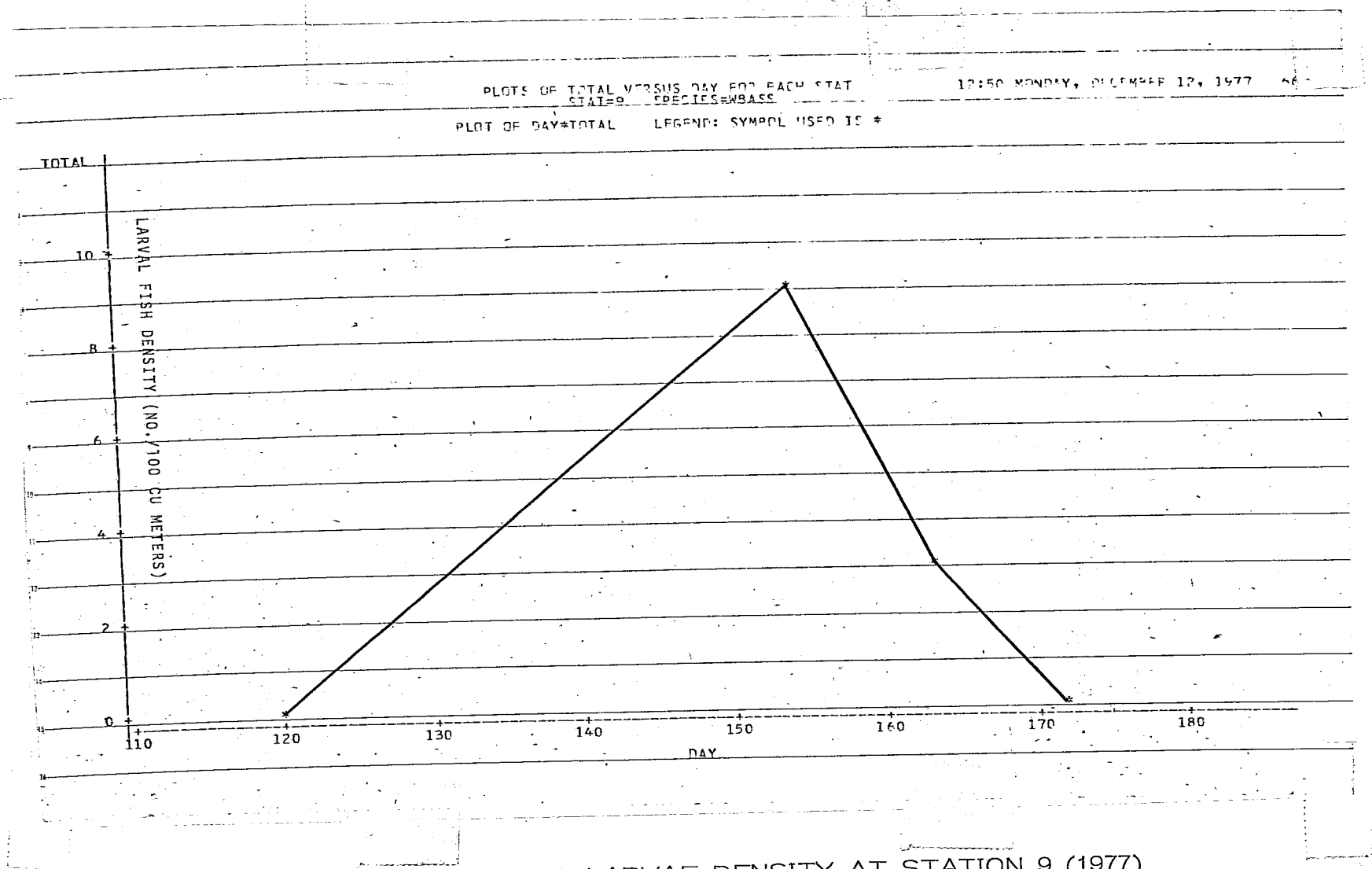


FIGURE 58. WHITE BASS LARVAE DENSITY AT STATION 9 (1977)

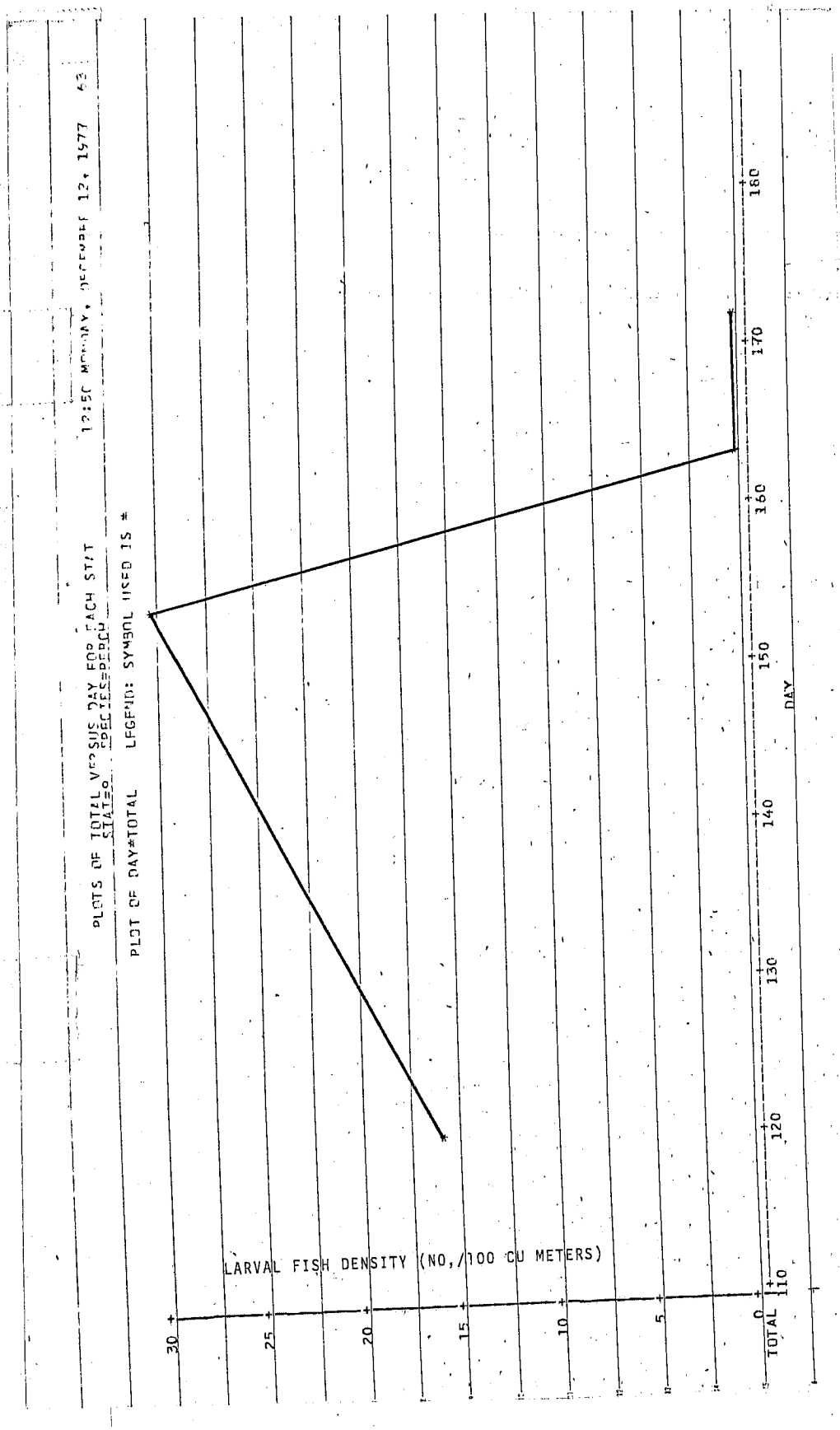


FIGURE 59. YELLOW PERCH LARVAE DENSITY AT STATION 9 (1977)

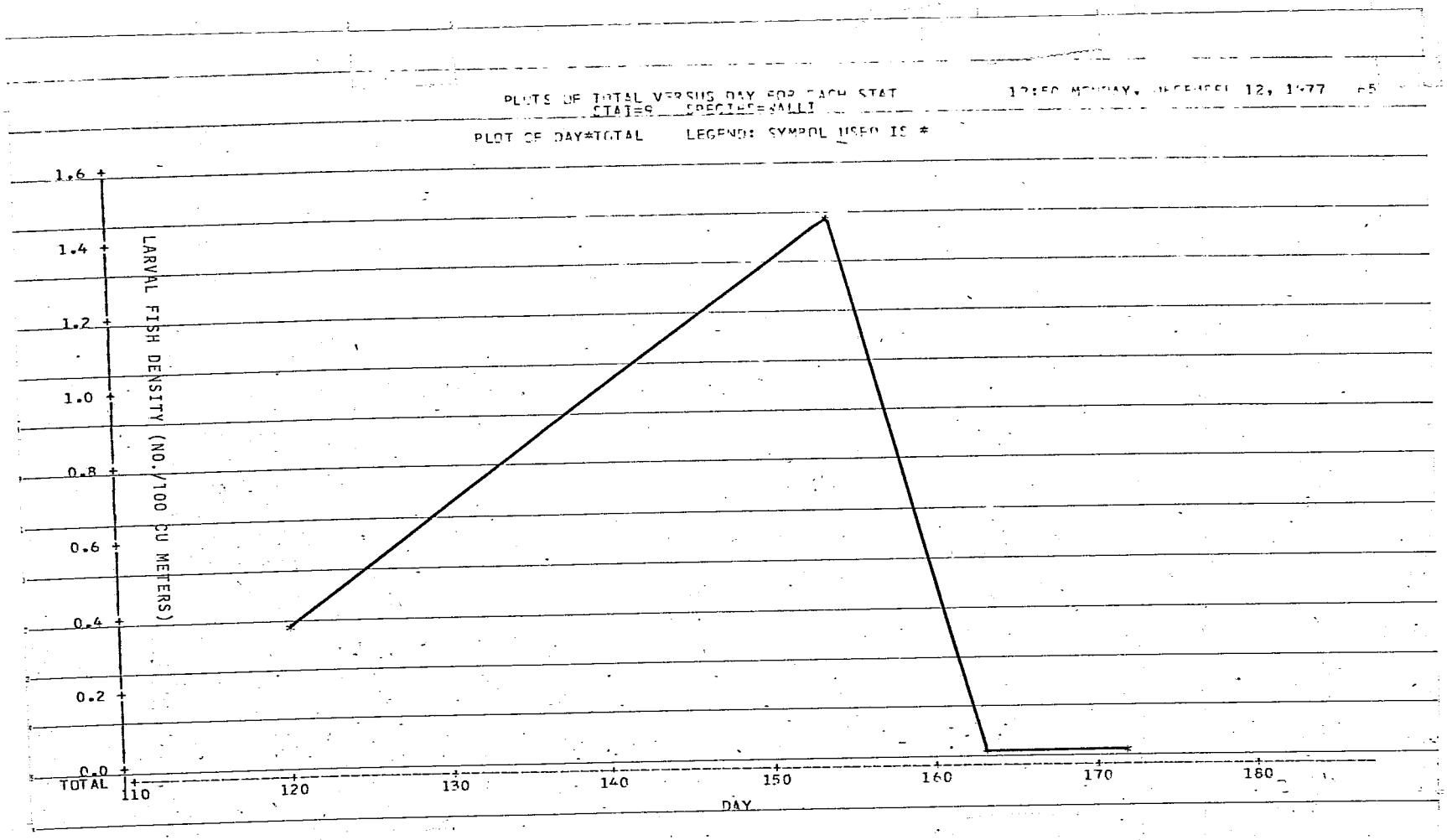


FIGURE 60. WALLEYE LARVAE DENSITY AT STATION 9 (1977)

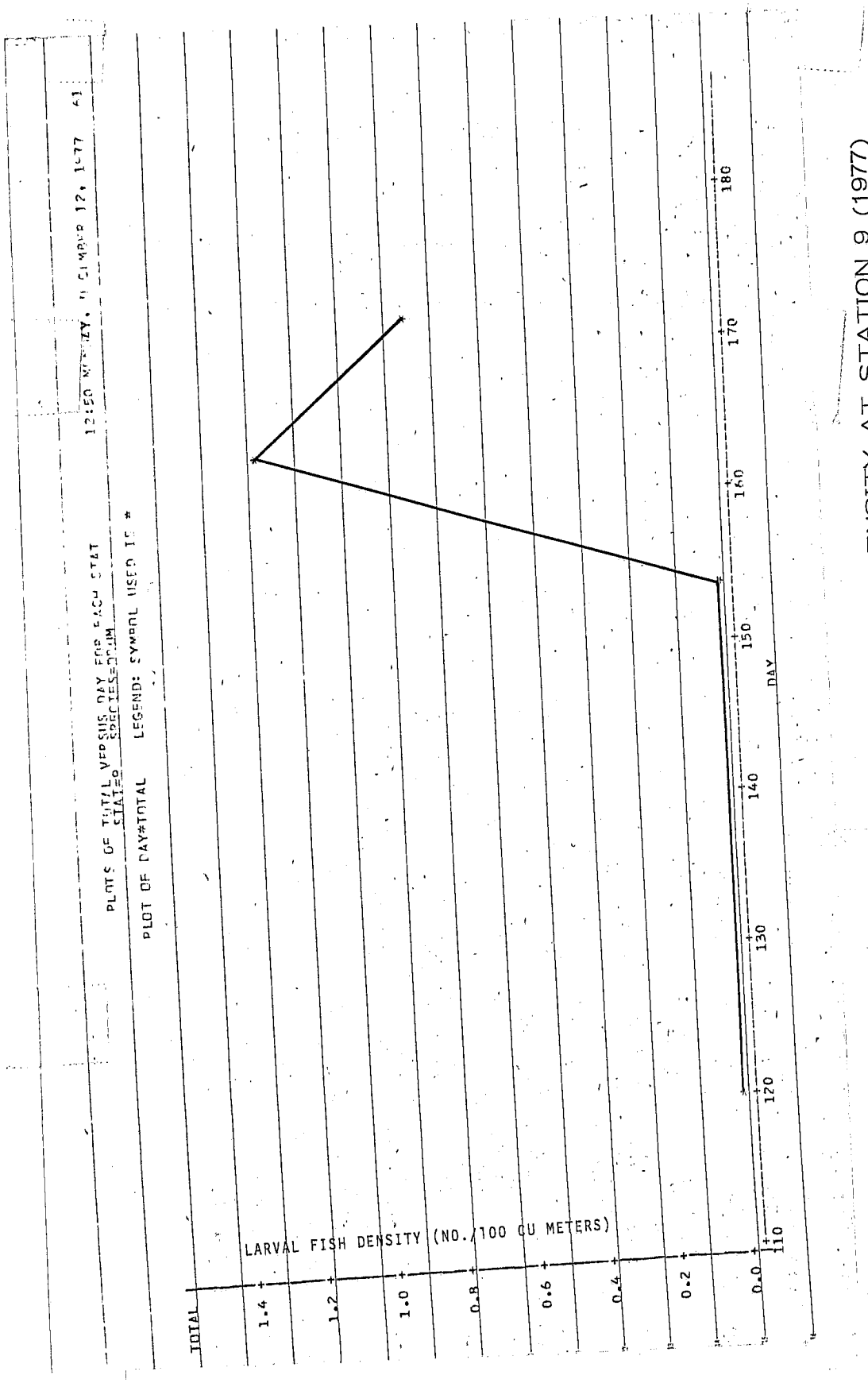


FIGURE 61. FRESHWATER DRUM LARVAE DENSITY AT STATION 9 (1977)

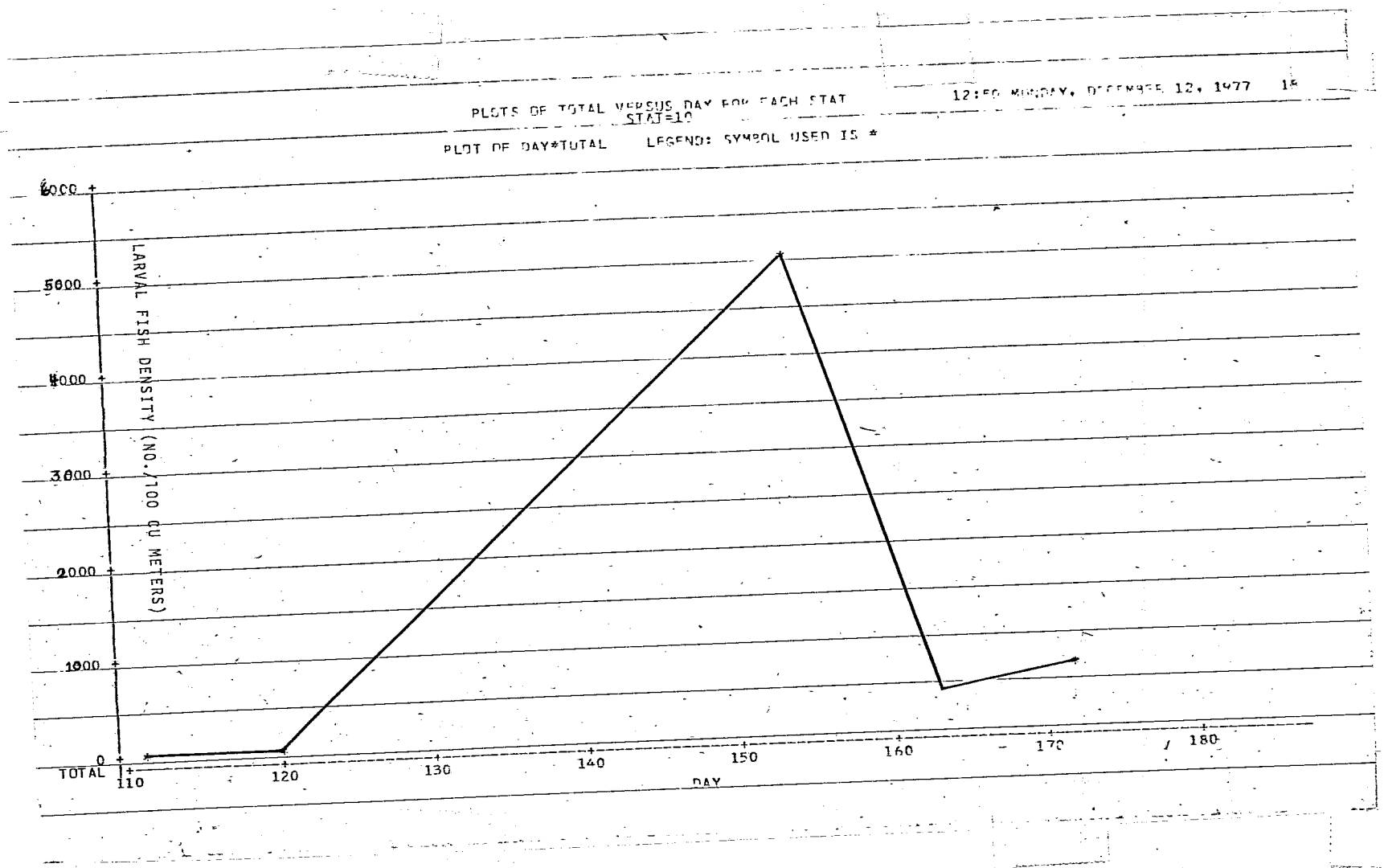


FIGURE 62. TOTAL FISH LARVAE DENSITY AT STATION 10 (1977)

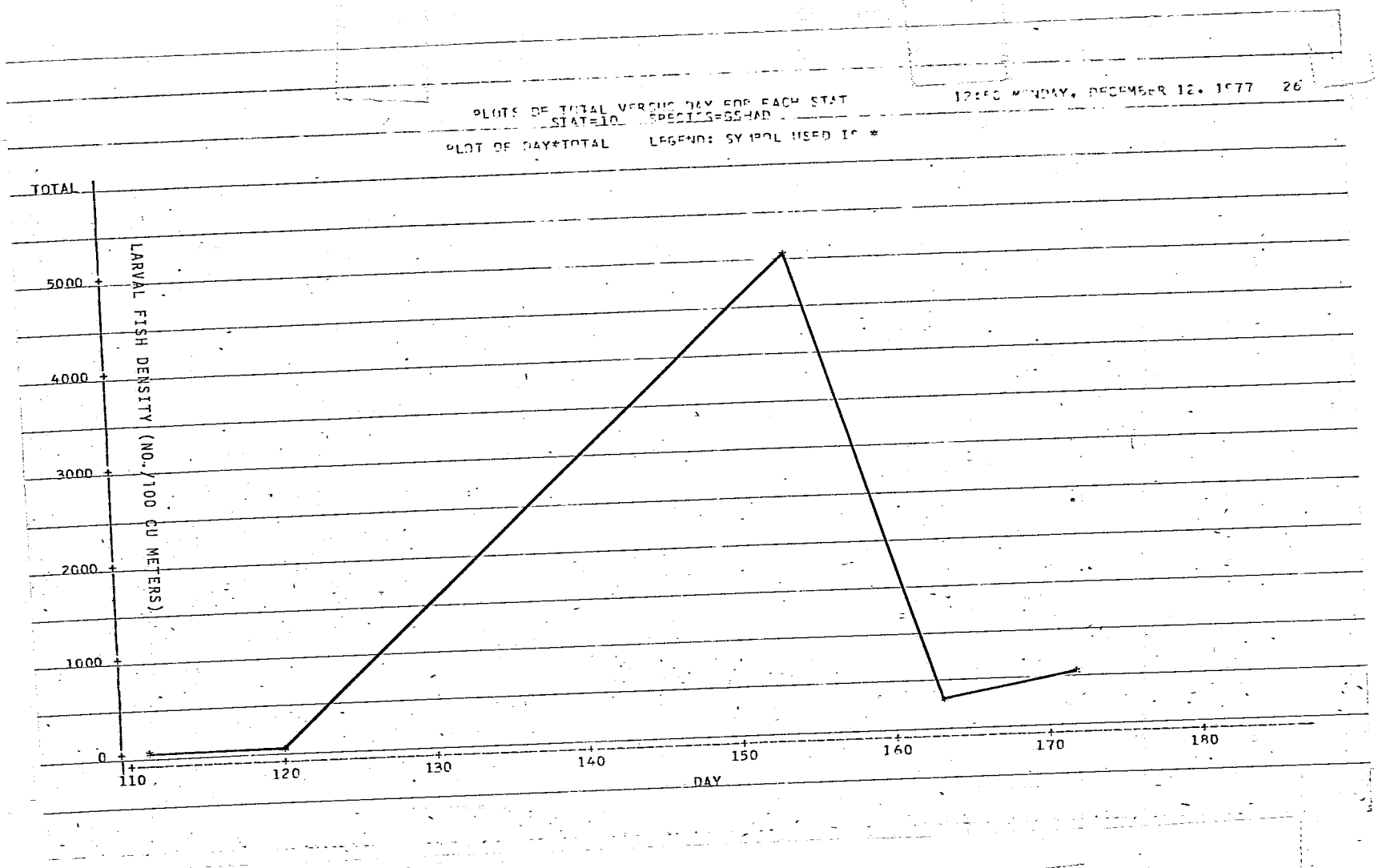


FIGURE 63. GIZZARD SHAD LARVAE DENSITY AT STATION 10 (1977)

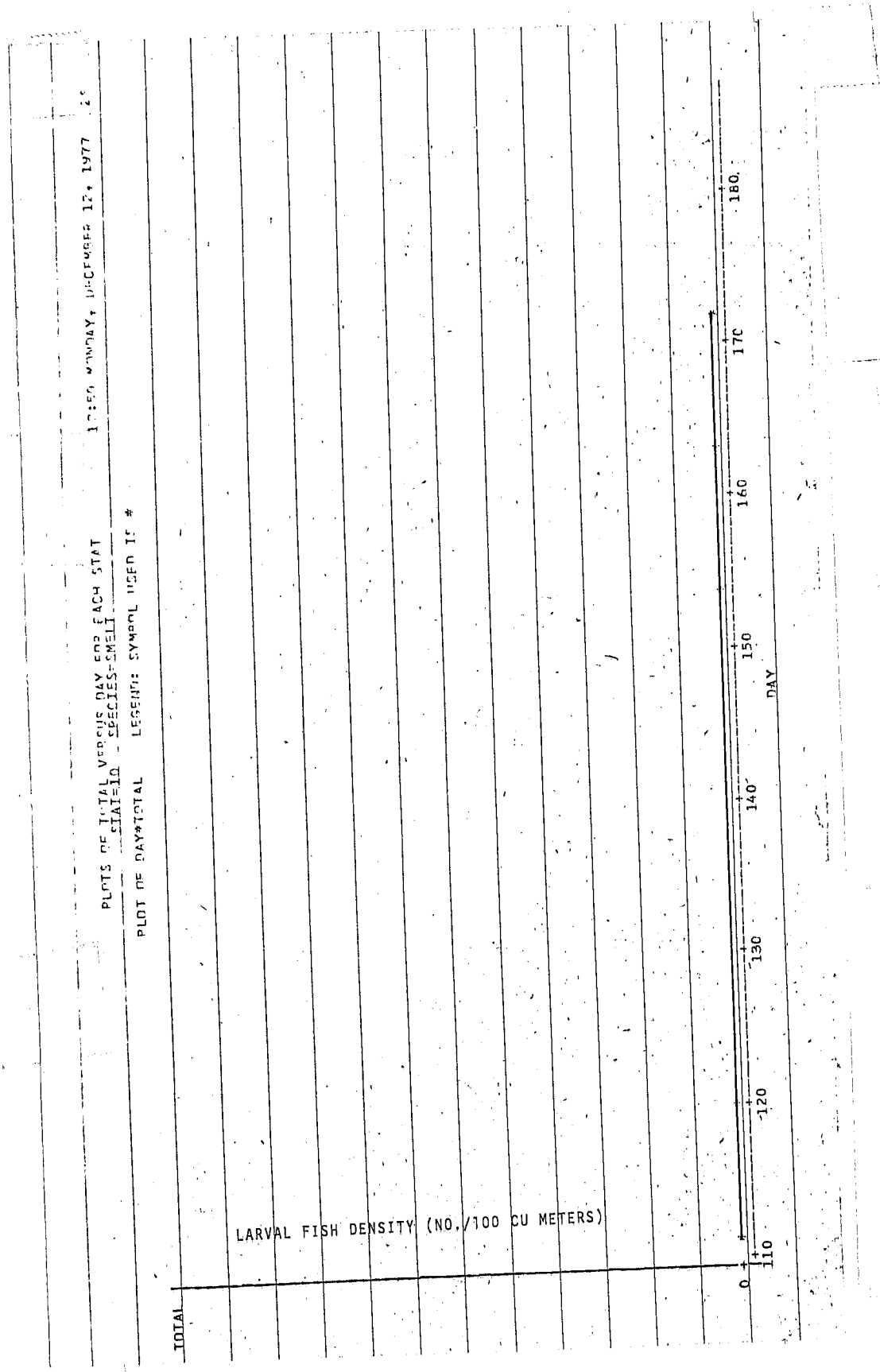


FIGURE 64. RAINBOW SMELT LARVAE DENSITY AT STATION 10 (1977)

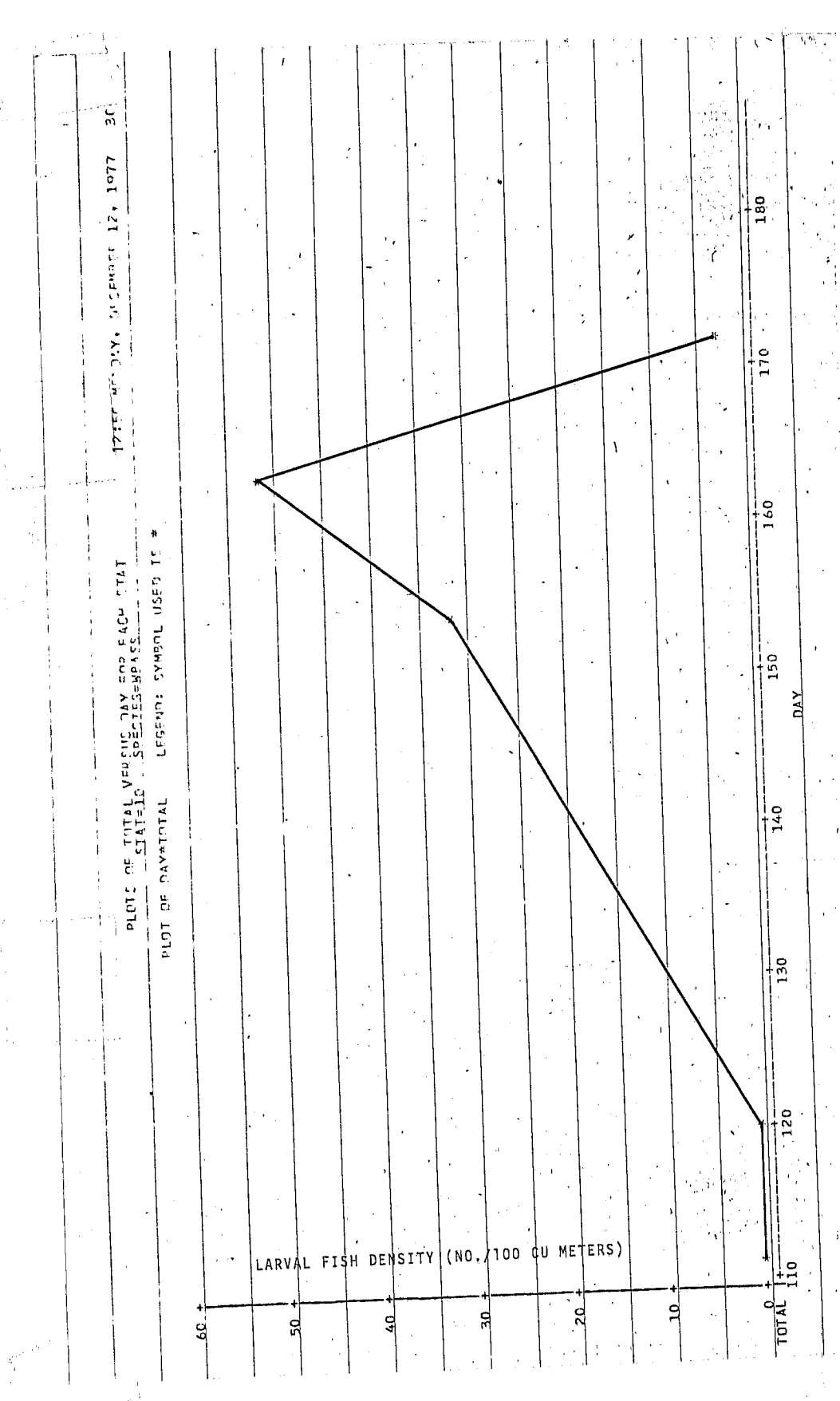


FIGURE 65. WHITE BASS LARVAE DENSITY AT STATION 10 (1977)

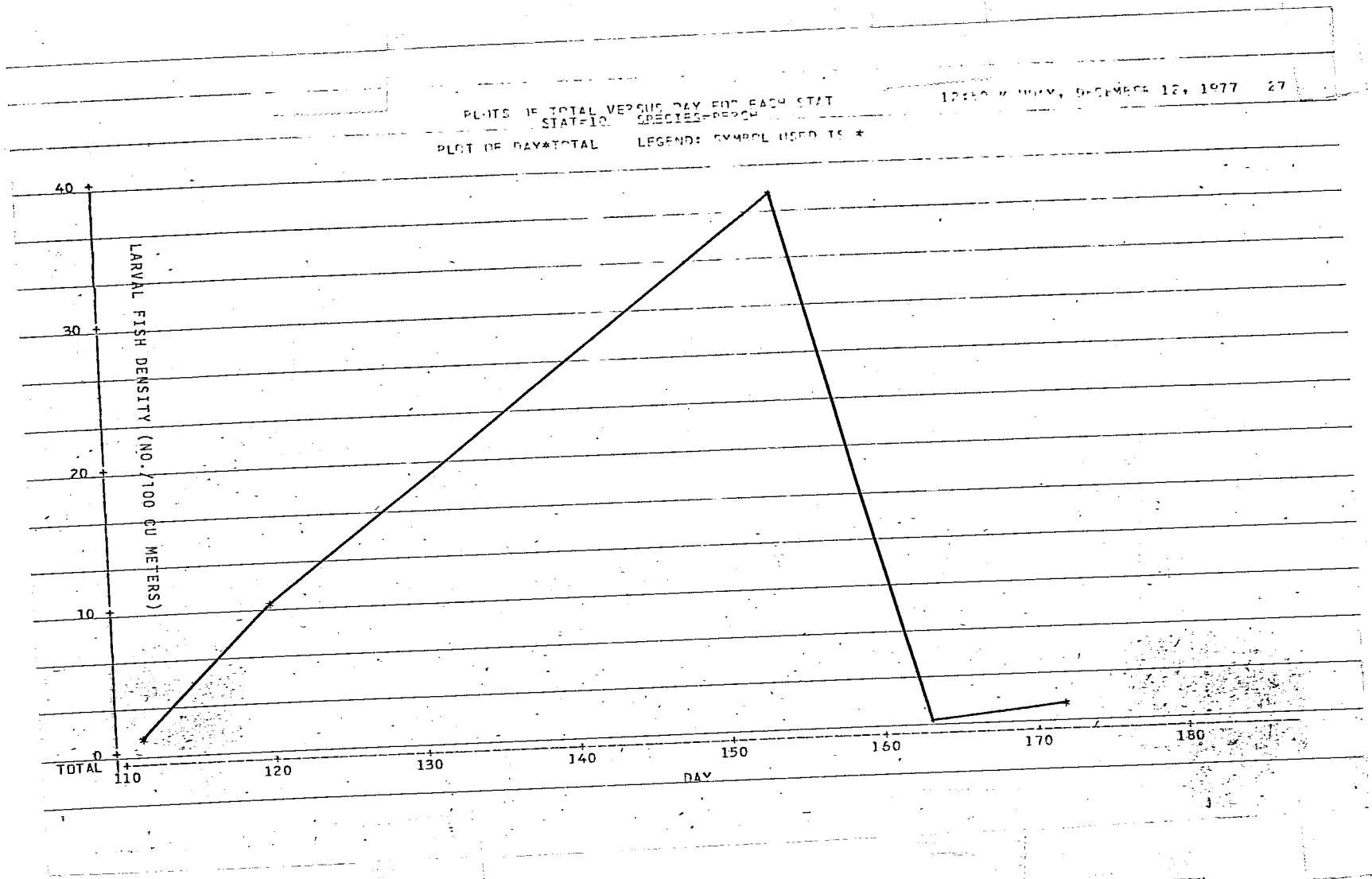


FIGURE 66. YELLOW PERCH LARVAE DENSITY AT STATION 10 (1977)

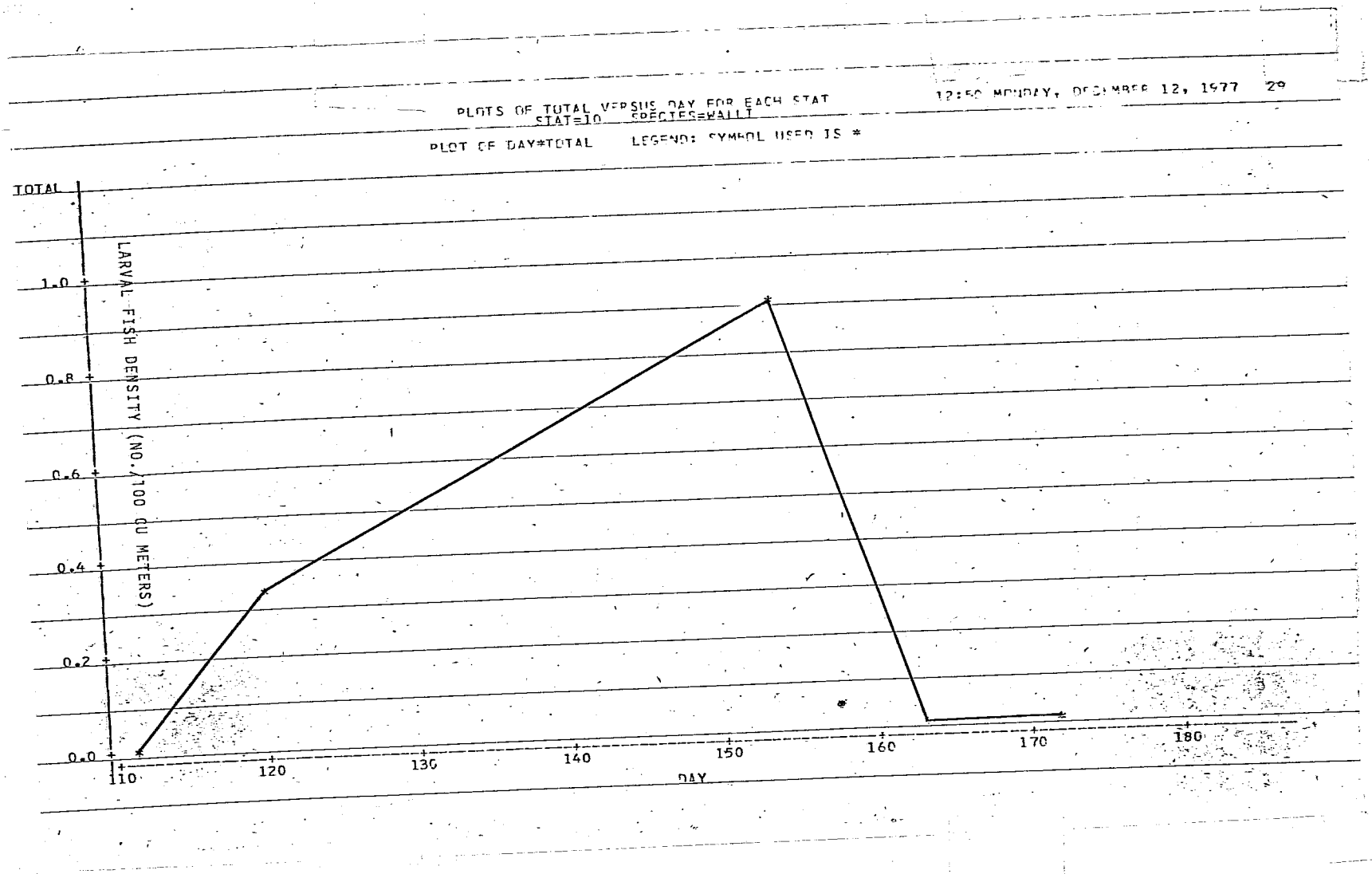


FIGURE 67. WALLEYE LARVAE DENSITY AT STATION 10 (1977)

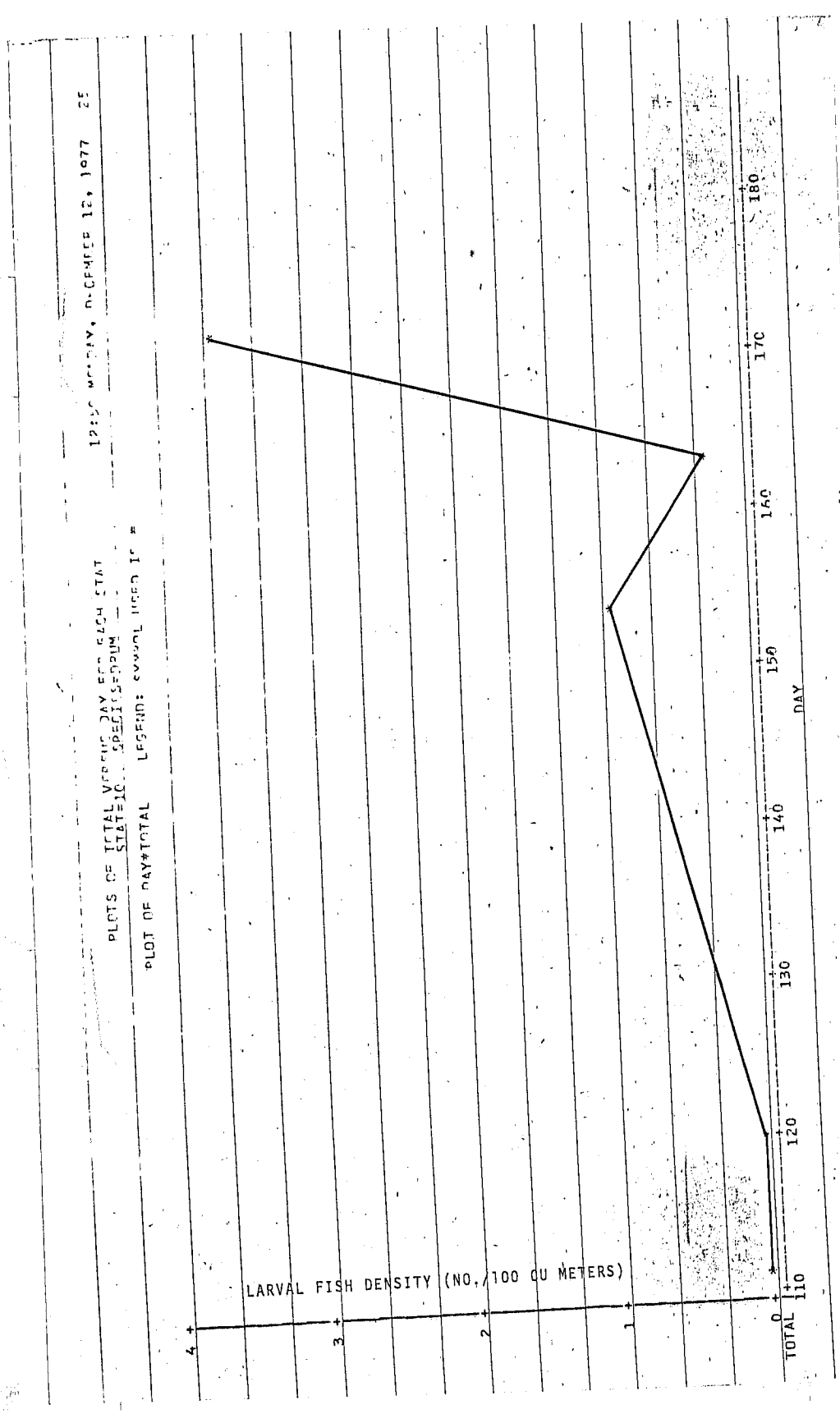


FIGURE 68. FRESHWATER DRUM LARVAE DENSITY AT STATION 10 (1977)

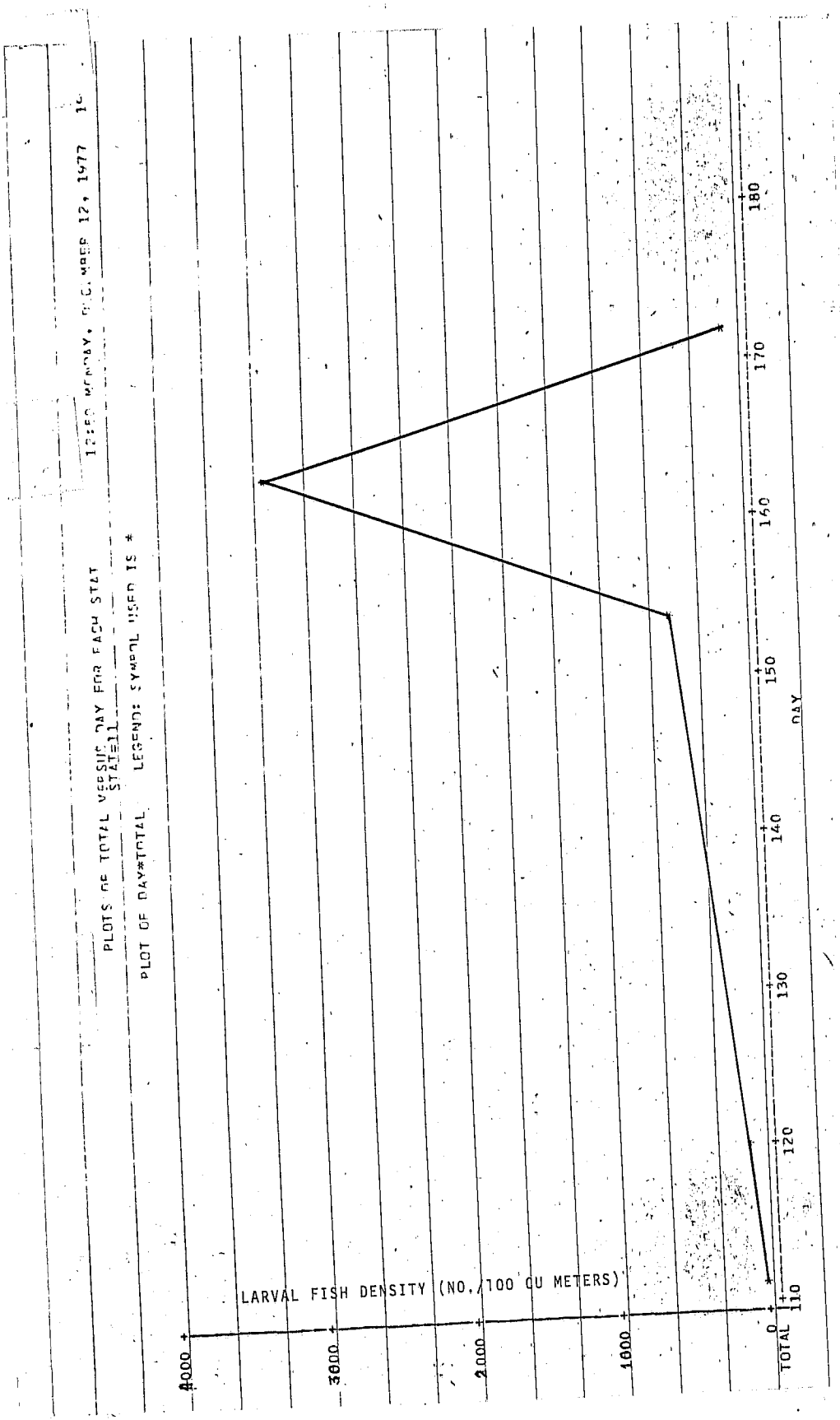


FIGURE 69. TOTAL FISH LARVAE DENSITY AT STATION 11 (1977)

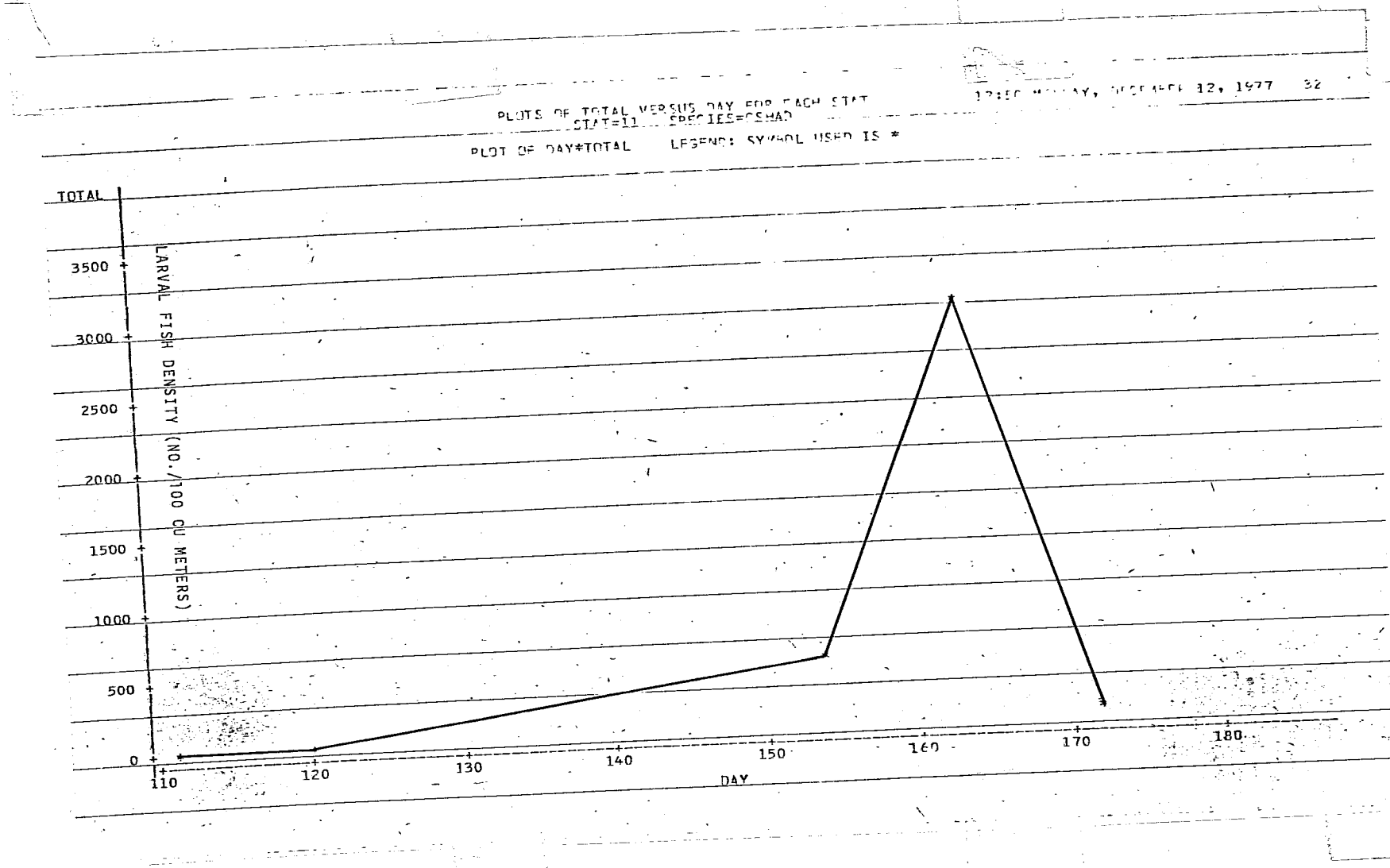


FIGURE 70. GIZZARD SHAD LARVAE DENSITY AT STATION 11 (1977)

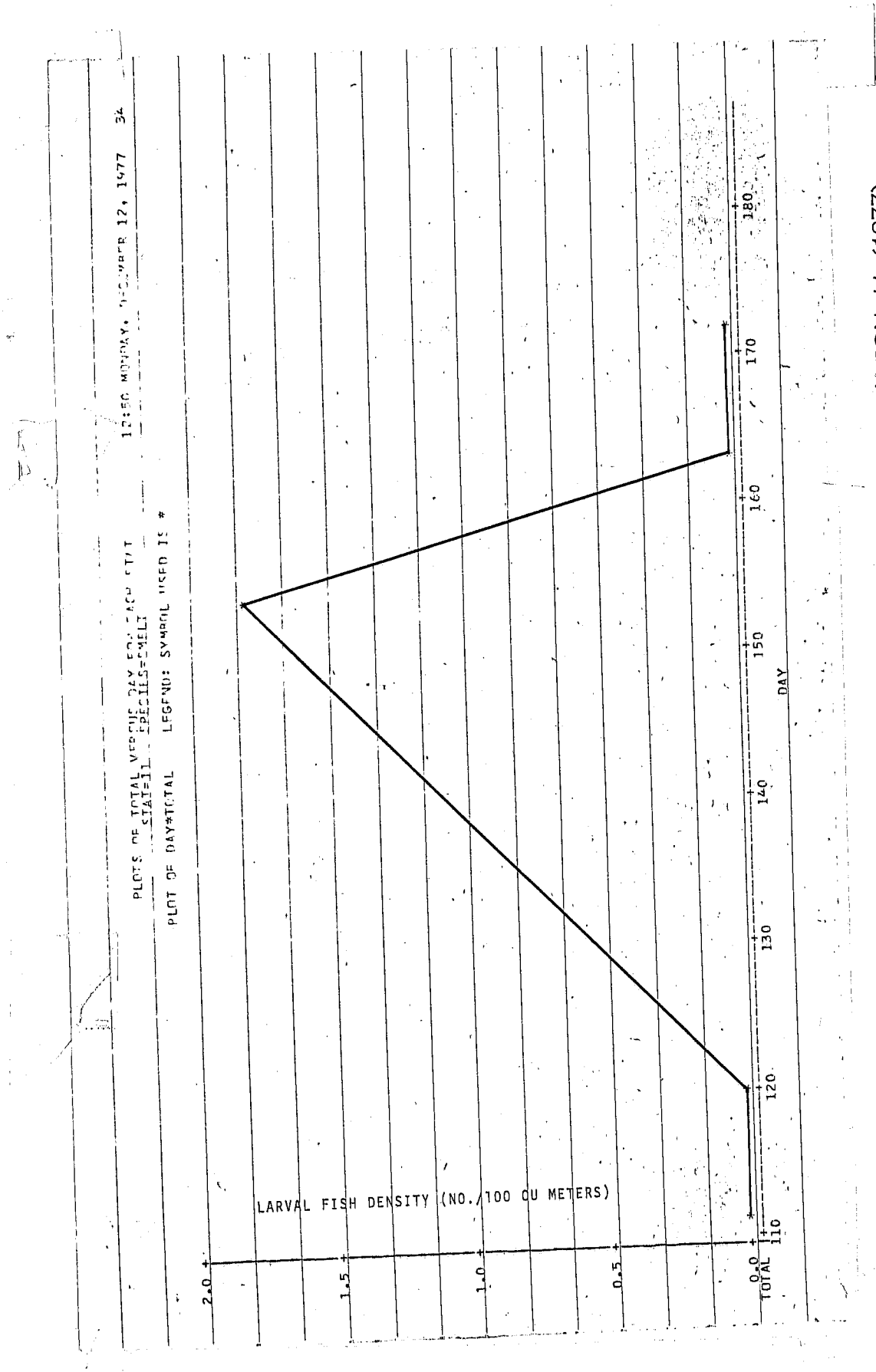


FIGURE 71. RAINBOW SMELT LARVAE DENSITY AT STATION 11 (1977)

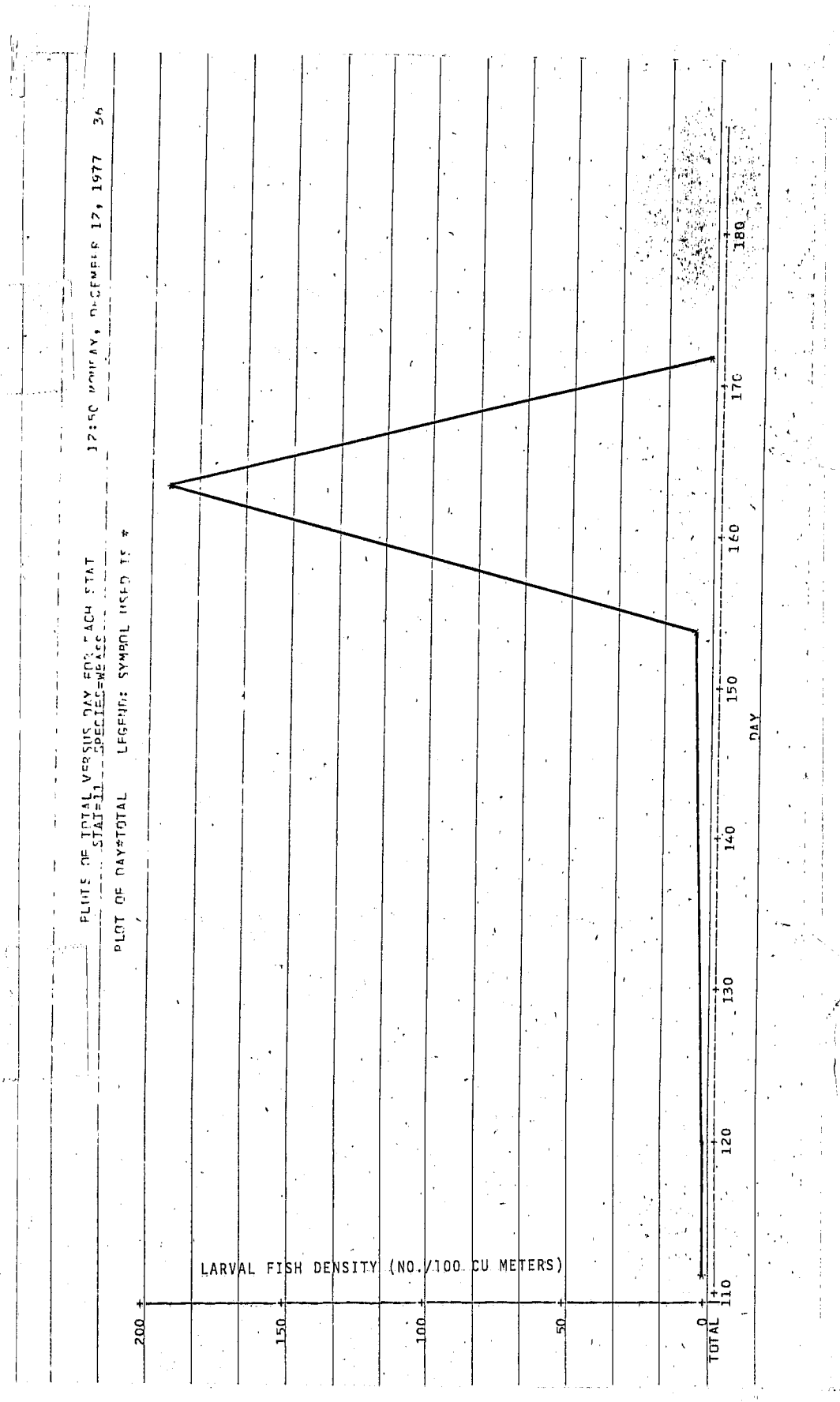


FIGURE 72. WHITE BASS LARVAE DENSITY AY STATION 11 (1977)

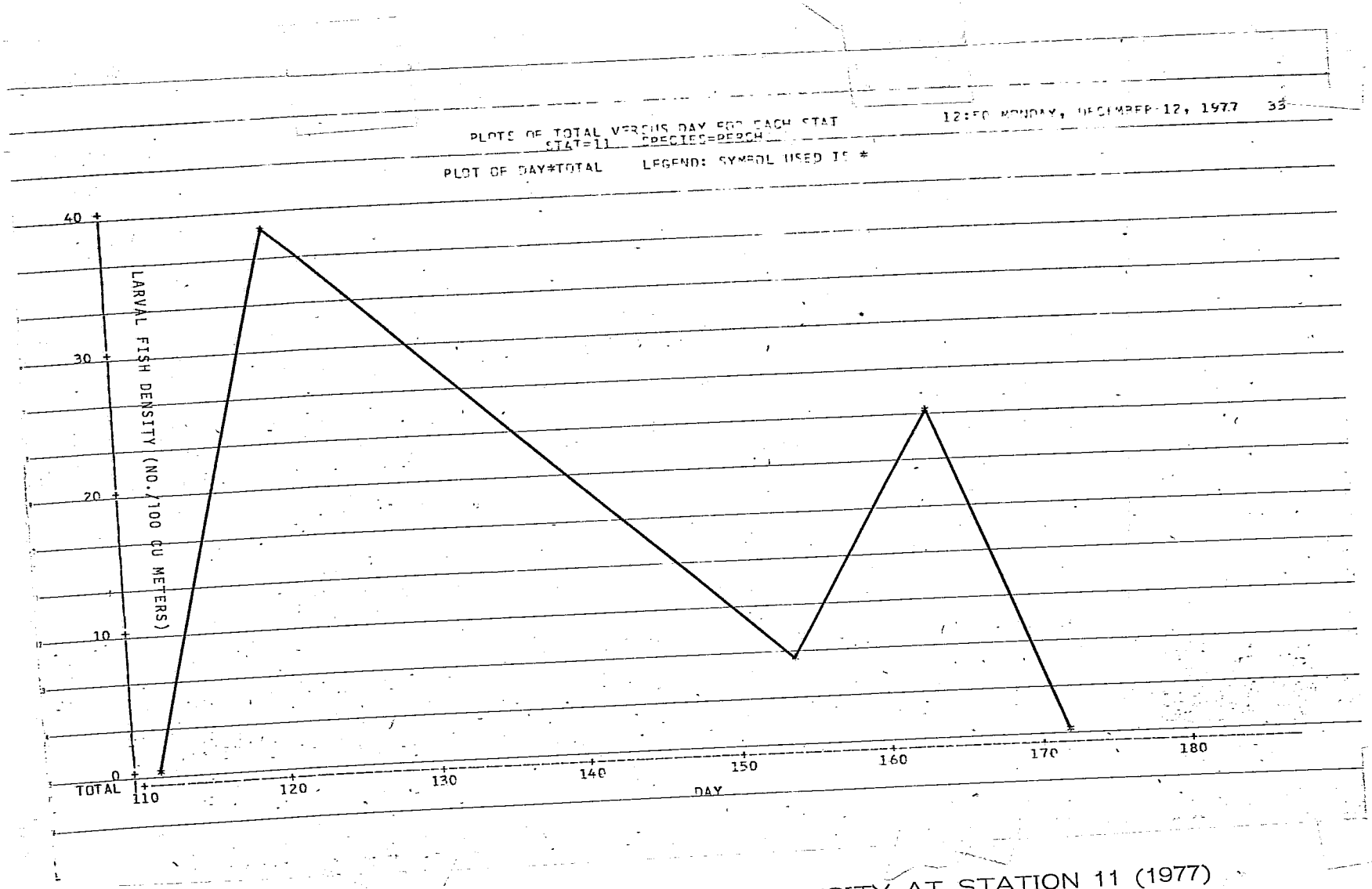


FIGURE 73. YELLOW PERCH LARVAE DENSITY AT STATION 11 (1977)

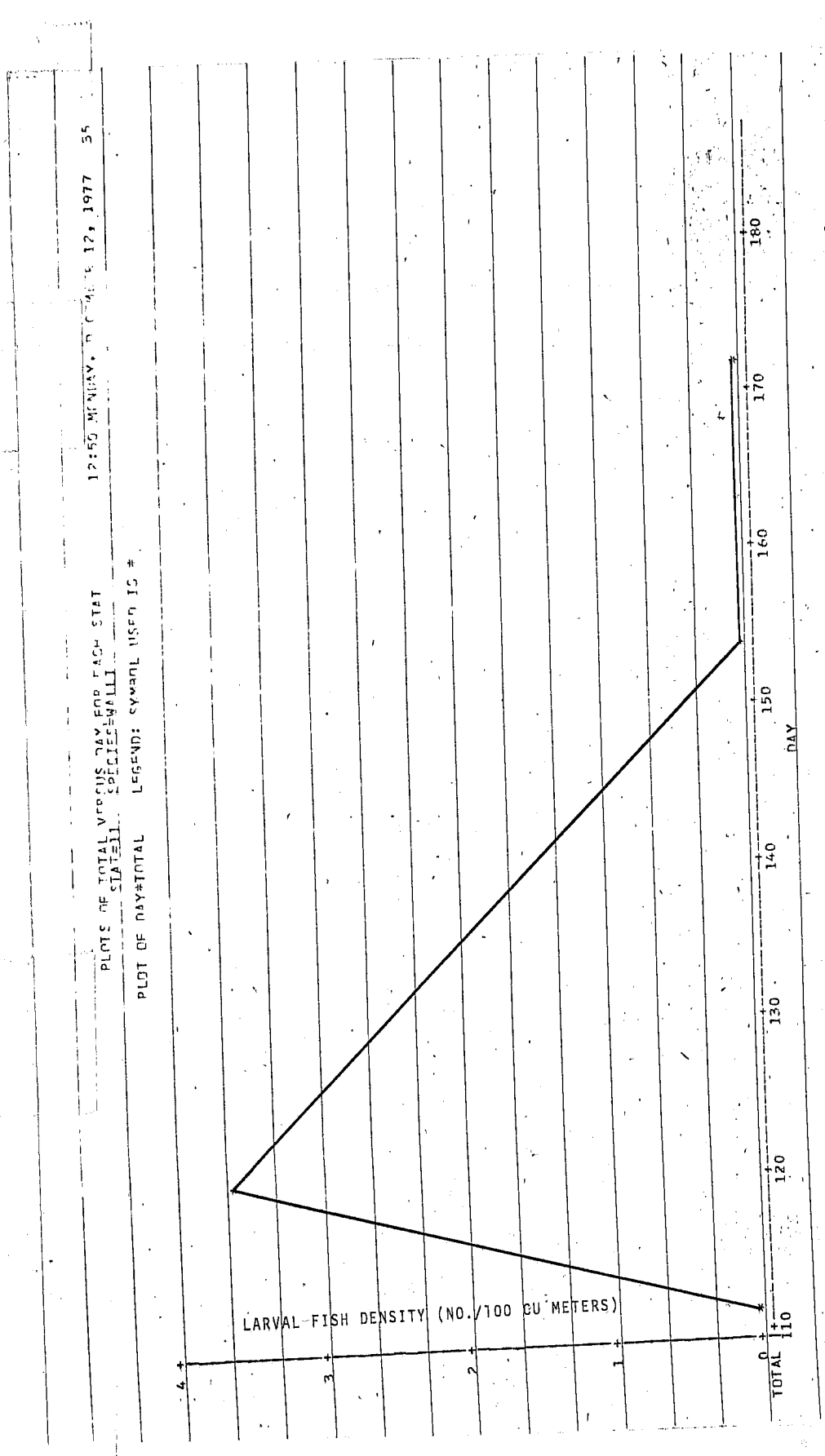


FIGURE 74. WALLEYE LARVAE DENSITY AT STATION 11 (1977)

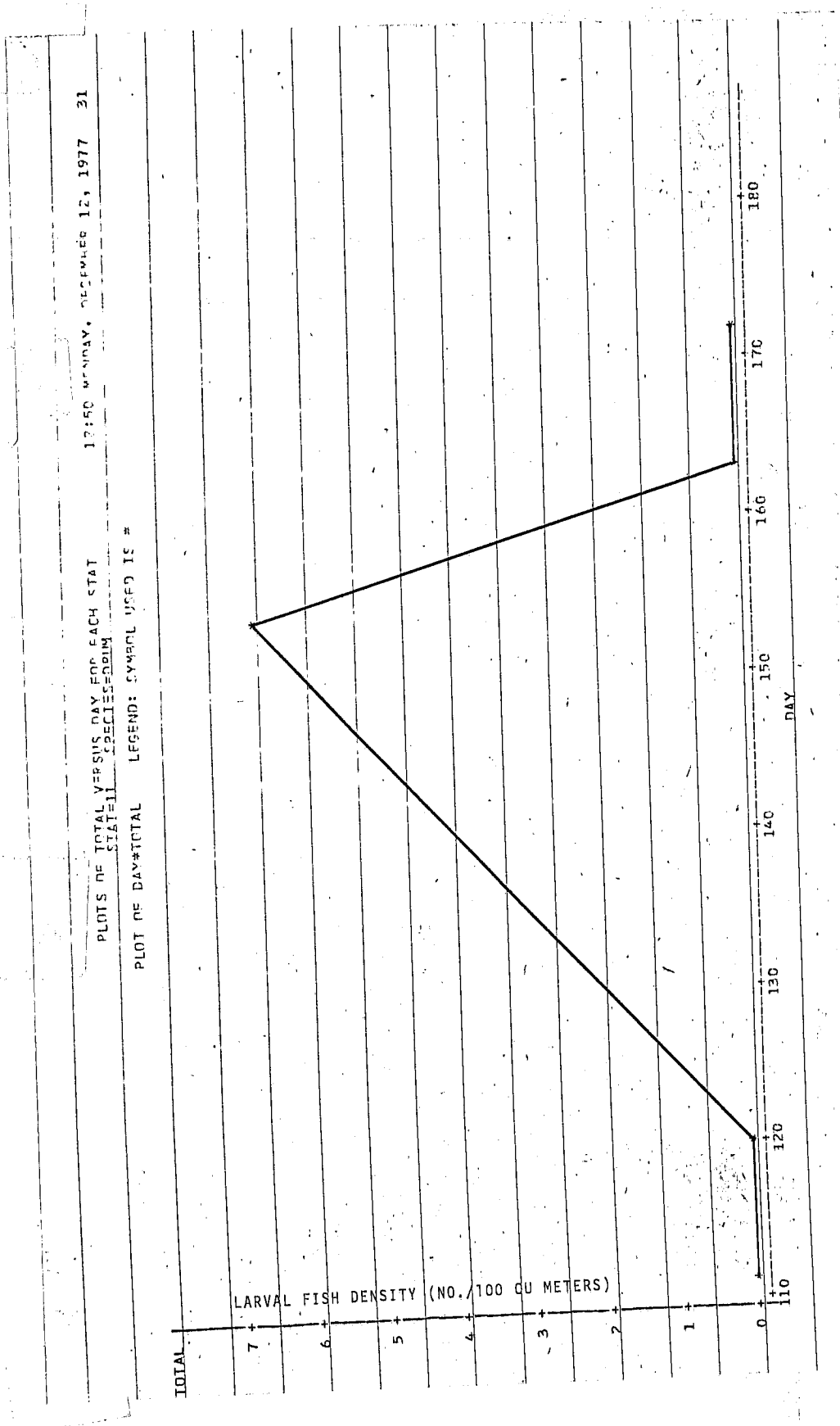


FIGURE 75. FRESHWATER DRUM LARVAE DENSITY AT STATION 11(1977)

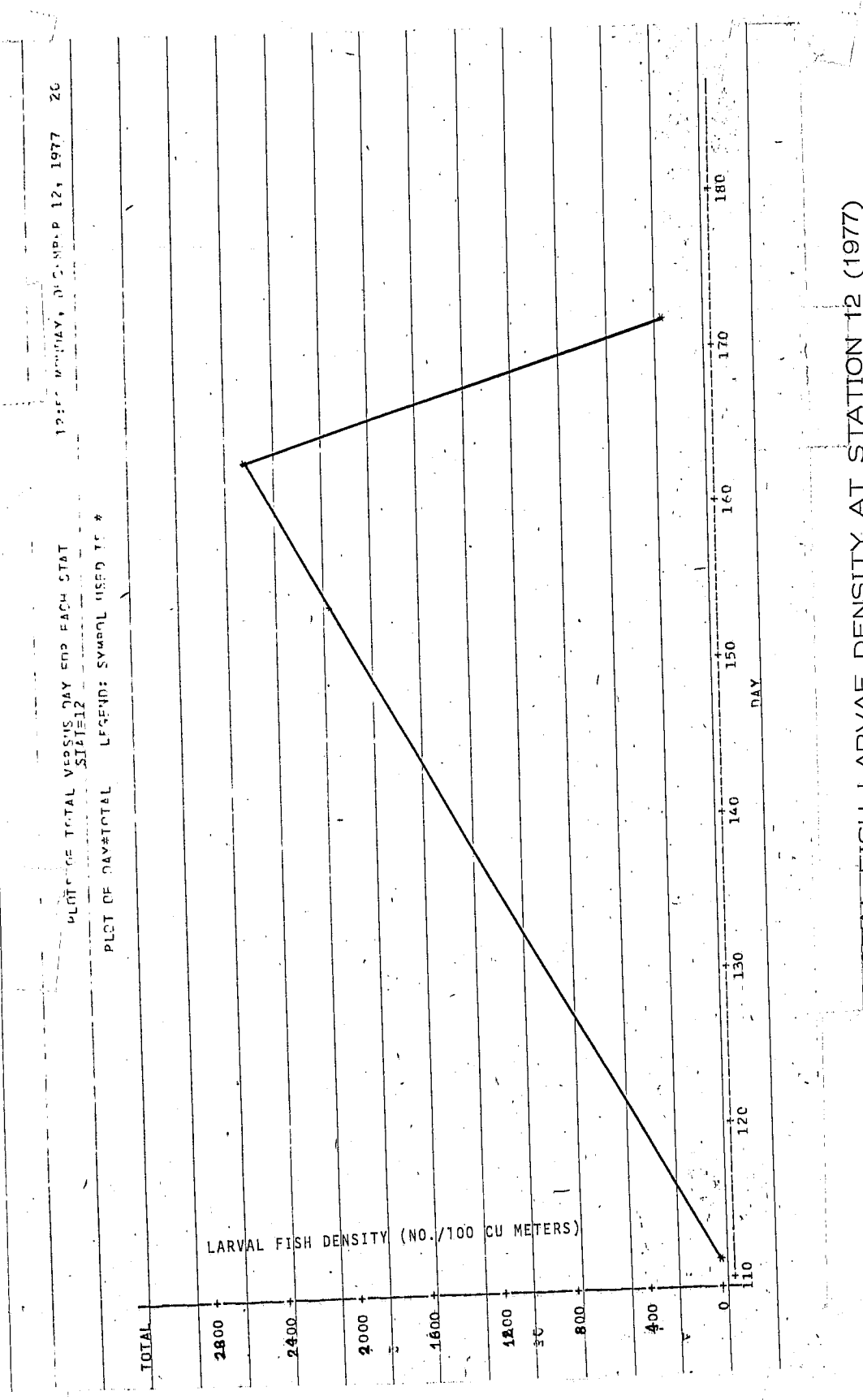


FIGURE 76. TOTAL FISH LARVAE DENSITY AT STATION 12 (1977)

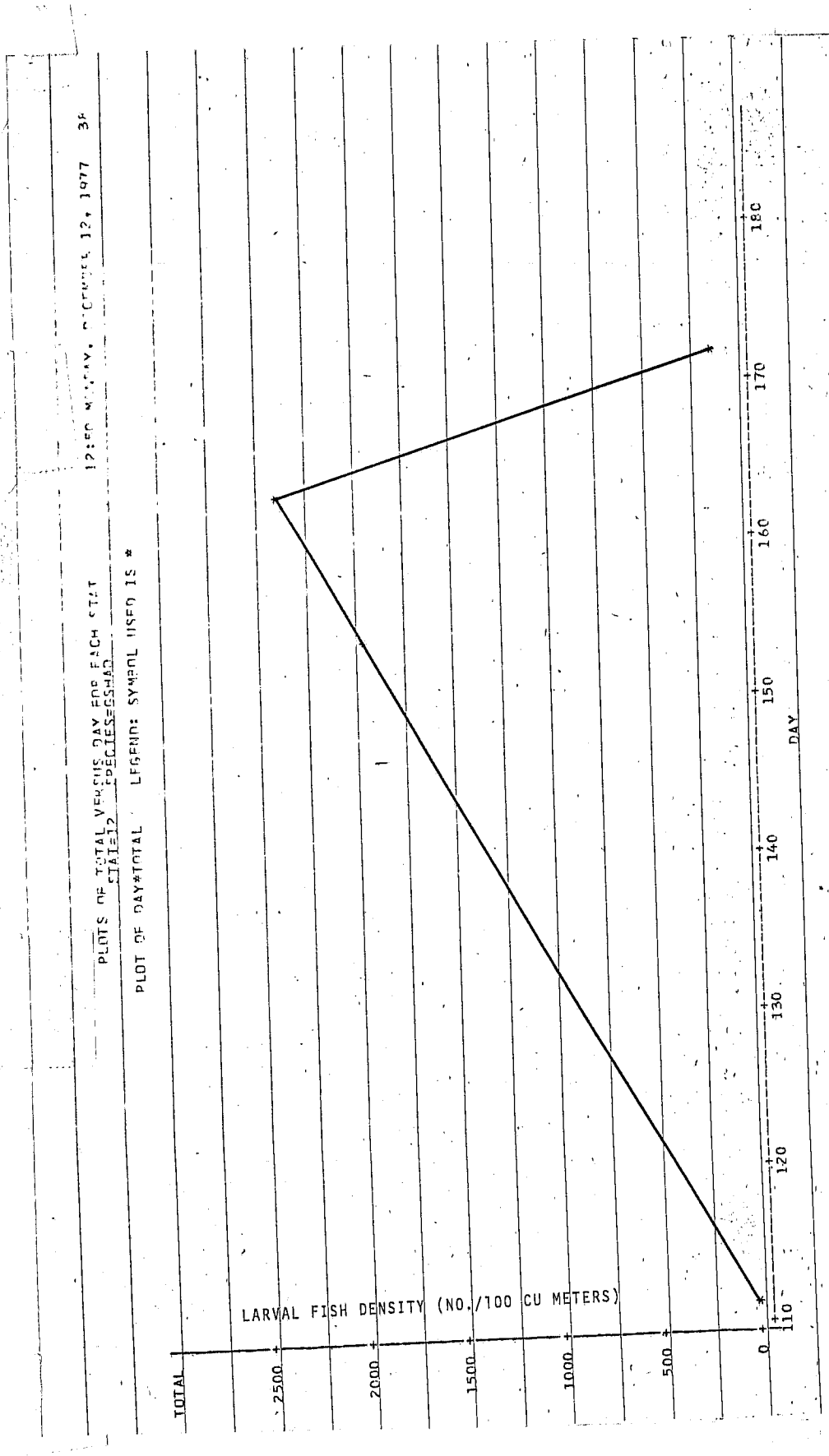


FIGURE 77. GIZZARD SHAD LARVAE DENSITY AT STATION 12 (1977)

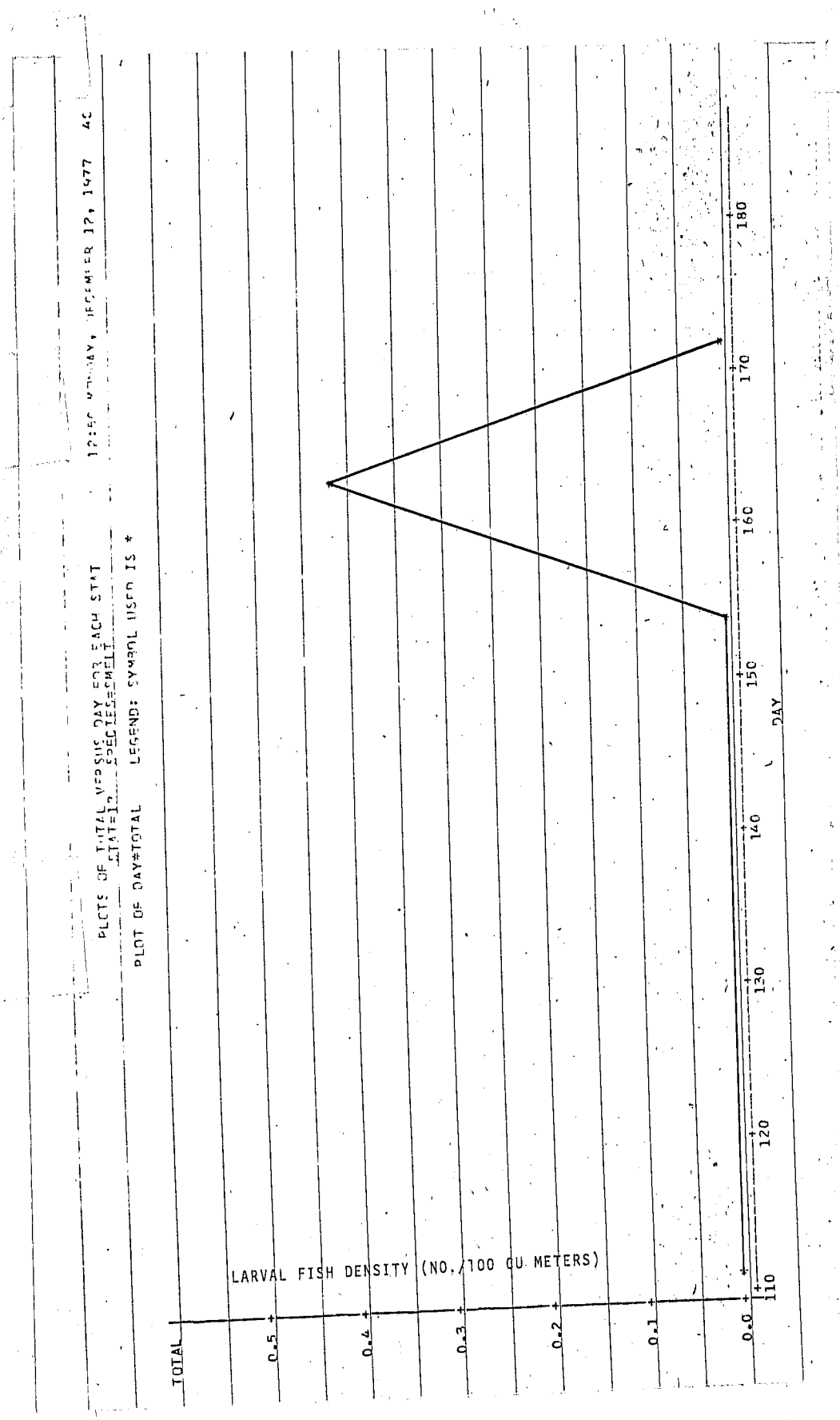


FIGURE 78. RAINBOW SMELT LARVAE DENSITY AT STATION 12 (1977)

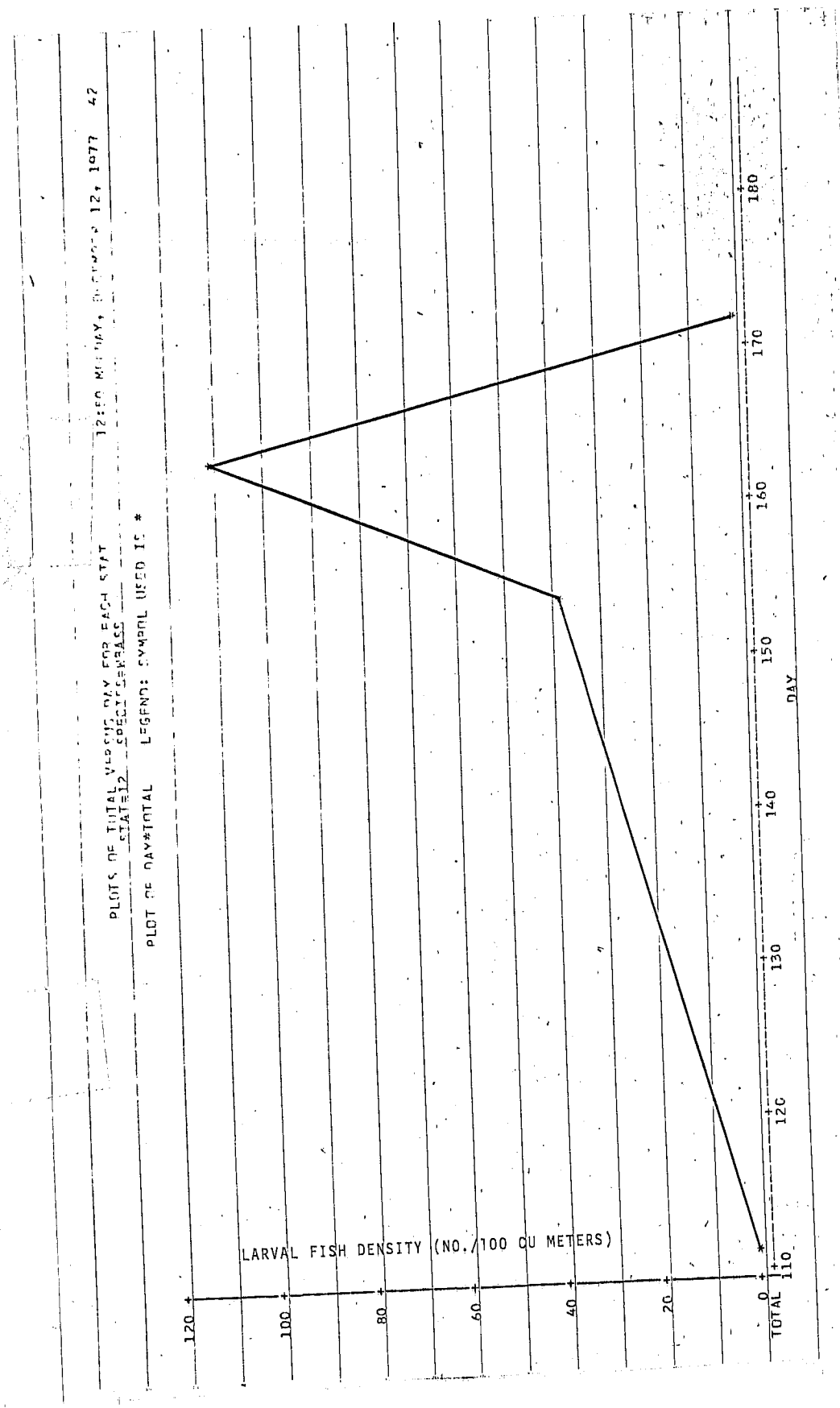


FIGURE 79. WHITE BASS LARVAE DENSITY AT STATION 12 (1977)

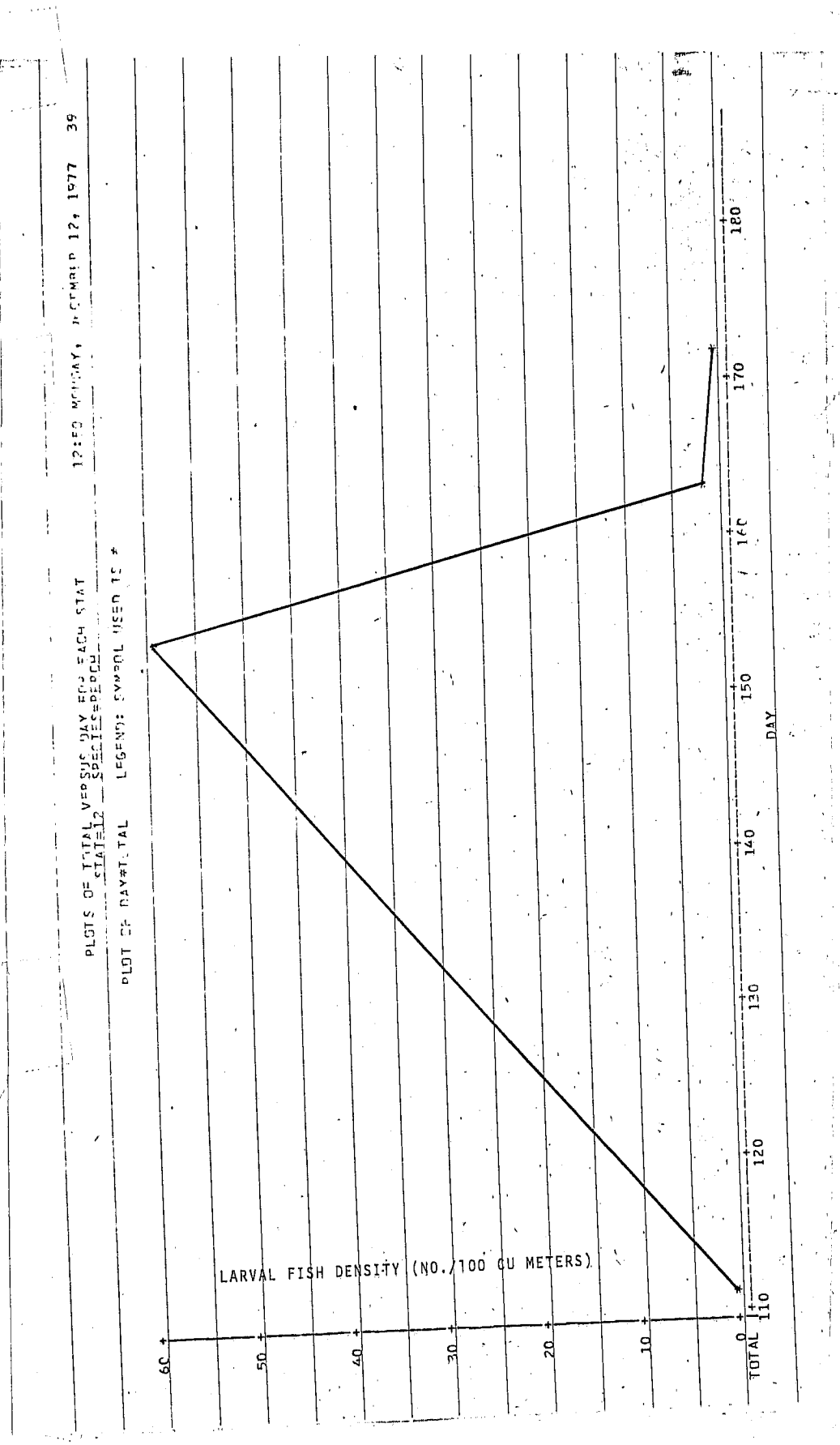


FIGURE 80. YELLOW PERCH LARVAE DENSITY AT STATION 12 (1977)

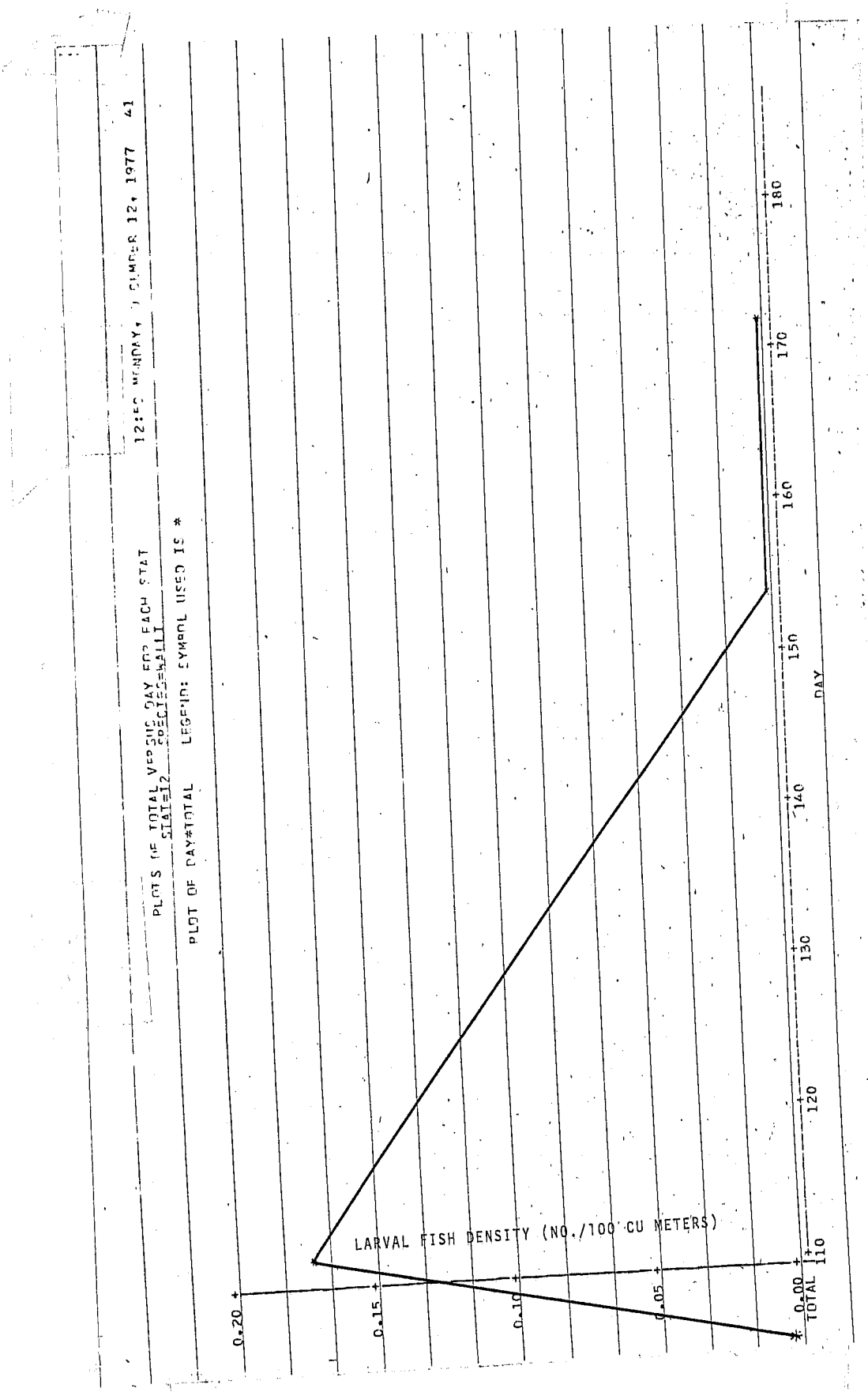


FIGURE 81. WALLEYE LARVAE DENSITY AT STATION 12 (1977)

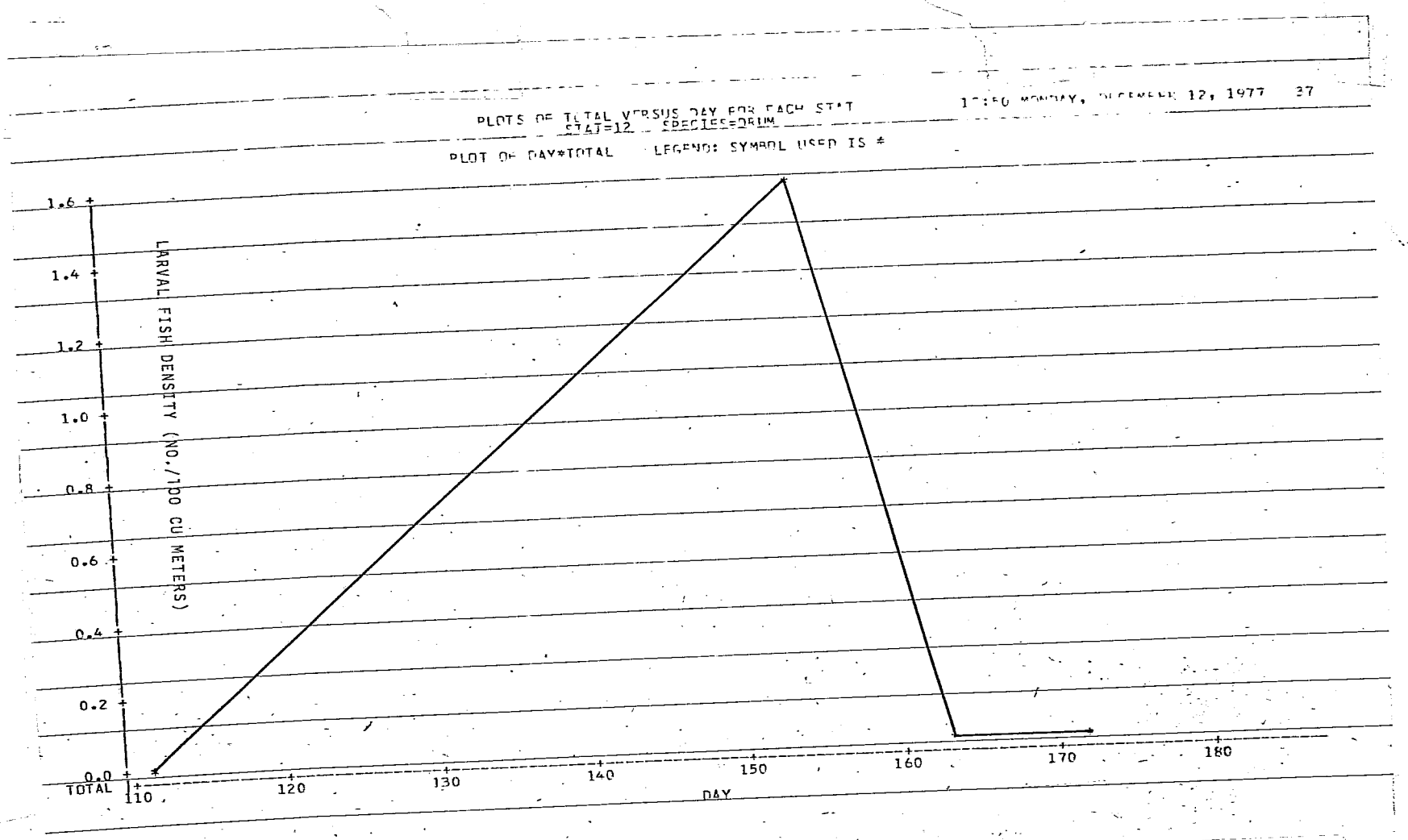


FIGURE 82. FRESHWATER DRUM LARVAE DENSITY AT STATION 12 (1977)

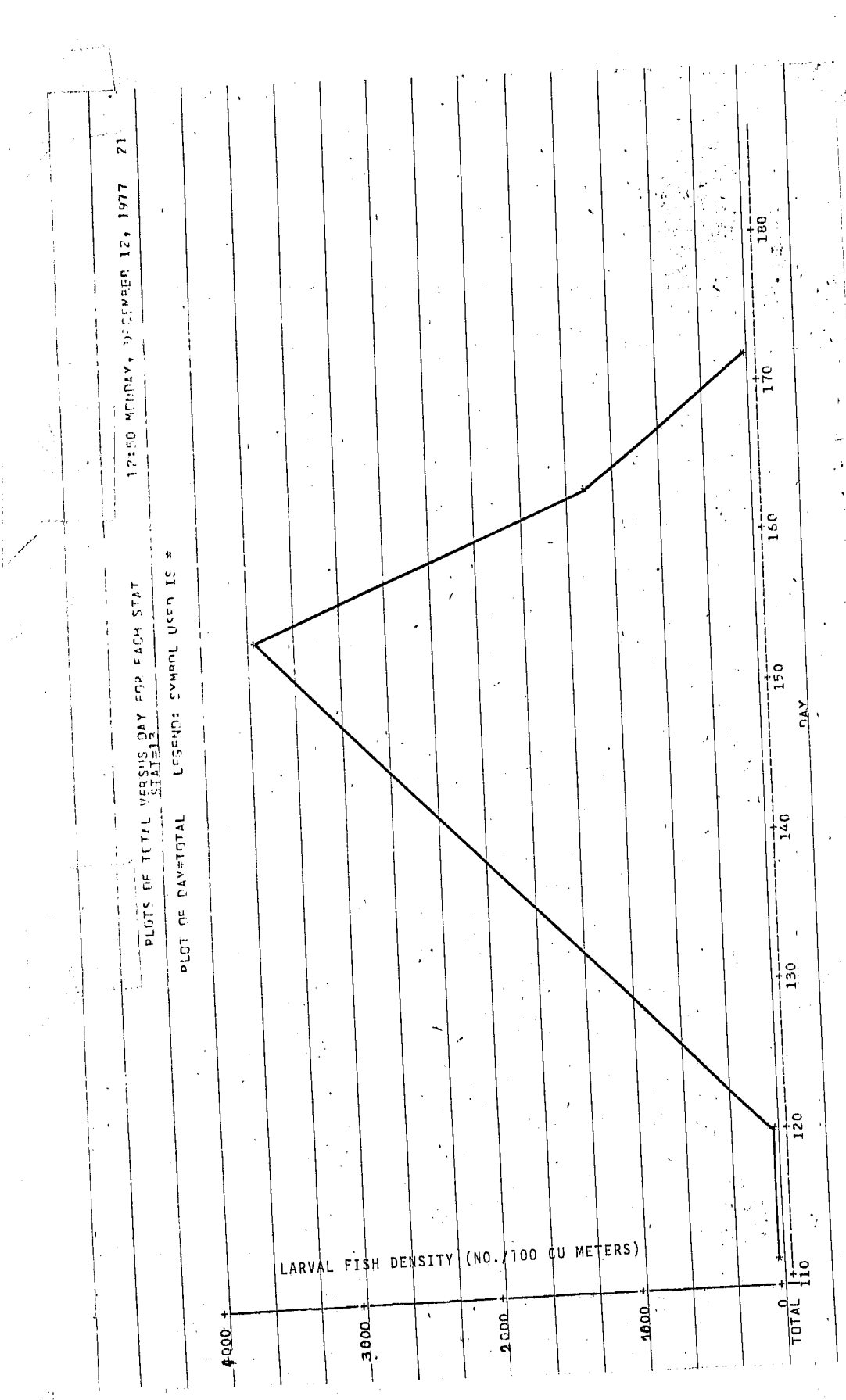


FIGURE 83. TOTAL FISH LARVAE DENSITY AT STATION 13 (1977)

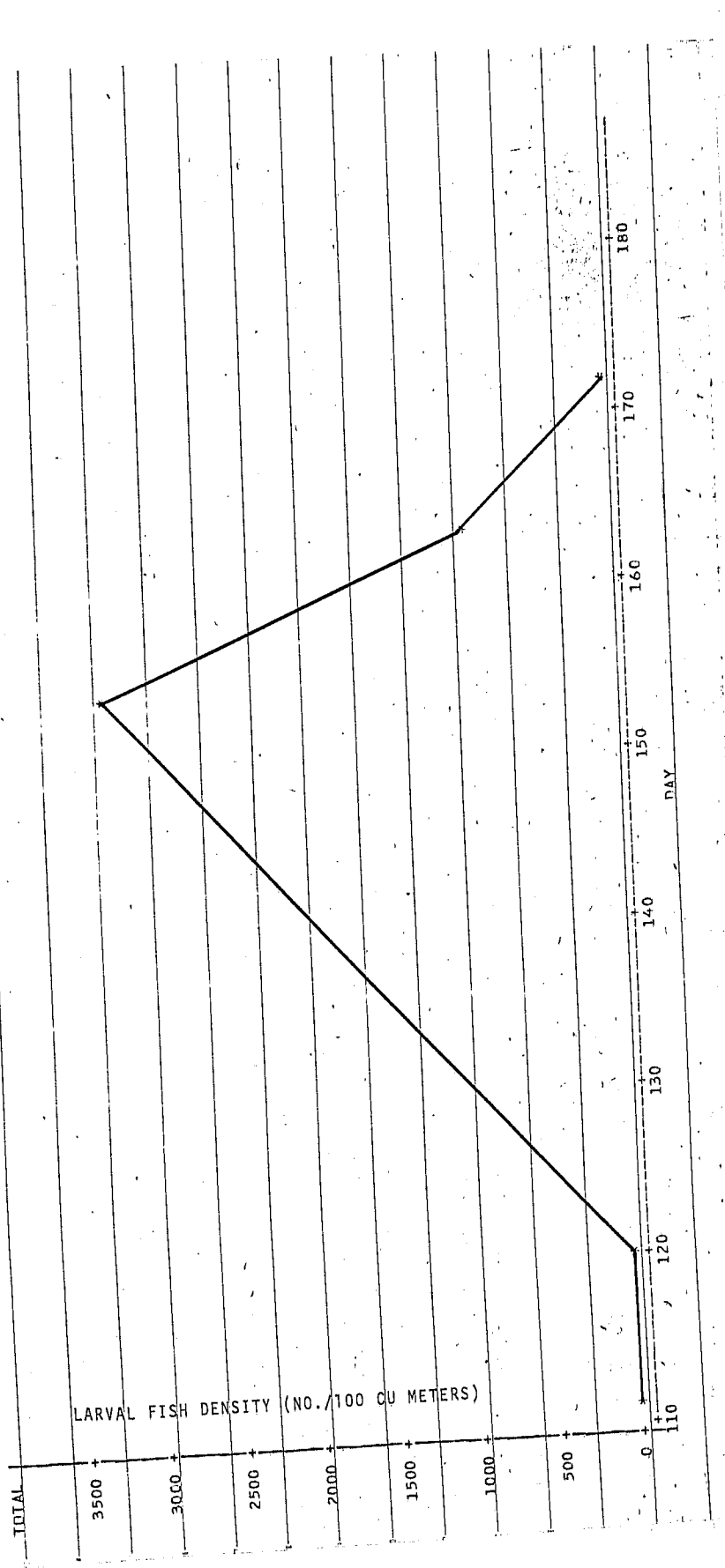


FIGURE 84. GIZZARD SHAD LARVAE DENSITY AT STATION 13 (1977)

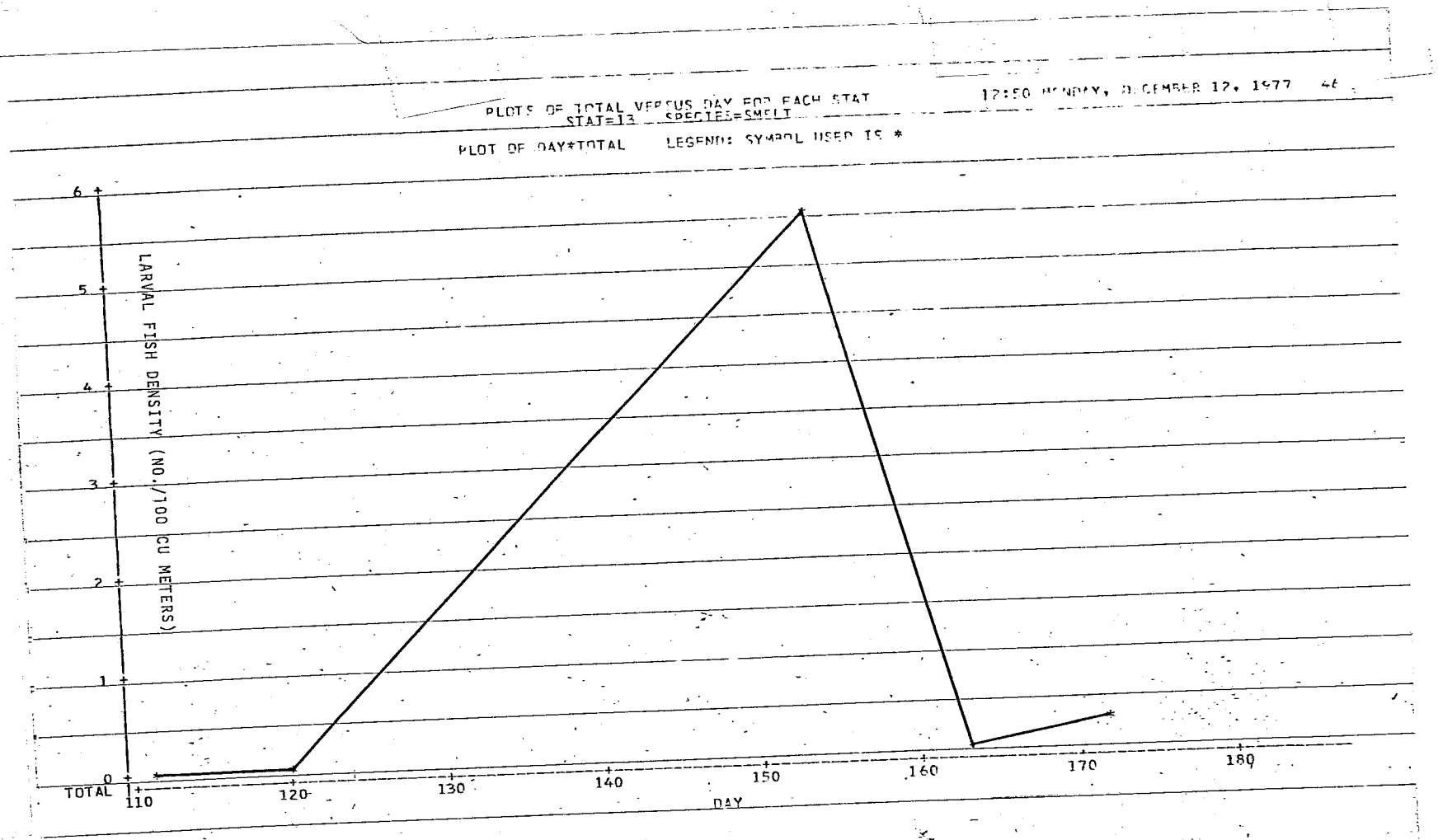


FIGURE 85. RAINBOW SMELT LARVAE DENSITY AT STATION 13 (1977)

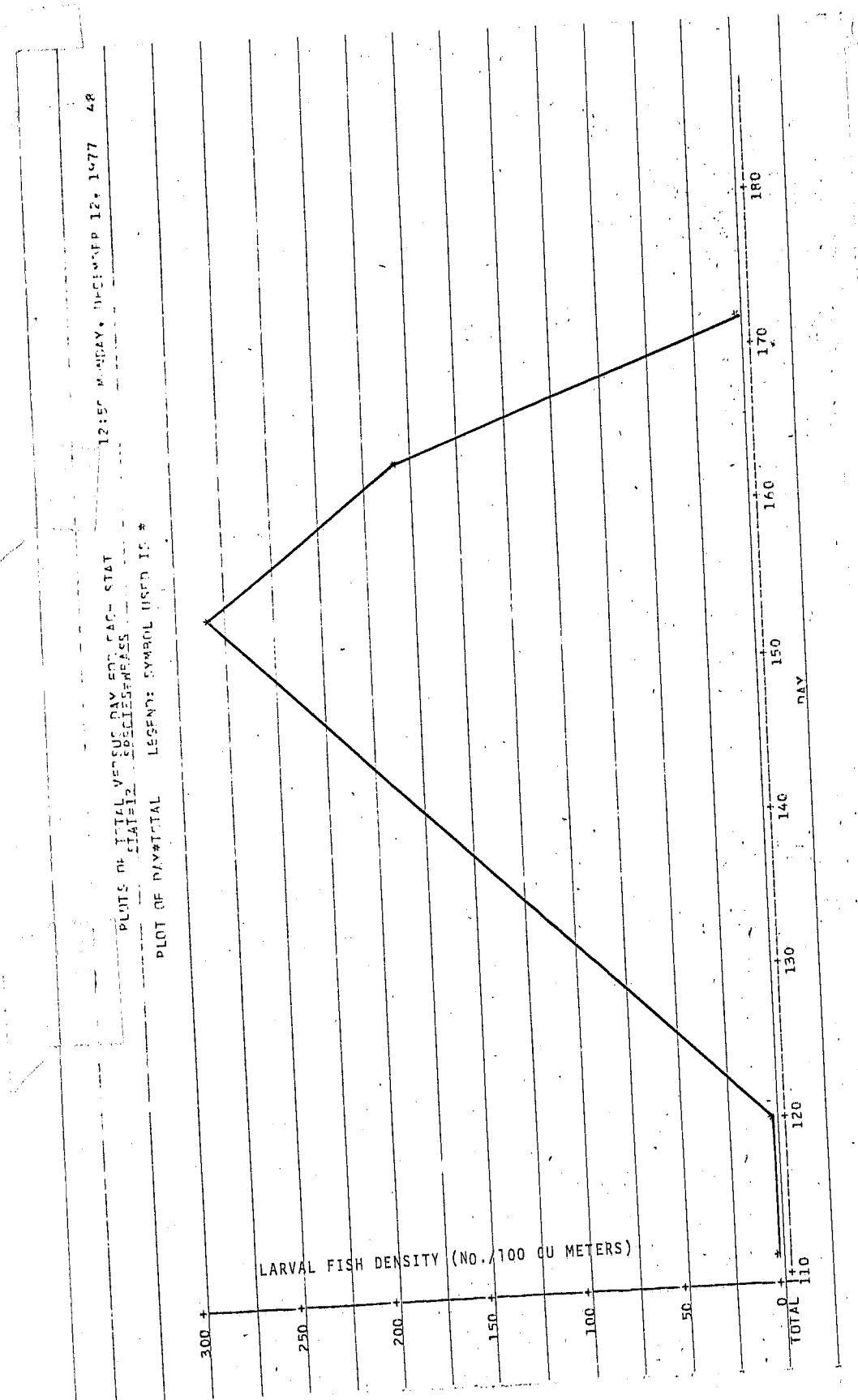


FIGURE 86. WHITE BASS LARVAE DENSITY AT STATION 13 (1977)

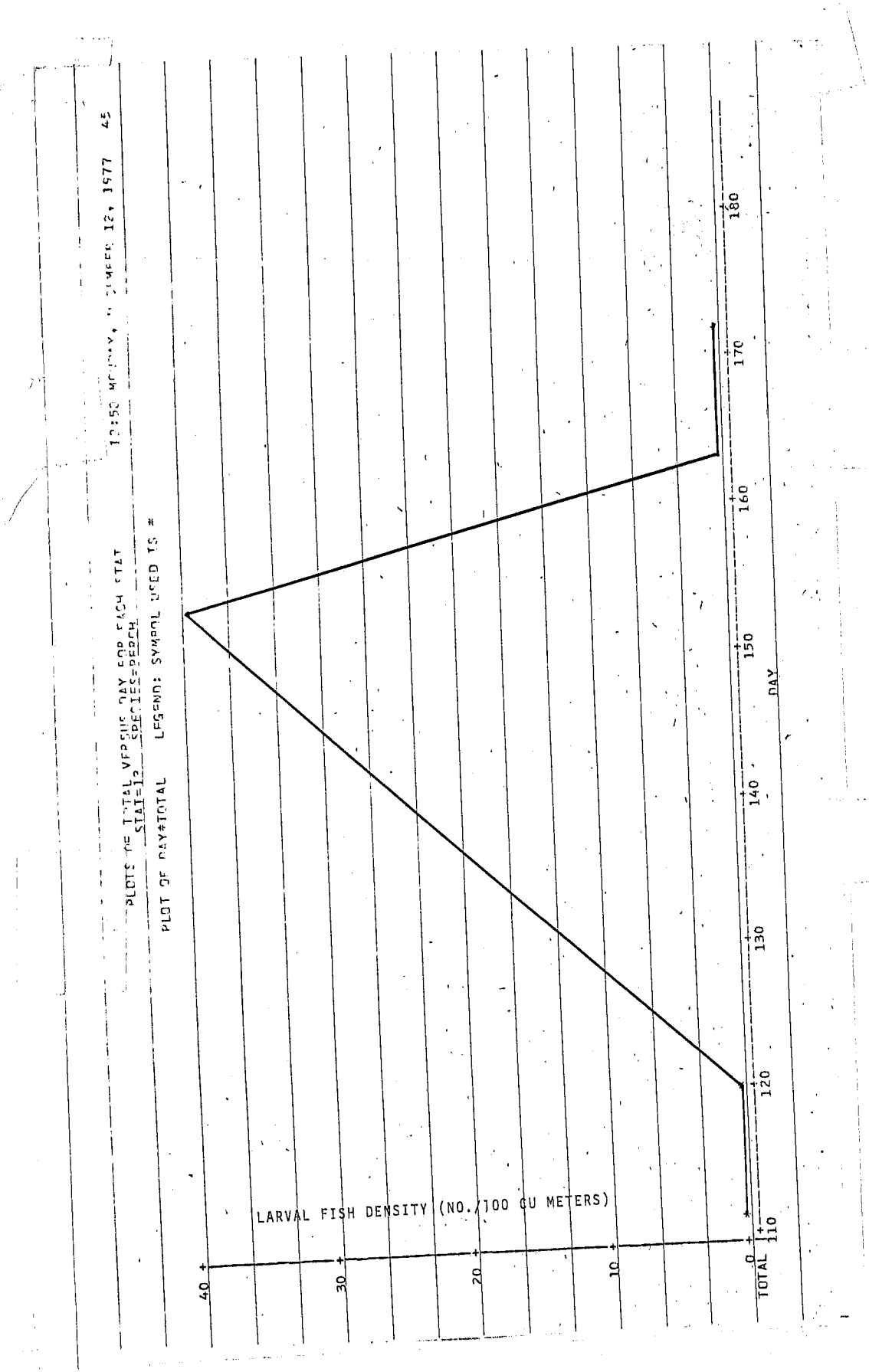


FIGURE 87. YELLOW PERCH LARVAE DENSITY AT STATION 13 (1977)

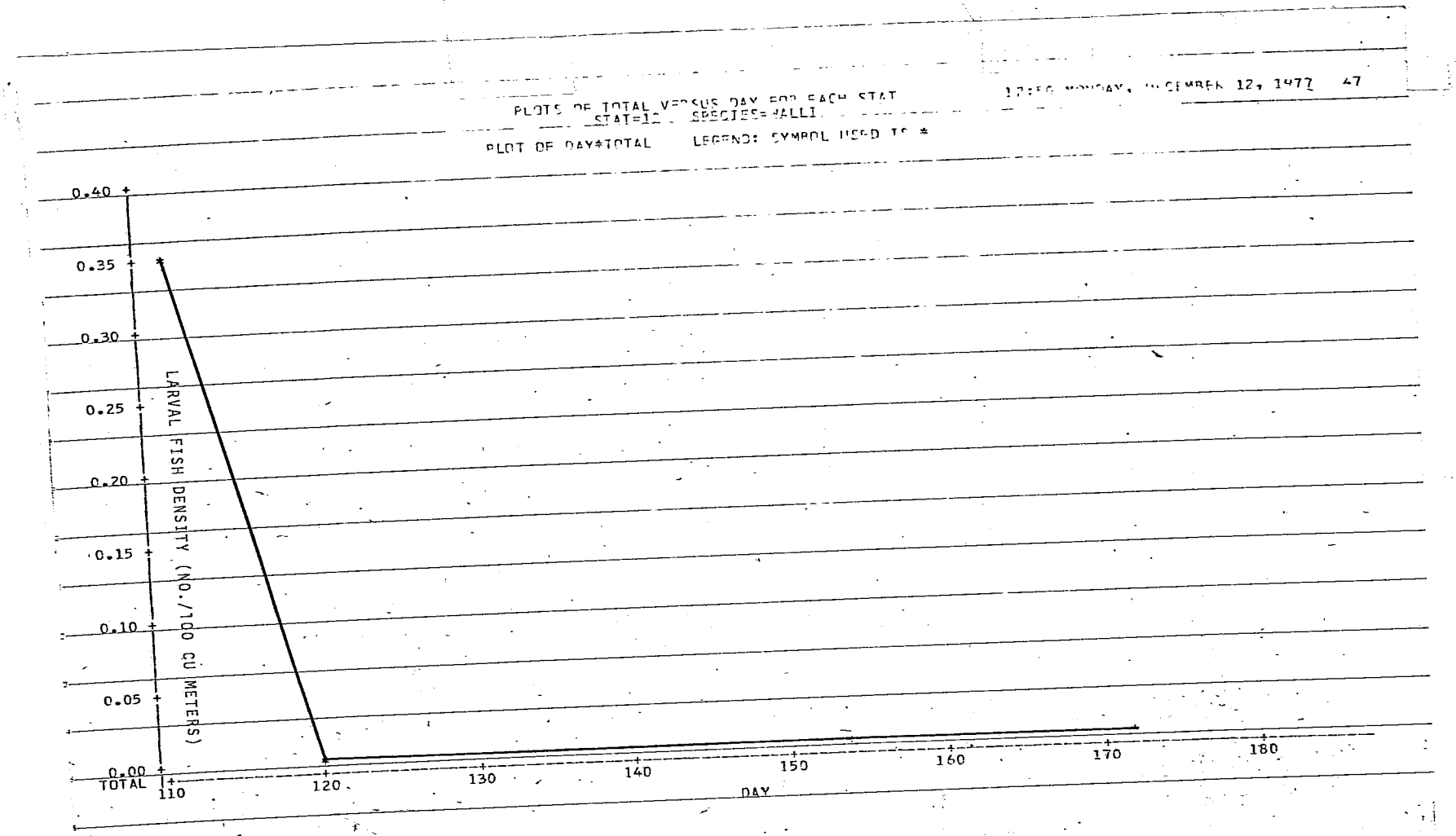


FIGURE 88. WALLEYE LARVAE DENSITY AT STATION 13 (1977)

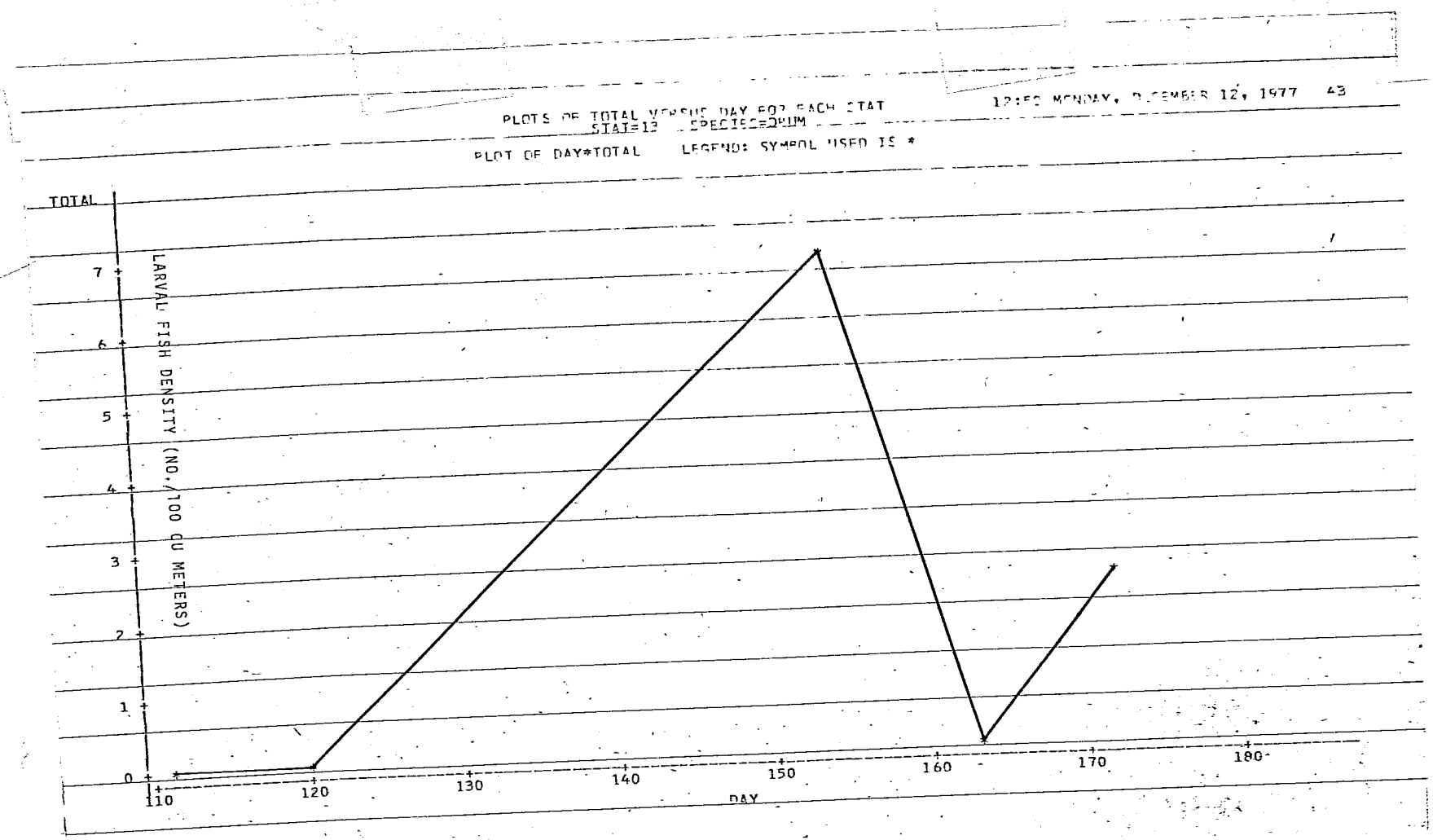


FIGURE 89. FRESHWATER DRUM LARVAE DENSITY AT STATION 13 (1977)

APPENDIX A

MAUMEE RIVER PERMIT
No. 76-03-1

Permit No. 76-03-1

Effective Date

Expiration Date: 31 December 1980

DEPARTMENT OF THE ARMY PERMIT

White Brothers Sand, Inc.
1845 Collingwood Boulevard
P. O. Box 714
Toledo, Ohio

District Engineer
U. S. Army Engineer District
Detroit, Corps of Engineers
Detroit, Michigan 48231

Gentlemen:
Referring to written request dated 31 December 1975 for a permit to:

(X) Perform work in or affecting navigable waters of the United States, upon the recommendation of the Chief of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C. 403);

(X) Discharge dredged or filled material into navigable waters upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 404 of the Federal Water Pollution Control Act (86 Stat. 816, P.L. 92-500);

is hereby authorized by the Secretary of the Army to: dredge sand and gravel from areas designated 1, 2, 3 in the vicinity of the I-75 Bridge to Corbutt Island to a maximum depth of 25 feet below LWD, elevation 568.6' (I.G.L.D); place the dredged material (approximately 150,000 cubic yards annually) on shore for commercial purposes

in Maumee River

at Toledo, Ohio

in accordance with the plans and drawings attached hereto which are incorporated in and made a part of this permit subject to the following conditions:

I. GENERAL CONDITIONS:

a. That all activities identified and authorized herein shall be consistent with the terms and conditions of this permit; and that any activities not specifically identified and authorized herein shall constitute a violation of the

id conditions of this permit which may result in the modification, suspension or revocation of this permit, in e or in part, as set forth more specifically in General Conditions j or k hereto, and in the institution of such legal roceedings as the United States Government may consider appropriate, whether or not this permit has been previously modified, suspended or revoked in whole or in part.

b. That all activities authorized herein shall, if they involve a discharge or deposit into navigable waters or ocean waters, be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, and pretreatment standards established pursuant to Sections 301, 302, 306 and 307 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500; 86 Stat. 816), or pursuant to applicable State and local law.

c. That when the activity authorized herein involves a discharge or deposit of dredged or fill material into navigable waters, the authorized activity shall, if applicable water quality standards are revised or modified during the term of this permit, be modified if necessary, to conform with such revised or modified water quality standards within 6 months of the effective date of any revision or modification of water quality standards, or as directed by an implementation plan contained in such revised or modified standards, or within such longer period of time as the District Engineer, in consultation with the Regional Administrator of the Environmental Protection Agency, may determine to be reasonable under the circumstances.

d. That the permittee agrees to make every reasonable effort to prosecute the construction or work authorized herein in a manner so as to minimize any adverse impact of the construction or work on fish, wildlife, and natural environmental values.

e. That the permittee(s) agrees to prosecute the construction or work authorized herein in a manner so as to minimize any degradation of water quality.

f. That the permittee shall permit the District Engineer or his authorized representative(s) or designee(s) to make periodic inspection at any time deemed necessary in order to assure that the activity being performed under authority of this permit is in accordance with the terms and conditions prescribed herein.

g. That the permittee shall maintain the structure or work authorized herein in good condition and in accordance with the plans and drawings attached hereto.

h. That this permit does not convey any property rights, either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations, nor does it obviate the requirement to obtain State or local assent required by law for the activity authorized herein.

i. That this permit does not authorize the interference with any existing or proposed Federal project and that the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized herein which may be caused by or result from exisiting or future operations undertaken by the United States in the public interest.

j That this permit may be summarily suspended, in whole or part, upon a finding by the District Engineer that immediate suspension of the activity authorized herein would be in the general public interest. Such suspension shall be effective upon receipt by the permittee of a written notice thereof which shall indicate (1) the extent of the suspension, (2) the reasons for this action, and (3) any corrective or preventative measures to be taken by the permittee which are deemed necessary by the District Engineer to abate imminent hazards to the general public interest. The permittee shall take immediate action to comply with the provisions of this notice. Within ten days following receipt of this notice of suspension, the permittee may request a hearing in order to present information relevant to a decision as to whether his permit should be reinstated, modified or revoked. If a hearing is requested, it shall be conducted pursuant to procedures prescribed by the Chief of Engineers. After completion of the hearing, or within a reasonable time after issuance of the suspension notice to the permittee if no hearing is requested, the permit will either be reinstated, modified or revoked.

k. That this permit may be either modified, suspended or revoked in whole or in part if the Secretary of the Army or his authorized representative determines that there has been a violation of any of the terms or conditions of this permit or that such action would otherwise be in the public interest. Any such modification, suspension, or revocation shall become effective 30 days after receipt by the permittee of written notice of such action which shall specify the facts or conduct warranting same unless (1) within the 30-day period the permittee is able to satisfactorily demonstrate that (a) the alleged violation of the terms and the conditions of this permit did not, in fact, occur or (b) the alleged violation was accidental, and the permittee has been operating in compliance with the terms and conditions of the permit and is able to provide satisfactory assurances that future operations shall be in full compliance with the terms and conditions of this permit; or (2) within the aforesaid 30-day period, the permittee requests that a public hearing be held to present oral and written evidence concerning the proposed modification, suspension or revocation. The conduct of this hearing and the procedures for making a final decision either to modify, suspend or revoke this permit in whole or in part shall be pursuant to procedures prescribed by the Chief of Engineers.

l. That in issuing this permit the Government has relied on the information and data which the permittee has provided in connection with his permit application. If, subsequent to the issuance of this permit, such information and data prove to be false, incomplete or inaccurate, this permit may be modified, suspended or revoked, in whole or in part and/or the Government may, be in addition, institute appropriate legal proceedings.

m. That any modification, suspension, or revocation of this permit shall not be the basis for any claim for damages against the United States.

n. That the permittee shall notify the District Engineer at what time the activity authorized herein will be commenced (as far in advance of the time of commencement as the District Engineer may specify), and of any suspension of work if for a period of more than one week, of resumption of work, and of completion of work.

o. That if the activity authorized herein is not started on or before the 20th day of January 19 78 and is not completed on or before the 31st day of December 19 80 this permit, if not previously revoked or specifically extended shall automatically expire.

p. That no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized by this permit.

q. That if the display lights and signals on any structure of work authorized herein is not otherwise provided for by the law, such lights and signals as may be prescribed by the United States Coast Guard shall be installed and maintained by and at the expense of the permittee.

r. That this permit does not authorize or approve the construction of particular structures, the authorization or approval of which may require authorization by the Congress or other agencies of the Federal Government.

s. That if and when the permittee desires to abandon the activity authorized herein, unless such abandoment is part of a transfer procedure by which the permittee is transferring his interests herein to a third party pursuant to General Condition v hereof, he must restore the area to a condition satisfactory to the District Engineer.

t. That if the recording of this permit is possible under applicable State or local law, the permittee shall take such action as may be necessary to record this permit with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to and interests in real property.

u. That there shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein.

v. That this permit may not be transferred to a third party without prior written notice to the District Engineer, either by the transferee's written agreement to comply with all terms and conditions of this permit or by

nsferee subscribing to this permit in the space provided below and thereby agreeing to comply with all terms conditions of this permit. In addition, if the permittee transfers the interests authorized herein by conveyance of realty, the deed shall reference this permit and the terms and conditions specified herein and this permit shall be recorded along with the deed with the Registrar of Deeds or other appropriate official.

II. SPECIAL CONDITIONS ARE CHECKED BELOW:

( ) **Structures for Small Boats:** That permittee hereby recognizes the possibility that the structure permitted herein may be subject to damage by wave wash from passing vessels. The issuance of this permit does not relieve the permittee from taking all proper steps to insure the integrity of the structure permitted herein and the safety of boats moored thereto from damage by wave wash and permittee shall not hold the United States liable for any such damage.

(a) **Erection Of Structure In Or Over Navigable Waters:** That the permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the authorized structure or work shall, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the waterway to its former condition. If the permittee fails to comply with the direction of the Secretary of the Army or his authorized representative, the Secretary or his designee may restore the waterway to its former condition, by contract or otherwise, and recover the cost thereof from the permittee.

( ) **Maintenance Dredging:** (1) That when the work authorized herein includes periodic maintenance dredging, it may be performed under this permit for years from the date of issuance of this permit; and (2) That the permittee will advise the District Engineer in writing at least two weeks before he intends to undertake any maintenance dredging.

(b) Dredging is not authorized within 500 feet of the I-75 Bridge in Area "2."

(c) That dredging will not be performed within 150 feet of the northerly shoreline or 250 feet of the southerly shoreline in the authorized areas.

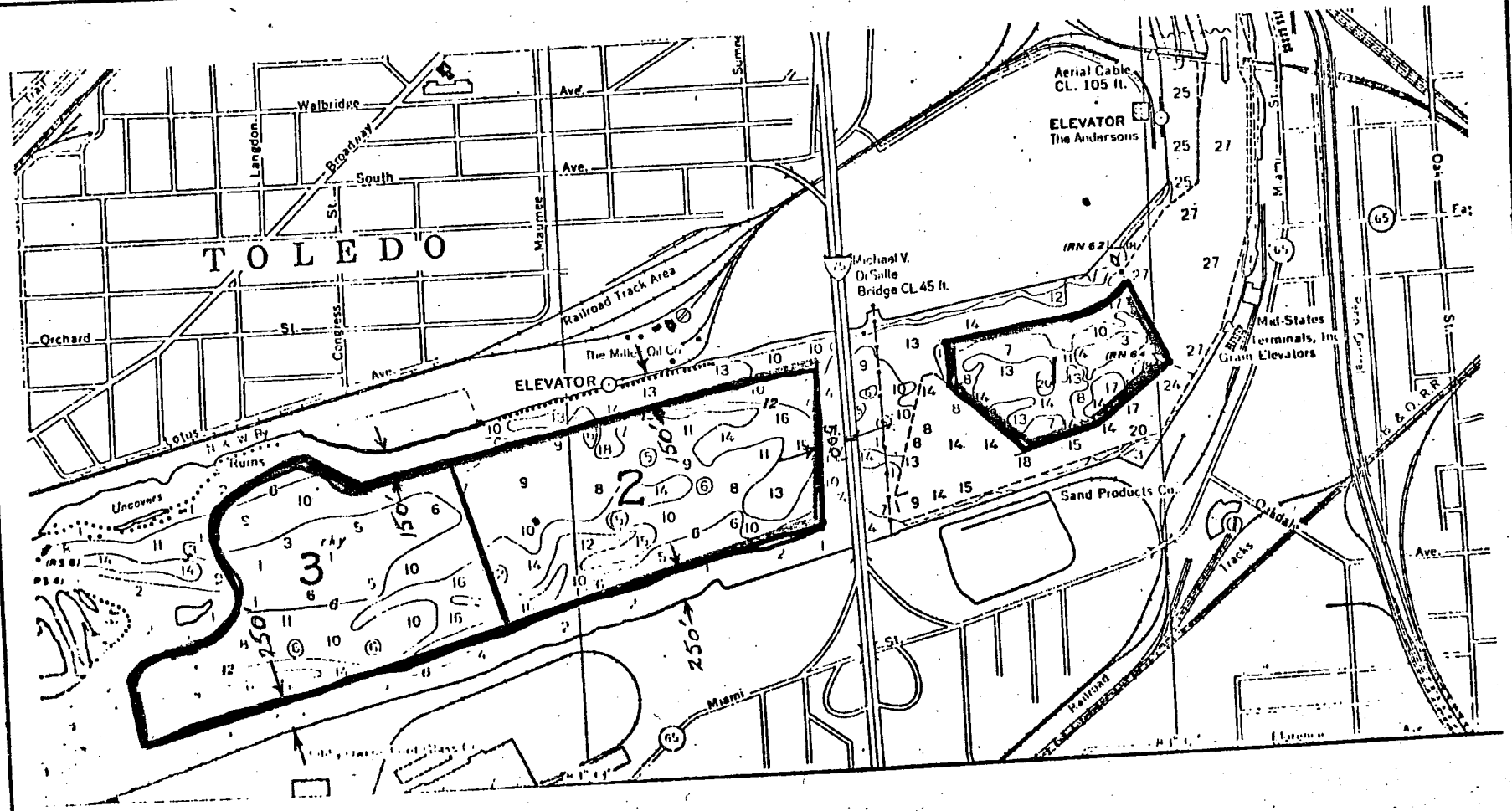
(d) That no dredging be performed in area "3" from 1 March through 31 May annually.

(e) The maximum allowable noise level from any of the pieces of dredging plant operating under this permit, in the areas designated 1, 2, and 3, shall not exceed 60 decibels at Frequency Range A when measured to the nearest shoreline.

(f) The permittee will monitor the fisheries betwen 15 March and 15 June of each year in accordance with procedures of CLEAR Technical Report #49 or the latest technology available. Data will be submitted to the District Engineer no later than 31 December of the same year it is obtained.

PERMIT No. 76 03 1

-128-



Note: Depths are in feet and are referred to Low Water Datum 568.6 feet on International Great Lakes Datum determined from Mean Water Level at Father Point , Quebec Canada.

PLAN "A"

PROPOSED DREDGING

IN: MAUMEE RIVER
COUNTY: LUCAS
TOWNSHIP:
CITY: TOLEDO
STATE: OHIO
APPLICATION BY: WHITE BROS. SAND

DATE: 31 Dec 1975

PROFSS 760012

This permit shall become effective on the date of the District Engineer's signature.

Permittee hereby accepts and agrees to comply with the terms and conditions of this permit.

Permittee Date

By Authority of the Secretary of the Army:

FOR THE DISTRICT ENGINEER Date

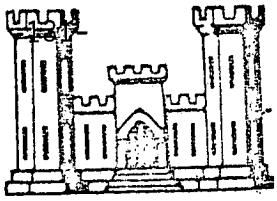
Transferee hereby agrees to comply with the terms and conditions of this permit.

Transferee Date

APPENDIX B

MAUMEE BAY PERMIT
No. 76-01-2

Permit No. 76-01-2



Effective Date

Expiration Date: 31 December 1980

DEPARTMENT OF THE ARMY PERMIT

White Brothers Sand, Inc.
1845 Collingwood Boulevard
P.O. Box 714
Toledo, Ohio

District Engineer
U. S. Army Engineer District
Detroit, Corps of Engineers
Detroit, Michigan 48231

Gentlemen:

Referring to written request dated 31 December 1975 for a permit to:

(X) Perform work in or affecting navigable waters of the United States, upon the recommendation of the Chief of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C. 403);

(X) Discharge dredged or filled material into navigable waters upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 404 of the Federal Water Pollution Control Act (86 Stat. 816, P.L. 92-500);

is hereby authorized by the Secretary of the Army to: dredge 100,000 cubic yards of sand and gravel from areas "A," "B," "C," place the dredge materials on shore for commercial purposes

in Lake Erie (Maumee Bay)

at Toledo, Ohio in the vicinity of North Cape and Cedar Point

in accordance with the plans and drawings attached hereto which are incorporated in and made a part of this permit subject to the following conditions:

I. GENERAL CONDITIONS:

a. That all activities identified and authorized herein shall be consistent with the terms and conditions of this permit; and that any activities not specifically identified and authorized herein shall constitute a violation of the

terms and conditions of this permit which may result in the modification, suspension or revocation of this permit, in whole or in part, as set forth more specifically in General Conditions j or k hereto, and in the institution of such legal proceedings as the United States Government may consider appropriate, whether or not this permit has been previously modified, suspended or revoked in whole or in part.

b. That all activities authorized herein shall, if they involve a discharge or deposit into navigable waters or ocean waters, be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, and pretreatment standards established pursuant to Sections 301, 302, 306 and 307 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500; 86 Stat. 816), or pursuant to applicable State and local law.

c. That when the activity authorized herein involves a discharge or deposit of dredged or fill material into navigable waters, the authorized activity shall, if applicable water quality standards are revised or modified during the term of this permit, be modified if necessary, to conform with such revised or modified water quality standards within 6 months of the effective date of any revision or modification of water quality standards, or as directed by an implementation plan contained in such revised or modified standards, or within such longer period of time as the District Engineer, in consultation with the Regional Administrator of the Environmental Protection Agency, may determine to be reasonable under the circumstances.

d. That the permittee agrees to make every reasonable effort to prosecute the construction or work authorized herein in a manner so as to minimize any adverse impact of the construction or work on fish, wildlife, and natural environmental values.

e. That the permittee(s) agrees to prosecute the construction or work authorized herein in a manner so as to minimize any degradation of water quality.

f. That the permittee shall permit the District Engineer or his authorized representative(s) or designee(s) to make periodic inspection at any time deemed necessary in order to assure that the activity being performed under authority of this permit is in accordance with the terms and conditions prescribed herein.

g. That the permittee shall maintain the structure or work authorized herein in good condition and in accordance with the plans and drawings attached hereto.

h. That this permit does not convey any property rights, either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations, nor does it obviate the requirement to obtain State or local assent required by law for the activity authorized herein.

i. That this permit does not authorize the interference with any existing or proposed Federal project and that the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized herein which may be caused by or result from exisiting or future operations undertaken by the United States in the public interest.

j That this permit may be summarily suspended, in whole or part, upon a finding by the District Engineer that immediate suspension of the activity authorized herein would be in the general public interest. Such suspension shall be effective upon receipt by the permittee of a written notice thereof which shall indicate (1) the extent of the suspension, (2) the reasons for this action, and (3) any corrective or preventative measures to be taken by the permittee which are deemed necessary by the District Engineer to abate imminent hazards to the general public interest. The permittee shall take immediate action to comply with the provisions of this notice. Within ten days following receipt of this notice of suspension, the permittee may request a hearing in order to present information relevant to a decision as to whether his permit should be reinstated, modified or revoked. If a hearing is requested, it shall be conducted pursuant to procedures prescribed by the Chief of Engineers. After completion of the hearing, or within a reasonable time after issuance of the suspension notice to the permittee if no hearing is requested, the permit will either be reinstated, modified or revoked.

k. That this permit may be either modified, suspended or revoked in whole or in part if the Secretary of the Army or his authorized representative determines that there has been a violation of any of the terms or conditions of this permit or that such action would otherwise be in the public interest. Any such modification, suspension, or revocation shall become effective 30 days after receipt by the permittee of written notice of such action which shall specify the facts or conduct warranting same unless (1) within the 30-day period the permittee is able to satisfactorily demonstrate that (a) the alleged violation of the terms and the conditions of this permit did not, in fact, occur or (b) the alleged violation was accidental, and the permittee has been operating in compliance with the terms and conditions of the permit and is able to provide satisfactory assurances that future operations shall be in full compliance with the terms and conditions of this permit; or (2) within the aforesaid 30-day period, the permittee requests that a public hearing be held to present oral and written evidence concerning the proposed modification, suspension or revocation. The conduct of this hearing and the procedures for making a final decision either to modify, suspend or revoke this permit in whole or in part shall be pursuant to procedures prescribed by the Chief of Engineers.

l. That in issuing this permit the Government has relied on the information and data which the permittee has provided in connection with his permit application. If, subsequent to the issuance of this permit, such information and data prove to be false, incomplete or inaccurate, this permit may be modified, suspended or revoked, in whole or in part and/or the Government may, be in addition, institute appropriate legal proceedings.

m. That any modification, suspension, or revocation of this permit shall not be the basis for any claim for damages against the United States.

n. That the permittee shall notify the District Engineer at what time the activity authorized herein will be commenced (as far in advance of the time of commencement as the District Engineer may specify), and of any suspension of work if for a period of more than one week, of resumption of work, and of completion of work.

o. That if the activity authorized herein is not started on or before the 20th day of January 19 78 and is not completed on or before the 31st day of December 1980 this permit, if not previously revoked or specifically extended shall automatically expire.

p. That no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized by this permit.

q. That if the display lights and signals on any structure of work authorized herein is not otherwise provided for by the law, such lights and signals as may be prescribed by the United States Coast Guard shall be installed and maintained by and at the expense of the permittee.

r. That this permit does not authorize or approve the construction of particular structures, the authorization or approval of which may require authorization by the Congress or other agencies of the Federal Government.

s. That if and when the permittee desires to abandon the activity authorized herein, unless such abandoment is part of a transfer procedure by which the permittee is transferring his interests herein to a third party pursuant to General Condition v hereof, he must restore the area to a condition satisfactory to the District Engineer.

t. That if the recording of this permit is possible under applicable State or local law, the permittee shall take such action as may be necessary to record this permit with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to and interests in real property.

u. That there shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein.

v. That this permit may not be transferred to a third party without prior written notice to the District Engineer, either by the transferee's written agreement to comply with all terms and conditions of this permit or by

the transferee subscribing to this permit in the space provided below and thereby agreeing to comply with all terms and conditions of this permit. In addition, if the permittee transfers the interests authorized herein by conveyance of realty, the deed shall reference this permit and the terms and conditions specified herein and this permit shall be recorded along with the deed with the Registrar of Deeds or other appropriate official.

II. SPECIAL CONDITIONS ARE CHECKED BELOW:

( ) **Structures for Small Boats:** That permittee hereby recognizes the possibility that the structure permitted herein may be subject to damage by wave wash from passing vessels. The issuance of this permit does not relieve the permittee from taking all proper steps to insure the integrity of the structure permitted herein and the safety of boats moored thereto from damage by wave wash and permittee shall not hold the United States liable for any such damage.

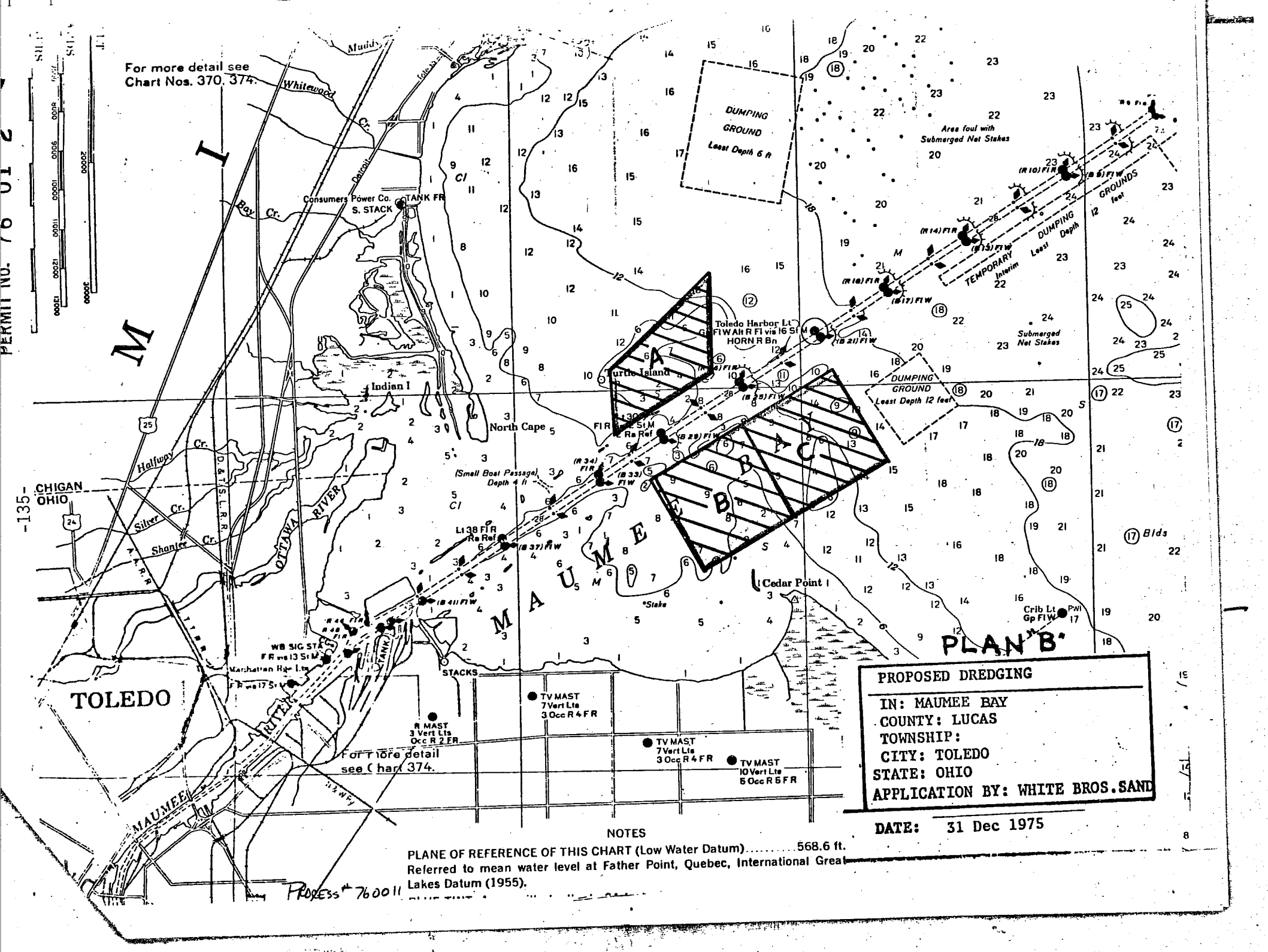
(a) **Erection Of Structure In Or Over Navigable Waters:** That the permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the authorized structure or work shall, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the waterway to its former condition. If the permittee fails to comply with the direction of the Secretary of the Army or his authorized representative, the Secretary or his designee may restore the waterway to its former condition, by contract or otherwise, and recover the cost thereof from the permittee.

( ) **Maintenance Dredging:** (1) That when the work authorized herein includes periodic maintenance dredging, it may be performed under this permit for years from the date of issuance of this permit; and (2) That the permittee will advise the District Engineer in writing at least two weeks before he intends to undertake any maintenance dredging.

(b) Dredging is not authorized within 1000 feet of Turtle Island nor within 1000 feet of the Federal navigation channel.

(c) Dredging is not authorized between 1 March through 31 May annually in areas "A," "B" and "C".

(d) The permittee will monitor the fisheries between 15 March and 15 June of each year in accordance with procedures of CLEAR Technical Report #49 or the latest technology available. Data will be submitted to the District Engineer no later than 31 December of the same year it is obtained.


For more detail see Chart Nos. 370, 374.
Whitewood Cr.
Muddy
Bay Cr.
Consumers Power Co. S. STACK
TANK FR
Indian I
North Cape
Halfway Cr.
Silver Cr.
Shanley Cr.
OTTAWA RIVER
D. & T. S. L. R. R.
MICHIGAN
OHIO
TOLEDO
Manhattan Rge Lts
WB SIG STA
STACKS
TANK
MAUMEE BAY
MAUMEE
Turtle Island
Toledo Harbor Lt
Gp Fl W Alt R Fl vis 16 St M
HORN R Bn
DUMPING GROUND
Least Depth 6 ft
Area foul with Submerged Net Stakes
DUMPING GROUND
Least Depth 12 feet
Submerged Net Stakes
TEMPORARY DUMPING GROUNDS
Interim Least Depth 12 feet
(Small Boat Passage) Depth 4 ft
Cedar Point
Crib Lt Gp Fl W
Bldg
PLAN "B"
TV MAST 7 Vert Lts 3 Occ R 4 FR
R MAST 3 Vert Lts Occ R 2 FR
TV MAST 7 Vert Lts 3 Occ R 4 FR
TV MAST 10 Vert Lts 5 Occ R 5 FR
For more detail see Chart 374.
PROPOSED DREDGING
IN: MAUMEE BAY
COUNTY: LUCAS
TOWNSHIP:
CITY: TOLEDO
STATE: OHIO
APPLICATION BY: WHITE BROS. SAND
DATE: 31 Dec 1975
NOTES
PLANE OF REFERENCE OF THIS CHART (Low Water Datum)..... 568.6 ft.
Referred to mean water level at Father Point, Quebec, International Great Lakes Datum (1955).
Process # 760011

This permit shall become effective on the date of the District Engineer's signature.

Permittee hereby accepts and agrees to comply with the terms and conditions of this permit.

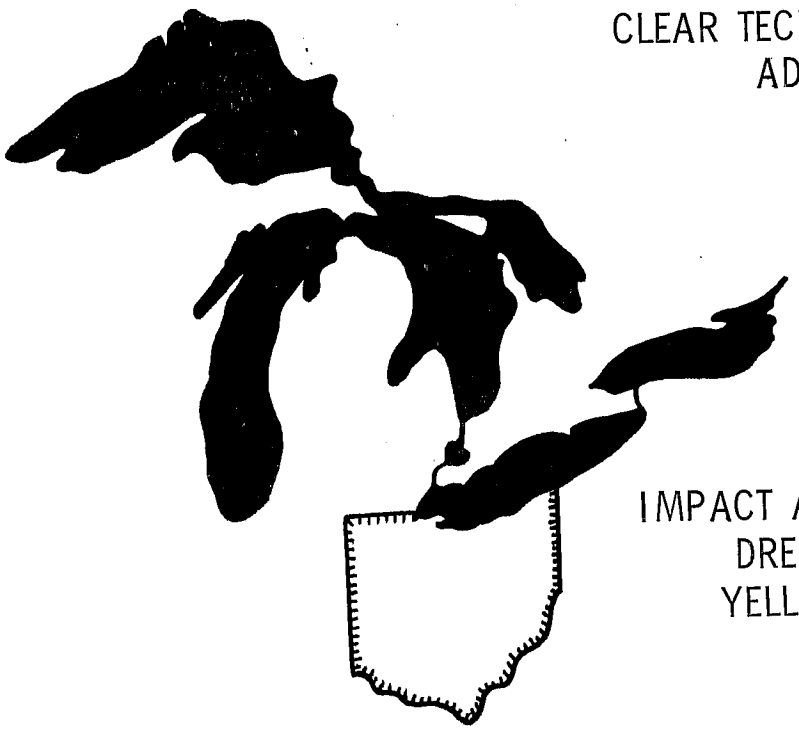
Permittee Date

By Authority of the Secretary of the Army:

FOR THE DISTRICT ENGINEER Date

Transferee hereby agrees to comply with the terms and conditions of this permit.

Transferee Date



CLEAR TECHNICAL REPORT NO. 75
ADDENDUM NO. 1

IMPACT ASSESSMENT OF COMMERCIAL DREDGING ON WALLEYE AND YELLOW PERCH POPULATIONS

Prepared by

Charles E. Herdendorf
and
Jeffrey M. Reutter

Prepared for

White Brothers Sand, Inc.
Toledo, Ohio

THE OHIO STATE UNIVERSITY
CENTER FOR LAKE ERIE AREA RESEARCH
COLUMBUS, OHIO

March 1978

The White Brothers Sand and Gravel Company removes sand from the Maumee River using the dredging vessel R.W. Holst and a floating stationary cutterhead dredge. The Holst pumps 246,000 gallons of water per hour (gph) and operates 5-7 hours/day, 6 days/week. The cutterhead dredge pumps 450,000 gph and operates 10-12 hours/day, 6 days/week. Based on an average of 6 hours/day and 6 days/week, the Holst pumps 8,856,000 gallons/week. Based on an average of 11 hours/day and 6 days/week, the cutterhead dredge pumps 29,700,000 gallons/week. The two dredges combined pump 38,556,000 gallons/week. Based on 7 days/week, 24 hours/day, and 60 minutes/hour, the two dredges combined average 3,825 gpm = 14.5 m^3/min = 0.24 m^3/sec = 8.6 cfs during the dredging season. This flow is 0.18% of the annual mean flow of the Maumee River, 133.1 m^3/sec or 4,754 cfs, and 0.10% of the mean flow from April and May, 233.5 m^3/sec or 8339 cfs. This may be the most significant point, for no matter how high or low concentrations become due to natural variability (discussed later) this dredging operation cannot take more than 0.10% of the river larvae.

In addition to supplementing CLEAR Technical Report 75, the objective of this report is to predict the number of walleye (Stizostedion v. vitreum) larvae entrained with the flow of water through the dredges and to evaluate the impact of this loss on the walleye populations of the Maumee River and western Lake Erie. Sampling between 15 March and 15 June indicated walleye were present at the upper river stations, 1-4, between 18 April and 16 May 1977. Based on a pumping rate of 0.24 m^3/sec, the dredges pumped 601,344 m^3 of water during this 29 day period. The mean density of walleye larvae at the three river dredge areas (Stations 2-4) from the 8 sampling dates during this 29-day period was 16.53/100m^3. Based on this value and the volume of water pumped, it is estimated that 99,402 walleye larvae were entrained by the dredges during this period. Since 99.9% of the flow is unaffected, 99,402,000 larvae passed the dredges unharmed.

The combined flow of the Acme and Bay Shore Power Stations of the Toledo Edison Company, 49.7 m^3/sec, is 21.3% of the mean river flow from April and May. Consequently, 21.3% of the larvae entrained by the dredges, 21,158 individuals, would have been entrained at these power stations. Therefore, the net effect of the dredges was the loss of 78,244 larvae or 0.079% of number flowing past the dredge.

Patterson (1976) has attempted to put larval mortality for yellow perch into perspective by converting larval losses to the potential loss of adult perch. Several assumptions are involved in this conversion.

I. All entrained larvae are killed.

II. All larvae lost by entrainment are in their late larval stage. This provides a conservative estimate because it does not account for early larval mortality which may range from 83-96 percent (Patterson, 1976).

III. Yellow perch become vulnerable to commercial capture, but reach sexual maturity at age class III.

IV. A one percent survival rate from late larvae to age III adults is assumed. Again, this is conservative since survival rates from:

late larvae to YOY = 4 to 17 percent;
YOY to age class I = 12 to 33 percent;
age class I to age class II = 38 percent;
age class II to age class III = 38 percent
(Patterson, 1976)

This trend translates to a survivorship ranging from 0.1 percent to one percent over the period from the late larval stage to age class III.

Ney (1978) has stated that mortality rates for yellow perch and walleye are similar. Hence, the 78,244 larvae entrained by the dredge potentially could have produced 78-782 adult walleyes. Again, it should be emphasized that this is a high estimate and is more indicative of "worst case" losses. In fact Ney (Virginia Polytechnical Institute, Dept. of Fisheries and Wildlife Sciences, personal communication) feels that in a system as variable as the Maumee River, a survival rate of 0.01% from larvae to age class III is probably high. Using this value the 78,244 larvae would have converted to 8 adult age class III walleyes.

The "First Technical Report of the GLFC Scientific Protocol Committee on Interagency Management of the Walleye Resource of Western Lake Erie" lists brood stocks (all males age 2 and older; all females age 3 and older) for walleye in the Western Basin during 1975, 1976, and 1977 as 3,086,600 fish, 5,119,000 fish, and 8,611,900 fish, respectively (personal communication, Allan Van Vooren, Ohio Division of Wildlife, Lake Erie Research Unit). The estimated losses due to dredging of 8-782 fish represent 0.0003-0.03% of the 1975 Western Basin brood stock, 0.0002-0.02% of the 1976 Western Basin brood stock, and, more appropriately, 0.00009-0.009% of the 1977 Western Basin brood stock. Estimated Maumee River brood stocks for 1975, 1976, and 1977 were 177,700 fish, 337,600 fish, and 540,800 fish, respectively (Scholl, 1977 and personal communication, Allan Van Vooren, Ohio Division of Wildlife, Lake Erie Research Unit). The estimated losses due to dredging of 8-782 fish represent 0.0045-0.44% of the 1975 Maumee River brood stock, 0.0024-0.23% of the 1976 Maumee River brood stock, and 0.0015-0.14% of the 1977 Maumee River brood stock.

From the above information several conclusions appear obvious: 1) the brood stock in the Western Basin is increasing, 2) the brood stock in the Maumee River is increasing, and 3) the Maumee River contributes only approximately 6% to the Western Basin brood stock. Furthermore, the estimate of the potential number of adults which could have been produced by the larvae which were entrained during 1977 should really be compared to the 1979 and 1980 brood stocks as it is in these years that they will become a portion of the brood stock. An accurate estimate of the 1979 and 80 brood stocks is unavailable, however it is clear that they will be much larger than the 1977 brood stock estimates. Based on a projected quota from the Scientific Protocol Committee of 2,500,000 walleye from the Western Basin for 1979, the 1979 brood stocks could be approximately 2.5 times as large as the 1977 brood stocks since the 1979 quota is approximately 2.5 times as large as the 1977 quota (personal communication, Dr. Ken Muth, Leader Lake Erie Research Unit USFWS). Consequently, the projected number of 8-782 walleye lost due to

dredging would be 0.0006-0.056% of the 1979 Maumee River brood stock and 0.000036-0.0036% of the 1979 Western Basin brood stock.

Laarman (1978) found no significant correlation between the number of fry stocked and the strength of the year class. He went on to say, "Success or failure of walleye stocking appeared to depend more on environmental and biological conditions of individual bodies of water than on the number and size of walleyes that were stocked". The Ohio Division of Wildlife, Lake Erie Fishery Research Unit, and the Scientific Protocol Committee feel that larval densities are not strong indicators of future year class strength and have decided to base quotas and year class strength predictions on fingerlings rather than larvae. Much of this is due to the extremely high and variable natural mortality suffered by ichthyoplankton populations.

One last point should be mentioned to put these losses into perspective. Ney (1978) estimates 99% mortality through the pro-larvae stage for walleye. This fact, coupled with an average egg production of approximately 300,000/female, indicates that 26 females could have produced these larvae. If one assumes that half of the 540,800 adults (270,400) which spawned in the Maumee River during 1977 were females, then the larval loss represents the spawn of 0.0096% of the female brood stock.

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Ney. J.J. 1978. A management-oriented review of the biology of yellow perch and walleye. Presented at "A Symposium on Selected Coolwater Fishes of North America". St. Paul-Minneapolis, Minn. March 7-9, 1978. (Abstract).

Patterson, R.L. 1976. Analysis of losses in standing crop and fishery yields of yellow perch in the Western Basin of Lake Erie due to entrainment and impingement mortality at the Detroit Edison Monroe Power Plant. Large Lakes Research Station. U.S. Environmental Protection Agency, Grosse Ile, Mich.

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