

Hydroakustiske undersøkelser av fiskebestanden i
Stordalsvatnet, 28-30 mai 1992.

av

Torfinn Lindem,
Fysisk institutt, Universitetet i Oslo.

INNLEDNING.

Denne rapporten er utarbeidet på oppdrag fra Stordalsvatnets fiskarlag v/Gunnar Øvernes.

Utgangspunktet var spekulasjoner om vatnet muligens var overbefolka av mindre røye. Det hadde ifølge fiskarlaget ikke blitt utført noen form for fiskeribiologiske undersøkelser i vatnet i løpet av de siste 20 år og laget trengte grunnlagsmateriale før eventuelle kultiveringstiltak ble satt i verk.

Den mest effektive metode man kjenner for kartlegging av pelagiske fiskebestander baserer seg på bruk av spesielle ekkolodd tilkoplet mindre datamaskiner. Slikt utstyr vil raskt kunne beregne både antall og størrelsesfordeling til de registrerte fiskene.

Fiskarlaget fikk lånt hydroakustisk registrerings-utstyr fra Universitetet i Oslo, - og etter en kort instruksjon i bruken gjennomførte laget selv registreringene i vatnet, 28-30 mai 1992. Dataopptakene ble senere analysert ved fysisk institutt Universitetet i Oslo.

MATERIALER OG METODER.

Stordalsvatnet ligger i Hordaland fylke. Det er ca 10 km langt og har et areal på 780 hektar. Største dyp er på ca 120 meter og midlere dyp er ca 50 meter.

Etne-elva som renner ut av vatnet er kjent som en god lakseførende elv.

Foruten laks inneholder vatnet røye, aure, ål og stingsild.

Det ble kjørt 15 kurser over vatnet på dagtid den 28/5 og 13 kurser om natten 30/31 mai.

Ekkoloddet som ble benyttet var et SIMRAD EY-M med transducer 7024F (Åpningsvinkel: 11.5 deg.) Systemets følsomhet ble satt til

GAIN = 8. Systemet var ikke kalibrert, men dette vil ikke gi seg annet utslag enn en liten forskyvning av lengdefordelingen. Beregningen av antallet fisk pr. hektar av innsjøen vil ikke bli endret.

Transduceren ble slept på ca. 1 meters dyp ved siden av båten. Alle fiske-ekko som ble registrert ble lagret på magnetbånd ved hjelp av en SONY TC-D5M båndopptaker.

Databåndene ble senere analysert av programsystemet HADAS,- Hydro Acoustic Data Acquisition System. - Et program utviklet ved fysisk institutt, Universitetet i Oslo og nå tatt i bruk av flere forskningsinstitutter verden over.

Det er viktig å huske at denne bruken av ekkolodd begrenser seg til registrering av pelagisk fisk, dvs. fisk som finnes i de frie vannmassene. Fisk nær overflaten eller bunden vil ikke bli registrert med riktig antall.

Det er derfor viktig å gjennomføre ekkolodd-registreringer på et tidspunkt da det meste av fiskebestanden finnes pelagisk.

RESULTATER.

Totalt 3 databånd ble undersøkt. Disse inneholdt alle ekko-signalene som ble registrert av ekkoloddet under de to kjøringene i vatnet. I alt 2500 signaler fra enkeltfisk ble funnet og analysert.

Det var liten forskjell mellom dag og natt i fordelingen av stor pelagisk fisk.

(Med "stor" fisk menes her fisk større enn 20-25 cm.)

Det meste av "stor"-fisken er lokalisert i austenden av vatnet. I den vestre delen av vatnet, ved utløpselva ble det registrert mest fisk av mindre størrelse.

Kursene 1 - 5 viste 58 stor fisk pr. hektar på dagtid, mot 60 fisk pr hektar om natten.

Kursene 6 - 12 viste 35 stor fisk pr. hektar om dagen , mot 27 om natten.

Hvis man ser på fisk større enn 30-35 cm (dvs. $TS \geq 32$ dB) dreier det seg om ca. 40 - 25 fisk/hektar i de to områdene.

Det viser seg imidlertid at antallet mindre fisk klart øker om natten. Dette er helt i samsvar med det som blir registrert i andre tilsvarende innsjøer.

Ut fra de registrerte fiskestørrelser og antall kan jeg antyde en biomasse på ca 10 -15 kg fisk pr. hektar.

Dette tallet er noe spekulativt da jeg ikke har noen resultater fra et pelagisk prøvefiske i vatnet.

Et mindre garnfiske med bunngarn ble utført i perioden 3-8 august 1992. Dette viser relativt mye stor og fin fisk. K-faktor for aure var på 0.97 og for røye 0.87.

Alle detaljer m.h.t. fiskefordeling langs kursene dag og natt, fordeling på målstyrke (TS) og resultatene fra prøvefisket er vist i appendiks.

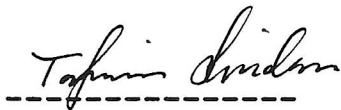
KONKLUSJON.

Denne undersøkelsen er ment som et første skritt i en fullstendig kartlegging av fiskebestandene i sjøen. For å få fullt utbytte av dette materialet forutsettes det at et tradisjonelt prøvefiske med både bunngarn og pelgiske flytegarn blir gjennomført i nær framtid.

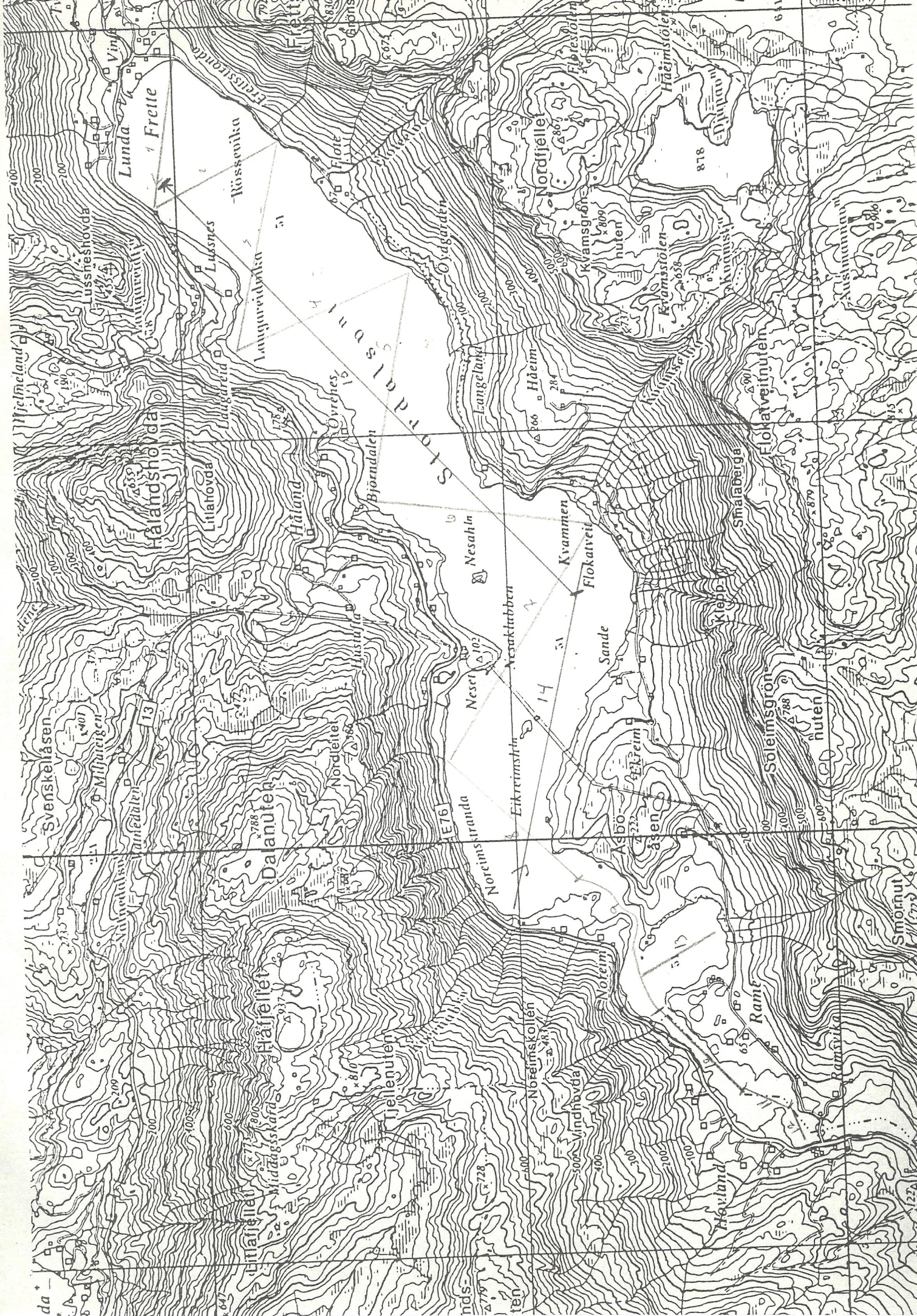
Det anbefales sterkt at dette arbeidet startes av fiskerikonsulenten i fylket og/eller i samarbeide med Norsk Institutt for Naturforskning (NINA) i Trondheim.

Ut fra resultatene fra denne ekkolodd-kjøringen virker det ikke som vatnet er overbefolket av mindre røye.

På denne tiden av året var det en god fordeling mellom stor og liten fisk i den palagiske delen av vatnet. Dette må imidlertid bli bekreftet med gjentatte kjøringer på andre tider av året, og sees i sammenheng med andre fiskeribiologiske undersøkelser.



Torfinn Lindem,
23 september 1992.



LDA COMPUT

PAGE: 1

ECHOANALYSIS: STORDALSVATNET

 DATE : 28 MAI 1992 DATA FROM TRANSECT : KURS 1 TIL 5
 ECHOSOUNDER : EY-M
 REMARKS: TAPE #1A
 NUMBER OF PINGS ANALYSED : 8200. START AT PING NO. 0
 IN 4 DEPTH LAYERS FROM 2 TO 50 METERS.

CALCULATED MEAN FISH DENSITY ALONG TRANSECT: 318 FISH/HECTARE.

DEPTH METERS	REGISTRATION SINGLE FISH	INTEGRAL SINGLE FISH	INTEGRAL SCHOOLS	TOTAL FISHDENSITY
2- 12	260 F/HA	1.826E+05	0.000E+00	260 FISH/HA
12- 22	14 F/HA	3.129E+05	1.320E+05	20 FISH/HA
22- 35	14 F/HA	8.526E+05	4.683E+05	22 FISH/HA
35- 50	6 F/HA	3.763E+05	5.874E+05	16 FISH/HA

FISH DENSITY SPLIT INTO 3 SIZEGROUPS.
 (CALCULATED WITH DATA FROM SINGLEFISH-ECHOES.)

TS 32-38 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	27 FISH/HA	100.0 %	27 FISH/HA
DEPTH: 12 - 22 METERS	8 FISH/HA	70.3 %	11 FISH/HA
DEPTH: 22 - 35 METERS	8 FISH/HA	64.5 %	13 FISH/HA
DEPTH: 35 - 50 METERS	2 FISH/HA	39.0 %	6 FISH/HA

TOTAL : 58 FISH/HA

TS 39-43 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	0 FISH/HA	0.0 %	0 FISH/HA
DEPTH: 12 - 22 METERS	2 FISH/HA	70.3 %	2 FISH/HA
DEPTH: 22 - 35 METERS	3 FISH/HA	64.5 %	4 FISH/HA
DEPTH: 35 - 50 METERS	1 FISH/HA	39.0 %	1 FISH/HA

TOTAL : 8 FISH/HA

TS 44-62 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	233 FISH/HA	100.0 %	233 FISH/HA
DEPTH: 12 - 22 METERS	5 FISH/HA	70.3 %	6 FISH/HA
DEPTH: 22 - 35 METERS	3 FISH/HA	64.5 %	4 FISH/HA
DEPTH: 35 - 50 METERS	3 FISH/HA	39.0 %	8 FISH/HA

TOTAL : 252 FISH/HA

IF THE SCALE SHIFT OPTION IS NOT CHOSEN, ALL SINGLE FISH ECHOES
 LARGER THAN TS=-38 DB WILL BE TRUNCATED AND SHIFTED DOWN
 INTO THE -38 DB SIZE GROUP.

IF FISH DENSITY IN A DEPTH LAYER IS FOLLOWED BY A :

"?" : THE NUMBER OF SINGLE FISH ECHOES IS TOO LOW AND THE CALCULATED
 DENSITY HAS POOR ACCURACY !

****: TOO MANY MULTIPLE ECHOES, ROUNDING ERRORS MAY OCCUR DUE TO
 INTEGER PRESENTATION OF REAL VARIABLES....!!

Listing date:25/6/1992


```

ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5
DEPTH LAYER : 2 - 12 METERS.    CALCULATED MEAN DEPTH: 12 METERS.
NUMBER OF PINGS ANALYSED : 8200 OUT OF 8200. STARTING AT PING # : 0
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 8200
SINGLEFISH RESOLUTION IN DEPTH LAYER : 100.0 % .
INTEGRATED VALUE FROM SCHOOLS      : 0.000E+00

```

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)

[illegible]

ECHODISTRIBUTION FROM STORDALSVATNET. DATE : 28 MAI 1992

ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5

DEPTH LAYER : 12 - 22 METERS. CALCULATED MEAN DEPTH: 22 METERS.

NUMBER OF PINGS ANALYSED : 7937 OUT OF 8200. STARTING AT PING # : 0

NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 7937

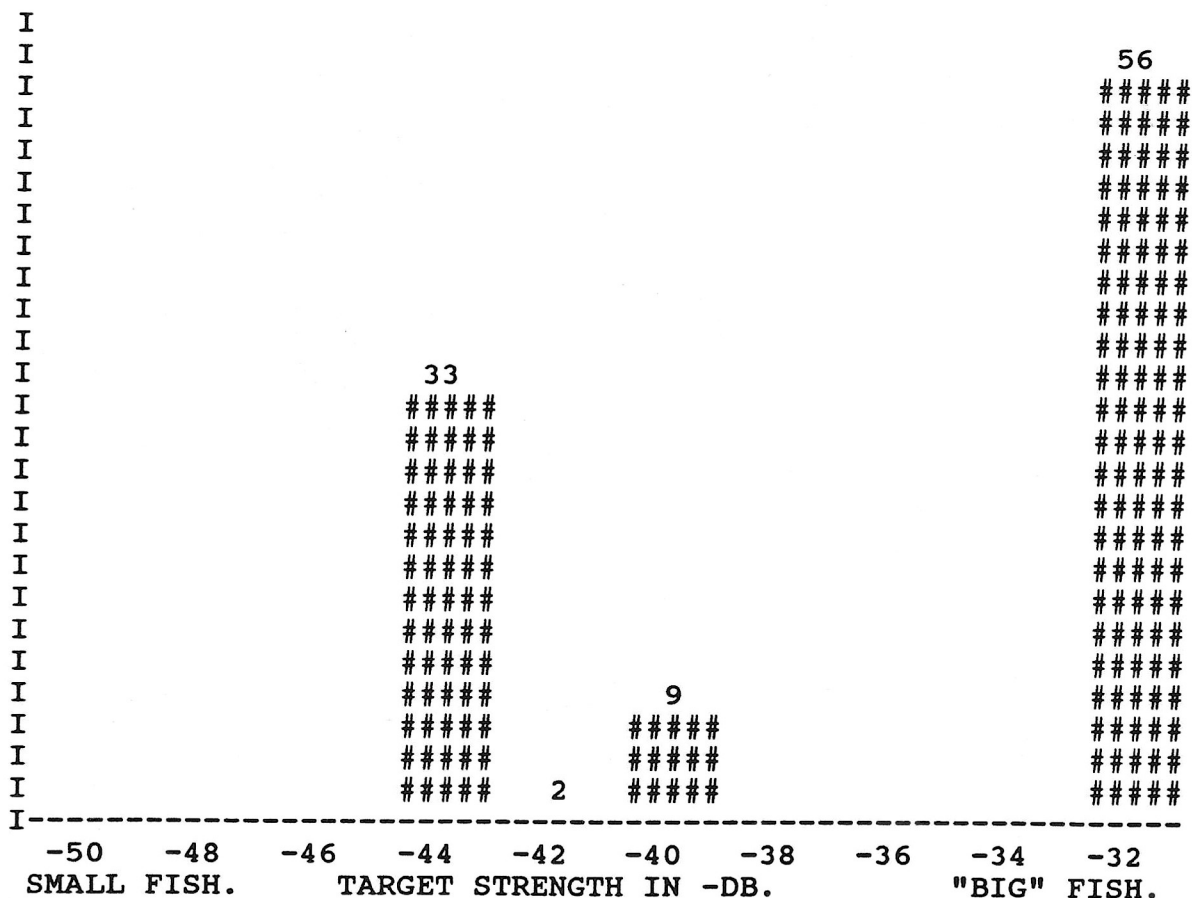
SINGLEFISH RESOLUTION IN DEPTH LAYER : 70.3 % .

INTEGRATED VALUE FROM SCHOOLS : 1.320E+05

TS (DB):	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	19	0.112	11
-34	11	0.000	0
-36	16	0.000	0
-38	14	0.000	0
-40	19	0.018	2
-42	19	0.005	0
-44	29	0.065	6
-46	19	0.000	0
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 146 TOTAL: 20 FISH/HA.

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



ECHODISTRIBUTION FROM STORDALSVATNET. DATE : 28 MAI 1992

ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5

DEPTH LAYER : 22 - 35 METERS. CALCULATED MEAN DEPTH: 34 METERS.

NUMBER OF PINGS ANALYSED : 7565 OUT OF 8200. STARTING AT PING # : 0

NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 7565

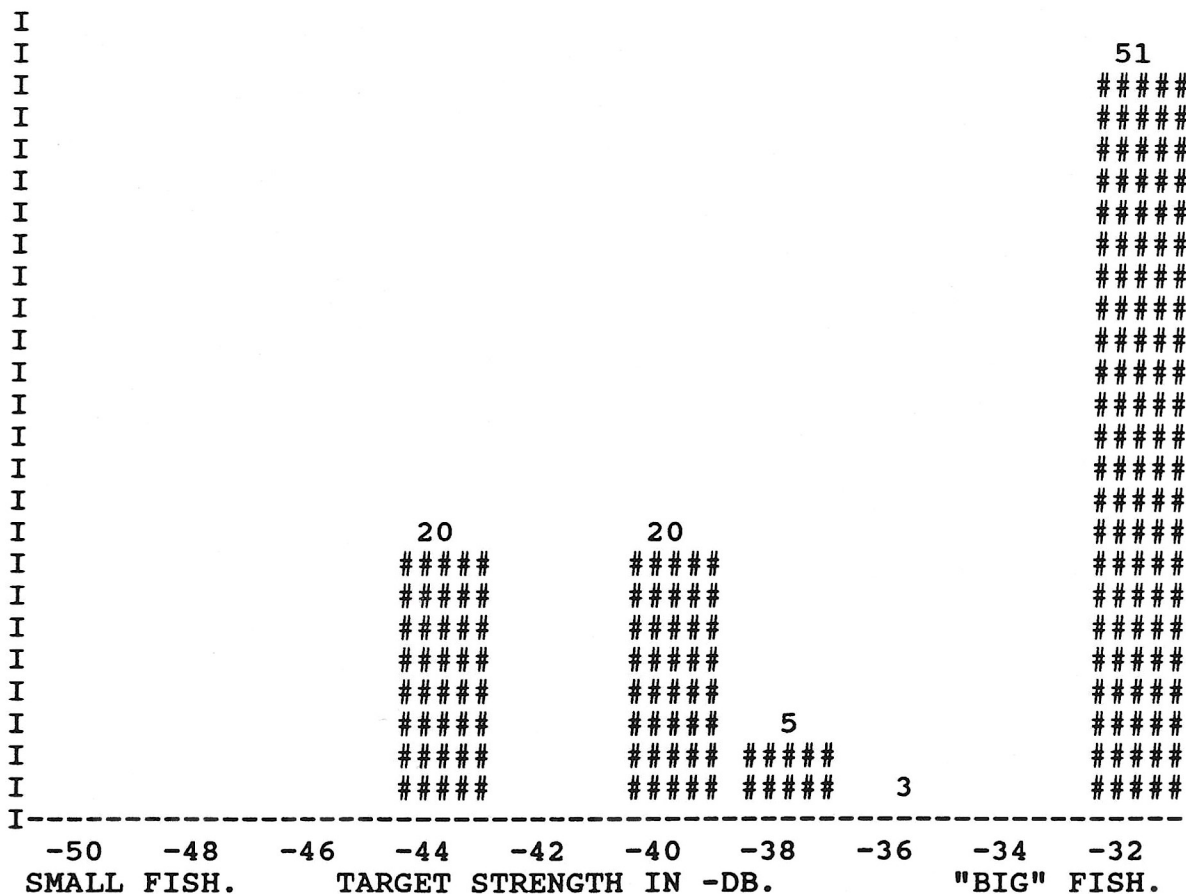
SINGLEFISH RESOLUTION IN DEPTH LAYER : 64.5 % .

INTEGRATED VALUE FROM SCHOOLS : 4.683E+05

TS (DB) :	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	49	0.095	11
-34	31	0.000	0
-36	48	0.005	1
-38	51	0.010	1
-40	68	0.037	4
-42	61	0.000	0
-44	81	0.037	4
-46	61	0.000	0
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 450 TOTAL: 22 FISH/HA.

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



ECHODISTRIBUTION FROM STORDALSVATNET. DATE : 28 MAI 1992

ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5

DEPTH LAYER : 35 - 50 METERS. CALCULATED MEAN DEPTH: 48 METERS.

NUMBER OF PINGS ANALYSED : 6738 OUT OF 8200. STARTING AT PING # : 0

NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 6738

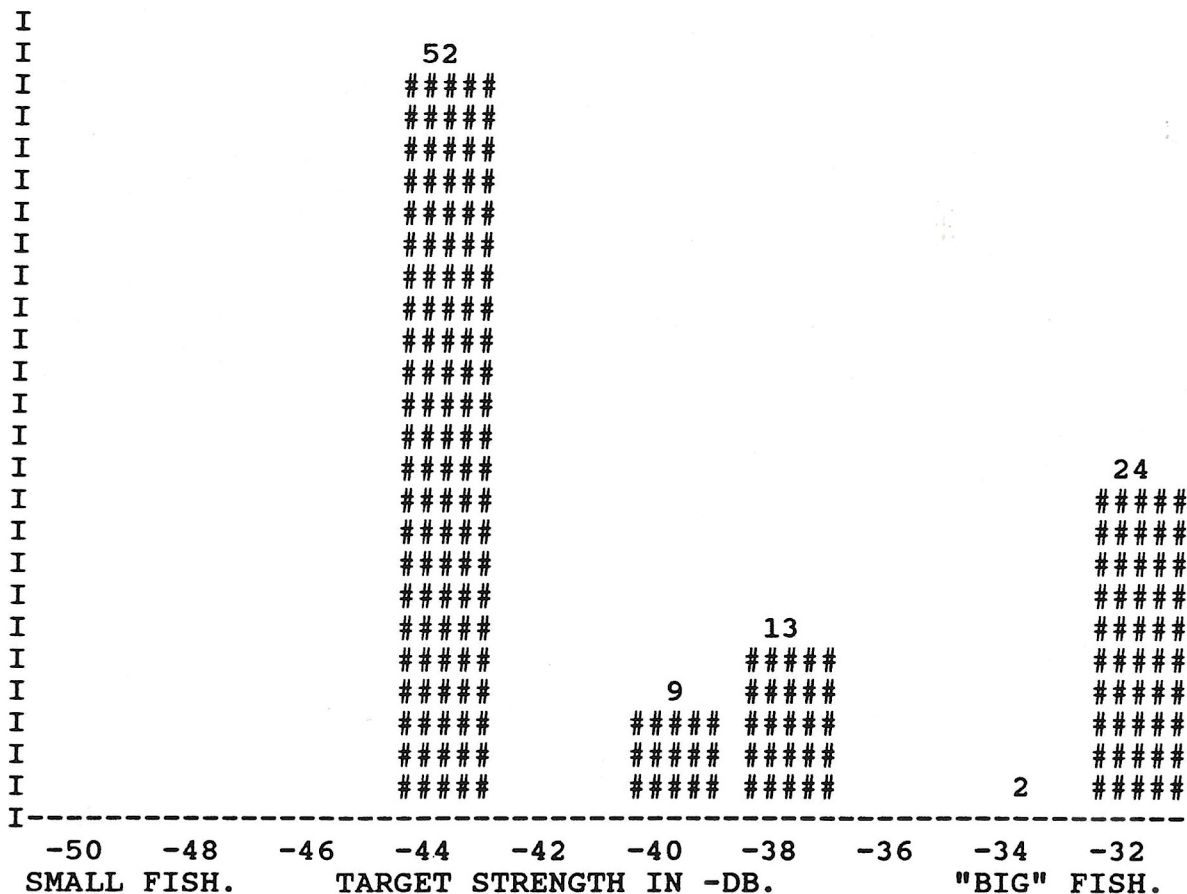
SINGLEFISH RESOLUTION IN DEPTH LAYER : 39.0 % .

INTEGRATED VALUE FROM SCHOOLS : 5.874E+05

TS (DB):	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	19	0.029	4
-34	20	0.003	0
-36	19	0.000	0
-38	29	0.016	2
-40	35	0.011	1
-42	30	0.000	0
-44	73	0.063	8
-46	55	0.000	0
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 280 TOTAL: 16 FISH/HA.

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



LDA COMPUT

PAGE: 6

ECHOANALYSIS: STORDALSVATNET

DATE : 28 MAI 1992 DATA FROM TRANSECT : KURS 6 TIL 12
ECHOSOUNDER : EY-M
REMARKS: TAPE #1B
NUMBER OF PINGS ANALYSED : 4000. START AT PING NO. 1790
IN 2 DEPTH LAYERS FROM 2 TO 25 METERS.

CALCULATED MEAN FISH DENSITY ALONG TRANSECT: 128 FISH/HECTARE.

DEPTH METERS	REGISTRATION SINGLE FISH	INTEGRAL SINGLE FISH	INTEGRAL SCHOOLS	TOTAL FISHDENSITY
2- 12	96 F/HA	4.778E+04	0.000E+00	96 FISH/HA?
12- 25	29 F/HA	2.948E+05	2.923E+04	32 FISH/HA

FISH DENSITY SPLIT INTO 3 SIZEGROUPS.
(CALCULATED WITH DATA FROM SINGLEFISH-ECHOES.)

TS 32-38 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	21 FISH/HA	100.0 %	21 FISH/HA ?
DEPTH: 12 - 25 METERS	12 FISH/HA	91.0 %	14 FISH/HA

TOTAL : 35 FISH/HA

TS 39-43 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	15 FISH/HA	100.0 %	15 FISH/HA ?
DEPTH: 12 - 25 METERS	3 FISH/HA	91.0 %	3 FISH/HA

TOTAL : 19 FISH/HA

TS 44-62 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	59 FISH/HA	100.0 %	59 FISH/HA ?
DEPTH: 12 - 25 METERS	14 FISH/HA	91.0 %	15 FISH/HA

TOTAL : 74 FISH/HA

IF THE SCALE SHIFT OPTION IS NOT CHOSEN, ALL SINGLE FISH ECHOES
LARGER THAN TS=-38 DB WILL BE TRUNCATED AND SHIFTED DOWN
INTO THE -38 DB SIZE GROUP.

IF FISH DENSITY IN A DEPTH LAYER IS FOLLOWED BY A :

"?" : THE NUMBER OF SINGLE FISH ECHOES IS TOO LOW AND THE CALCULATED
DENSITY HAS POOR ACCURACY !

****: TOO MANY MULTIPLE ECHOES, ROUNDING ERRORS MAY OCCUR DUE TO
INTEGER PRESENTATION OF REAL VARIABLES....!!

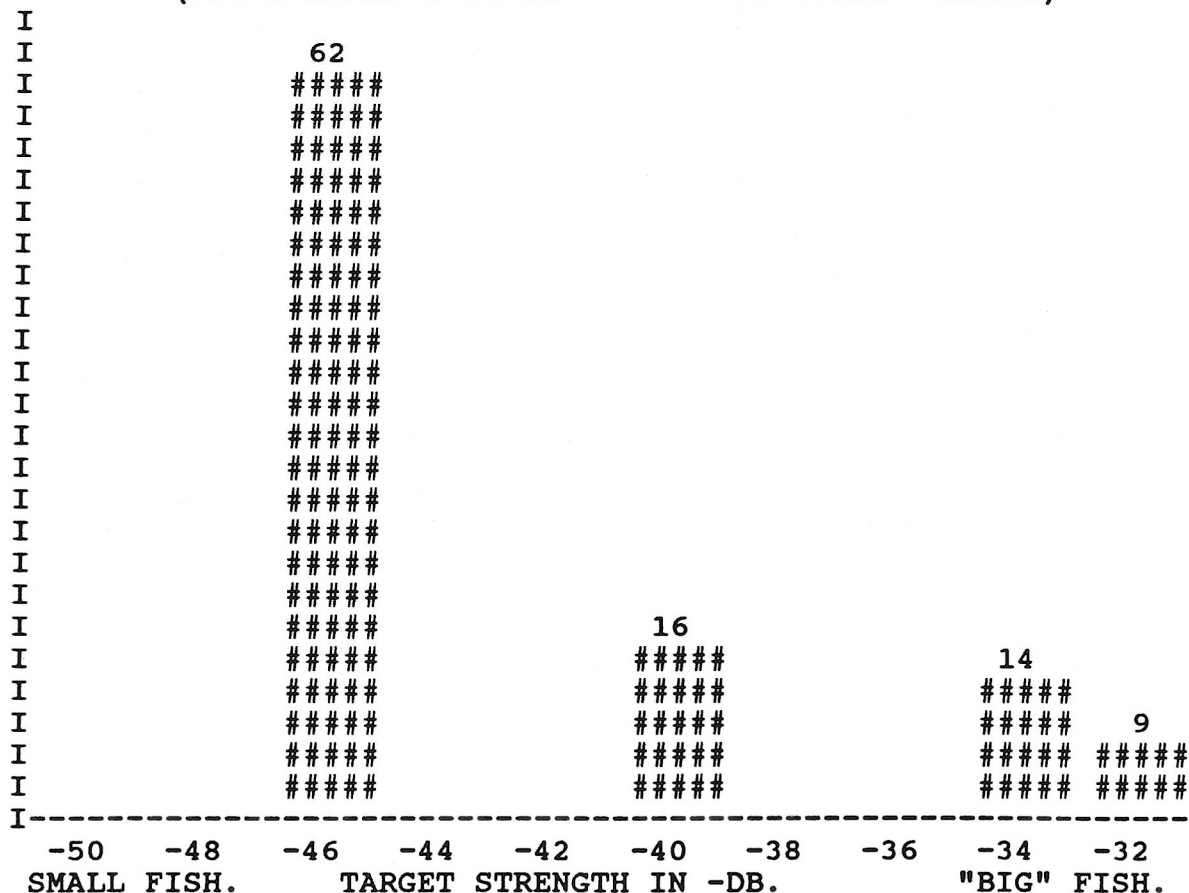
Listing date:25/6/1992

ECHOSIGNALS FROM TRANSECT : KURS 6 TIL 12
DEPTH LAYER : 2 - 12 METERS. CALCULATED MEAN DEPTH: 12 METERS.
NUMBER OF PINGS ANALYSED : 4000 OUT OF 4000. STARTING AT PING # : 1790
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 4000
SINGLEFISH RESOLUTION IN DEPTH LAYER : 100.0 % .
INTEGRATED VALUE FROM SCHOOLS : 0.000E+00

TS (DB) :	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	2	0.084	8
-34	5	0.130	13
-36	1	0.000	0
-38	2	0.000	0
-40	8	0.151	15
-42	4	0.000	0
-44	5	0.000	0
-46	21	0.592	59
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 48 TOTAL: 96 FISH/HA.
WARNING: SINGLE FISH REG. TOO LOW. UNCERTAIN RESULTS..

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



ECHODISTRIBUTION FROM STORDALSVATNET. DATE : 28 MAI 1992

ECHOSIGNALS FROM TRANSECT : KURS 6 TIL 12

DEPTH LAYER : 12 - 25 METERS. CALCULATED MEAN DEPTH: 25 METERS.

NUMBER OF PINGS ANALYSED : 3956 OUT OF 4000. STARTING AT PING # : 1790

NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 3956

SINGLEFISH RESOLUTION IN DEPTH LAYER : 91.0 % .

INTEGRATED VALUE FROM SCHOOLS : 2.923E+04

TS (DB):	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	18	0.105	14
-34	14	0.000	0
-36	11	0.000	0
-38	4	0.000	0
-40	18	0.016	2
-42	19	0.010	1
-44	37	0.111	14
-46	36	0.003	0
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 157 TOTAL: 32 FISH/HA.

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)

TS (DB)	Percentage
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-42	43
-44	43
-46	43
-48	43
-50	43
-32	43
-34	43
-36	43
-38	43
-40	43
-4	

LDA COMPUT

PAGE: 9

ECHOANALYSIS: STORDALSVATNET

DATE : 28 MAI 1992 DATA FROM TRANSECT : KURS 13 TIL 15
ECHOSOUNDER : EY-M
REMARKS: TAPE #2A
NUMBER OF PINGS ANALYSED : 8900. START AT PING NO. 0
IN 2 DEPTH LAYERS FROM 2 TO 30 METERS.

CALCULATED MEAN FISH DENSITY ALONG TRANSECT: 291 FISH/HECTARE.

DEPTH METERS	REGISTRATION SINGLE FISH	INTEGRAL SINGLE FISH	INTEGRAL SCHOOLS	TOTAL FISHDENSITY
2- 12	145 F/HA	1.063E+05	7.007E+04	240 FISH/HA
12- 30	24 F/HA	4.120E+05	4.503E+05	51 FISH/HA

FISH DENSITY SPLIT INTO 3 SIZEGROUPS.
(CALCULATED WITH DATA FROM SINGLEFISH-ECHOES.)

TS 32-38 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	15 FISH/HA	60.3 %	25 FISH/HA
DEPTH: 12 - 30 METERS	11 FISH/HA	47.8 %	23 FISH/HA

TOTAL : 48 FISH/HA

TS 39-43 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	25 FISH/HA	60.3 %	42 FISH/HA
DEPTH: 12 - 30 METERS	8 FISH/HA	47.8 %	17 FISH/HA

TOTAL : 59 FISH/HA

TS 44-62 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	105 FISH/HA	60.3 %	174 FISH/HA
DEPTH: 12 - 30 METERS	5 FISH/HA	47.8 %	11 FISH/HA

TOTAL : 184 FISH/HA

IF THE SCALE SHIFT OPTION IS NOT CHOSEN, ALL SINGLE FISH ECHOES
LARGER THAN TS=-38 DB WILL BE TRUNCATED AND SHIFTED DOWN
INTO THE -38 DB SIZE GROUP.

IF FISH DENSITY IN A DEPTH LAYER IS FOLLOWED BY A :

"?" : THE NUMBER OF SINGLE FISH ECHOES IS TOO LOW AND THE CALCULATED
DENSITY HAS POOR ACCURACY !

****: TOO MANY MULTIPLE ECHOES, ROUNDING ERRORS MAY OCCUR DUE TO
INTEGER PRESENTATION OF REAL VARIABLES....!!

Listing date:25/6/1992


```

ECHOSIGNALS FROM TRANSECT : KURS 13 TIL 15
DEPTH LAYER : 2 - 12 METERS.    CALCULATED MEAN DEPTH: 12 METERS.
NUMBER OF PINGS ANALYSED : 8900 OUT OF 8900. STARTING AT PING # : 0
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 8900
SINGLEFISH RESOLUTION IN DEPTH LAYER : 60.3 % .
INTEGRATED VALUE FROM SCHOOLS      : 7.007E+04

```

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)

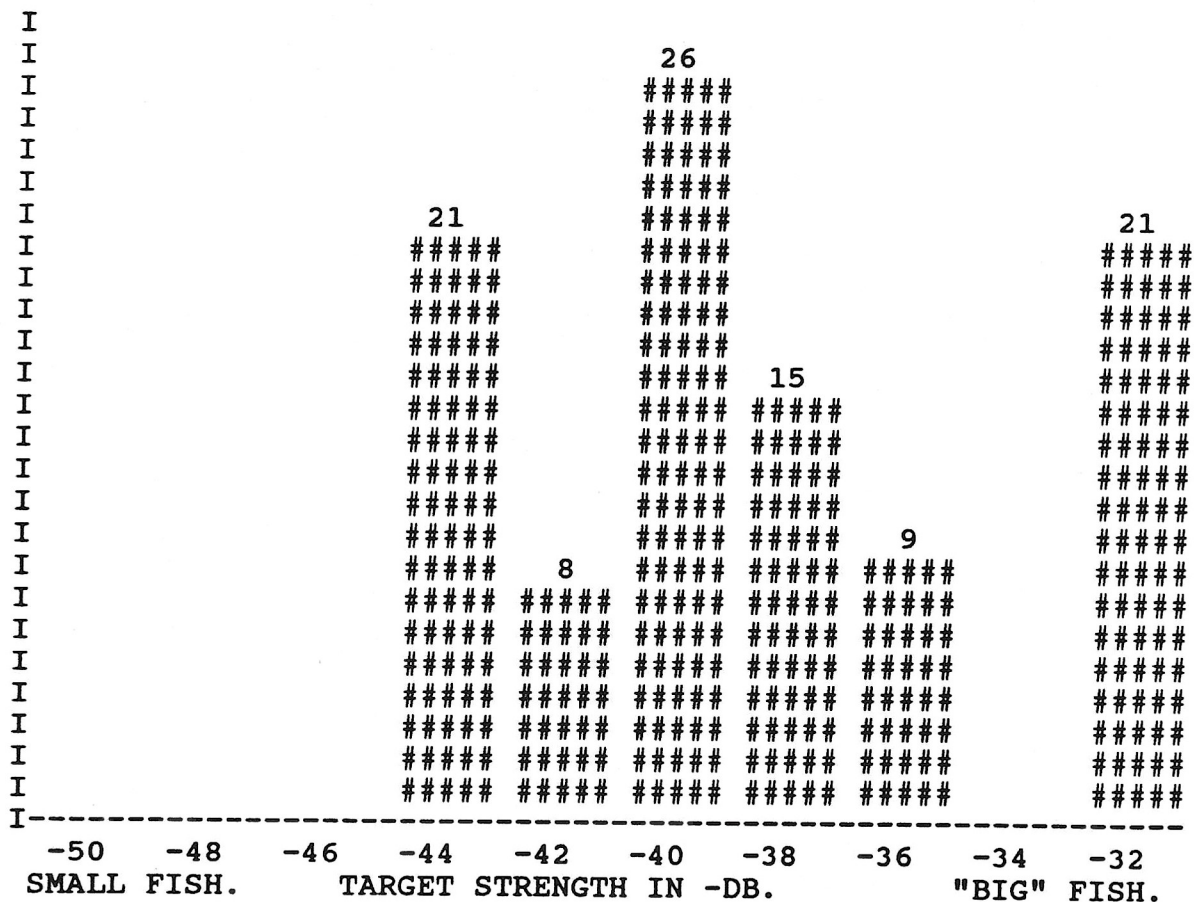
[illegible]

```

ECHOSIGNALS FROM TRANSECT : KURS 13 TIL 15
DEPTH LAYER : 12 - 30 METERS.    CALCULATED MEAN DEPTH: 28 METERS.
NUMBER OF PINGS ANALYSED : 8375 OUT OF 8900. STARTING AT PING # : 0
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 8375
SINGLEFISH RESOLUTION IN DEPTH LAYER : 47.8 % .
INTEGRATED VALUE FROM SCHOOLS      : 4.503E+05

```

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



LDA COMPUT

PAGE: 12

ECHOANALYSIS: STORDALSVATNET

 DATE : 28 MAI 1992 DATA FROM TRANSECT : KURS 11 TIL 13
 ECHOSOUNDER : EY-M
 REMARKS: TAPE #2B
 NUMBER OF PINGS ANALYSED : 1280. START AT PING NO. 720
 IN 2 DEPTH LAYERS FROM 2 TO 30 METERS.

CALCULATED MEAN FISH DENSITY ALONG TRANSECT: 346 FISH/HECTARE.

DEPTH METERS	REGISTRATION SINGLE FISH	INTEGRAL SINGLE FISH	INTEGRAL SCHOOLS	TOTAL FISHDENSITY
2- 12	280 F/HA	2.319E+03	3.470E+02	322 FISH/HA?
12- 30	24 F/HA	3.633E+04	0.000E+00	24 FISH/HA?

FISH DENSITY SPLIT INTO 3 SIZEGROUPS.
 (CALCULATED WITH DATA FROM SINGLEFISH-ECHOES.)

TS 32-38 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	0 FISH/HA	0.0 %	0 FISH/HA ?
DEPTH: 12 - 30 METERS	4 FISH/HA	100.0 %	4 FISH/HA ?
TOTAL :			4 FISH/HA

TS 39-43 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	0 FISH/HA	0.0 %	0 FISH/HA ?
DEPTH: 12 - 30 METERS	6 FISH/HA	100.0 %	6 FISH/HA ?
TOTAL :			6 FISH/HA

TS 44-62 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	280 FISH/HA	87.0 %	322 FISH/HA ?
DEPTH: 12 - 30 METERS	14 FISH/HA	100.0 %	14 FISH/HA ?
TOTAL :			336 FISH/HA

IF THE SCALE SHIFT OPTION IS NOT CHOSEN, ALL SINGLE FISH ECHOES
 LARGER THAN TS=-38 DB WILL BE TRUNCATED AND SHIFTED DOWN
 INTO THE -38 DB SIZE GROUP.

IF FISH DENSITY IN A DEPTH LAYER IS FOLLOWED BY A :
 "?" : THE NUMBER OF SINGLE FISH ECHOES IS TOO LOW AND THE CALCULATED
 DENSITY HAS POOR ACCURACY !
 "****": TOO MANY MULTIPLE ECHOES, ROUNDING ERRORS MAY OCCUR DUE TO
 INTEGER PRESENTATION OF REAL VARIABLES....!!

Listing date:25/6/1992

```

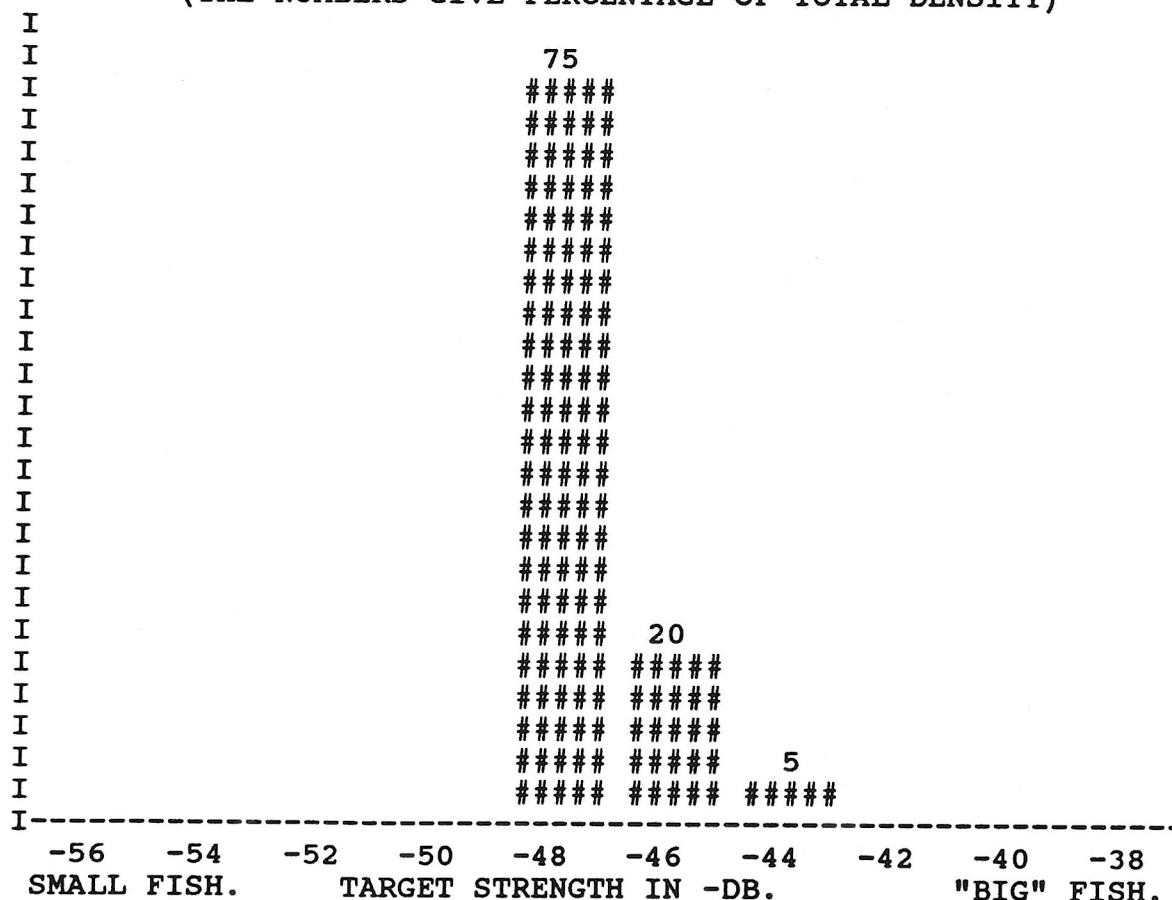
ECHOSIGNALS FROM TRANSECT : KURS 11 TIL 13
DEPTH LAYER : 2 - 12 METERS.    CALCULATED MEAN DEPTH: 12 METERS.
NUMBER OF PINGS ANALYSED : 1268 OUT OF 1280. STARTING AT PING # : 720
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 1268
SINGLEFISH RESOLUTION IN DEPTH LAYER : 87.0 % .
INTEGRATED VALUE FROM SCHOOLS      : 3.470E+02

```

TS (DB) :	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-38	0	0.000	0
-40	0	0.000	0
-42	0	0.000	0
-44	1	0.159	16
-46	5	0.642	64
-48	20	2.416	242
-50	0	0.000	0
-52	0	0.000	0
-54	0	0.000	0
-56	0	0.000	0

SINGLE FISH: 26 TOTAL: 322 FISH/HA.
WARNING: SINGLE FISH REG. TOO LOW. UNCERTAIN RESULTS..

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



ECHODISTRIBUTION FROM STORDALSVATNET. DATE : 28 MAI 1992

ECHOSIGNALS FROM TRANSECT : KURS 11 TIL 13

DEPTH LAYER : 12 - 30 METERS. CALCULATED MEAN DEPTH: 26 METERS.

NUMBER OF PINGS ANALYSED : 1161 OUT OF 1280. STARTING AT PING # : 720

NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 1161

SINGLEFISH RESOLUTION IN DEPTH LAYER : 100.0 % .

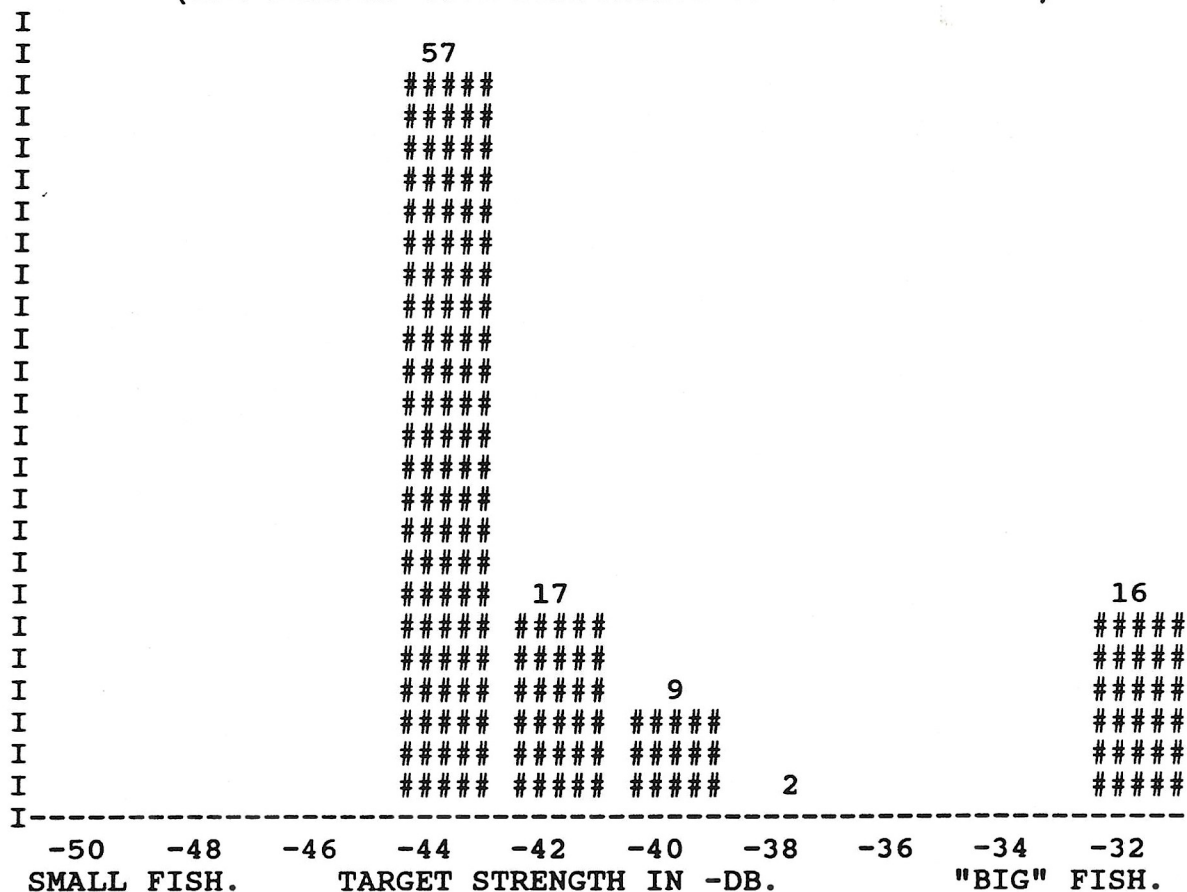
INTEGRATED VALUE FROM SCHOOLS : 0.000E+00

TS (DB):	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	2	0.027	4
-34	1	0.000	0
-36	1	0.000	0
-38	2	0.003	0
-40	3	0.015	2
-42	5	0.029	4
-44	12	0.098	14
-46	11	0.000	0
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 37 TOTAL: 24 FISH/HA.

WARNING: SINGLE FISH REG. TOO LOW. UNCERTAIN RESULTS..

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



LDA COMPUT

PAGE: 15

ECHOANALYSIS: STORDALSVATNET

 DATE : 30 MAI 1992 NATT DATA FROM TRANSECT : KURS 1 TIL 5 NATT
 ECHOSOUNDER : EY-M
 REMARKS: TAPE #3A
 NUMBER OF PINGS ANALYSED : 8000. START AT PING NO. 0
 IN 4 DEPTH LAYERS FROM 2 TO 50 METERS.

CALCULATED MEAN FISH DENSITY ALONG TRANSECT: 464 FISH/HECTARE.

DEPTH METERS	REGISTRATION SINGLE FISH	INTEGRAL SINGLE FISH	INTEGRAL SCHOOLS	TOTAL FISHDENSITY
2- 12	411 F/HA	1.235E+05	0.000E+00	411 FISH/HA
12- 22	10 F/HA	2.864E+05	5.433E+04	12 FISH/HA
22- 35	11 F/HA	3.064E+05	1.266E+05	15 FISH/HA
35- 50	13 F/HA	4.170E+05	3.876E+05	25 FISH/HA

FISH DENSITY SPLIT INTO 3 SIZEGROUPS.
 (CALCULATED WITH DATA FROM SINGLEFISH-ECHOES.)

TS 32-38 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	32 FISH/HA	100.0 %	32 FISH/HA
DEPTH: 12 - 22 METERS	8 FISH/HA	84.1 %	10 FISH/HA
DEPTH: 22 - 35 METERS	7 FISH/HA	70.8 %	10 FISH/HA
DEPTH: 35 - 50 METERS	4 FISH/HA	51.8 %	7 FISH/HA

TOTAL : 60 FISH/HA

TS 39-43 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	0 FISH/HA	0.0 %	0 FISH/HA
DEPTH: 12 - 22 METERS	1 FISH/HA	84.1 %	1 FISH/HA
DEPTH: 22 - 35 METERS	2 FISH/HA	70.8 %	2 FISH/HA
DEPTH: 35 - 50 METERS	4 FISH/HA	51.8 %	9 FISH/HA

TOTAL : 12 FISH/HA

TS 44-62 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	379 FISH/HA	100.0 %	379 FISH/HA
DEPTH: 12 - 22 METERS	1 FISH/HA	84.1 %	1 FISH/HA
DEPTH: 22 - 35 METERS	2 FISH/HA	70.8 %	2 FISH/HA
DEPTH: 35 - 50 METERS	5 FISH/HA	51.8 %	9 FISH/HA

TOTAL : 391 FISH/HA

IF THE SCALE SHIFT OPTION IS NOT CHOSEN, ALL SINGLE FISH ECHOES
 LARGER THAN TS=-38 DB WILL BE TRUNCATED AND SHIFTED DOWN
 INTO THE -38 DB SIZE GROUP.

IF FISH DENSITY IN A DEPTH LAYER IS FOLLOWED BY A :

"?" : THE NUMBER OF SINGLE FISH ECHOES IS TOO LOW AND THE CALCULATED
 DENSITY HAS POOR ACCURACY !

****: TOO MANY MULTIPLE ECHOES, ROUNDING ERRORS MAY OCCUR DUE TO
 INTEGER PRESENTATION OF REAL VARIABLES....!!

Listing date:25/6/1992


```

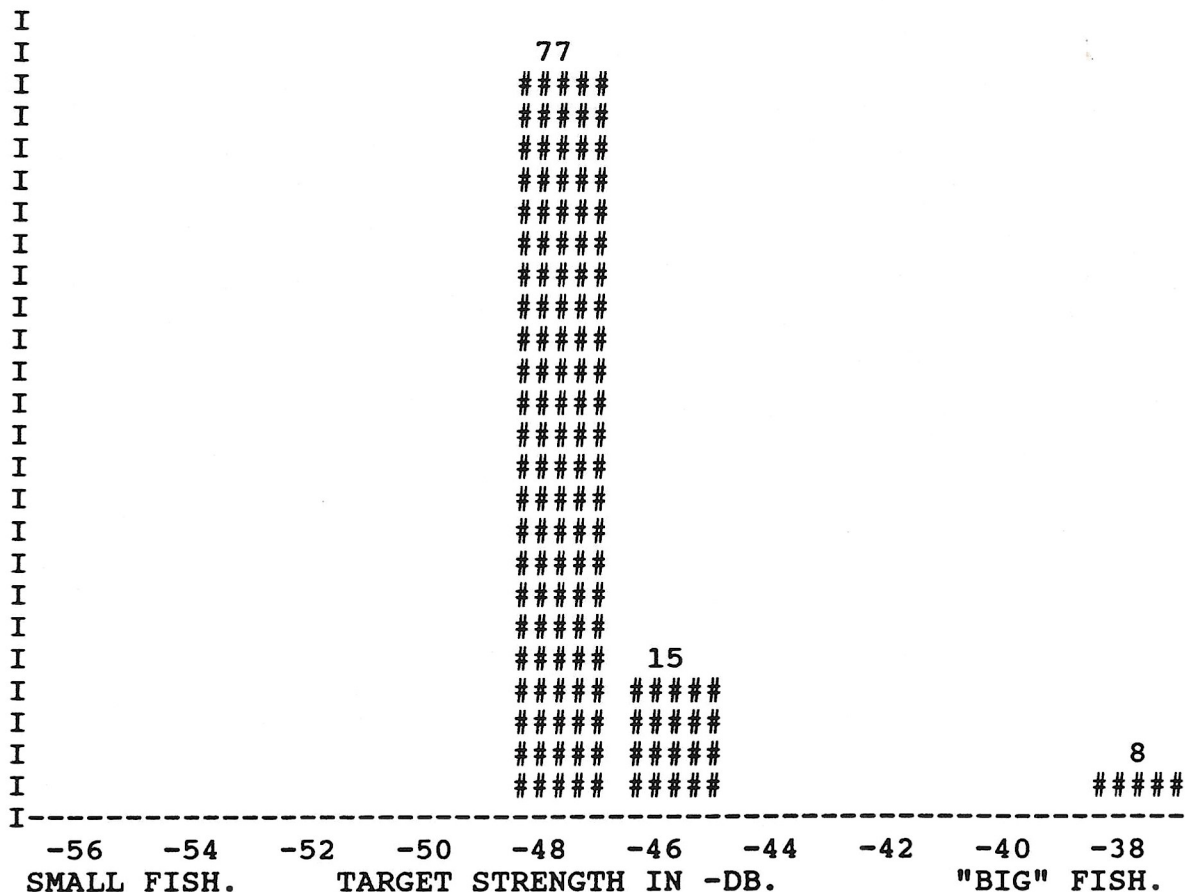
ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5 NATT
DEPTH LAYER : 2 - 12 METERS.    CALCULATED MEAN DEPTH: 12 METERS.
NUMBER OF PINGS ANALYSED : 8000 OUT OF 8000. STARTING AT PING # : 0
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 8000
SINGLEFISH RESOLUTION IN DEPTH LAYER : 100.0 % .
INTEGRATED VALUE FROM SCHOOLS      : 0.000E+00

```

TS (DB) :	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-38	15	0.323	32
-40	6	0.000	0
-42	8	0.000	0
-44	10	0.000	0
-46	41	0.610	61
-48	187	3.179	318
-50	0	0.000	0
-52	0	0.000	0
-54	0	0.000	0
-56	0	0.000	0

SINGLE FISH: 267 TOTAL: 411 FISH/HA.

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



ECHODISTRIBUTION FROM STORDALSVATNET. DATE : 30 MAI 1992 NATT

ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5 NATT

DEPTH LAYER : 12 - 22 METERS. CALCULATED MEAN DEPTH: 22 METERS.

NUMBER OF PINGS ANALYSED : 7665 OUT OF 8000. STARTING AT PING # : 0

NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 7665

SINGLEFISH RESOLUTION IN DEPTH LAYER : 84.1 % .

INTEGRATED VALUE FROM SCHOOLS : 5.433E+04

TS (DB):	ECHO-NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	19	0.097	10
-34	9	0.000	0
-36	7	0.000	0
-38	12	0.000	0
-40	12	0.000	0
-42	18	0.014	1
-44	14	0.000	0
-46	18	0.009	1
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 109 TOTAL: 12 FISH/HA.

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)

TS (DB)	ECHO-NUMBER	VOLUME DENSITY (FISH/1000 M**3)	AREA DENSITY (FISH/HECTARE)
-50	0	0.000	0
-48	0	0.000	0
-46	18	0.009	1
-44	14	0.000	0
-42	18	0.014	1
-40	12	0.000	0
-38	12	0.000	0
-36	7	0.000	0
-34	9	0.000	0
-32	19	0.097	10

SMALL FISH. TARGET STRENGTH IN -DB. "BIG" FISH.


```

ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5 NATT
DEPTH LAYER : 22 - 35 METERS.    CALCULATED MEAN DEPTH: 34 METERS.
NUMBER OF PINGS ANALYSED : 7184 OUT OF 8000. STARTING AT PING # : 0
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 7184
SINGLEFISH RESOLUTION IN DEPTH LAYER : 70.8 % .
INTEGRATED VALUE FROM SCHOOLS      : 1.266E+05

```

TS (DB) :	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	10	0.019	2
-34	24	0.027	3
-36	25	0.004	0
-38	44	0.038	5
-40	53	0.021	2
-42	34	0.000	0
-44	58	0.018	2
-46	43	0.000	0
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 291 TOTAL: 15 FISH/HA.

[illegible]

ECHODISTRIBUTION FROM STORDALSVATNET. DATE : 30 MAI 1992 NATT

ECHOSIGNALS FROM TRANSECT : KURS 1 TIL 5 NATT

DEPTH LAYER : 35 - 50 METERS. CALCULATED MEAN DEPTH: 48 METERS.

NUMBER OF PINGS ANALYSED : 6294 OUT OF 8000. STARTING AT PING # : 0

NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 6294

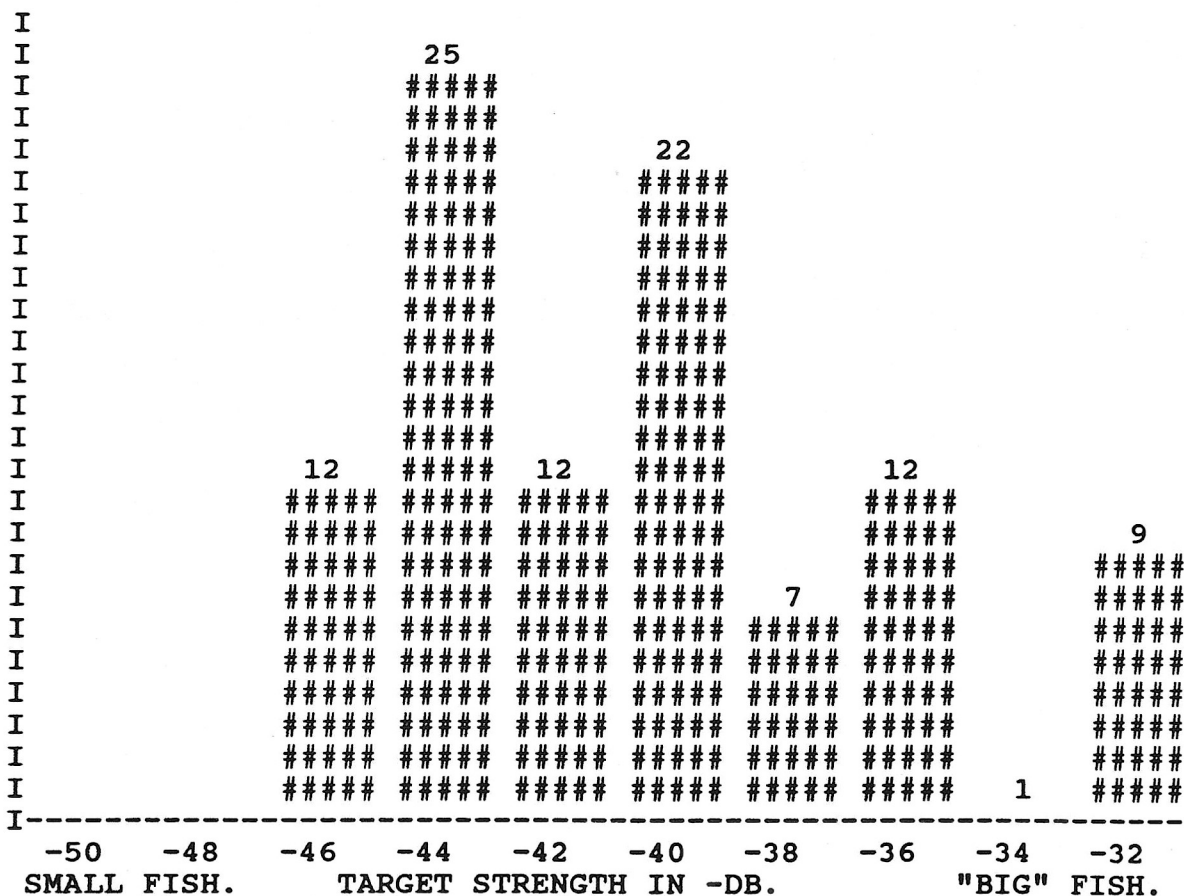
SINGLEFISH RESOLUTION IN DEPTH LAYER : 51.8 % .

INTEGRATED VALUE FROM SCHOOLS : 3.876E+05

TS (DB):	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	15	0.019	2
-34	16	0.002	0
-36	34	0.023	3
-38	44	0.014	2
-40	77	0.043	6
-42	92	0.023	3
-44	128	0.049	6
-46	141	0.023	3
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 547 TOTAL: 25 FISH/HA.

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



LDA COMPUT

PAGE: 20

ECHOANALYSIS: STORDALSVATNET

DATE : 30 MAI 1992 NATT DATA FROM TRANSECT : KURS 7 OG 8

ECHOSOUNDER : EY-M

REMARKS: TAPE #3B

NUMBER OF PINGS ANALYSED : 4500. START AT PING NO. 2000

IN 2 DEPTH LAYERS FROM 2 TO 25 METERS.
-----CALCULATED MEAN FISH DENSITY ALONG TRANSECT: 169 FISH/HECTARE.

DEPTH METERS	REGISTRATION SINGLE FISH	INTEGRAL SINGLE FISH	INTEGRAL SCHOOLS	TOTAL FISHDENSITY
2- 12	152 F/HA	8.493E+04	0.000E+00	152 FISH/HA?
12- 25	12 F/HA	9.138E+04	3.063E+04	16 FISH/HA?

-----FISH DENSITY SPLIT INTO 3 SIZEGROUPS.
(CALCULATED WITH DATA FROM SINGLEFISH-ECHOES.)

TS 32-38 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	20 FISH/HA	100.0 %	20 FISH/HA ?
DEPTH: 12 - 25 METERS	6 FISH/HA	74.9 %	8 FISH/HA ?

-----TOTAL : 27 FISH/HA

TS 39-43 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	7 FISH/HA	100.0 %	7 FISH/HA ?
DEPTH: 12 - 25 METERS	4 FISH/HA	74.9 %	5 FISH/HA ?

-----TOTAL : 11 FISH/HA

TS 44-62 DB:	SINGLE FISH	RES.	TOTAL.
DEPTH: 2 - 12 METERS	126 FISH/HA	100.0 %	126 FISH/HA ?
DEPTH: 12 - 25 METERS	3 FISH/HA	74.9 %	4 FISH/HA ?

-----TOTAL : 130 FISH/HA
-----IF THE SCALE SHIFT OPTION IS NOT CHOSEN, ALL SINGLE FISH ECHOES
LARGER THAN TS=-38 DB WILL BE TRUNCATED AND SHIFTED DOWN
INTO THE -38 DB SIZE GROUP.

IF FISH DENSITY IN A DEPTH LAYER IS FOLLOWED BY A :

"?" : THE NUMBER OF SINGLE FISH ECHOES IS TOO LOW AND THE CALCULATED
DENSITY HAS POOR ACCURACY !"***": TOO MANY MULTIPLE ECHOES, ROUNDING ERRORS MAY OCCUR DUE TO
INTEGER PRESENTATION OF REAL VARIABLES....!!

Listing date:25/6/1992

```

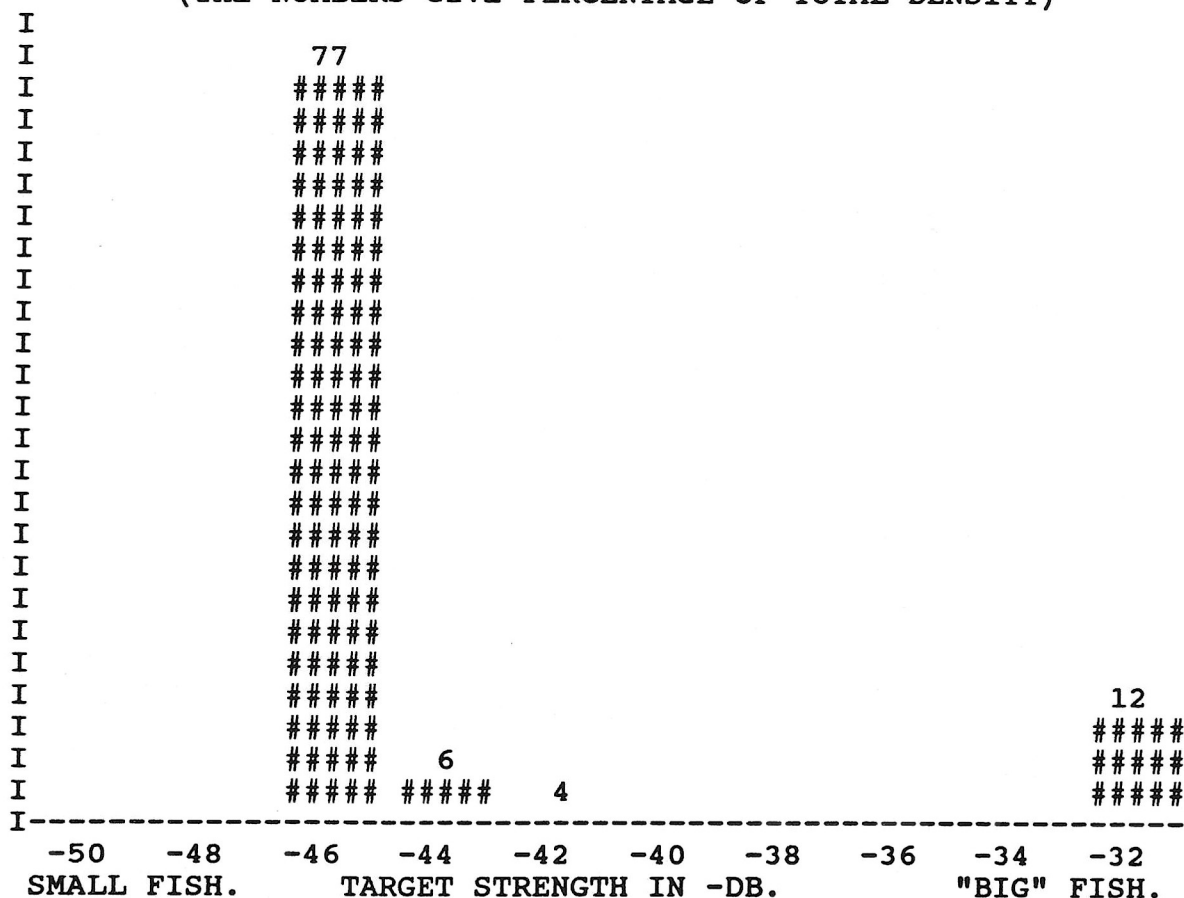
ECHOSIGNALS FROM TRANSECT : KURS 7 OG 8
DEPTH LAYER : 2 - 12 METERS.      CALCULATED MEAN DEPTH: 12 METERS.
NUMBER OF PINGS ANALYSED : 4500 OUT OF 4500. STARTING AT PING # : 2000
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 4500
SINGLEFISH RESOLUTION IN DEPTH LAYER : 100.0 % .
INTEGRATED VALUE FROM SCHOOLS      : 0.000E+00

```

TS (DB) :	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	5	0.187	19
-34	5	0.008	1
-36	2	0.000	0
-38	1	0.000	0
-40	3	0.000	0
-42	6	0.067	7
-44	8	0.087	9
-46	39	1.174	117
-48	0	0.000	0
-50	0	0.000	0

SINGLE FISH: 69 TOTAL: 152 FISH/HA.
WARNING: SINGLE FISH REG. TOO LOW. UNCERTAIN RESULTS..

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



```

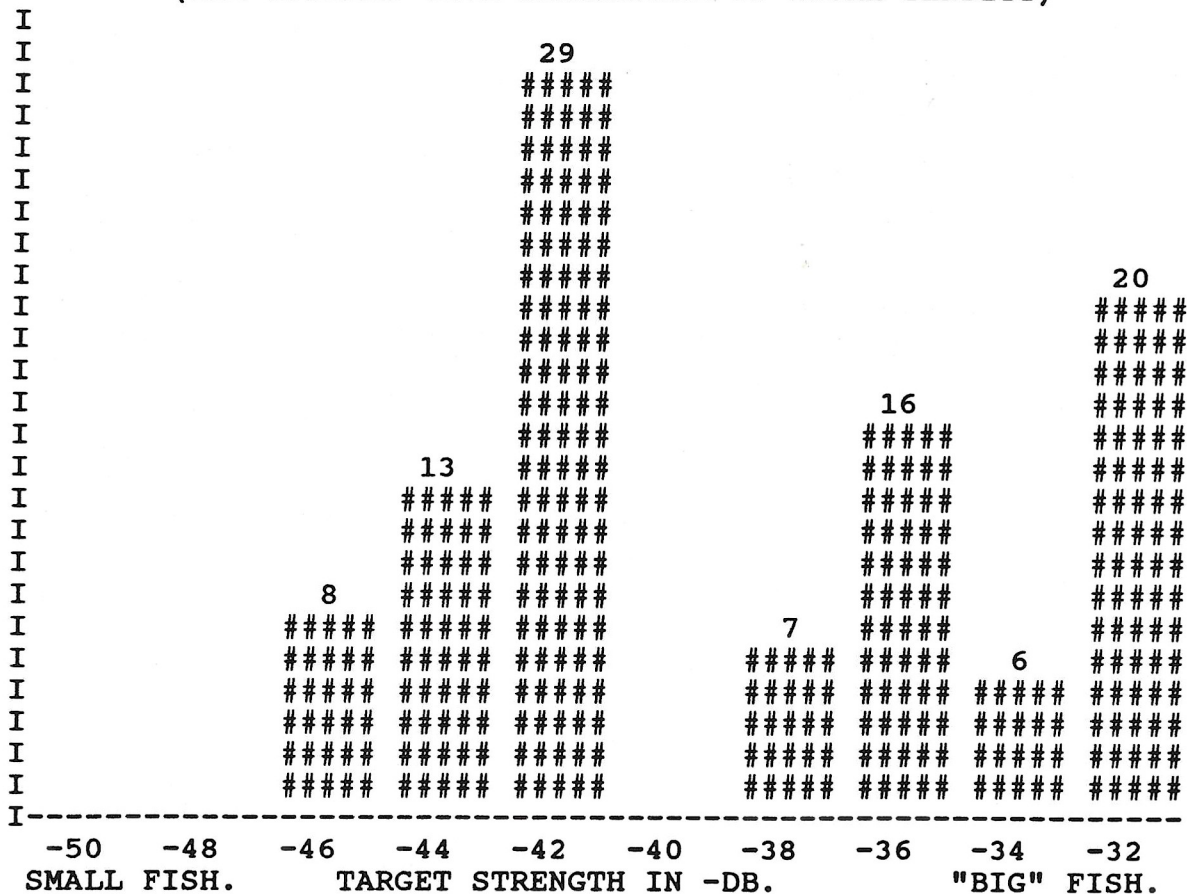
ECHOSIGNALS FROM TRANSECT : KURS 7 OG 8
DEPTH LAYER : 12 - 25 METERS.      CALCULATED MEAN DEPTH: 25 METERS.
NUMBER OF PINGS ANALYSED : 4449 OUT OF 4500. STARTING AT PING # : 2000
NUMBER OF PINGS FOUND WITHIN THIS DEPTH LAYER : 4449
SINGLEFISH RESOLUTION IN DEPTH LAYER : 74.9 % .
INTEGRATED VALUE FROM SCHOOLS      : 3.063E+04

```

TS (DB) :	ECHO- NUMBER:	VOLUME DENSITY, FISH/1000 M**3:	AREA DENSITY, FISH/HECTARE:
-32	4	0.025	3
-34	5	0.007	1
-36	8	0.020	3
-38	9	0.008	1
-40	5	0.000	0
-42	14	0.036	5
-44	16	0.017	2
-46	17	0.011	1
-48	0	0.000	0
-50	0	0.000	0

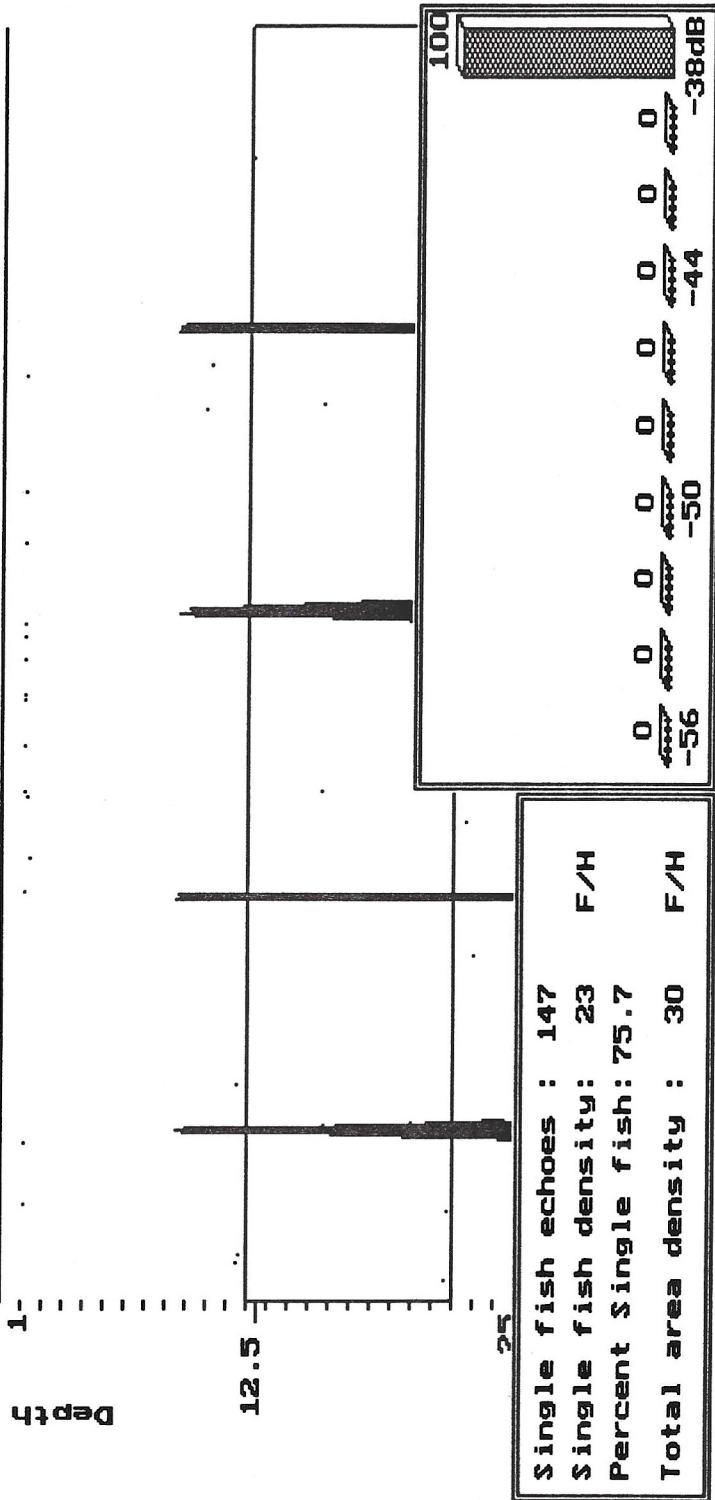
SINGLE FISH: 78 TOTAL: 16 FISH/HA.
WARNING: SINGLE FISH REG. TOO LOW. UNCERTAIN RESULTS..

RELATIVE SIZEDISTRIBUTION OF FISH.
(THE NUMBERS GIVE PERCENTAGE OF TOTAL DENSITY)



Ping #: 0 9000
Depth : 12 22

SDU1A592 STORDALSUATNET TR 1 28 MAI 1992



SDU1A592 STORDALSUATNET TR 1 28 MAY 1992

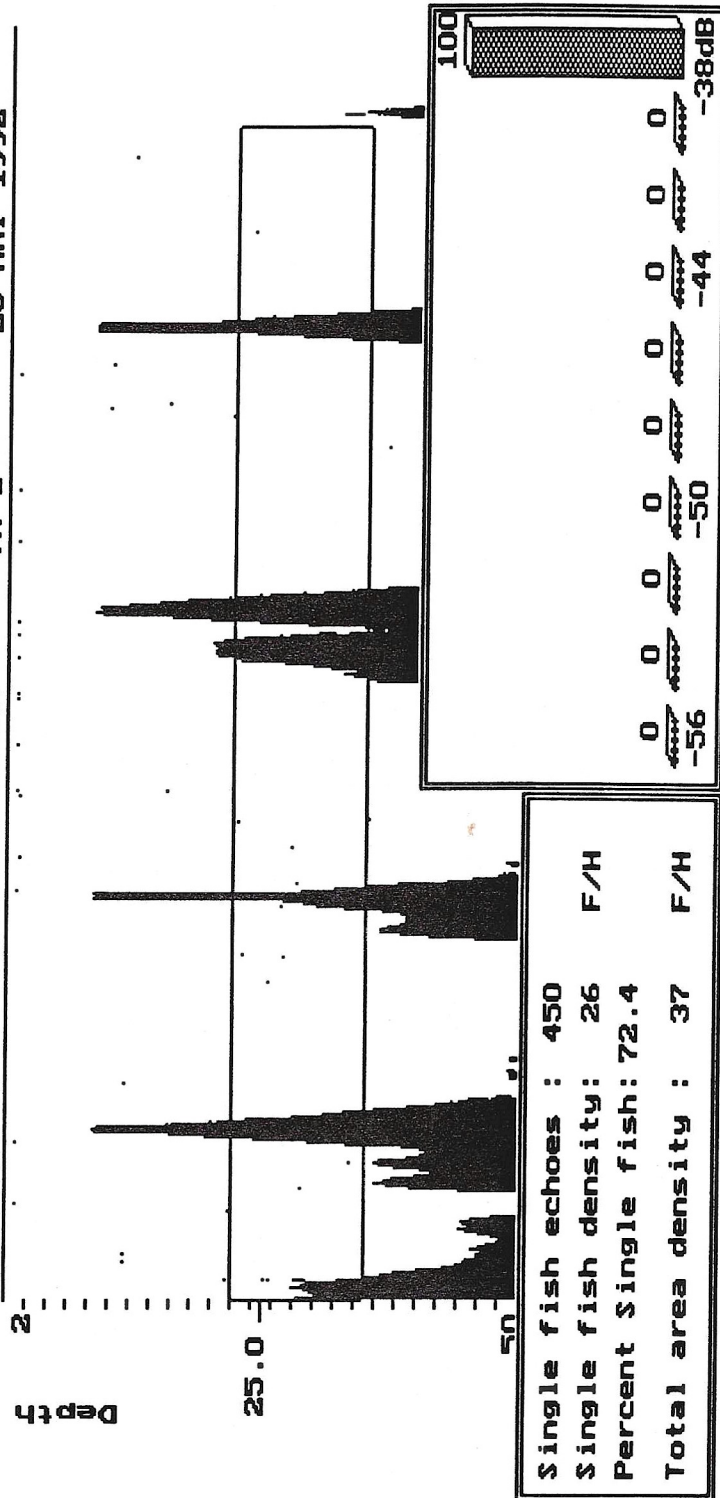
Depth

1-
12.5
25

Single fish echoes : 164
Single fish density: 218 F/H
Percent Single fish: 100.0
Total area density : 218 F/H

Ping #: 0 8280
 Depth : 22 35

SDU1A592 STORDALSUATNET TR 1 28 MAI 1992



TORFINN LINDEM, HYDRO ACOUSTIC FISH STOCK ASSESSMENT.

HYDROACOUSTIC SURVEY LOG.

Lake, survey area: Stordalsvatnet, Etna Date: 28.5.92 Survey by: G. Øvernes

Echosounder: EY-M Gain: 8 TVG: Transducer:

Tape recorder: Nakamichi 550 Tape brand: Maxell 40XL II Bias: None

Tape no.: 1 Test tone record level: -3 dB VU meter reading.

Remarks, survey description: Fant Sknopp

Remember : Record test tone on both sides of the tape for 1 min.. Do not change record level.

Transect no.	Tape side	Tape counter Start	Tape counter Stop	Time Start	Time End	Heading	Comments
1	A	8	98	11.31	11.38	A - V	Slåttebekken
2	A	99	204	11.38	11.48	N - S	Lund (hytte)
3	A	205	349	11.48	11.58	A - V	Rugtveit
4	A	357	524	11.58	12.10	N - S	Lanarvåkk
5	A	530	708	12.10	12.22	A - V	Øygarden
6	B	0	103	12.35	12.44	N - S	Björnåsen
7	B	110	293	12.45	12.59	A - V	Flokatveit
8	B	297	427	12.59	13.08	A - S	Norheimstrand (v.k) → Norheimstrand

TORFINN LINDEM, HYDRO ACOUSTIC FISH STOCK ASSESSMENT.

HYDROACOUSTIC SURVEY LOG.

Lake, survey area: Stordalsvatnet, Etna Date: 28.5.92 Survey by: G. Øvernes

Echosounder: _____ Gain: _____ TVG: _____ Transducer: _____

Tape recorder: _____ Tape brand: _____ Bias: _____

Tape no.: 1 of 2 Test tone record level: -3 dB VU meter reading.

Remarks, survey description: 5 Knop. Sol, svak vind, brukt, vass temp.

Remember : Record test tone on both sides of the tape for 1 min.. Do not change record level.

Transect no.	Tape side	Tape counter Start	Tape counter Stop	Time Start	Time End	Heading	Comments
9	1B	429	516	13.08		17 - V	Norheimsund - Kvalthen 5 - Kurs
10	1B	517	650			17A - SV	Kvalthen - Rame
11	1B	655	688	13.20	13.24	17A - SV	Rame - Ramevik
12	1B	703	769	13.24	13.27	17A - SV	Ramevik - Grevstokk
13	2A	5	75	13.37	13.44	N - S	Asbjørk →
14	2A	76	278	13.52	14.04	NV - 5A	Norheim - Flokka tveit
15	2A	280	800	14.07	14.38	V - 17	Flokkatveit - Linde vik

Kurs 15. Havnør: 400 Øvernes: 502 Lysnes 710.

TORFINN LINDEM, HYDRO ACOUSTIC FISH STOCK ASSESSMENT.

HYDROACOUSTIC SURVEY LOG.

Lake, survey area: Stor del, water Date: 30-31. 5-92 Survey by: _____

Echosounder: _____ Gain: _____ TVG: _____ Transducer: _____

Tape recorder: _____ Tape brand: _____ Bias: _____

Tape no.: 3 of 2 Test tone record level: -3 dB VU meter reading.

Remarks, survey description: _____

Remember : Record test tone on both sides of the tape for 1 min.. Do not change record level.

Transect no.	Tape side	Tape counter Start	Tape counter Stop	Time Start	Time End	Heading	Comments
9	3 B	547	627	0.45		A-U	Norheim sund - knetten 5-kurs
10	3 B	632	800	0.50		N17-SV	knetten
11	2 B	0	35	0.56		N17-SV	Ranne
12	2 B	36	61	1.00		N17-SV	Rannwik - Grobshad
13	2 B	64	135	1.10		N-5	A's by wik →

TORFINN LINDEM, HYDRO ACOUSTIC FISH STOCK ASSESSMENT.

HYDROACOUSTIC SURVEY LOG.

Lake, survey area: Stor delv wetland Date: 30.5 Survey by: B. Evers

Echosounder: EY-M Gain: 8 TVG: Transducer:

Tape recorder: Nakamichi SSU Tape brand: Norel 40AL II Bias: none

Tape no.: 3 Test tone record level: -3 dB VU meter reading.

Remarks, survey description: 5. Knop 0-60 m

Remember : Record test tone on both sides of the tape for 1 min.. Do not change record level.

Transect no.	Tape side	Tape counter Start	Tape counter Stop	Time Start	Time End	Heading	Comments
1	3A	4	84	23.18		A-V	Sluka bekken
2	A	88	180	23.25		N-S	Lunda
3	A	184	316	23.33		A-V	Rugtwit
4	A	325	468	23.44		N-S	Lamareiduk
5	A	475	596			A-V	Dygarden
6	3B	3	132	0.07		N-S	Björn dellen
7	B	136	365	0.17		A-V	Floka Luit
8	B	369	575	0.35		N, A-SV	Norheim strand (V.k.)

Prøvefiske i Stordalsvatnet 3.- 8. aug.1992

Prøvefisket blei føreteke med 2 seriar av følgjande garn: 12, 14, 16, 18, 22, 24 og 2 x 30 omfar (53, 45, 40, 35, 29, 26 og 2 x 21 mm).

Vatnet blei delt i tre. Dei to første nettene fiska Knut Norheim og Torleif Sande i midterste delen frå Norheimssund og til Neseholmen med kvar sin serie og med nye plasser for kvar natt. Deretter fiska Gunnar Øvernes ei natt i øverste delen frå Neseholmen med 2 seriar. Så var det opphald på ei natt på grunn av sterk vind, og til slutt fiska Anfinn Rame nederste delen frå Norheimsund på ei natt og to seriar.

Det var regn og uvanleg høg vannstand medan fisket føregjekk. Dette kan ha favorisert aurefisket. Normalt brukar ein å få ca 20 prosent røye ved garnfiske frå land sommarstid.

Det blei fanga i alt 146 fiskar på 3 netter og 2 seriar. Av dette var berre 11 røye og resten aure. Det blei fiska 1 ål.

Auren fordelte seg slik på garnseriane:

Omfar	antal	vektområde gram
12	4	158 - 4500
14	0	
16	5	492 - 8200
18	0	
22	4	180 - 258
24	23	148 - 300
30	99	60 - 270

Skjema for "Prøvefiske med garn" er fylt ut med byrjande nummerering for kvart garn og merka med bokstav eller namn for den som har fiska. Det er to ark for aure og eitt for røye. Kjønn, gytestadium og kjøttfarge er påført det dette blei gjort. Nøyaktig plassering av og type garn er notert på kartet.

Ved tilfeldig fiske med 28 omfars garn av ca 40 fisk tidlegare i sommar har gjennomsnittleg K-faktor for aure vore 0,97 (frå 0,83 - 1.25) og for røye 0.87 (frå 0,75 - 1,08).

Med helsing

Gunnar Øvernes

Start her med minste
maskevidde

ntype: Flytegarn ☐ Bunngarn: ☐
eriale: Spunnet nylon: ☐ Monofilament ☐ Andre, angi type: _____

Start her med minste
maskevidde

mm - omfar					mm 24 omfar					mm omfar					mm 30 omfar				
rn:					Ant. garn:					Ant. garn:					Ant. garn:				
tter:					Ant. netter:					Ant. netter:					Ant. netter:				
Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	
	Hann ♂	Hunn ♀						Hann ♂	Hunn ♀						Hann ♂	Hunn ♀			
					1	213	73		0.76						1	241	130	0.93	
					1	240	127		0.92						2	245	117	0.77	
					1	240	130	III	0.94	H					1	191	66	0.95	
															2	215	78	0.78	
															1	180	45	0.77	
															1	235	110	0.95	LR
															2	205	78	0.73	LR
															3	215	80	0.87	LR

a: Flytegarn ☐ Bunnegarn: ☐
a: Spunnet nylon: ☐ Monofilament ☐ Andre, angi type: _____
dybde: _____

AURE

mm 12 omfar							mm 14 omfar							mm 16 omfar										
Ant. garn:							Ant. garn:							Ant. garn:							Ant. garn:			
Ant. netter:							Ant. netter:							Ant. netter:							Ant. netter:			
Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm		
			Hann ♂	Hunn ♀						Hann ♂	Hunn ♀						Hann ♂	Hunn ♀						
<u>Kjøtt:</u>																								
	1 680	450			1,43	R									1 590	2025			0,79	R				
<u>Aufbau:</u>																								
	1 430	982			1,23	R									1 463	1100			1,11					
	1 250	158			1,01										1 355	492			1,10					
<u>Gunnar:</u>																								
	1 580	3000	IV		1,54	R									1 570	2000	III		1,42	R				
															1 800	8200	III		1,60	R				

Dominerende mageinnhold: _____

Parasitter: _____

AURE

AURE

Start
mas

18 omfar				mm 22 omfar				mm 24 omfar				mm 30 omfar								
Ant. garn:				Ant. garn:				Ant. garn:				Ant. garn:				Ant. garn:				
Ant. netter:				Ant. netter:				Ant. netter:				Ant. netter:				Ant. netter:				
Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram
Hann ♂	Hunn ♀						Hann ♂	Hunn ♀						Hann ♂	Hunn ♀					
				1	276	176					1	276	160					1	276	16
				2	296	245					2	296	200					2	296	13
											1	300	295					3	296	5
											2	250	140					4	230	10
				1	260	150					3	250	150					5	220	1
											4	210	105					6	200	2
											1	230	121					7	180	2
											2	220	98					8	210	2
											3	148	36					1	190	2
				1	280	258	III		LR		1	261	173					2	180	6
											2	260	164					3	200	5
											3	243	137					4	200	5
											4	258	155					5	220	10
											1	250	154					1	200	8
											2	160	45					2	200	5
											3	250	147					3	210	5
											1	250	141					4	270	10
											2	252	163					5	200	5
											3	253	153					6	220	5
											4	245	151					7	210	5
											5	278	198					8	200	5
											1	230	125	IV				1	220	10
											1	250	153	IV				6	210	5
																		4	200	5
																		12	180	5
																		13	200	5
																		1	230	1
																		2	220	10
																		3	200	5
																		4	120	5

Garntype: Flytegarn ☐Bunngarn: ☐Materiale: Spunnet nylon: ☐Monofilament ☐

Andre, angi type: _____

Garnas dybde: _____

AURE

Start her med minste
maskevidde

mm 22 omfar							mm 24 omfar							mm 30 omfar							mm 30 omfar													
Ant. garn:							Ant. garn:							Ant. garn:							Ant. garn:													
Ant. netter:							Ant. netter:							Ant. netter:							Ant. netter:													
Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge	Nr.	Lengde i mm	Vekt i gram	Kjønn		K-faktor	Kjøttfarge
			Hann ♂	Hunn ♀						Hann ♂	Hunn ♀						Hann ♂	Hunn ♀						Hann ♂	Hunn ♀						Hann ♂	Hunn ♀		
1	276	176					1	270	160					1							1	270	165											
2	296	245					2	250	200					2							2	230	135											
							1	300	295	1				1	25	75					3	200	75									0.74		
							2	250	140					2	196	80					4	230	100											
1	260	150					3	250	150					3	217	99					5	220	110											
							4	210	105					4	233	120					6	200	70									0.83		
							1	230	121	1				5	227	117					7	180	70									1.20		
							2	220	98					6	215	102					8	210	80											
							3	148	36					1	223	119	1				1	190	70	x										
280	258		III		LR		1	261	173	1				2	231	120					2	150	60									1.02		
							2	260	164					3	192	73					3	200	75											
							3	243	137					4	208	99					4	200	80											
							4	258	155					5	201	89					5	220	100											
							1	250	154	1				6	191	68					1	200	85	x										
							2	160	45					1	212	95	1				2	200	70											
							3	250	147					2	216	89					3	210	80											
							1	250	141	1				3	202	72					4	210	130											
							2	252	163					4	205	75					5	200	80											
							3	253	153					5	195	66					6	220	70											
							4	245	151					6	230	116					7	210	85											
							5	278	198					7	216	83	1				8	200	80	x										
							1	230	125	1			1	232	113						1	220	100											
							1	250	153	1			LR	3	217	101					6	210	80											
														4	226	101					4	200	85											
																					12	190	75											
																					13	200	80											
																					1	230	115	K										
																					2	220	115											
																					3	200	70											
																					4	120	70											

Garn type: Flytegarn ☐Bunn garn: ☐Materiale: Spunnet nylon: ☐Monofilament ☐

Andre, angi type: _____

Garnas dybde: _____