

**Mesures *in situ* des index de réflectivité à l'aide d'un écho sondeur type « Dual beam » (129 kHz, *BioSonics*)  
Et chalutage d'identification spécifique**

**Venezuela orientale,  
Mission Varget 2/1996-99,  
(Orstom-Flasa-CroDT)**

Par  
**Patrice Brehmer et Pascal Cotel**  
IRD/DRV/UR061  
(Mars 2003)



(Photo : P. Brehmer, Chalutage Varget)

## **Adresse contact**

Patrice Brehmer, IRD/DRV/CRHMT//UR061

CRHMT, Ave Jean Monnet, BP171, 34200, Sète, France

☎ +33 4 99 57 3241

☎ + 33 4 99 57 3295

✉ [brehmer@ird.fr](mailto:brehmer@ird.fr)

Pascal Cotel, IRD/DRV//UR061

IFOP, Blanco 839, Casilla 8-V, Valparaiso, 5a Region Chile

☎ +56.32 322495

☎ +56.32 220824

✉ [pcotel@ifop.cl](mailto:pcotel@ifop.cl)

**Rapport interne; 2003 ©IRD/DRV/CRHMT/UR061**

Ne peut être cité sans l'avis de ses auteurs.

## Sommaire

Adresse contact .....	2
Sommaire .....	3
Table des figures et tableaux : .....	3
1. Introduction.....	6
2. Chalutage d'identification au Venezuela Orientale (N/O Antéa, 1996-98-99) .....	6
a. Caractéristique de l'engin de pêche : le chalut pélagique.....	11
i. Pélagique 111.00 m * 87.00 m.....	11
ii. CHALUT GOV 29.00 m * 40.30 m.....	11
3. Résultat : mesure in situ TS brutes.....	12
a. Calibration du sondeur <i>Biosonics 102</i> .....	12
b. Analyse des TS du sondeur Dual Beam 120 kHz.....	13
i. Analyse de la séquence d'échantillonnage (TS) vg298_03.dat .....	14
ii. Analyse de la séquence d'échantillonnage (TS) vg298_03.dat .....	16
iii. Analyse de la séquence d'échantillonnage (TS) vg298_04.dat .....	18
iv. Analyse de la séquence d'échantillonnage (TS) vg298_04.dat .....	20
v. Analyse de la séquence d'échantillonnage (TS) vg298_05.dat .....	22
vi. Analyse de la séquence d'échantillonnage (TS) vg298_06.dat .....	24
vii. Analyse de la séquence d'échantillonnage (TS) vg298_07.dat .....	27
viii. Analyse de la séquence d'échantillonnage (TS) vg298_08.dat .....	29
ix. Analyse de la séquence d'échantillonnage (TS) vg298_09.dat .....	31
x. Analyse de la séquence d'échantillonnage (TS) vg298_10.dat .....	33
xi. Analyse de la séquence d'échantillonnage (TS) vg298_12.dat .....	35
xii. Analyse de la séquence d'échantillonnage (TS) vg298_13.dat .....	37
xiii. Analyse de la séquence d'échantillonnage (TS) vg298_14.dat .....	40
xiv. Analyse de la séquence d'échantillonnage (TS) vg298_15.dat .....	42
xv. Analyse de la séquence d'échantillonnage (TS) vg298_15.dat .....	44
xvi. Analyse de la séquence d'échantillonnage (TS) vg298_16.dat .....	46
xvii. Analyse de la séquence d'échantillonnage (TS) vg298_16.dat .....	48
xviii. Analyse de la séquence d'échantillonnage (TS) vg298_17.dat .....	50
xix. Analyse de la séquence d'échantillonnage (TS) vg298_17.dat .....	52
xx. Analyse de la séquence d'échantillonnage (TS) vg298_18.dat .....	55
xxi. Analyse de la séquence d'échantillonnage (TS) vg298_19.dat .....	57
xxii. Analyse de la séquence d'échantillonnage (TS) vg298_21.dat .....	59
xxiii. Analyse de la séquence d'échantillonnage (TS) vg298_22.dat .....	61
xxiv. Analyse de la séquence d'échantillonnage (TS) vg298_23.dat .....	65
4. Interprétation préliminaires.....	67
5. Discussion .....	70
6. Références.....	70
7. Annexes.....	70
Pélagique 111.00 m * 87.00 m.....	71
CHALUT GOV 29.00 m * 40.30.....	72

### Table des figures et tableaux :

Figure 1 : Chalutage d'identification durant la mission d'observation acoustique Varget 2/1996, Navire Océanographique Antéa .....	7
Figure 2 : Chalutage d'identification durant la mission d'observation acoustique Varget 2/1998, Navire Océanographique Antéa .....	7
Figure 3 : Chalutage d'identification durant la mission d'observation acoustique Varget 2/1999, Navire Océanographique Antéa .....	8
Figure 4 : (03A) Echogramme ESP Echo Biosonics, nombre de ping <2000, .....	13
Figure 5 : (3B), Echogramme ESP Echo Biosonics, nombre de ping 2000- 3500 .....	16
Figure 6 : (04 A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	18
Figure 7 : (04 B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (04C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000 .....	21
Figure 8 ; (04D), Echogramme ESP Echo Biosonics, nombre de ping 6000-8000, et (05A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	22
Figure 9 : (05B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (05C), Echogramme ESP Echo Biosonics, nombre de ping 4000-4500 .....	24
Figure 10 : (06A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	24
Figure 11 : (06B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000 et (06C), Echogramme ESP Echo Biosonics, nombre de ping 4000-5000 .....	26
Figure 12 : (07A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	26
Figure 13 : (08A), Echogramme ESP Echo Biosonics, nombre de ping 12500-13500 .....	28
Figure 14 : (08B), Echogramme ESP Echo Biosonics, nombre de ping 13500-15500, et (08C), Echogramme ESP Echo Biosonics, nombre de ping 14500-16500 .....	30
Figure 15 : (09A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	31
Figure 16 : 09B), Echogramme ESP Echo Biosonics, nombre de ping 2000-3000 et (010), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	33
Figure 17 : (010A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	35
Figure 18 : (010B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000 et (012A), Echogramme ESP Echo Biosonics, nombre de ping <500 .....	35
Figure 19 : (012B), Echogramme ESP Echo Biosonics, nombre de ping <250 et (013A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	37
Figure 20 : (013B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (013C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000 .....	39
Figure 21 : (013D), Echogramme ESP Echo Biosonics, nombre de ping 6000-8000, et (013E), Echogramme ESP Echo Biosonics, nombre de ping 8000-10000 .....	39
Figure 22 : (013F), Echogramme ESP Echo Biosonics, nombre de ping 10000-11800, et (014A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	40
Figure 23 : (014B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (014C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000 .....	42
Figure 24 : (014D), Echogramme ESP Echo Biosonics, nombre de ping 6000-6500, et (015A), Echogramme ESP Echo Biosonics, nombre de ping <500 .....	42
Figure 25 : (015B), Echogramme ESP Echo Biosonics, nombre de ping <800 .....	46
Figure 26 : (015C), Echogramme ESP Echo Biosonics, nombre de ping <800, et (016A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	46
Figure 27 : (016B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (016C), Echogramme ESP Echo Biosonics, nombre de ping 4000-4700 .....	50
Figure 28 : (017A), Echogramme ESP Echo Biosonics, nombre de ping <700 .....	50
Figure 29 : (017B), Echogramme ESP Echo Biosonics, fin et (017C), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	54
Figure 30 0 (17D), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000 .....	54
Figure 31: (017 <sup>E</sup> ), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000, et (018A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	54

Figure 32: (018B), Echogramme ESP Echo Biosonics, nombre de ping <4000, et (018C), Echogramme ESP Echo Biosonics, nombre de ping 4000-5600 .....	56
Figure 33 : (019A), Echogramme ESP Echo Biosonics, nombre de ping <300 .....	57
Figure 34: (019B), Echogramme ESP Echo Biosonics, nombre de ping <2000, et (019C), Echogramme ESP Echo Biosonics, nombre de ping 2500 .....	59
Figure 35 : (021A), Echogramme ESP Echo Biosonics, fin.....	59
Figure 36 ; (021B), Echogramme ESP Echo Biosonics, nombre de ping <2000, et (021C), Echogramme ESP Echo Biosonics, nombre de ping 2000-3000 .....	61
Figure 37 : (022A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	61
Figure 38: (022b), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000.....	63
Figure 39: (022C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000 .....	63
Figure 40; (022D), Echogramme ESP Echo Biosonics, nombre de ping 6000-8000.....	64
Figure 41: (022E), Echogramme ESP Echo Biosonics, nombre de ping 8000-10000 .....	64
Figure 42: (022F), Echogramme ESP Echo Biosonics, nombre de ping 10000-12000 .....	64
Figure 43: (022G), Echogramme ESP Echo Biosonics, nombre de ping 12000-14000.....	65
Figure 44: (023A), Echogramme ESP Echo Biosonics, nombre de ping <2000 .....	65
Figure 45: (023B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000 .....	67
Figure 46: (023C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000 .....	67
Figure 47: (023D), Echogramme ESP Echo Biosonics, nombre de ping 6000-7900.....	67
Tableau 1 : Logiciel d'analyse des données du sondeur dual beam Biosonics 102 : Dual Beam ESP V3.2.....	6
Tableau 2 : Capture totale varget 2 1996 .....	9
Tableau 3 : Capture totale varget 2 1998 .....	9
Tableau 4 : Capture totale varget 2 1999 .....	10
Tableau 5 : valeur moyenne par séquence d'enregistrement sondeur des valeurs de backscattering cross section et de Target Strenght (index de reflectivité) des poissons isolé. (en dB) (TVG 40 log R) .....	69

## 1. Introduction

Les données ont été enregistrées au cours de la mission varget 2/98 (Gerlotto, 1998), par le sondeur « scientifique » *Biosonics 102* et traitées par le logiciel d'analyse (Cotel, 1998) de données du biosnics : « TS Version 2.31 » (Tableau 1).

```
***** TS Version 2.31 *****
      Dual Beam Data Reduction Program
      For ESP V1.x, V2.x, V3.x, and DBM data files
*****

Copyright BioSonics, Inc., 1 March, 1995, for BioSonics Consulting Division and
Friends

Serial Number 5205-V2.31-95-000
```

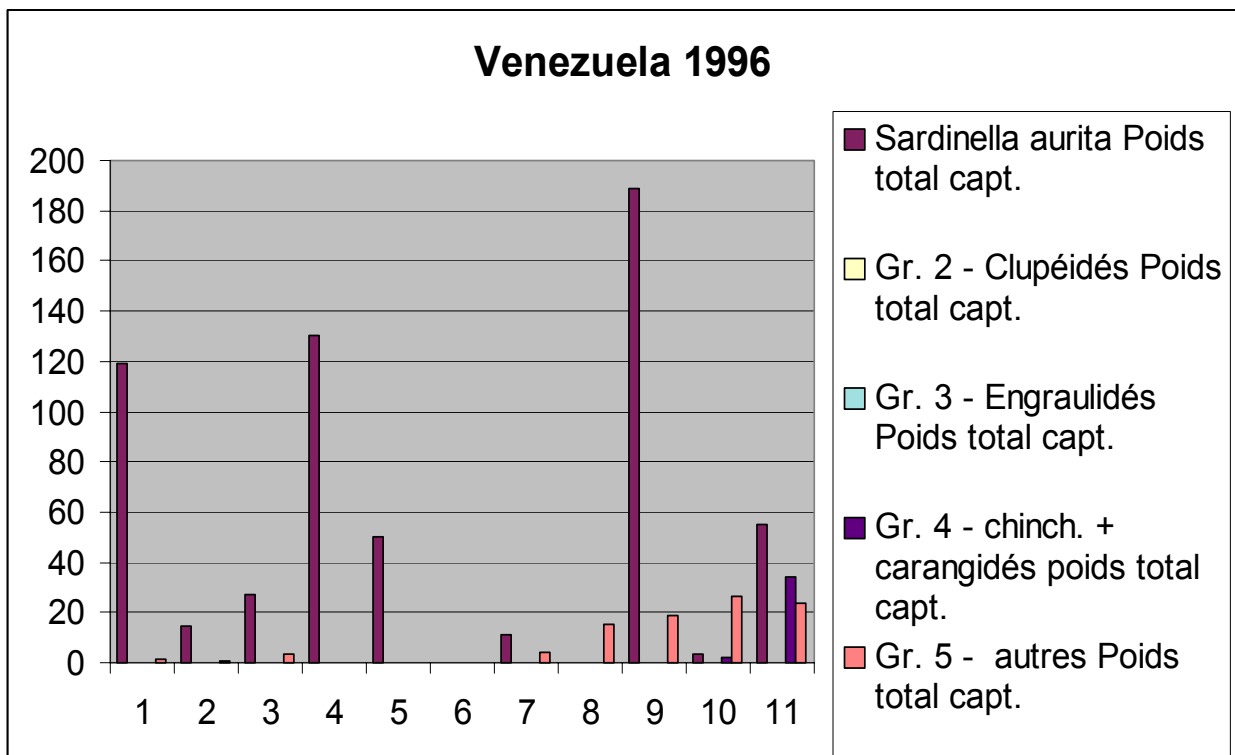
**Tableau 1 :** Logiciel d'analyse des données du sondeur dual beam Biosonics 102 : Dual Beam ESP V3.2

Simultanément nous avons enregistré les données issues du sondeur split beam EK500 Simrad, les données ont été enregistrées via le software d'analyse et d'acquisition « EP500 ». Ces données ne seront pas abordées dans ce premier rapport. Tous les enregistrements se sont déroulés durant les pêches d'identification<sup>1</sup>. Le même engin a été utilisé, mis en œuvre par le même équipage. Des données identiques ont été enregistrées en 1999 et 1996 qui ne seront pas abordées ici.

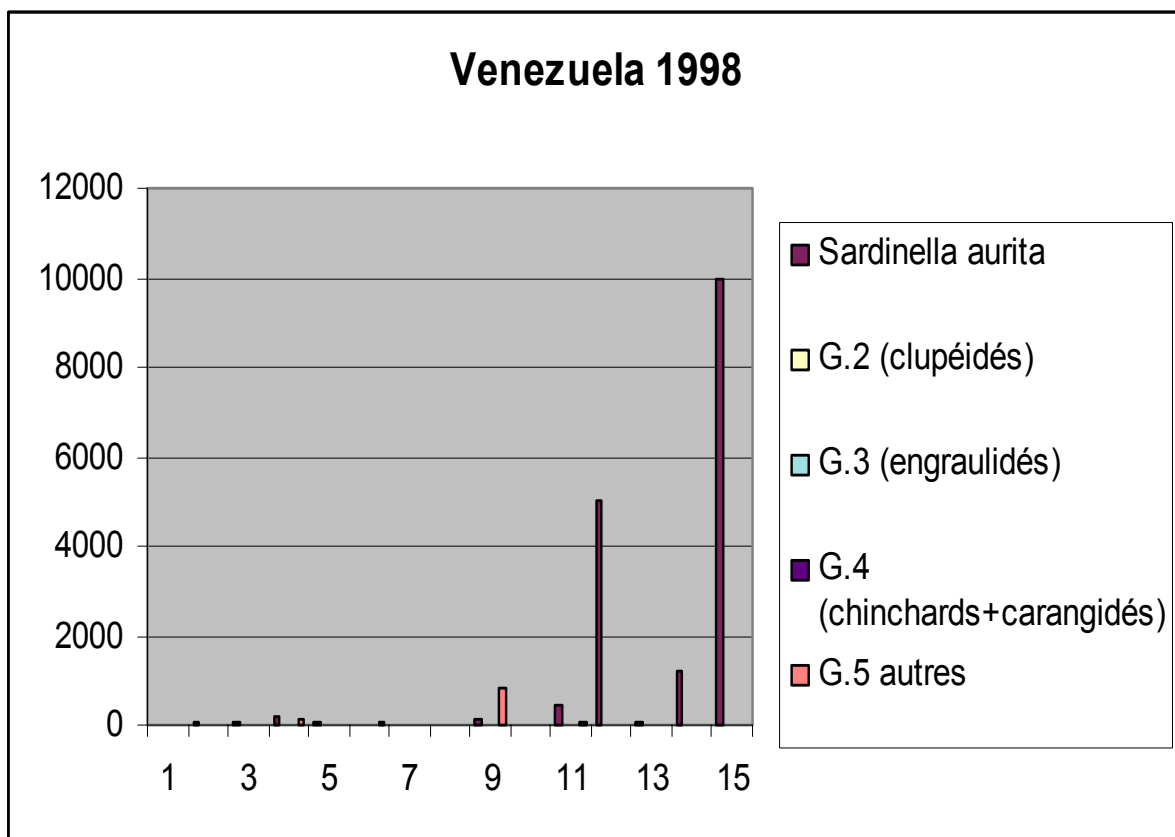
## 2. Chalutage d'identification au Venezuela Orientale (N/O Antéa, 1996-98-99)

Nous présentons dans les résultats bruts de nos pêches d'identification (pour en savoir plus se reporter à la Thèse de Patrice Brehmer). Les figures 1 à 3 représentent les histogrammes des quantités pêchées par catégories d'intérêt. Les tableaux détaillés de capture totale les accompagnent (tableau 2 à 4).

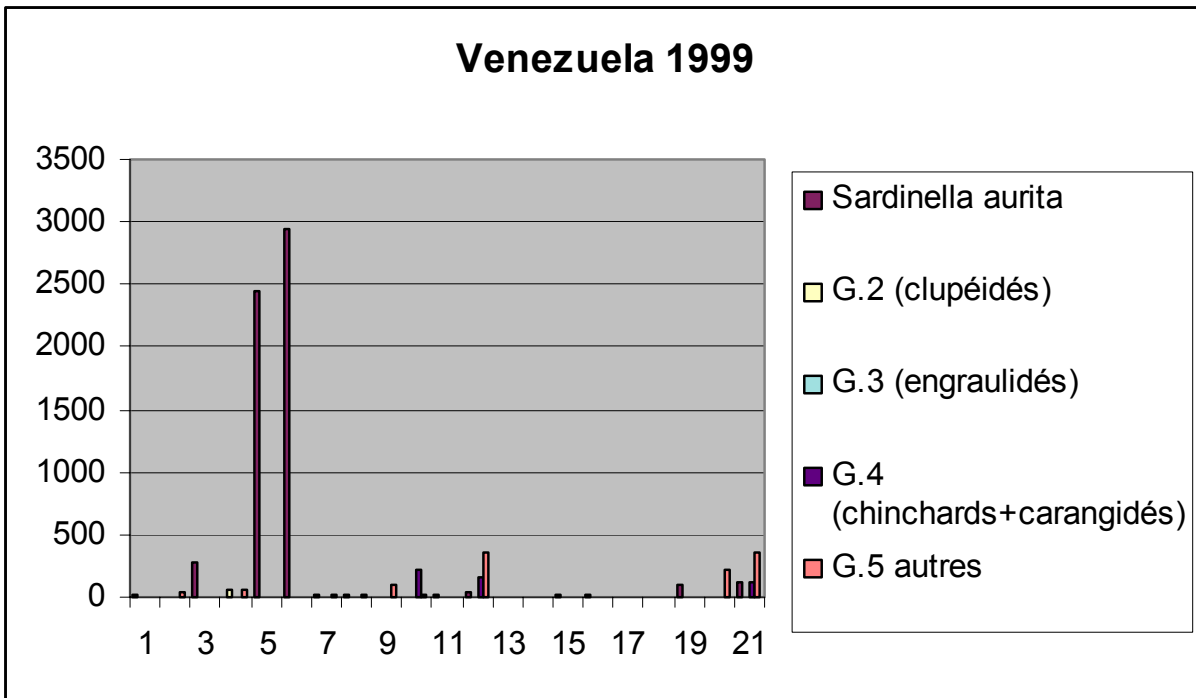
<sup>1</sup> Chalut pélagique N/O Antéa (IRD, 35m)



**Figure 1 :** Chalutage d'identification durant la mission d'observation acoustique Varget 2/1996, Navire Océanographique Antéa



**Figure 2 :** Chalutage d'identification durant la mission d'observation acoustique Varget 2/1998, Navire Océanographique Antéa



**Figure 3 :** Chalutage d'identification durant la mission d'observation acoustique Varget 2/1999, Navire Océanographique Antéa



Survey	Année	Stock	chalut	Trawl code	Sardinella aurita	G.2 (clupéidés)	G.3 (engraulidés)	G.4 (chinchard +carangidés)	autres	capture totale
Venezuela 96	1996	2	1	2~96-1	119	0	0	0	1,5	120,5
Venezuela 96	1996	2	2	2~96-2	14,5	0	0	0	0,5	15
Venezuela 96	1996	2	3	2~96-3	27	0	0	0	3,317	30,317
Venezuela 96	1996	2	4	2~96-4	130	0	0	0	0	130
Venezuela 96	1996	2	5	2~96-5	50	0	0	0	0	50
Venezuela 96	1996	2	6	2~96-6	0	0	0	0	0	0
Venezuela 96	1996	2	7	2~96-7	11	0	0	0	4	15
Venezuela 96	1996	2	8	2~96-8	0	0	0	0	15,5	15,5
Venezuela 96	1996	2	9	2~96-9	188,65	0	0	0	18,51	207,16
Venezuela 96	1996	2	10	2~96-10	3,5	0	0	2	26,5	32
Venezuela 96	1996	2	11	2~96-11	55,19	0	0	33,96	23,35	112,5

Tableau 2 : Capture totale varget 2 1996

Survey	Année	Stock	chalut	Trawl code	Sardinella aurita	G.2 (clupéidés)	G.3 (engraulidés)	G.4 (chinchard +carangidés)	autres	capture totale
Venezuela 98	1998	2	1	2~98-1	20,7	0	0	0	0,2	20,9
Venezuela 98	1998	2	2	2~98-2	76,5	0	0	0	14,9	91,4
Venezuela 98	1998	2	3	2~98-3	31,9	0	0	0	0	31,9
Venezuela 98	1998	2	4	2~98-4	161	0	0	0	135	296
Venezuela 98	1998	2	5	2~98-5	50	0	0	0	15	65
Venezuela 98	1998	2	6	2~98-6	5,2	0,3	0	27,9	34,99	68,39
Venezuela 98	1998	2	8	2~98-7	125	7	0	23	851	1006
Venezuela 98	1998	2	10	2~98-8	445	5,35	0	2	57,3	509,65
Venezuela 98	1998	2	11	2~98-9	5000	0	0	0	25	5025
Venezuela 98	1998	2	12	2~98-10	50	0	0	0	0,125	50,125
Venezuela 98	1998	2	13	2~98-11	1191,3	0	0	0	8,7	1200
Venezuela 98	1998	2	14	2~98-12	10000	0	0	0	0	10000

Tableau 3 : Capture totale varget 2 1998

Survey	Année	Stock	chalut	Trawl code	Sardinella aurita	G.2 (clupéidés)	G.3 (engraulidés)	G.4 (chinchard +carangidés)	autres	capture totale
Venezuela 99	1999	2	1	2~99-1	19	0	0	0	0,1	20
Venezuela 99	1999	2	2	2~99-2	0,1	1	0,1	0	36,5	37,7
Venezuela 99	1999	2	3	2~99-3	270,3	0	0,8	0	8,8	280
Venezuela 99	1999	2	4	2~99-4	0,1	56,2	7,8	0,2	51,2	115,5
Venezuela 99	1999	2	5	2~99-5	2450	0	0	0	9	2459
Venezuela 99	1999	2	6	2~99-6	2940	0	0	0	0	2940
Venezuela 99	1999	2	7	2~99-7	16	4,2	3,3	0,1	17,1	40
Venezuela 99	1999	2	8	2~99-8	22	0	0	4	26	52
Venezuela 99	1999	2	9	2~99-9	2,3	0,8	0,1	4	91,6	98,8
Venezuela 99	1999	2	10	2~99-10	8	0	0	210,4	25,5	243
Venezuela 99	1999	2	11	2~99-11	15	0	0	0	5,2	20
Venezuela 99	1999	2	12	2~99-12	30	0	0	162	359,25	552
Venezuela 99	1999	2	13	2~99-13	0	0	0	0	0	0
Venezuela 99	1999	2	14	2~99-14	0,1	0	0	7	1,1	8,2
Venezuela 99	1999	2	15	2~99-15	28	0	0	0	2,5	30,5
Venezuela 99	1999	2	16	2~99-16	16	0	0	0	0	16
Venezuela 99	1999	2	17	2~99-17	0,6	0	0	0	0	0,6
Venezuela 99	1999	2	18	2~99-18	0	0	0	0	0,6	0,6
Venezuela 99	1999	2	19	2~99-19	92	0	0	4,1	0,2	96,3
Venezuela 99	1999	2	20	2~99-20	0	0	0	2,4	210	212
Venezuela 99	1999	2	21	2~99-21	114,8	0	0	121,1	362,1	600

Tableau 4 : Capture totale varget 2 1999

## **a. Caractéristique de l'engin de pêche : le chalut pélagique<sup>2</sup>**

### **i. Pélagique 111.00 m \* 87.00 m**

Entièrement réalisé en nylon selon le plan réf: FTGM157 / P111003 avec

Les mailles de 8.00 m à 4.00 m en PA 08 m/m (renforts en 10 m/m)

Les mailles de 800 m/m en TPA 180 m/kg

Les mailles de 400 m/m en TPA 280 m/kg

Les mailles de 200 m/m en TPA 400 m/kg

Les mailles de 100 m/m en TPA 600 m/kg

Les mailles de 60 m/m en TPA 600 m/kg

Les mailles de 40 m/m en TPA 1000 m/kg

Les mailles de 20 m/m en TPA 1000 m/kg

#### **Montage sur**

Corde de dos, bourrelet acier diamètre 12.7 m/m

Ralingues de cotés tressées PES diamètre 17 m/m

Manchons cuivre, mailles rapides inox

#### **Avec fond**

De 70 mailles (+ 10 mailles) \* 300 en 20 m/m TPA 600 m/kg

70 + 10 \* 200 en 20 m/m TPA 400 m/kg ralingué sur toute sa longueur en PA 14 m/m

Herse 4.80 m PA diamètre 22 m/m

20 anneaux plastiques

Raban de cul

Largueur de cul inox Boss 121 116

Coupe cul nylon diamètre 34 m/m de 32 m

#### **Lestage**

Lesté double dans carré, chaîne HR dont 1 amovible

**Maillage** voir annexe

### **ii. CHALUT GOV 29.00 m \* 40.30 m**

2 Faces grande ouverture réalisé entièrement en nylon selon plan référence comprenant:

Les mailles de 100 m/m en TPA 280

Les mailles de 60 m/m en TPA 400

Les mailles de 50 m/m et 25 m/m en TPA de 600

Corde de dos acier inox de 12.7 m/m fourré PA en 3 parties

Corde de bête nylon 16 m/m teint

Ailière mixte inox diamètre 18 m/m sur ailes supérieures et grand dos

Ailière PP diamètre 22 m/m sur petit dos

4 Têtières PA diamètre 16 m/m avec cosses

2 Pattes de 6.15 m en acier galvanisé diamètre 14 m/m

Faux bourrelet en acier gaiva diamètre 14 m/m Fourré rondelle diamètre 60 m/m avec 2 maillons de chaîne bourrelet non monté

---

<sup>2</sup> Informations : source NTMN IRD-Brest et N/O Antéa, IRD-Abidjan.

## Fond de

100 mailles \* 150 mailles MS 25 TPA 400  
100 mailles \* 100 mailles MS 25 TPA 180  
Ralingue sur toute la longueur PP diamètre 22 m/m  
Fourreau en 50 TPA 110 + VAHINE  
Herse de 4.20 m de nylon diamètre 22 m/m  
20 anneaux nylon raban de cul  
Largueur de cul en inox BOSS 12116  
Coupe cul en nylon diamètre 28 m/m

## Lestage

140 Kg de chaînes de lestage diamètre 14 m/m en 4 morceaux de 30 Kg

Maillage voir annexe

### 3. Résultat : mesure in situ TS brutes

#### a. Calibration du sondeur *Biosonics 102*

La calibration du sondeur *Simrad EK500* ainsi que du sondeur *Biosonics 102* de l'Antéa ont été effectuées en baie de mochima au cours de la mission « claiB 98 » (Joss, 1999), précédant la récolte de nos données (Varget2/1998). Les résultats de la calibration sont présentés ci-dessous ainsi que les paramètres utilisés pour l'analyse de nos données TS (sondeur, TVG 40 log R) issue du *Biosonics 102*.

CALIBRATION DATE (MO/DA/YR)	03/27/98
(2) ECHOSOUNDER SERIAL NUMBER	102-91-036
(3) SYSTEM OPERATING FREQUENCY	120.00
(4) TVG STARTUP RANGE IN METERS	2.50
(5) ABSORPTION COEFFICIENT AT CALIBRATION (dB/km)	.0000
(6) RECEIVER RANGE AT CALIBRATION	1.00
(7) RECEIVING SENSITIVITY AT CAL RANGE CHANNEL 1, 40logR:	-180.20
RECEIVING SENSITIVITY AT CAL RANGE CHANNEL 1, 20logR:	-152.30
RECEIVING SENSITIVITY AT CAL RANGE SIMULTANEOUS 20logR:	-152.20
RECEIVING SENSITIVITY AT CAL RANGE CHANNEL 2, 40logR:	-180.20
RECEIVING SENSITIVITY AT CAL RANGE CHANNEL 2, 20logR:	-152.20
(8) SOURCE LEVEL FOR EACH TRANSMIT POWER SETTING:	
AT 0 TRANSMIT POWER	225.50
AT -3 TRANSMIT POWER	222.90
AT -6 TRANSMIT POWER	220.10
AT -10 TRANSMIT POWER	216.40
AT -13 TRANSMIT POWER	213.60
(9) TRANSDUCER SERIAL NUMBER:	5344-022
(10) CABLE LENGTH AT CALIBRATION (METERS):	10.00
(11) TRANSDUCER IS SIDE BY SIDE CIRCULAR DUAL BEAM NOMINAL BEAMWIDTHS WHERE APPLICABLE	
NARROW BEAMWIDTH, OR LONG AXIS OF NARROW ELLIPSE:	7.00
SHORT AXIS OF NARROW BEAM ELLIPSE:	.00
WIDE BEAMWIDTH, OR LONG AXIS OF WIDE ELLIPSE:	18.00

	SHORT AXIS OF WIDE BEAM ELLIPSE:	.00
(12)	WIDE BEAM DROPOFF IN dB:	1.130
	"A" COEFFICIENT FOR POWER EQUATION:	1.838
	"B" COEFFICIENT FOR POWER EQUATION:	.461
(13)	AV. SQUARED NARROW BEAM PATTERN FACTOR:	.1969E-02
	AV. SQUARED COMPOSITE BEAM PATTERN FACTOR:	.4367E-02

THE PROCESSING PARAMETER FILE CONTAINS THE FOLLOWING PARAMETERS

(1)	NARROW BEAM CHANNEL NUMBER	1
(2)	NARROW BEAM CORRECTION MULTIPLIER	1.000
(3)	WIDE BEAM CORRECTION MULTIPLIER	1.000
(4)	NARROW BEAM THRESHOLD IN mV (BEFORE CORRECTION)	.0
(5)	WIDE BEAM THRESHOLD IN mV (BEFORE CORRECTION)	.0
(6)	MINIMUM DEPTH TO PROCESS IN METERS	.0
(7)	MAXIMUM DEPTH TO PROCESS IN METERS	100.0
(8)	BOTTOM THRESHOLD IN mV (BEFORE CORRECTION)	3000.0
(9)	MINIMUM -6 dB PULSE WIDTH IN msec	.000
	MAXIMUM -6 dB PULSE WIDTH IN msec	9.999
	MINIMUM -12dB PULSE WIDTH IN msec	.000
	MAXIMUM -12dB PULSE WIDTH IN msec	9.999
	MINIMUM -18dB PULSE WIDTH IN msec	.000
	MAXIMUM -18dB PULSE WIDTH IN msec	9.999
(10)	RECEIVER GAIN USED TO COLLECT DATA	.0
(11)	TRANSMIT POWER USED TO COLLECT DATA	-6
(12)	MAXIMUM HALF-ANGLE FOR PROCESSING TARGETS	3.5
(13)	HISTOGRAM CENTERED ABOUT WHAT TS VALUE:	-45.00
(14)	BEAM PATTERN FACTOR > ZERO THRESHOLD IN dB	20

**b. Analyse des TS du sondeur Dual Beam 120 kHz**

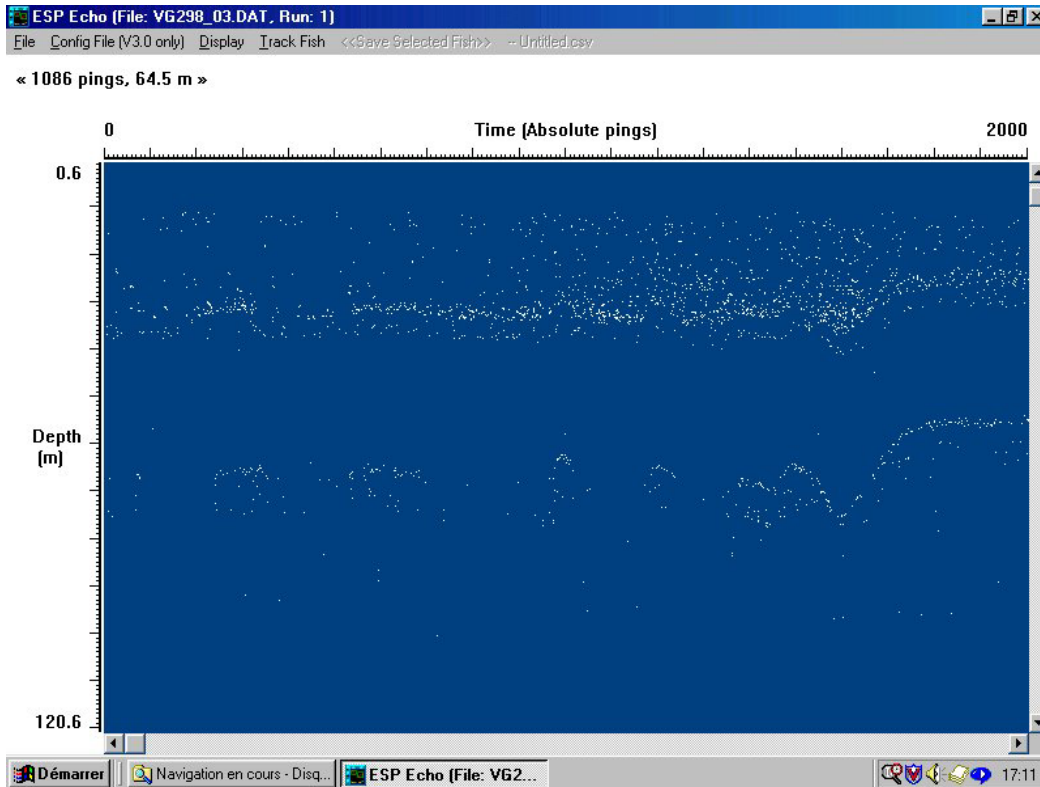


Figure 4 : (03A) Echogramme ESP Echo Biosonics, nombre de ping <2000,

## i. Analyse de la séquence d'échantillonnage (TS) vg298\_03.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 3588  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

SUMMARY OF DATA FROM DEPTH .0 TO 100.0

### DEPTH INTERVALS

FROM .00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00  
 TO 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00

TS											SUM
-74	0	0	0	0	0	0	0	0	0	0	0
-72	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0
-68	0	0	0	0	0	0	0	0	0	0	0
-66	0	0	0	0	0	0	0	0	0	0	0
-64	0	0	0	0	0	0	0	0	0	0	0
-62	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0
-58	0	0	0	0	0	0	0	0	0	0	0
-56	0	38	25	11	0	15	10	3	0	0	102
-54	0	55	62	12	0	43	20	8	0	1	201
-52	0	94	111	29	0	40	15	8	0	0	297
-50	0	82	163	41	1	60	28	6	0	1	382
-48	0	49	182	40	0	79	29	8	1	1	389
-46	0	15	127	51	0	80	22	3	1	0	299
-44	0	14	94	79	1	53	15	6	1	0	263
-42	0	12	97	71	0	23	6	1	1	0	211
-40	0	10	92	67	1	13	1	0	0	1	185
-38	0	9	54	59	0	2	1	0	0	0	125
-36	0	0	33	49	0	0	0	0	0	0	82
-34	0	0	16	47	0	0	0	0	0	0	63
-32	0	0	9	29	0	0	0	0	0	0	38
-30	0	0	4	12	0	0	0	0	0	0	16
-28	0	0	0	7	0	0	0	0	0	0	7
-26	0	0	0	0	0	0	0	0	0	0	0
-24	0	0	0	0	0	0	0	0	0	0	0
-22	0	0	0	0	0	0	0	0	0	0	0

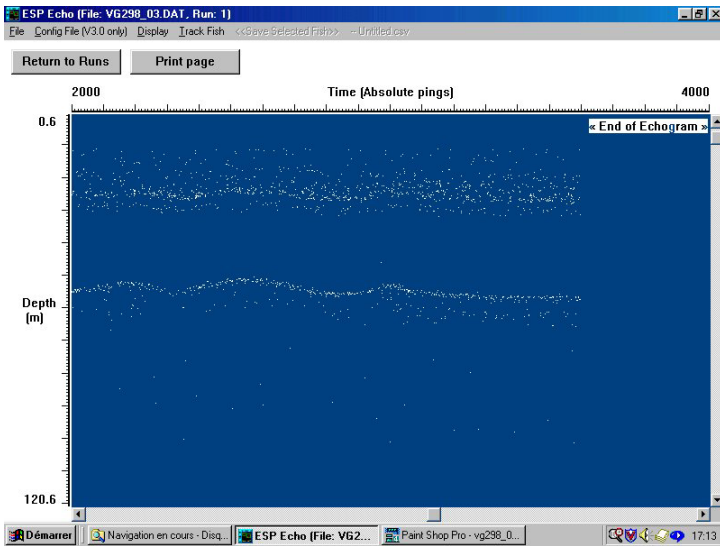
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	378	1069	604	3	408	147	43	4	4	2660

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B=	0 dB	TO B =	1 dB	NUMBER OF ECHOES =	188
B=	1 dB	TO B =	2 dB	NUMBER OF ECHOES =	55
B=	2 dB	TO B =	3 dB	NUMBER OF ECHOES =	24
B=	3 dB	TO B =	4 dB	NUMBER OF ECHOES =	6
B=	4 dB	TO B =	5 dB	NUMBER OF ECHOES =	4
B=	5 dB	TO B =	6 dB	NUMBER OF ECHOES =	2
B=	6 dB	TO B =	7 dB	NUMBER OF ECHOES =	2
B=	7 dB	TO B =	8 dB	NUMBER OF ECHOES =	0
B=	8 dB	TO B =	9 dB	NUMBER OF ECHOES =	0
B=	9 dB	TO B =	10 dB	NUMBER OF ECHOES =	0
B=	10 dB	TO B =	11 dB	NUMBER OF ECHOES =	0
B=	11 dB	TO B =	12 dB	NUMBER OF ECHOES =	0
B=	12 dB	TO B =	13 dB	NUMBER OF ECHOES =	0
B=	13 dB	TO B =	14 dB	NUMBER OF ECHOES =	0
B=	14 dB	TO B =	15 dB	NUMBER OF ECHOES =	0
B=	15 dB	TO B =	16 dB	NUMBER OF ECHOES =	0
B=	16 dB	TO B =	17 dB	NUMBER OF ECHOES =	0
B=	17 dB	TO B =	18 dB	NUMBER OF ECHOES =	0
B=	18 dB	TO B =	19 dB	NUMBER OF ECHOES =	0
B=	19 dB	TO B =	20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 3759  
 NUMBER OF ECHOES USED FOR STATISTICS = 2660  
 AVERAGE BACKSCATTERING CROSS SECTION = .6654E-04 IN dB = -41.77  
 BACKSCATTERING CROSS SECTION STD DEV = .1460E-03  
 AVERAGE TARGET STRENGTH IN dB = -46.29  
 TARGET STRENGTH STD DEV IN dB = 5.83  
 # ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 281

(nom de fichier 3)



**Figure 5 : (3B), Echogramme ESP Echo Biosonics, nombre de ping 2000- 3500**

Reading file c:\ts\vg298\_03.dat 28/03/98 03:45

## ii. Analyse de la séquence d'échantillonnage (TS) vg298\_03.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 3588  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

-----  
 SUMMARY OF DATA FROM DEPTH .0 TO 40.0

### DEPTH INTERVALS

FROM	.00	4.00	8.00	12.00	16.00	20.00	24.00	28.00	32.00	36.00
TO	4.00	8.00	12.00	16.00	20.00	24.00	28.00	32.00	36.00	40.00

TS											SUM	
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0



-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		0	0	4	23	11	14	8	9	1	4	74
-54		0	0	11	28	16	29	22	18	2	3	129
-52		0	0	17	43	34	47	48	37	3	5	234
-50		0	0	13	35	34	63	79	51	3	8	286
-48		0	0	2	17	30	74	86	48	9	5	271
-46		0	0	0	6	9	40	66	52	15	5	193
-44		0	0	0	4	10	27	52	49	38	7	187
-42		0	0	0	9	3	26	60	45	30	7	180
-40		0	0	0	2	8	21	57	53	24	4	169
-38		0	0	0	0	9	15	30	31	32	5	122
-36		0	0	0	0	0	1	24	27	27	3	82
-34		0	0	0	0	0	0	14	15	33	1	63
-32		0	0	0	0	0	0	5	12	21	0	38
-30		0	0	0	0	0	0	4	1	11	0	16
-28		0	0	0	0	0	0	0	0	6	1	7
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	0	47	167	164	357	555	448	255	58	2051

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	144
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	32
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	14
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	3
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	3
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	1
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	2
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 3759  
NUMBER OF ECHOES USED FOR STATISTICS = 2051  
AVERAGE BACKSCATTERING CROSS SECTION = .7987E-04 IN dB = -40.98  
BACKSCATTERING CROSS SECTION STD DEV = .1635E-03  
AVERAGE TARGET STRENGTH IN dB = -45.66  
TARGET STRENGTH STD DEV IN dB = 6.13  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 199

(Nom de fichier : 03 zoom)

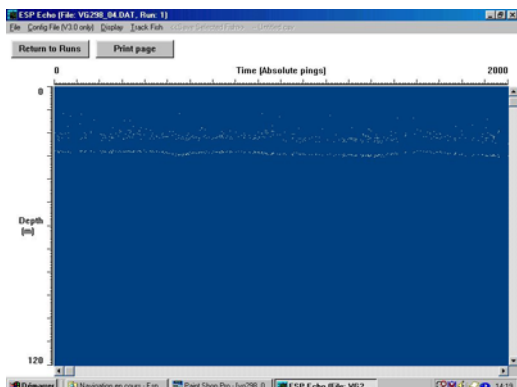


Figure 6 : (04 A), Echogramme ESP Echo Biosonics, nombre de ping <2000

### iii. Analyse de la séquence d'échantillonnage (TS) vg298\_04.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```
TOTAL NUMBER OF PINGS = 10084
ANALYSIS START RANGE, m = 11.00
PULSE WIDTH, mSec = .6000
SOUND VELOCITY IN WATER, m/sec = 1536.0
MIN - 6dB PULSE WIDTH, msec = .2800
MAX - 6dB PULSE WIDTH, msec = .8000
MAXIMUM ANALYSIS DEPTH, m = 101
"LIMIT DATA COLLECTION" IS ON
```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH .0 TO 30.0

#### DEPTH INTERVALS

	FROM	.00	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	SUM
	TO	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00	
TS												
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0

-58		0	0	0	0	0	0	0	0	0	0	0
-56		0	0	0	2	6	7	19	32	0	0	66
-54		0	0	0	6	17	34	69	47	1	0	174
-52		0	0	0	7	12	48	104	77	0	0	248
-50		0	0	0	3	13	69	98	96	2	0	281
-48		0	0	0	4	10	52	88	74	0	0	228
-46		0	0	0	3	6	37	57	35	1	0	139
-44		0	0	0	1	7	37	55	16	0	0	116
-42		0	0	0	2	4	28	69	13	0	0	116
-40		0	0	0	3	3	26	52	23	0	0	107
-38		0	0	0	3	1	28	31	7	0	0	70
-36		0	0	0	0	6	4	6	0	0	0	16
-34		0	0	0	1	2	4	3	0	0	0	10
-32		0	0	0	3	4	5	1	0	0	0	13
-30		0	0	0	5	7	2	1	0	0	0	15
-28		0	0	0	1	4	1	0	0	0	0	6
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	1	0	0	0	0	0	0	1
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	0	0	45	102	382	653	420	4	0	1606

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	104
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	24
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	10
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	3
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	0
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 2029

NUMBER OF ECHOES USED FOR STATISTICS = 1606  
 AVERAGE BACKSCATTERING CROSS SECTION = .5618E-04 IN dB = -42.50  
 BACKSCATTERING CROSS SECTION STD DEV = .1725E-03  
 AVERAGE TARGET STRENGTH IN dB = -47.48  
 TARGET STRENGTH STD DEV IN dB = 5.62  
 # ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 141

#### iv. Analyse de la séquence d'échantillonnage (TS) vg298\_04.dat

Analyzing Run # 2

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 1624  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

SUMMARY OF DATA FROM DEPTH .0 TO 30.0

#### DEPTH INTERVALS

FROM	.00	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	
TO	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00	
TS											SUM
-74		0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0
-56		0	0	0	8	10	11	4	1	0	34
-54		0	0	0	8	24	13	8	3	0	56
-52		0	0	0	17	41	26	14	6	0	104
-50		0	0	0	15	60	69	34	13	0	191
-48		0	0	0	17	65	75	47	15	0	219
-46		0	0	0	9	44	69	72	19	0	213
-44		0	0	0	1	23	44	61	21	0	150
-42		0	0	0	2	12	33	42	13	0	102
-40		0	0	0	0	6	12	12	6	0	36
-38		0	0	0	0	2	1	8	1	0	12
-36		0	0	0	1	3	2	1	0	0	7
-34		0	0	0	0	1	1	0	0	0	2
-32		0	0	0	0	0	0	0	0	0	0
-30		0	0	0	0	0	0	0	0	0	0
-28		0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	1	0	0	0	0	1

-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	0	0	78	292	356	303	98	0	0	1127

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	77
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	34
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	15
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	7
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	1
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 1309  
NUMBER OF ECHOES USED FOR STATISTICS = 1127  
AVERAGE BACKSCATTERING CROSS SECTION = .3177E-04 IN dB = -44.98  
BACKSCATTERING CROSS SECTION STD DEV = .1222E-03  
AVERAGE TARGET STRENGTH IN dB = -47.32  
TARGET STRENGTH STD DEV IN dB = 4.01  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 134

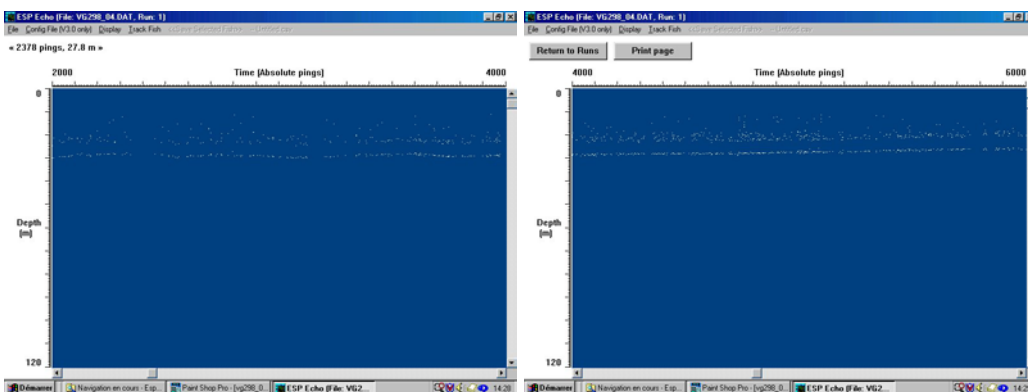


Figure 7 : (04 B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (04C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000

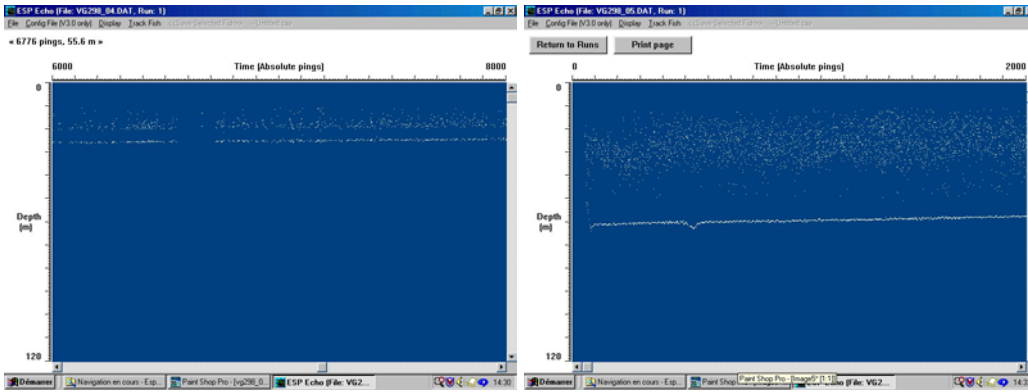


Figure 8 ; (04D), Echogramme ESP Echo Biosonics, nombre de ping 6000-8000, et (05A), Echogramme ESP Echo Biosonics, nombre de ping <2000

### v. Analyse de la séquence d'échantillonnage (TS) vg298\_05.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 4555  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

-----  
 SUMMARY OF DATA FROM DEPTH 5.0 TO 55.0

#### DEPTH INTERVALS

FROM	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	
TO	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	55.00	SUM
TS											
-74	0	0	0	0	0	0	0	0	0	0	0
-72	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0
-68	0	0	0	0	0	0	0	0	0	0	0
-66	0	0	0	0	0	0	0	0	0	0	0
-64	0	0	0	0	0	0	0	0	0	0	0
-62	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0
-58	0	0	0	0	0	0	0	0	0	0	0

-56		0	34	60	55	39	44	34	19	9	1	295
-54		0	75	119	133	119	79	65	32	24	1	647
-52		0	108	188	207	178	159	82	66	26	0	1014
-50		0	104	263	286	240	203	101	59	32	1	1289
-48		0	147	246	296	298	185	72	40	23	0	1307
-46		0	70	176	177	226	125	26	3	5	0	808
-44		0	27	67	68	89	45	5	1	0	0	302
-42		0	16	20	13	30	13	3	2	0	0	97
-40		0	6	2	1	7	2	1	2	0	0	21
-38		0	0	1	0	1	0	0	1	0	0	3
-36		0	2	0	0	0	1	1	0	0	0	4
-34		0	0	0	0	2	0	1	1	0	0	4
-32		0	0	0	0	0	0	0	0	0	0	0
-30		0	0	0	0	0	0	0	1	0	0	1
-28		0	0	0	1	0	0	0	0	0	0	1
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	589	1142	1237	1229	856	391	227	119	3	5793

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	345
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	126
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	57
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	28
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	9
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	2
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	1
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	1
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 6605  
NUMBER OF ECHOES USED FOR STATISTICS = 5793  
AVERAGE BACKSCATTERING CROSS SECTION = .1536E-04 IN dB = -48.14  
BACKSCATTERING CROSS SECTION STD DEV = .2993E-04  
AVERAGE TARGET STRENGTH IN dB = -49.57  
TARGET STRENGTH STD DEV IN dB = 3.28  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 569

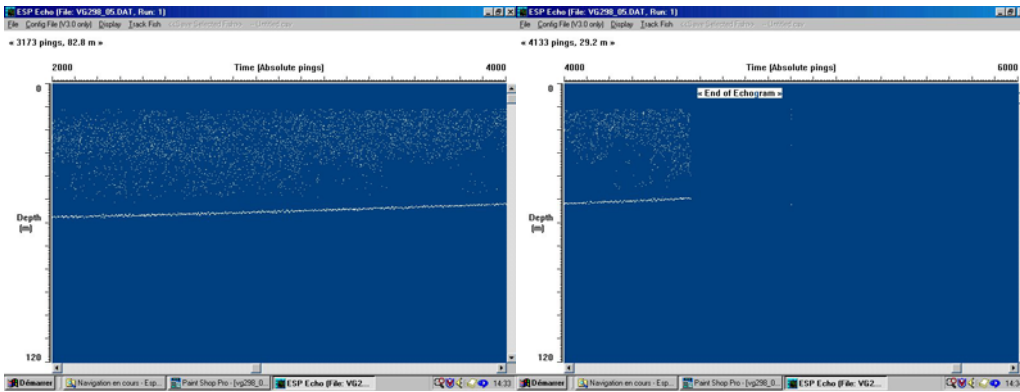


Figure 9 : (05B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (05C), Echogramme ESP Echo Biosonics, nombre de ping 4000-4500

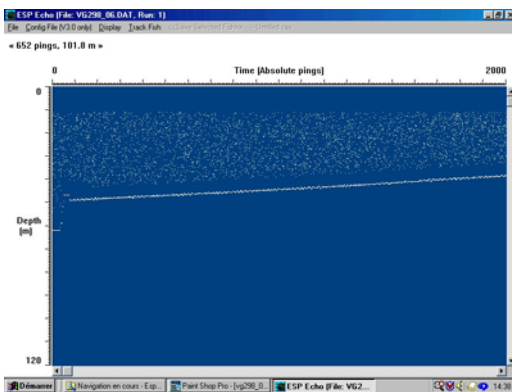


Figure 10 : (06A), Echogramme ESP Echo Biosonics, nombre de ping <2000

## vi. Analyse de la séquence d'échantillonnage (TS) vg298\_06.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS =	4913
ANALYSIS START RANGE, m =	11.00
PULSE WIDTH, mSec =	.6000
SOUND VELOCITY IN WATER, m/sec =	1536.0
MIN - 6dB PULSE WIDTH, msec =	.2800
MAX - 6dB PULSE WIDTH, msec =	.8000
MAXIMUM ANALYSIS DEPTH, m =	101

"LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.



-----  
SUMMARY OF DATA FROM DEPTH 5.0 TO 55.0

DEPTH INTERVALS

FROM 5.00 10.00 15.00 20.00 25.00 30.00 35.00 40.00 45.00 50.00  
TO 10.00 15.00 20.00 25.00 30.00 35.00 40.00 45.00 50.00 55.00

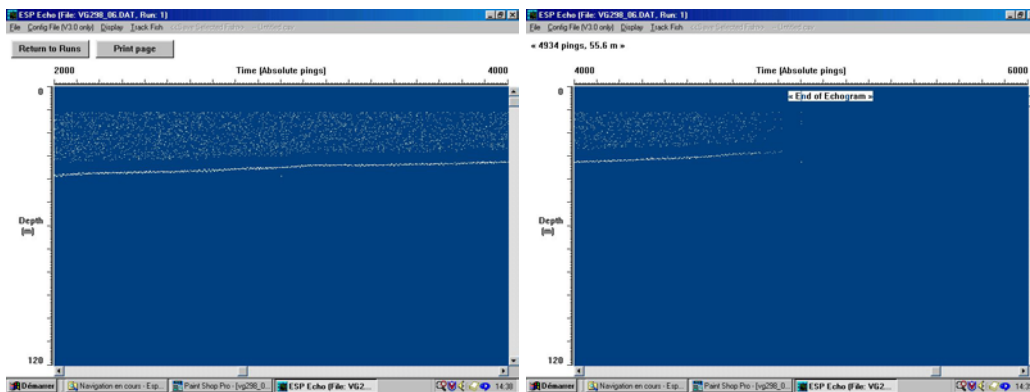
TS												SUM
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		0	41	58	46	23	17	16	1	0	0	202
-54		0	85	111	107	57	57	25	12	0	0	454
-52		0	152	206	155	121	82	46	13	1	0	776
-50		0	200	296	251	179	121	70	12	0	0	1129
-48		0	251	325	307	218	134	83	10	1	0	1329
-46		0	171	225	257	199	85	48	5	0	0	990
-44		0	119	120	148	157	61	9	1	0	0	615
-42		0	64	60	72	81	26	4	1	0	0	308
-40		0	20	12	39	33	9	1	0	0	0	114
-38		0	8	6	9	6	3	0	0	0	0	32
-36		0	2	2	0	0	0	0	0	0	0	4
-34		0	0	0	0	0	0	0	0	0	0	0
-32		0	0	0	0	0	0	0	0	0	0	0
-30		0	0	0	0	0	0	0	0	0	0	0
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	1113	1421	1391	1074	595	302	55	2	0	5953

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

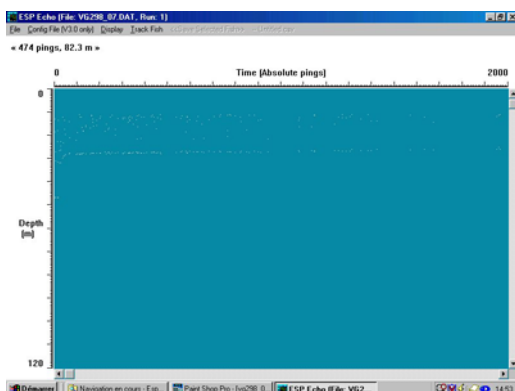
B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	357
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	159
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	59
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	23
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	6
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	2
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	1
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0

B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 7095  
 NUMBER OF ECHOES USED FOR STATISTICS = 5953  
 AVERAGE BACKSCATTERING CROSS SECTION = .2099E-04 IN dB = -46.78  
 BACKSCATTERING CROSS SECTION STD DEV = .2152E-04  
 AVERAGE TARGET STRENGTH IN dB = -48.35  
 TARGET STRENGTH STD DEV IN dB = 3.65  
 # ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 607



**Figure 11 : (06B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000 et (06C), Echogramme ESP Echo Biosonics, nombre de ping 4000-5000**



**Figure 12 : (07A), Echogramme ESP Echo Biosonics, nombre de ping <2000**

**vii. Analyse de la séquence d'échantillonnage (TS)  
vg298\_07.dat**

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 5489  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

-----  
 SUMMARY OF DATA FROM DEPTH 5.0 TO 35.0

DEPTH INTERVALS

FROM 5.00 8.00 11.00 14.00 17.00 20.00 23.00 26.00 29.00 32.00  
 TO 8.00 11.00 14.00 17.00 20.00 23.00 26.00 29.00 32.00 35.00

TS	DEPTH INTERVALS											SUM
	5.00-8.00	8.00-11.00	11.00-14.00	14.00-17.00	17.00-20.00	20.00-23.00	23.00-26.00	26.00-29.00	29.00-32.00	32.00-35.00		
-74	0	0	0	0	0	0	0	0	0	0	0	0
-72	0	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0	0
-68	0	0	0	0	0	0	0	0	0	0	0	0
-66	0	0	0	0	0	0	0	0	0	0	0	0
-64	0	0	0	0	0	0	0	0	0	0	0	0
-62	0	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0	0
-58	0	0	0	0	0	0	0	0	0	0	0	0
-56	0	0	8	3	2	0	0	0	0	0	0	13
-54	0	0	16	2	2	2	1	1	1	0	0	25
-52	0	0	16	8	5	3	0	0	0	0	0	32
-50	0	0	15	7	4	4	1	0	0	0	0	31
-48	0	0	13	2	1	1	0	0	0	0	0	17
-46	0	0	1	0	0	0	0	0	1	0	0	2
-44	0	0	4	0	0	0	0	1	0	0	0	5
-42	0	0	0	0	0	0	0	0	0	0	0	0
-40	0	0	3	0	0	0	0	0	0	0	0	3
-38	0	0	0	0	0	0	0	0	0	0	0	0
-36	0	0	0	0	0	0	0	0	0	0	0	0
-34	0	0	0	0	0	0	0	0	0	0	0	0
-32	0	0	0	0	0	0	0	0	0	0	0	0
-30	0	0	0	1	0	0	0	0	0	0	0	1
-28	0	0	0	0	0	0	0	0	0	0	0	0
-26	0	0	0	0	0	0	0	0	0	0	0	0
-24	0	0	0	0	0	0	0	0	0	0	0	0
-22	0	0	0	0	0	0	0	0	0	0	0	0
-20	0	0	0	0	0	0	0	0	0	0	0	0

-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	0	76	23	14	10	2	2	2	0	129

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	9
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	2
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	0
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	1
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	0
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 144  
NUMBER OF ECHOES USED FOR STATISTICS = 129  
AVERAGE BACKSCATTERING CROSS SECTION = .1725E-04 IN dB = -47.63  
BACKSCATTERING CROSS SECTION STD DEV = .7430E-04  
AVERAGE TARGET STRENGTH IN dB = -50.97  
TARGET STRENGTH STD DEV IN dB = 3.64  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 12

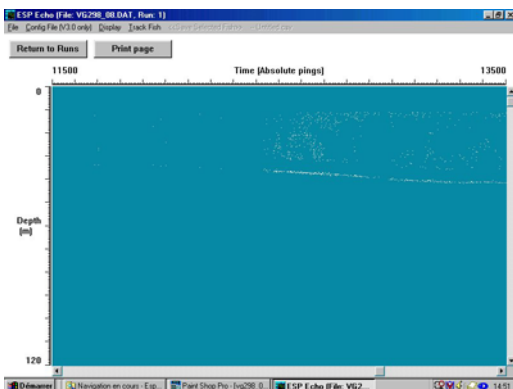


Figure 13 : (08A), Echogramme ESP Echo Biosonics, nombre de ping 12500-13500

### viii. Analyse de la séquence d'échantillonnage (TS) vg298\_08.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =          15668
ANALYSIS START RANGE, m =        11.00
PULSE WIDTH, mSec =              .6000
SOUND VELOCITY IN WATER, m/sec =  1536.0
MIN - 6dB PULSE WIDTH, msec =    .2800
MAX - 6dB PULSE WIDTH, msec =    .8000
MAXIMUM ANALYSIS DEPTH, m =      101
"LIMIT DATA COLLECTION" IS ON
  
```

DATA FOR FREQUENCY 120.

SUMMARY OF DATA FROM DEPTH 5.0 TO 55.0

#### DEPTH INTERVALS

FROM	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00		
TO	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	55.00		
TS											SUM	
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		0	27	24	19	19	24	13	12	7	2	147
-54		0	61	55	36	37	39	20	21	13	2	284
-52		0	82	86	53	70	74	40	36	25	3	469
-50		0	150	94	90	91	101	40	43	25	5	639
-48		0	124	110	52	77	75	24	13	11	1	487
-46		0	65	47	19	37	40	11	3	6	1	229
-44		0	36	11	7	18	14	2	1	0	0	89
-42		0	3	8	0	10	2	0	0	0	0	23
-40		0	0	1	0	1	0	0	0	0	0	2
-38		0	0	1	0	0	0	0	0	0	0	1
-36		0	1	0	0	0	0	0	0	0	0	1
-34		0	0	0	0	0	0	0	0	0	0	0
-32		0	0	0	0	0	0	0	0	0	0	0
-30		0	0	0	0	0	0	0	0	0	0	0
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0

SUM 0 549 437 276 360 369 150 129 87 14 2371

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	135
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	53
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	19
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	8
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	2
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	1
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 2667  
NUMBER OF ECHOES USED FOR STATISTICS = 2371  
AVERAGE BACKSCATTERING CROSS SECTION = .1250E-04 IN dB = -49.03  
BACKSCATTERING CROSS SECTION STD DEV = .1122E-04  
AVERAGE TARGET STRENGTH IN dB = -50.12  
TARGET STRENGTH STD DEV IN dB = 3.01  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 218

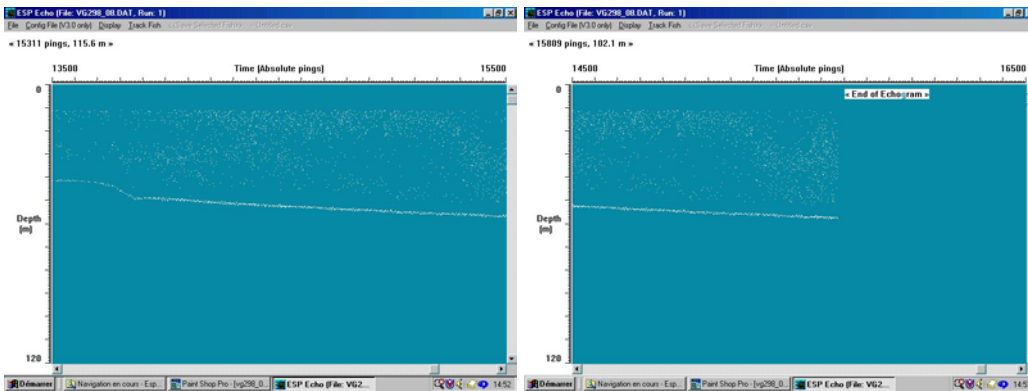


Figure 14 : (08B), Echogramme ESP Echo Biosonics, nombre de ping 13500-15500, et (08C), Echogramme ESP Echo Biosonics, nombre de ping 14500-16500

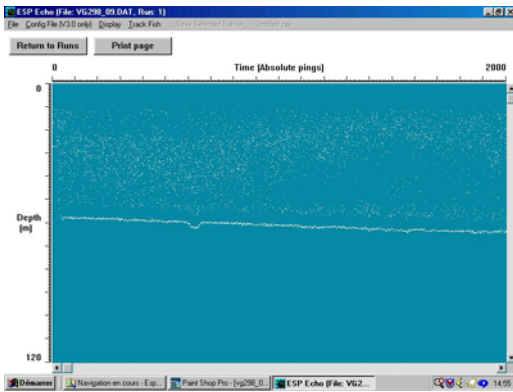


Figure 15 : (09A), Echogramme ESP Echo Biosonics, nombre de ping <2000

### ix. Analyse de la séquence d'échantillonnage (TS) vg298\_09.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 2913  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

SUMMARY OF DATA FROM DEPTH 5.0 TO 65.0

#### DEPTH INTERVALS

FROM 5.00 11.00 17.00 23.00 29.00 35.00 41.00 47.00 53.00 59.00  
 TO 11.00 17.00 23.00 29.00 35.00 41.00 47.00 53.00 59.00 65.00

TS												SUM	
-74		0	0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0	0
-56		0	37	46	45	25	17	21	18	32	1	242	

-54		0	76	96	95	68	40	39	29	57	3	503
-52		0	117	136	146	110	84	63	57	81	6	800
-50		0	103	177	215	133	83	57	63	106	10	947
-48		0	101	197	202	146	91	65	32	94	7	935
-46		0	50	112	148	88	49	15	14	29	4	509
-44		0	14	53	73	46	23	5	1	9	4	228
-42		0	3	13	19	14	8	0	0	3	1	61
-40		0	1	2	5	2	0	0	0	0	0	10
-38		0	0	0	0	1	0	0	0	0	0	1
-36		0	0	0	0	0	0	0	0	0	0	0
-34		0	0	0	0	0	0	0	0	0	0	0
-32		0	0	0	0	0	0	0	0	0	0	0
-30		0	0	0	0	0	0	0	0	0	0	0
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		0	502	832	948	633	395	265	214	411	36	4236

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	267
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	109
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	39
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	9
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	6
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	3
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	2
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 4838  
NUMBER OF ECHOES USED FOR STATISTICS = 4236  
AVERAGE BACKSCATTERING CROSS SECTION = .1373E-04 IN dB = -48.62  
BACKSCATTERING CROSS SECTION STD DEV = .1155E-04  
AVERAGE TARGET STRENGTH IN dB = -49.81  
TARGET STRENGTH STD DEV IN dB = 3.20  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 435



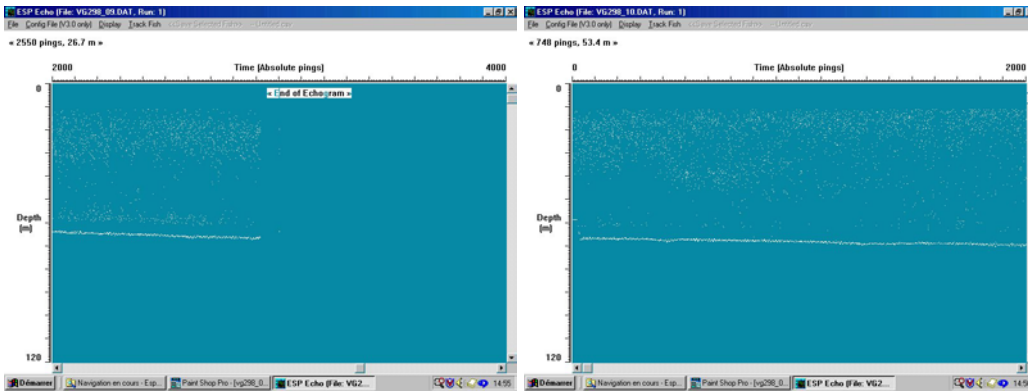


Figure 16 : 09B), Echogramme ESP Echo Biosonics, nombre de ping 2000-3000 et (010), Echogramme ESP Echo Biosonics, nombre de ping <2000

## x. Analyse de la séquence d'échantillonnage (TS) vg298\_10.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 4006  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

SUMMARY OF DATA FROM DEPTH 5.0 TO 70.0

### DEPTH INTERVALS

FROM 5.00 11.50 18.00 24.50 31.00 37.50 44.00 50.50 57.00 63.50  
 TO 11.50 18.00 24.50 31.00 37.50 44.00 50.50 57.00 63.50 70.00

TS												SUM
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0

-58		0	0	0	0	0	0	0	0	0	0	0
-56		6	61	72	48	36	47	32	14	6	0	322
-54		10	159	123	59	75	86	60	20	19	0	611
-52		17	233	221	122	125	138	90	33	26	0	1005
-50		27	318	270	156	101	153	93	39	30	0	1187
-48		25	354	286	83	67	105	74	16	11	0	1021
-46		12	194	114	32	19	49	23	5	5	0	453
-44		3	94	72	3	4	13	6	0	0	0	195
-42		2	35	20	0	0	3	1	0	0	0	61
-40		1	4	3	0	0	2	1	0	0	0	11
-38		0	3	1	0	0	0	0	0	0	0	4
-36		0	0	0	0	0	0	0	0	0	0	0
-34		0	0	0	0	0	0	0	0	0	0	0
-32		0	0	0	0	0	0	0	0	0	0	0
-30		0	0	0	0	0	0	0	0	0	0	0
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		103	1455	1182	503	427	596	380	127	97	0	4870

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	283
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	135
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	40
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	14
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	3
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	1
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 5481  
NUMBER OF ECHOES USED FOR STATISTICS = 4870  
AVERAGE BACKSCATTERING CROSS SECTION = .1264E-04 IN dB = -48.98  
BACKSCATTERING CROSS SECTION STD DEV = .1121E-04  
AVERAGE TARGET STRENGTH IN dB = -50.15  
TARGET STRENGTH STD DEV IN dB = 3.11  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 476

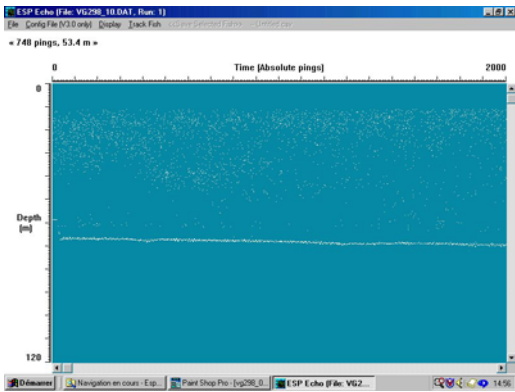


Figure 17 : (010A), Echogramme ESP Echo Biosonics, nombre de ping <2000

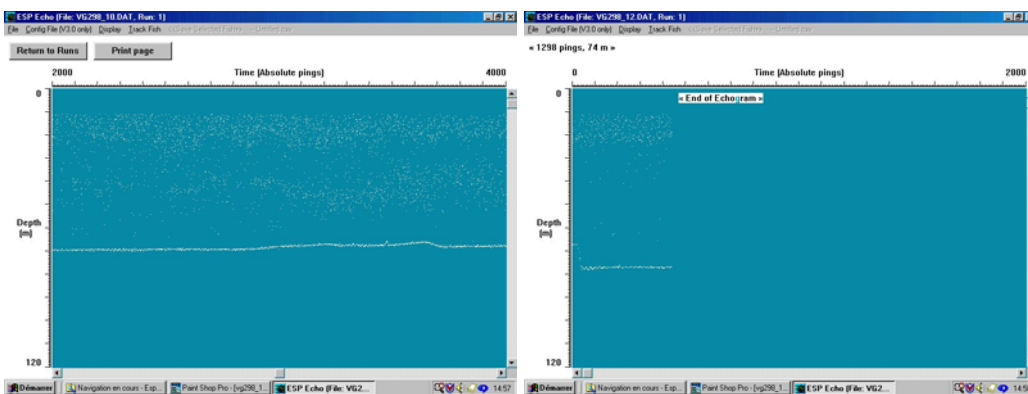


Figure 18 : (010B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000 et (012A), Echogramme ESP Echo Biosonics, nombre de ping <500

## xi.

### Analyse de la séquence d'échantillonnage (TS) vg298\_12.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =                0
ANALYSIS START RANGE, m =              11.00
PULSE WIDTH, mSec =                    .6000
SOUND VELOCITY IN WATER, m/sec =      1536.0
MIN - 6dB PULSE WIDTH, msec =         .2800
MAX - 6dB PULSE WIDTH, msec =         .8000
MAXIMUM ANALYSIS DEPTH, m =            101
"LIMIT DATA COLLECTION" IS ON

```

DATA FOR FREQUENCY 120.

---

SUMMARY OF DATA FROM DEPTH 5.0 TO 75.0

DEPTH INTERVALS

FROM 5.00 12.00 19.00 26.00 33.00 40.00 47.00 54.00 61.00 68.00  
 TO 12.00 19.00 26.00 33.00 40.00 47.00 54.00 61.00 68.00 75.00

TS											SUM
-74	0	0	0	0	0	0	0	0	0	0	0
-72	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0
-68	0	0	0	0	0	0	0	0	0	0	0
-66	0	0	0	0	0	0	0	0	0	0	0
-64	0	0	0	0	0	0	0	0	0	0	0
-62	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0
-58	0	0	0	0	0	0	0	0	0	0	0
-56	3	25	9	3	1	0	0	0	1	0	42
-54	2	37	19	3	4	0	0	0	2	0	67
-52	9	51	21	4	1	1	1	1	1	0	90
-50	13	55	42	4	0	0	1	1	1	0	117
-48	11	59	30	1	1	0	1	1	0	0	104
-46	2	33	26	0	0	0	3	1	0	0	65
-44	3	5	2	0	0	0	1	0	0	0	11
-42	0	0	7	0	0	0	1	0	0	0	8
-40	0	0	0	0	0	0	0	0	0	0	0
-38	0	0	1	0	0	0	0	0	0	0	1
-36	0	0	1	0	0	0	0	0	0	0	1
-34	0	0	0	0	0	0	0	0	0	0	0
-32	0	0	0	0	0	0	0	0	0	0	0
-30	0	0	0	0	0	0	0	0	0	0	0
-28	0	0	0	0	0	0	0	0	0	0	0
-26	0	0	0	0	0	0	0	0	0	0	0
-24	0	0	0	0	0	0	0	0	0	0	0
-22	0	0	0	0	0	0	0	0	0	0	0
-20	0	0	0	0	0	0	0	0	0	0	0
-18	0	0	0	0	0	0	0	0	0	0	0
-16	0	0	0	0	0	0	0	0	0	0	0
SUM	43	265	158	15	7	1	8	4	5	0	506

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	28
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	19
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	5
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	5
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	2
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0

```

B= 14 dB TO B = 15 dB      NUMBER OF ECHOES = 0
B= 15 dB TO B = 16 dB      NUMBER OF ECHOES = 0
B= 16 dB TO B = 17 dB      NUMBER OF ECHOES = 0
B= 17 dB TO B = 18 dB      NUMBER OF ECHOES = 0
B= 18 dB TO B = 19 dB      NUMBER OF ECHOES = 0
B= 19 dB TO B = 20 dB      NUMBER OF ECHOES = 0

```

```

TOTAL NUMBER OF RECORDED ECHOES = 577
NUMBER OF ECHOES USED FOR STATISTICS = 506
AVERAGE BACKSCATTERING CROSS SECTION = .1332E-04 IN dB = -48.76
BACKSCATTERING CROSS SECTION STD DEV = .1464E-04
AVERAGE TARGET STRENGTH IN dB = -50.11
TARGET STRENGTH STD DEV IN dB = 3.32
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 59

```

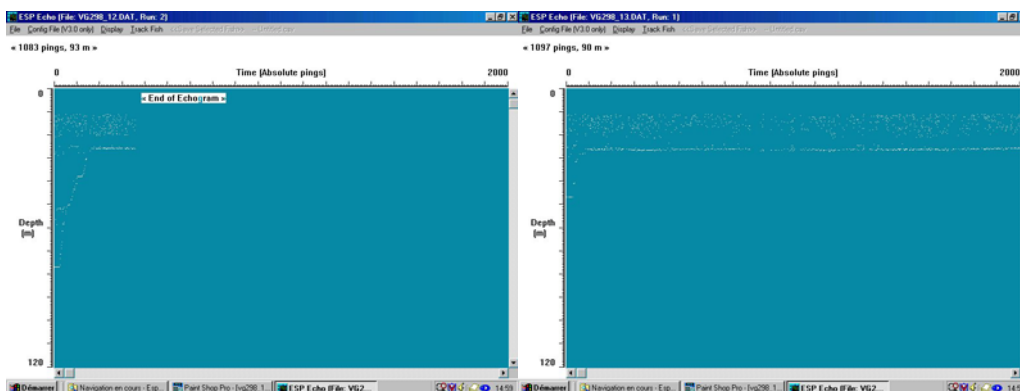


Figure 19 : (012B), Echogramme ESP Echo Biosonics, nombre de ping <250 et (013A), Echogramme ESP Echo Biosonics, nombre de ping <2000

## xii. Analyse de la séquence d'échantillonnage (TS) vg298\_13.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS = 11740
ANALYSIS START RANGE, m = 11.00
PULSE WIDTH, mSec = .6000
SOUND VELOCITY IN WATER, m/sec = 1536.0
MIN - 6dB PULSE WIDTH, msec = .2800
MAX - 6dB PULSE WIDTH, msec = .8000
MAXIMUM ANALYSIS DEPTH, m = 101
"LIMIT DATA COLLECTION" IS ON

```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 5.0 TO 55.0

DEPTH INTERVALS

FROM 5.00 10.00 15.00 20.00 25.00 30.00 35.00 40.00 45.00 50.00  
 TO 10.00 15.00 20.00 25.00 30.00 35.00 40.00 45.00 50.00 55.00

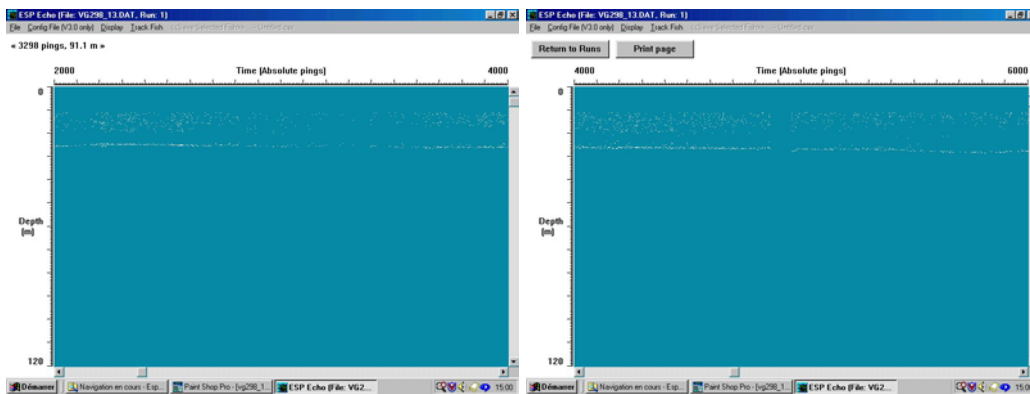
TS											SUM	
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		0	87	108	27	8	2	2	0	0	0	234
-54		0	212	205	37	22	12	2	0	0	0	490
-52		0	359	308	65	24	12	2	0	0	0	770
-50		0	502	372	86	37	10	0	0	0	0	1007
-48		0	437	360	64	24	9	0	1	0	0	895
-46		0	299	173	45	21	1	0	0	0	0	539
-44		0	145	70	20	8	3	0	0	0	0	246
-42		0	61	21	3	0	1	1	0	0	0	87
-40		0	13	1	0	1	1	1	2	0	0	19
-38		0	2	0	0	0	3	1	0	0	0	6
-36		0	0	0	0	0	0	2	2	0	0	4
-34		0	1	0	0	0	1	1	0	0	0	3
-32		0	0	0	0	0	0	1	0	0	0	1
-30		0	0	0	0	0	0	0	0	0	0	0
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
SUM		0	2118	1618	347	145	55	13	5	0	0	4301

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

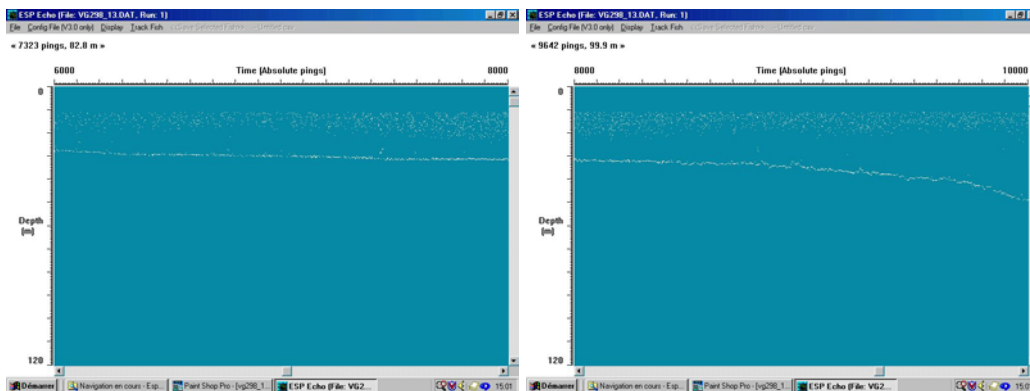
B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	248
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	109
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	55
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	14
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	2
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	1
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	2
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	1
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	1
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0

B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES =	4968	
NUMBER OF ECHOES USED FOR STATISTICS =	4301	
AVERAGE BACKSCATTERING CROSS SECTION =	.1528E-04	IN dB = -48.16
BACKSCATTERING CROSS SECTION STD DEV =	.2169E-04	
AVERAGE TARGET STRENGTH IN dB =		-49.63
TARGET STRENGTH STD DEV IN dB =		3.35
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB=	433	



**Figure 20 : (013B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (013C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000**



**Figure 21 : (013D), Echogramme ESP Echo Biosonics, nombre de ping 6000-8000, et (013E), Echogramme ESP Echo Biosonics, nombre de ping 8000-10000**

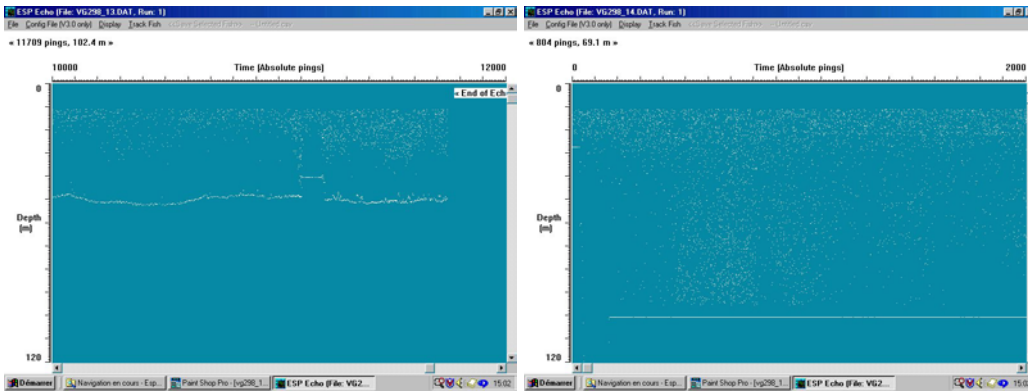


Figure 22 : (013F), Echogramme ESP Echo Biosonics, nombre de ping 10000-11800, et (014A), Echogramme ESP Echo Biosonics, nombre de ping <2000

### xiii. Analyse de la séquence d'échantillonnage (TS) vg298\_14.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 6528  
 ANALYSIS START RANGE, m = 11.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 101  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

SUMMARY OF DATA FROM DEPTH 5.0 TO 95.0

#### DEPTH INTERVALS

FROM 5.00 14.00 23.00 32.00 41.00 50.00 59.00 68.00 77.00 86.00  
 TO 14.00 23.00 32.00 41.00 50.00 59.00 68.00 77.00 86.00 95.00

TS												SUM
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		6	21	90	70	57	59	46	57	37	35	478
-54		38	81	200	130	120	125	83	92	56	47	972



-52		82	170	289	202	159	160	127	112	87	77	1465
-50		138	332	367	228	190	149	131	146	103	71	1855
-48		204	521	266	128	92	99	82	73	68	60	1593
-46		261	567	90	32	16	21	24	20	13	18	1062
-44		247	597	28	7	1	2	1	5	7	8	903
-42		188	496	16	4	0	0	0	0	1	0	705
-40		88	287	12	3	0	0	0	0	0	0	390
-38		46	102	4	0	0	0	0	0	0	0	152
-36		9	36	0	0	0	0	0	0	0	0	45
-34		4	11	0	0	0	0	0	0	0	0	15
-32		2	4	0	0	0	0	0	0	0	0	6
-30		0	2	0	0	0	0	0	0	0	0	2
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		1313	3227	1362	804	635	615	494	505	372	316	9643

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	570
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	233
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	80
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	24
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	14
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	2
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 11070  
NUMBER OF ECHOES USED FOR STATISTICS = 9643  
AVERAGE BACKSCATTERING CROSS SECTION = .2582E-04 IN dB = -45.88  
BACKSCATTERING CROSS SECTION STD DEV = .4010E-04  
AVERAGE TARGET STRENGTH IN dB = -48.39  
TARGET STRENGTH STD DEV IN dB = 4.41  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 923

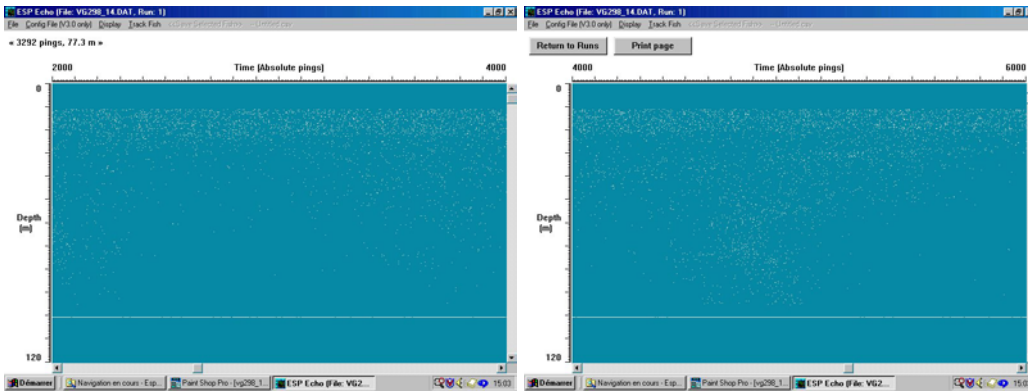


Figure 23 : (014B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (014C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000

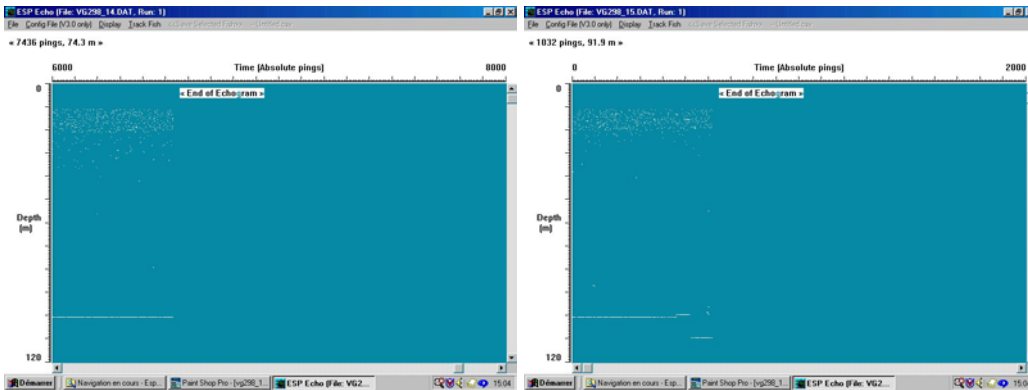


Figure 24 : (014D), Echogramme ESP Echo Biosonics, nombre de ping 6000-6500, et (015A), Echogramme ESP Echo Biosonics, nombre de ping <500

#### xiv. Analyse de la séquence d'échantillonnage (TS) vg298\_15.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =                2052
ANALYSIS START RANGE, m =                1.00
PULSE WIDTH, mSec =                      .6000
SOUND VELOCITY IN WATER, m/sec =         1536.0
MIN - 6dB PULSE WIDTH, msec =           .2800
MAX - 6dB PULSE WIDTH, msec =           .8000
MAXIMUM ANALYSIS DEPTH, m =              125
"LIMIT DATA COLLECTION" IS ON

```

DATA FOR FREQUENCY 120.

---

SUMMARY OF DATA FROM DEPTH 5.0 TO 115.0

DEPTH INTERVALS

FROM 5.00 16.00 27.00 38.00 49.00 60.00 71.00 82.00 93.00104.00  
 TO 16.00 27.00 38.00 49.00 60.00 71.00 82.00 93.00104.00115.00

TS											SUM	
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		24	18	3	1	0	6	1	5	9	3	70
-54		66	49	6	3	1	4	6	16	20	7	178
-52		135	75	5	2	2	3	11	20	41	16	310
-50		195	87	5	1	4	4	13	21	54	21	405
-48		222	102	2	2	0	3	17	38	49	9	444
-46		157	72	1	1	0	3	15	31	46	6	332
-44		55	56	1	0	0	5	20	34	26	4	201
-42		26	19	0	0	0	5	20	34	15	8	127
-40		4	5	0	0	1	1	5	12	8	0	36
-38		1	5	0	0	1	0	4	5	2	0	18
-36		0	3	0	0	0	0	1	5	4	0	13
-34		1	1	0	0	0	0	0	5	2	0	9
-32		0	0	0	0	0	0	0	1	1	0	2
-30		0	0	0	0	1	0	0	0	0	0	1
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
SUM		886	492	23	10	10	34	113	227	277	74	2146

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	155
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	39
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	13
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	4
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	0
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	1
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	1
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

```

TOTAL NUMBER OF RECORDED ECHOES =                2818
NUMBER OF ECHOES USED FOR STATISTICS =            2146
AVERAGE BACKSCATTERING CROSS SECTION =           .2487E-04   IN dB = -46.04
BACKSCATTERING CROSS SECTION STD DEV =           .4509E-04
AVERAGE TARGET STRENGTH IN dB =                  -48.30
TARGET STRENGTH STD DEV IN dB =                   4.00
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB=       213

```

(fichier 15)

### xv. Analyse de la séquence d'échantillonnage (TS) vg298\_15.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =                2052
ANALYSIS START RANGE, m =                1.00
PULSE WIDTH, mSec =                      .6000
SOUND VELOCITY IN WATER, m/sec =         1536.0
MIN - 6dB PULSE WIDTH, msec =            .2800
MAX - 6dB PULSE WIDTH, msec =            .8000
MAXIMUM ANALYSIS DEPTH, m =               125
"LIMIT DATA COLLECTION" IS ON

```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 5.0 TO 35.0

#### DEPTH INTERVALS

FROM	5.00	8.00	11.00	14.00	17.00	20.00	23.00	26.00	29.00	32.00	
TO	8.00	11.00	14.00	17.00	20.00	23.00	26.00	29.00	32.00	35.00	
TS											SUM
-74	0	0	0	0	0	0	0	0	0	0	0
-72	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0
-68	0	0	0	0	0	0	0	0	0	0	0
-66	0	0	0	0	0	0	0	0	0	0	0
-64	0	0	0	0	0	0	0	0	0	0	0
-62	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0
-58	0	0	0	0	0	0	0	0	0	0	0
-56	6	3	12	5	8	4	4	1	2	0	45
-54	9	13	27	26	20	9	10	3	1	0	118
-52	22	21	51	48	35	21	11	3	1	0	213
-50	29	27	75	86	45	10	10	2	1	2	287
-48	37	41	88	91	56	9	2	2	0	0	326
-46	26	26	55	86	32	3	1	1	0	0	230
-44	14	4	16	48	28	0	1	0	0	1	112

-42		4	4	5	21	10	1	0	0	0	0	45
-40		2	0	2	1	3	0	0	1	0	0	9
-38		0	0	1	2	1	0	1	1	0	0	6
-36		0	0	0	2	1	0	0	0	0	0	3
-34		0	0	0	1	1	0	0	0	0	0	2
-32		0	0	0	0	0	0	0	0	0	0	0
-30		0	0	0	0	0	0	0	0	0	0	0
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		149	139	332	417	240	57	40	14	5	3	1396

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	84
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	30
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	10
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	4
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	0
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	1
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	1
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 2818  
NUMBER OF ECHOES USED FOR STATISTICS = 1396  
AVERAGE BACKSCATTERING CROSS SECTION = .1885E-04 IN dB = -47.25  
BACKSCATTERING CROSS SECTION STD DEV = .2504E-04  
AVERAGE TARGET STRENGTH IN dB = -48.81  
TARGET STRENGTH STD DEV IN dB = 3.47  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 130

(fichier 15 zoom)

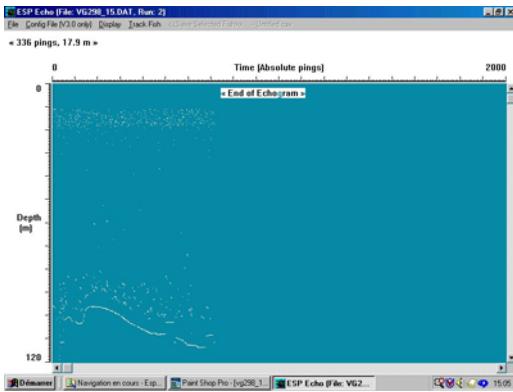


Figure 25 : (015B), Echogramme ESP Echo Biosonics, nombre de ping <800

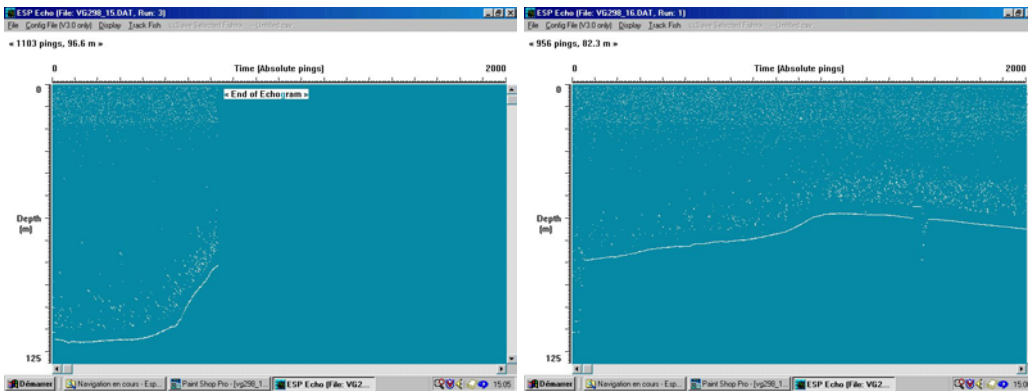


Figure 26 : (015C), Echogramme ESP Echo Biosonics, nombre de ping <800, et (016A), Echogramme ESP Echo Biosonics, nombre de ping <2000

## xvi. Analyse de la séquence d'échantillonnage (TS) vg298\_16.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =                4694
ANALYSIS START RANGE, m =                1.00
PULSE WIDTH, mSec =                      .6000
SOUND VELOCITY IN WATER, m/sec =        1536.0
MIN - 6dB PULSE WIDTH, msec =           .2800
MAX - 6dB PULSE WIDTH, msec =           .8000
MAXIMUM ANALYSIS DEPTH, m =              125
"LIMIT DATA COLLECTION" IS ON

```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 5.0 TO 80.0

DEPTH INTERVALS

FROM 5.00 12.50 20.00 27.50 35.00 42.50 50.00 57.50 65.00 72.50  
 TO 12.50 20.00 27.50 35.00 42.50 50.00 57.50 65.00 72.50 80.00

TS											SUM	
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		66	83	27	3	4	13	20	13	1	2	232
-54		185	151	61	12	14	57	58	46	7	1	592
-52		268	269	101	26	18	69	98	68	14	1	932
-50		339	331	117	22	23	117	146	102	12	1	1210
-48		256	316	85	14	22	160	206	134	27	2	1222
-46		160	167	31	8	32	142	222	113	22	1	898
-44		84	81	9	9	33	140	138	65	6	2	567
-42		42	38	6	5	17	82	70	28	7	3	298
-40		18	21	0	2	6	31	29	8	3	3	121
-38		16	10	2	0	2	12	8	6	0	0	56
-36		10	6	0	2	0	4	4	2	0	0	28
-34		6	4	1	0	0	2	7	1	0	0	21
-32		0	1	0	0	0	1	2	0	0	0	4
-30		1	0	0	0	0	1	2	0	0	0	4
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
SUM		1451	1478	440	103	171	831	1010	586	99	16	6185

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	447
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	95
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	30
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	9
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	8
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	1
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0

B= 19 dB TO B = 20 dB NUMBER OF ECHOES = 0

TOTAL NUMBER OF RECORDED ECHOES = 8298  
NUMBER OF ECHOES USED FOR STATISTICS = 6185  
AVERAGE BACKSCATTERING CROSS SECTION = .2362E-04 IN dB = -46.27  
BACKSCATTERING CROSS SECTION STD DEV = .4503E-04  
AVERAGE TARGET STRENGTH IN dB = -48.54  
TARGET STRENGTH STD DEV IN dB = 4.00  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 590

(ficher 16)

### xvii. Analyse de la séquence d'échantillonnage (TS) vg298\_16.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 4694  
ANALYSIS START RANGE, m = 1.00  
PULSE WIDTH, mSec = .6000  
SOUND VELOCITY IN WATER, m/sec = 1536.0  
MIN - 6dB PULSE WIDTH, msec = .2800  
MAX - 6dB PULSE WIDTH, msec = .8000  
MAXIMUM ANALYSIS DEPTH, m = 125  
"LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 5.0 TO 35.0

#### DEPTH INTERVALS

	FROM	5.00	8.00	11.00	14.00	17.00	20.00	23.00	26.00	29.00	32.00	
	TO	8.00	11.00	14.00	17.00	20.00	23.00	26.00	29.00	32.00	35.00	
TS												SUM
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		19	33	30	29	38	15	12	1	2	0	179



-54		83	64	62	71	56	31	21	13	6	2	409
-52		99	105	124	122	87	57	32	26	5	7	664
-50		105	150	161	131	123	55	54	15	8	7	809
-48		66	128	136	150	92	49	24	18	3	5	671
-46		49	68	85	94	31	20	9	4	3	3	366
-44		38	31	28	53	15	4	2	3	2	7	183
-42		19	15	16	28	2	3	3	1	1	3	91
-40		5	10	8	13	3	0	0	1	1	0	41
-38		6	9	3	6	2	1	1	0	0	0	28
-36		7	2	2	5	0	0	0	1	1	0	18
-34		2	1	5	1	1	1	0	0	0	0	11
-32		0	0	0	1	0	0	0	0	0	0	1
-30		0	1	0	0	0	0	0	0	0	0	1
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		498	617	660	704	450	236	158	83	32	34	3472

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	210
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	68
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	23
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	6
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	6
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	1
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 8298  
NUMBER OF ECHOES USED FOR STATISTICS = 3472  
AVERAGE BACKSCATTERING CROSS SECTION = .1897E-04 IN dB = -47.22  
BACKSCATTERING CROSS SECTION STD DEV = .3778E-04  
AVERAGE TARGET STRENGTH IN dB = -49.46  
TARGET STRENGTH STD DEV IN dB = 3.78  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 314

(fichier 16 zoom)

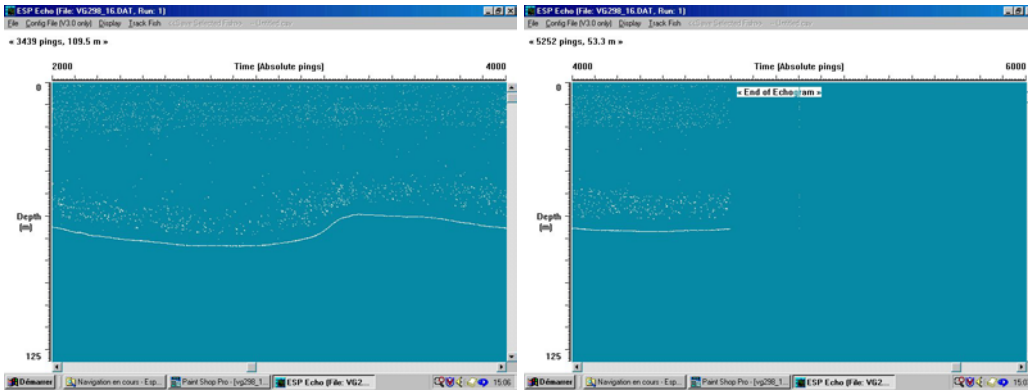


Figure 27 : (016B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000, et (016C), Echogramme ESP Echo Biosonics, nombre de ping 4000-4700

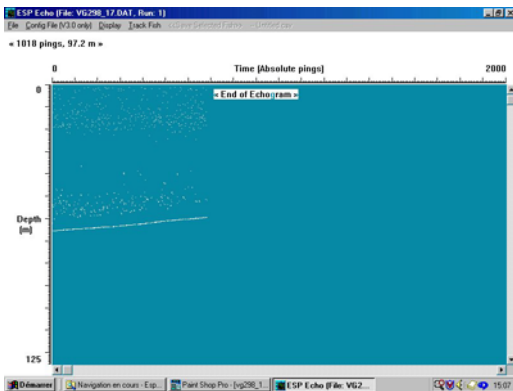


Figure 28 : (017A), Echogramme ESP Echo Biosonics, nombre de ping <700

### xviii. Analyse de la séquence d'échantillonnage (TS) vg298\_17.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 5561  
 ANALYSIS START RANGE, m = 1.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 125  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

---

SUMMARY OF DATA FROM DEPTH 5.0 TO 65.0

DEPTH INTERVALS

FROM 5.00 11.00 17.00 23.00 29.00 35.00 41.00 47.00 53.00 59.00  
 TO 11.00 17.00 23.00 29.00 35.00 41.00 47.00 53.00 59.00 65.00

TS												SUM	
-74		0	0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0	0
-56		60	65	33	15	9	0	2	2	4	0	0	190
-54		145	143	98	39	17	4	5	8	9	0	0	468
-52		208	242	172	52	29	20	6	16	14	2	0	761
-50		198	342	211	78	29	24	13	20	12	0	0	927
-48		162	328	239	81	17	20	13	17	14	0	0	891
-46		86	232	199	37	11	20	8	18	20	0	0	631
-44		36	182	127	10	3	18	14	18	24	0	0	432
-42		23	100	68	7	0	13	3	4	14	0	0	232
-40		11	44	41	1	0	0	1	1	2	0	0	101
-38		11	22	19	0	0	0	0	0	1	0	0	53
-36		8	14	2	0	0	0	0	2	1	0	0	27
-34		6	5	5	0	0	0	0	1	0	0	0	17
-32		5	3	0	0	0	0	0	1	0	0	0	9
-30		1	2	0	0	0	0	0	0	0	0	0	3
-28		0	1	0	0	0	0	0	0	0	0	0	1
-26		0	0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0	0
SUM		960	1725	1214	320	115	119	65	108	115	2	0	4743

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	286
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	101
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	36
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	10
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	2
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	2
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	2
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0

```

B= 17 dB TO B = 18 dB      NUMBER OF ECHOES =      0
B= 18 dB TO B = 19 dB      NUMBER OF ECHOES =      0
B= 19 dB TO B = 20 dB      NUMBER OF ECHOES =      0

TOTAL NUMBER OF RECORDED ECHOES =      6586
NUMBER OF ECHOES USED FOR STATISTICS = 4743
AVERAGE BACKSCATTERING CROSS SECTION = .2524E-04   IN dB = -45.98
BACKSCATTERING CROSS SECTION STD DEV = .5696E-04
AVERAGE TARGET STRENGTH IN dB =      -48.58
TARGET STRENGTH STD DEV IN dB =      4.17
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 439

```

(fichier 17)

### xix. Analyse de la séquence d'échantillonnage (TS) vg298\_17.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =      5561
ANALYSIS START RANGE, m =      1.00
PULSE WIDTH, mSec =      .6000
SOUND VELOCITY IN WATER, m/sec = 1536.0
MIN - 6dB PULSE WIDTH, msec = .2800
MAX - 6dB PULSE WIDTH, msec = .8000
MAXIMUM ANALYSIS DEPTH, m =      125
"LIMIT DATA COLLECTION" IS ON

```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 5.0 TO 30.0

#### DEPTH INTERVALS

FROM	5.00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50		
TO	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00		
TS											SUM	
-74	0	0	0	0	0	0	0	0	0	0	0	0
-72	0	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0	0
-68	0	0	0	0	0	0	0	0	0	0	0	0
-66	0	0	0	0	0	0	0	0	0	0	0	0
-64	0	0	0	0	0	0	0	0	0	0	0	0
-62	0	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0	0
-58	0	0	0	0	0	0	0	0	0	0	0	0

-56		31	18	20	33	26	20	10	9	5	2	174
-54		77	55	39	64	76	49	19	24	14	13	430
-52		110	55	91	116	98	101	42	28	24	15	680
-50		94	69	90	159	152	123	55	47	28	19	836
-48		73	60	90	138	158	124	70	61	24	15	813
-46		31	34	67	103	110	110	49	36	9	6	555
-44		15	12	27	89	83	73	43	11	2	1	356
-42		8	6	19	46	48	35	26	9	0	1	198
-40		2	4	14	15	23	21	17	1	0	0	97
-38		4	6	4	16	4	11	7	0	0	0	52
-36		2	2	5	6	8	0	1	0	0	0	24
-34		5	0	4	2	1	1	3	0	0	0	16
-32		3	1	3	0	1	0	0	0	0	0	8
-30		1	0	1	1	0	0	0	0	0	0	3
-28		0	0	0	0	1	0	0	0	0	0	1
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		456	322	474	788	789	668	342	226	106	72	4243

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	255
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	93
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	36
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	9
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	2
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	2
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	2
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 6586  
NUMBER OF ECHOES USED FOR STATISTICS = 4243  
AVERAGE BACKSCATTERING CROSS SECTION = .2535E-04 IN dB = -45.96  
BACKSCATTERING CROSS SECTION STD DEV = .5864E-04  
AVERAGE TARGET STRENGTH IN dB = -48.62  
TARGET STRENGTH STD DEV IN dB = 4.19  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 399

(fichier 17 zoom)

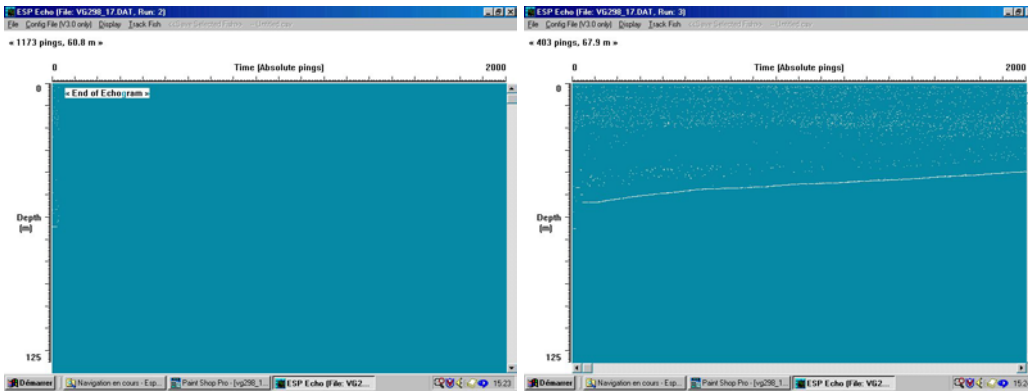


Figure 29 : (017B), Echogramme ESP Echo Biosonics, fin et (017C), Echogramme ESP Echo Biosonics, nombre de ping <2000

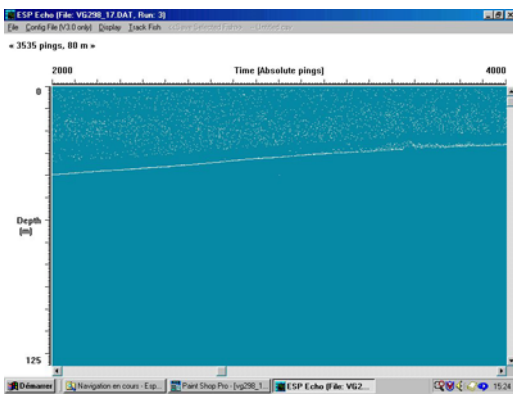


Figure 30 0 (17D), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000

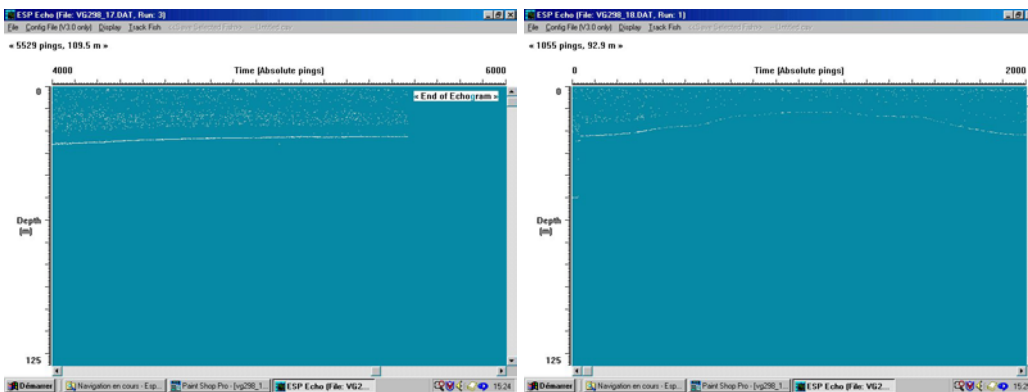


Figure 31: (017<sup>E</sup>), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000, et (018A), Echogramme ESP Echo Biosonics, nombre de ping <2000

**xx. Analyse de la séquence d'échantillonnage (TS)  
vg298\_18.dat**

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 5538  
 ANALYSIS START RANGE, m = 1.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 125  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

-----  
 SUMMARY OF DATA FROM DEPTH 5.0 TO 25.0

DEPTH INTERVALS

FROM 5.00 7.00 9.00 11.00 13.00 15.00 17.00 19.00 21.00 23.00  
 TO 7.00 9.00 11.00 13.00 15.00 17.00 19.00 21.00 23.00 25.00

TS											SUM	
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		12	13	4	16	14	9	1	0	0	0	69
-54		17	25	24	32	44	32	3	2	0	0	179
-52		30	50	29	56	67	52	23	0	0	0	307
-50		37	67	46	63	87	71	23	0	0	0	394
-48		26	58	33	57	87	83	27	1	0	0	372
-46		16	47	40	39	77	73	23	0	0	1	316
-44		10	34	40	47	30	49	19	2	0	0	231
-42		6	18	51	22	10	17	6	2	1	0	133
-40		2	14	38	17	3	4	2	0	0	0	80
-38		1	2	47	9	4	4	2	0	0	0	69
-36		0	1	19	4	1	1	0	0	0	0	26
-34		2	0	12	5	2	0	0	0	0	0	21
-32		1	0	7	1	3	0	0	0	0	0	12
-30		2	1	0	0	0	1	0	0	0	0	4
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	2	0	0	0	0	2
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0

-----

SUM 162 330 390 368 429 398 129 7 1 1 2215

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	151
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	57
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	21
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	5
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	1
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 3301  
 NUMBER OF ECHOES USED FOR STATISTICS = 2215  
 AVERAGE BACKSCATTERING CROSS SECTION = .3959E-04 IN dB = -44.02  
 BACKSCATTERING CROSS SECTION STD DEV = .1076E-03  
 AVERAGE TARGET STRENGTH IN dB = -47.55  
 TARGET STRENGTH STD DEV IN dB = 4.80  
 # ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 235

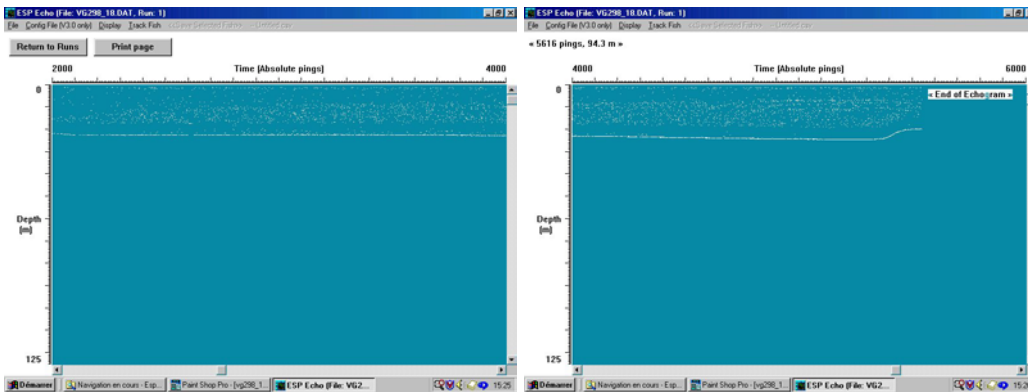


Figure 32: (018B), Echogramme ESP Echo Biosonics, nombre de ping <4000, et (018C), Echogramme ESP Echo Biosonics, nombre de ping 4000-5600



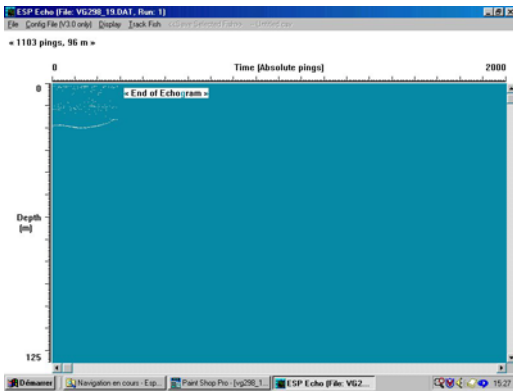


Figure 33 : (019A), Echogramme ESP Echo Biosonics, nombre de ping <300

## xxi. Analyse de la séquence d'échantillonnage (TS) vg298\_19.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =                0
ANALYSIS START RANGE, m =              1.00
PULSE WIDTH, mSec =                    .6000
SOUND VELOCITY IN WATER, m/sec =       1536.0
MIN - 6dB PULSE WIDTH, msec =          .2800
MAX - 6dB PULSE WIDTH, msec =          .8000
MAXIMUM ANALYSIS DEPTH, m =            125
"LIMIT DATA COLLECTION" IS ON
  
```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 2.5 TO 30.0

### DEPTH INTERVALS

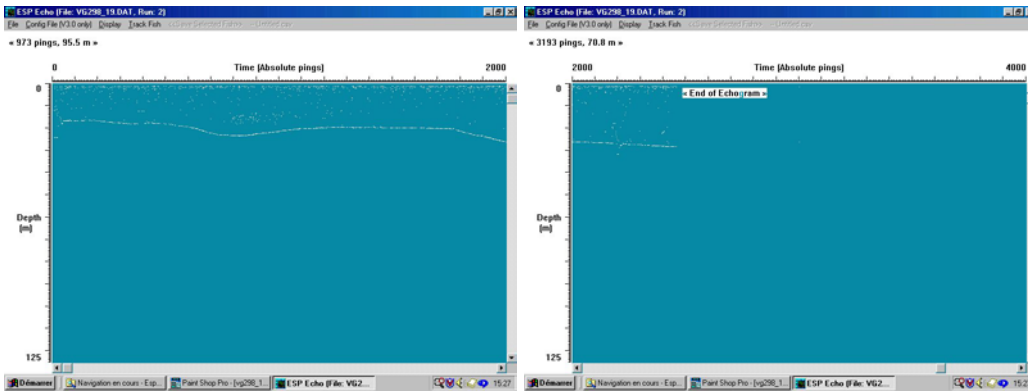
FROM	2.50	5.25	8.00	10.75	13.50	16.25	19.00	21.75	24.50	27.25		
TO	5.25	8.00	10.75	13.50	16.25	19.00	21.75	24.50	27.25	30.00		
TS												SUM
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		3	2	4	4	1	0	0	0	0	0	14
-54		19	6	9	5	3	1	0	1	0	0	44
-52		24	10	15	10	2	1	1	0	0	0	63
-50		27	11	11	7	2	1	0	1	0	0	60
-48		23	9	15	6	8	1	0	1	1	0	64

-46		15	3	6	5	1	1	0	0	0	0	31
-44		8	4	6	6	5	0	0	1	0	0	30
-42		3	1	3	5	6	2	2	0	0	0	22
-40		3	1	0	0	1	1	0	0	0	0	6
-38		0	0	0	1	1	0	1	0	0	0	3
-36		0	0	1	0	2	0	0	0	0	0	3
-34		0	0	1	0	1	0	0	0	0	0	2
-32		0	0	0	0	0	0	0	0	0	0	0
-30		0	2	1	0	0	0	0	0	0	0	3
-28		0	2	0	0	0	0	0	0	0	0	2
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
-----												
SUM		125	51	72	49	33	8	4	4	1	0	347

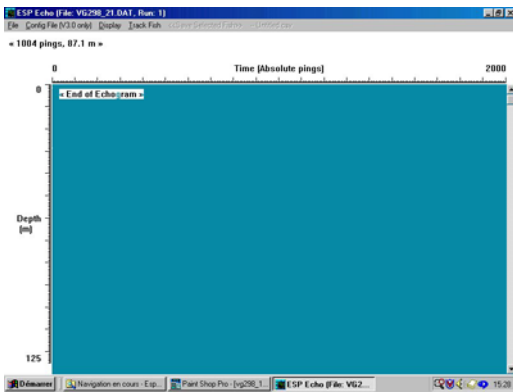
HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	21
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	5
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	1
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	0
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	0
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 1099  
NUMBER OF ECHOES USED FOR STATISTICS = 347  
AVERAGE BACKSCATTERING CROSS SECTION = .3955E-04 IN dB = -44.03  
BACKSCATTERING CROSS SECTION STD DEV = .1401E-03  
AVERAGE TARGET STRENGTH IN dB = -48.57  
TARGET STRENGTH STD DEV IN dB = 4.82  
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 27



**Figure 34: (019B), Echogramme ESP Echo Biosonics, nombre de ping <2000, et (019C), Echogramme ESP Echo Biosonics, nombre de ping 2500**



**Figure 35 : (021A), Echogramme ESP Echo Biosonics, fin**

## xxii. Analyse de la séquence d'échantillonnage (TS) vg298\_21.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =                2961
ANALYSIS START RANGE, m =                1.00
PULSE WIDTH, mSec =                      .6000
SOUND VELOCITY IN WATER, m/sec =        1536.0
MIN - 6dB PULSE WIDTH, msec =           .2800
MAX - 6dB PULSE WIDTH, msec =           .8000
MAXIMUM ANALYSIS DEPTH, m =              125
"LIMIT DATA COLLECTION" IS ON
  
```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 2.5 TO 40.0

DEPTH INTERVALS

```

FROM  2.50  6.25 10.00 13.75 17.50 21.25 25.00 28.75 32.50 36.25
TO    6.25 10.00 13.75 17.50 21.25 25.00 28.75 32.50 36.25 40.00
  
```

TS

SUM

-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		4	8	3	9	18	18	15	0	2	0	77
-54		25	22	7	17	24	32	23	2	1	0	153
-52		36	19	18	24	51	42	37	9	1	0	237
-50		36	16	12	30	60	78	56	6	2	0	296
-48		47	7	7	17	47	69	47	4	2	0	247
-46		15	3	4	7	14	21	23	10	1	0	98
-44		7	0	1	1	2	14	7	3	2	0	37
-42		1	0	0	1	0	5	5	0	0	0	12
-40		1	0	0	1	1	2	3	1	0	0	9
-38		0	0	0	0	0	2	3	0	0	0	5
-36		0	0	0	0	2	2	0	1	0	0	5
-34		1	0	0	0	0	1	0	0	0	0	2
-32		0	0	0	0	0	0	1	0	0	0	1
-30		1	0	0	0	0	0	0	0	0	0	1
-28		0	0	0	0	0	0	0	0	0	0	0
-26		0	0	0	0	0	0	0	0	0	0	0
-24		0	0	0	0	0	0	0	0	0	0	0
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
SUM		174	75	52	107	219	286	220	36	11	0	1180

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	66
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	31
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	8
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	3
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	2
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 1838  
NUMBER OF ECHOES USED FOR STATISTICS = 1180  
AVERAGE BACKSCATTERING CROSS SECTION = .1653E-04 IN dB = -47.82  
BACKSCATTERING CROSS SECTION STD DEV = .4554E-04

AVERAGE TARGET STRENGTH IN dB = -50.02  
 TARGET STRENGTH STD DEV IN dB = 3.50  
 # ECHOES WITH BEAM PATTERN FACTORS > 0 dB= 110

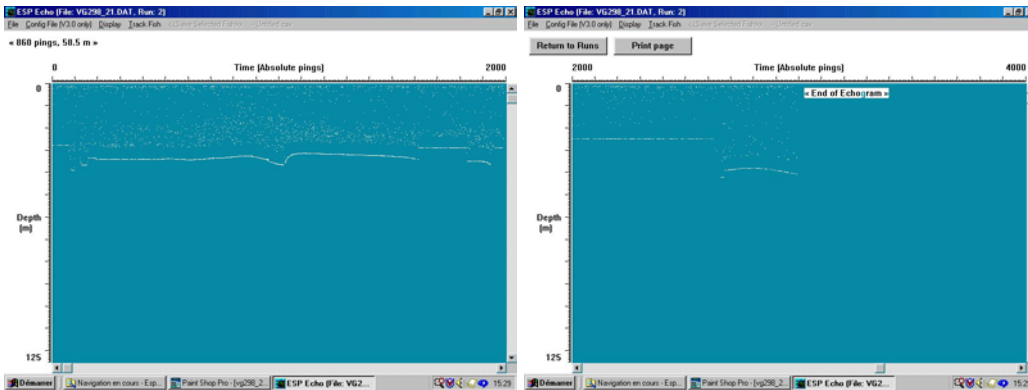


Figure 36 ; (021B), Echogramme ESP Echo Biosonics, nombre de ping <2000, et (021C), Echogramme ESP Echo Biosonics, nombre de ping 2000-3000

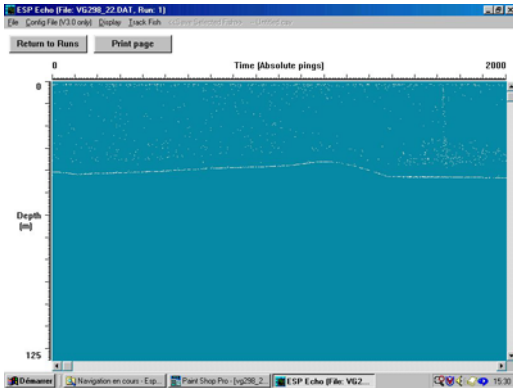


Figure 37 : (022A), Echogramme ESP Echo Biosonics, nombre de ping <2000

### xxiii. Analyse de la séquence d'échantillonnage (TS) vg298\_22.dat

DATA GROUP REPORT FOR TRANSDUCER 1

TOTAL NUMBER OF PINGS = 13910  
 ANALYSIS START RANGE, m = 1.00  
 PULSE WIDTH, mSec = .6000  
 SOUND VELOCITY IN WATER, m/sec = 1536.0  
 MIN - 6dB PULSE WIDTH, msec = .2800  
 MAX - 6dB PULSE WIDTH, msec = .8000  
 MAXIMUM ANALYSIS DEPTH, m = 125  
 "LIMIT DATA COLLECTION" IS ON

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 2.5 TO 60.0

DEPTH INTERVALS

FROM 2.50 8.25 14.00 19.75 25.50 31.25 37.00 42.75 48.50 54.25  
TO 8.25 14.00 19.75 25.50 31.25 37.00 42.75 48.50 54.25 60.00

TS												SUM
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		27	39	25	9	19	34	18	26	11	0	208
-54		85	85	39	43	61	81	46	39	21	0	500
-52		152	99	55	47	81	125	80	71	41	0	751
-50		140	89	92	79	107	143	90	67	35	0	842
-48		105	77	87	59	58	109	61	61	23	0	640
-46		73	66	60	48	29	35	29	26	13	3	382
-44		51	47	49	28	30	20	16	22	5	1	269
-42		28	49	40	25	26	21	17	9	6	0	221
-40		41	36	32	34	13	26	24	12	6	0	224
-38		27	20	22	29	20	29	26	12	6	0	191
-36		23	26	21	28	21	18	19	9	10	0	175
-34		26	28	30	30	21	12	4	0	0	0	151
-32		25	25	27	27	5	8	0	0	1	0	118
-30		11	19	31	13	4	1	0	0	0	0	79
-28		10	16	11	1	0	1	0	0	0	0	39
-26		4	15	1	0	0	0	1	0	1	0	22
-24		4	3	0	0	0	0	0	0	0	0	7
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
SUM		832	739	622	500	495	663	431	354	179	4	4819

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	311
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	50
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	15
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	6
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	1
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	1
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	1
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0

B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES =	9116	
NUMBER OF ECHOES USED FOR STATISTICS =	4819	
AVERAGE BACKSCATTERING CROSS SECTION =	.1059E-03	IN dB = -39.75
BACKSCATTERING CROSS SECTION STD DEV =	.2998E-03	
AVERAGE TARGET STRENGTH IN dB =		-46.65
TARGET STRENGTH STD DEV IN dB =		6.83
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB=	385	

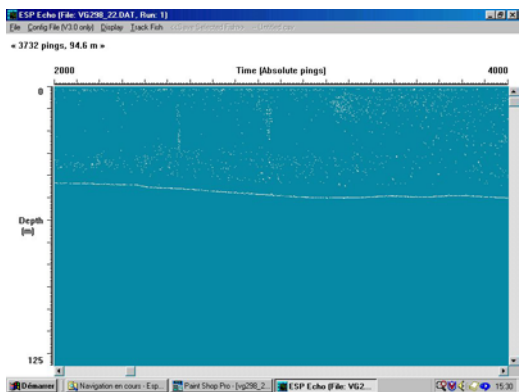


Figure 38: (022b), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000

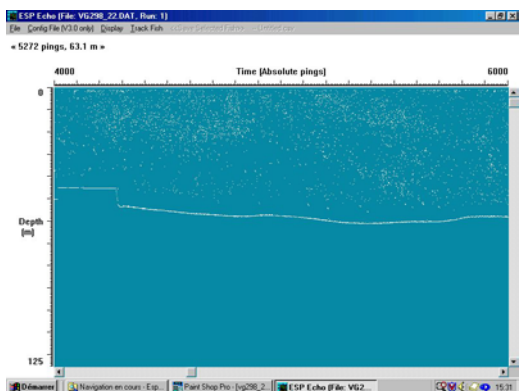


Figure 39: (022C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000

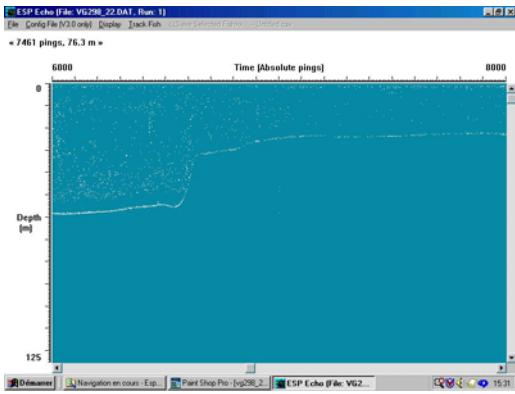


Figure 40; (022D), Echogramme ESP Echo Biosonics, nombre de ping 6000-8000

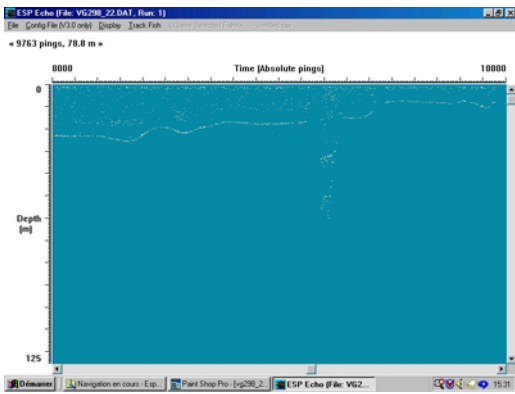


Figure 41: (022E), Echogramme ESP Echo Biosonics, nombre de ping 8000-10000

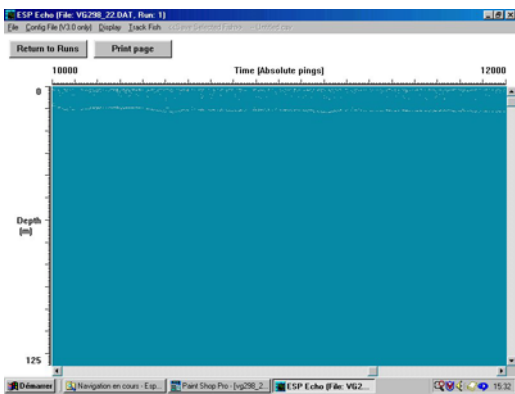


Figure 42: (022F), Echogramme ESP Echo Biosonics, nombre de ping 10000-12000



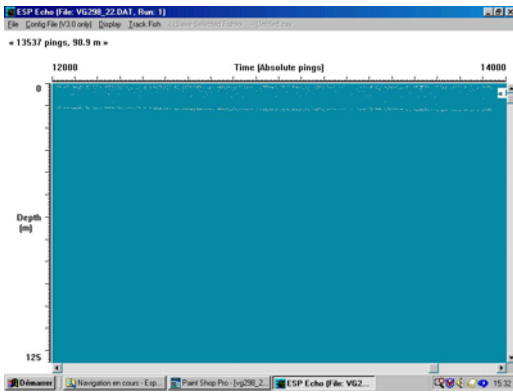


Figure 43: (022G), Echogramme ESP Echo Biosonics, nombre de ping 12000-14000

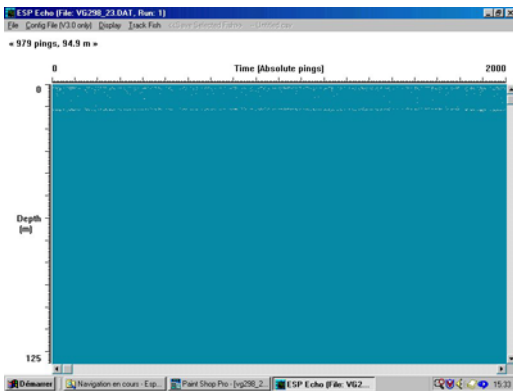


Figure 44: (023A), Echogramme ESP Echo Biosonics, nombre de ping <2000

## xxiv. Analyse de la séquence d'échantillonnage (TS) vg298\_23.dat

DATA GROUP REPORT FOR TRANSDUCER 1

```

TOTAL NUMBER OF PINGS =                0
ANALYSIS START RANGE, m =                1.00
PULSE WIDTH, mSec =                      .6000
SOUND VELOCITY IN WATER, m/sec =        1536.0
MIN - 6dB PULSE WIDTH, msec =           .2800
MAX - 6dB PULSE WIDTH, msec =           .8000
MAXIMUM ANALYSIS DEPTH, m =              125
"LIMIT DATA COLLECTION" IS ON

```

DATA FOR FREQUENCY 120.

-----  
SUMMARY OF DATA FROM DEPTH 2.5 TO 32.5

DEPTH INTERVALS

FROM 2.50 5.50 8.50 11.50 14.50 17.50 20.50 23.50 26.50 29.50  
 TO 5.50 8.50 11.50 14.50 17.50 20.50 23.50 26.50 29.50 32.50

TS											SUM	
-74		0	0	0	0	0	0	0	0	0	0	0
-72		0	0	0	0	0	0	0	0	0	0	0
-70		0	0	0	0	0	0	0	0	0	0	0
-68		0	0	0	0	0	0	0	0	0	0	0
-66		0	0	0	0	0	0	0	0	0	0	0
-64		0	0	0	0	0	0	0	0	0	0	0
-62		0	0	0	0	0	0	0	0	0	0	0
-60		0	0	0	0	0	0	0	0	0	0	0
-58		0	0	0	0	0	0	0	0	0	0	0
-56		14	6	12	10	9	17	10	0	0	0	78
-54		30	19	30	36	27	13	8	0	0	0	163
-52		49	22	46	61	41	25	10	1	0	0	255
-50		46	23	31	73	44	30	15	0	0	0	262
-48		24	18	29	67	42	31	8	0	0	0	219
-46		9	7	19	18	24	18	3	0	0	0	98
-44		6	5	5	18	13	15	2	0	0	0	64
-42		5	5	3	5	10	6	0	1	0	0	35
-40		2	4	3	5	2	1	0	0	0	0	17
-38		5	6	1	0	0	0	2	0	0	0	14
-36		2	5	0	1	1	1	0	0	0	0	10
-34		3	4	6	2	3	0	1	0	0	0	19
-32		2	2	5	0	0	0	1	0	0	0	10
-30		1	2	4	0	1	1	0	0	0	0	9
-28		2	0	1	1	0	0	0	0	0	0	4
-26		0	0	1	0	0	0	0	0	0	0	1
-24		0	0	1	0	0	0	0	0	0	0	1
-22		0	0	0	0	0	0	0	0	0	0	0
-20		0	0	0	0	0	0	0	0	0	0	0
-18		0	0	0	0	0	0	0	0	0	0	0
-16		0	0	0	0	0	0	0	0	0	0	0
SUM		200	128	197	297	217	158	60	2	0	0	1259

HISTOGRAM OF BEAM PATTERN FACTORS > 0 dB

B= 0 dB	TO B = 1 dB	NUMBER OF ECHOES =	85
B= 1 dB	TO B = 2 dB	NUMBER OF ECHOES =	25
B= 2 dB	TO B = 3 dB	NUMBER OF ECHOES =	6
B= 3 dB	TO B = 4 dB	NUMBER OF ECHOES =	2
B= 4 dB	TO B = 5 dB	NUMBER OF ECHOES =	0
B= 5 dB	TO B = 6 dB	NUMBER OF ECHOES =	0
B= 6 dB	TO B = 7 dB	NUMBER OF ECHOES =	0
B= 7 dB	TO B = 8 dB	NUMBER OF ECHOES =	0
B= 8 dB	TO B = 9 dB	NUMBER OF ECHOES =	0
B= 9 dB	TO B = 10 dB	NUMBER OF ECHOES =	0
B= 10 dB	TO B = 11 dB	NUMBER OF ECHOES =	0
B= 11 dB	TO B = 12 dB	NUMBER OF ECHOES =	0
B= 12 dB	TO B = 13 dB	NUMBER OF ECHOES =	0
B= 13 dB	TO B = 14 dB	NUMBER OF ECHOES =	0
B= 14 dB	TO B = 15 dB	NUMBER OF ECHOES =	0
B= 15 dB	TO B = 16 dB	NUMBER OF ECHOES =	0
B= 16 dB	TO B = 17 dB	NUMBER OF ECHOES =	0
B= 17 dB	TO B = 18 dB	NUMBER OF ECHOES =	0
B= 18 dB	TO B = 19 dB	NUMBER OF ECHOES =	0
B= 19 dB	TO B = 20 dB	NUMBER OF ECHOES =	0

TOTAL NUMBER OF RECORDED ECHOES = 2677

NUMBER OF ECHOES USED FOR STATISTICS =	1259	
AVERAGE BACKSCATTERING CROSS SECTION =	.4579E-04	IN dB = -43.39
BACKSCATTERING CROSS SECTION STD DEV =	.1989E-03	
AVERAGE TARGET STRENGTH IN dB =		-49.07
TARGET STRENGTH STD DEV IN dB =		5.07
# ECHOES WITH BEAM PATTERN FACTORS > 0 dB=	118	

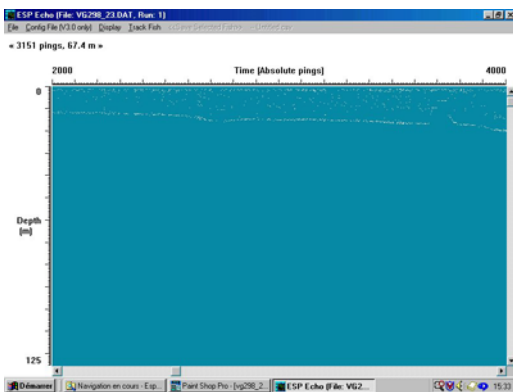


Figure 45: (023B), Echogramme ESP Echo Biosonics, nombre de ping 2000-4000

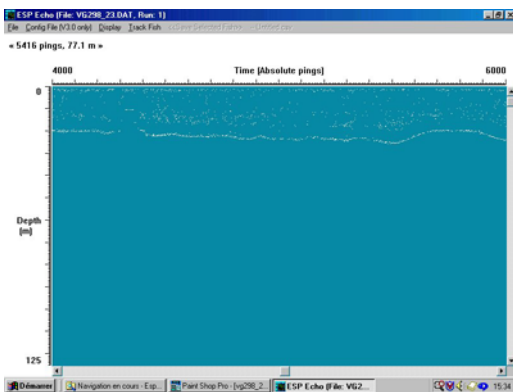


Figure 46: (023C), Echogramme ESP Echo Biosonics, nombre de ping 4000-6000

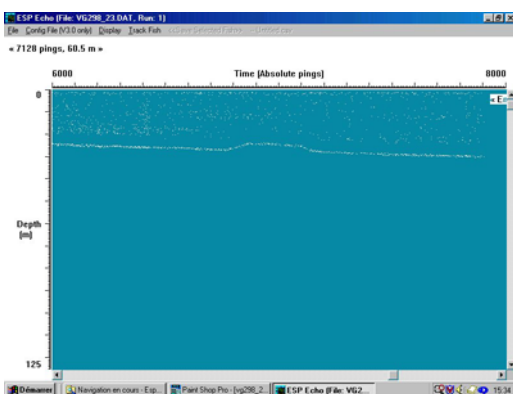


Figure 47: (023D), Echogramme ESP Echo Biosonics, nombre de ping 6000-7900

#### 4. Interprétation préliminaires

Commentaires et remarques des fichiers de séquence de TS « Vénézuéla » 1998 traitées par EPS B V3.2 durant la mission Varget 2/98 :

-vg29801.txt

Valeurs de TS correctes. Deux couches (0-35m et 40-55m)

-vg29801zoom.txt

Mesure effectuée sur la 1ere couche 0-35m

-vg29802.txt

Valeurs de TS ambiguës, valeurs très (trop) fortes (méduses?). En aucun cas des sardinelles. Un seul groupe, donc pas de zoom.

-vg29803.txt

Valeurs de TS ambiguës, valeurs très (trop) fortes. Confirmées par le zoom.

-vg29804.txt

Valeurs de TS ambiguës, valeurs très (trop) fortes. Fond absent. Mauvais fonctionnement.

-vg29805.txt

Valeurs de TS correctes parfait, merveilleux ! Voilà des bonnes valeurs.

-vg29806.txt

Valeurs de TS correctes , formidable !

-vg29807.txt

Valeurs de TS correctes,... à regretter le manque d'échos...

-vg29808.txt

Valeurs de TS correctes , excellent (malgré un dysfonctionnement sondeur)

-vg29809.txt

Valeurs de TS correctes , nickel !

-vg29810.txt

Valeurs de TS correctes , aussi excellent que son prédécesseur (vg29809.txt)

-vg29812.txt

Valeurs de TS correctes , bon mais peu d'échos.

-vg29813.txt

Valeurs de TS correctes , excellent

-vg29814.txt

Valeurs de TS ambiguës, valeurs un peu fortes dues aux prédateurs de surface. Dans l'ensemble, satisfaisant.

-vg29815.txt

Valeurs de TS correctes , deux populations. la moyenne donne des valeurs un peu fortes (poissons de fond).

-vg29815zoom.txt

Valeurs de TS correctes , zoom 5-35m sur pop de subsurface. On retrouve des valeurs normales.

-vg29816.txt

même chose: 2 populations, une surface, une fond. voir zoom.

-vg29816zoom.txt

Valeurs de TS correctes , zoom 5-35m sur pop de subsurface. On retrouve des valeurs normales.

-vg29817.txt

Valeurs de TS correctes , acceptable. Deux pops qui se mélangent sans pouvoir les discriminer malgré le zoom (voir zoom)

-vg29817zoom.txt

Valeurs de TS ambiguës, de 5 à 30m sans grand changement. Les 2 pops se mélangent (faible fond).

-vg29818.txt

Valeurs de TS correctes , acceptable. Deux pops qui se mélangent sans pouvoir les discriminer d'où valeurs un peu fortes.

-vg29819.txt

Valeurs de TS ambiguës, pas assez d'échos valables comparés au nombre total d'échos reçus (347 / 1099). pas représentatif.

-vg29821.txt

Valeurs de TS correctes , excellent.

-vg29822.txt

Valeurs de TS ambiguës, valeurs très (trop) fortes. Mélange de prédateurs-proies impossibles à discriminer (run trop long). Seule, la moitié des échos reçus ont été utilisés pour les statistiques, pas représentatif.

-vg29823.txt

Valeurs de TS correctes , valeurs un peu fortes dues aux prédateurs de surface. Dans l'ensemble, satisfaisant.

Le tableau ci desous (tableau 5) recaptile les valeurs moyenne de TS et backscattering cross section en decibels.

<b>Séquence</b>	<b>Average backscattering cross section (dB)</b>	<b>Average Target Strenght (dB)</b>
<b>Vg298_01</b>	-46.1	-51.53
<b>Vg298_05</b>	-48.14	-49.57
<b>Vg298_06</b>	-46.78	-48.35
<b>Vg298_07</b>	-47.63	-50.97
<b>Vg298_08</b>	-49.03	-50.12
<b>Vg298_09</b>	-48.62	-49.81
<b>Vg298_10</b>	-48.98	-50.15
<b>Vg298_12</b>	-48.76	-50.11
<b>Vg298_13</b>	-48.16	-49.63
<b>Vg298_15zoom</b>	-47.25	-48.81
<b>Vg298_16zoom</b>	-47.22	-49.46
<b>Vg298_21</b>	-47.82	-50.02

**Tableau 5 :** valeur moyenne par séquence d'enregistrement sondeur des valeurs de backscattering cross section et de Target Strenght (index de reflectivité) des poissons isolé. (en dB) (TVG 40 log R)

## 5. Discussion

Les résultats bruts présentés serviront de base à une analyse approfondie de la mesure de l'index de réflectivité (TS) de *Sardinella aurita* en particulier, au Venezuela Oriental. Les données de TS sont issues du sondeur *Biosonics* « dual beam » (129 kHz) mais des données complémentaires et synchrones ont été enregistrées par le sondeur *Simrad EK500* « split beam » (38 kHz). Les données de pêches des années antérieures nous motivent à analyser aussi les mesures de TS des deux autres campagnes effectuées sur le stock orientale du Venezuela (Varget 2/1996 et Varget2/1999). La Flasa est aussi en possession de données historique intéressante (Voire : Alina Manchury, Pepe Cardenas, FLASA, Margarita) nous permettent d'envisager de compiler les données historique. Jean Guillard (Inra Thonon les Bains) partenaires de nos analyses prend part à la rédaction d'un Manuscrit sur la mesure de TS in situ de la Sardinelle Venezuelienne.

La comparaison des données du Split beam et du dual beam ne présente a priori pas un intérêt majeur (ICES 232, Ona), par contre les variations de TS en fonction de la fréquence du sondeur (sur des enregistrements synchrones : quelque mètre d'ecrat tout de meme) est un champs d'application d'actualité (multifréquence). Une étude minutieuse par layer fine de la partie supérieure de la colonne d'eau sera faites pour chaque sondeur (Gauthier et al., 2002). Un intérêt particulier sera porté à la composition faunistique (mono spécifique etc.) des chalutages. Les données complémentaires de salinité température, CTD et vitesses de nages individuelles (Split beam) et des bancs seront implémenter pour des analyses exploratoires (coupler les valeurs moyennes avec leurs variances et l'environnement local voir les caractéristiques intrinsèques des poissons individuels).

## 6. Références

Bertrand, A., and Josse, E., 2000: Tuna target-strength related to fish length and swimbladder volume; *ICES Journal of Marine Science*, 57: 1143-1146. 2000.

Cotel, P. 1998. Manual of Acoustics- Theory and application to the BioSonics system for target strength measurement . PELFISH - Scientific and technical document No 37 April 1998

Gauthier S., G.A. Rose, In situ target strength studies on Atlantic redfish (*Sebastes spp.*), *ICES Journal of Marine Science*, 59, 4, 805-815, 2002.

Ona, 1999. ICES 235 Recommendation on in situ TS measurement.

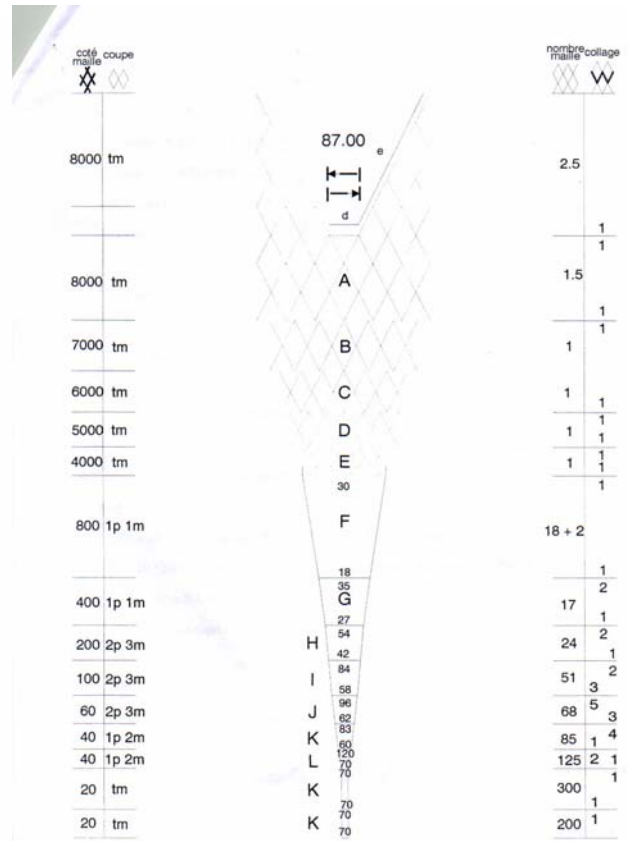
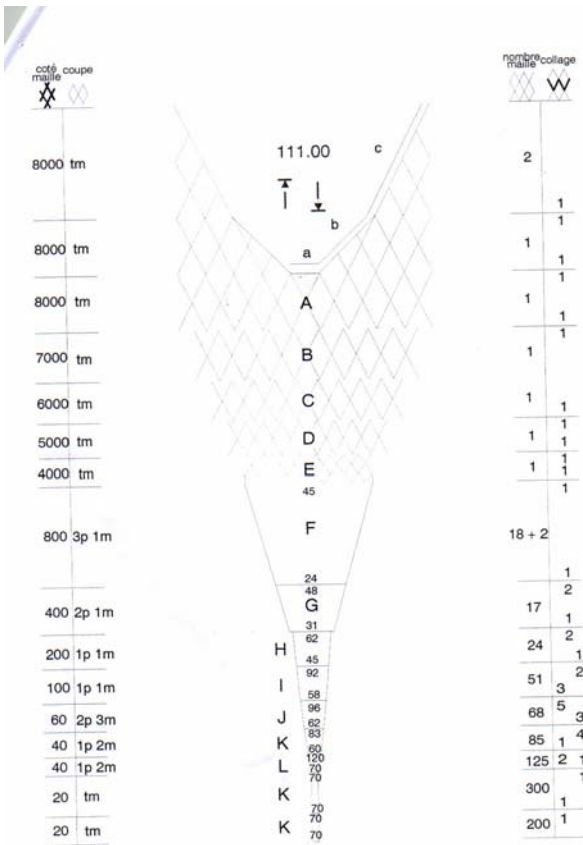
Josse. E. 1999. Calibration des sondeurs EY500-EK 500 Simrad ; N/O Antéa, Mochima Bay, Venezuela 1998. Doc IRD Brest.

Gerlotto, F. 1995. Projet de Recherche Varget. Doc. Sci IRD/DRV Paris.

## 7. Annexes

Deux engins de pêches ont été utilisés à partir du N/O Antéa :

# Pélagique 111.00 m \* 87.00 m



# CHALUT GOV 29.00 m \* 40.30

