Data analysis manual of A-tag for towed monitoring

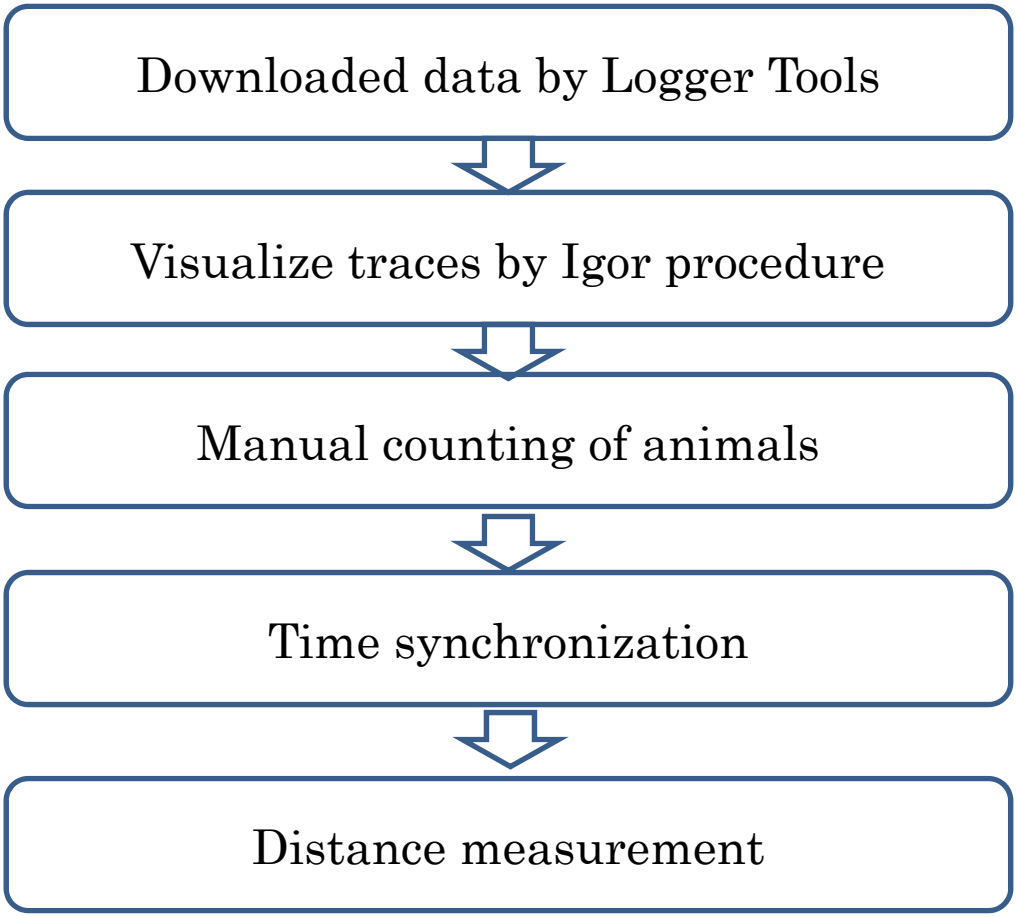
Ver.1.0

September 12, 2012

CONTENTS

1. Data you will get.

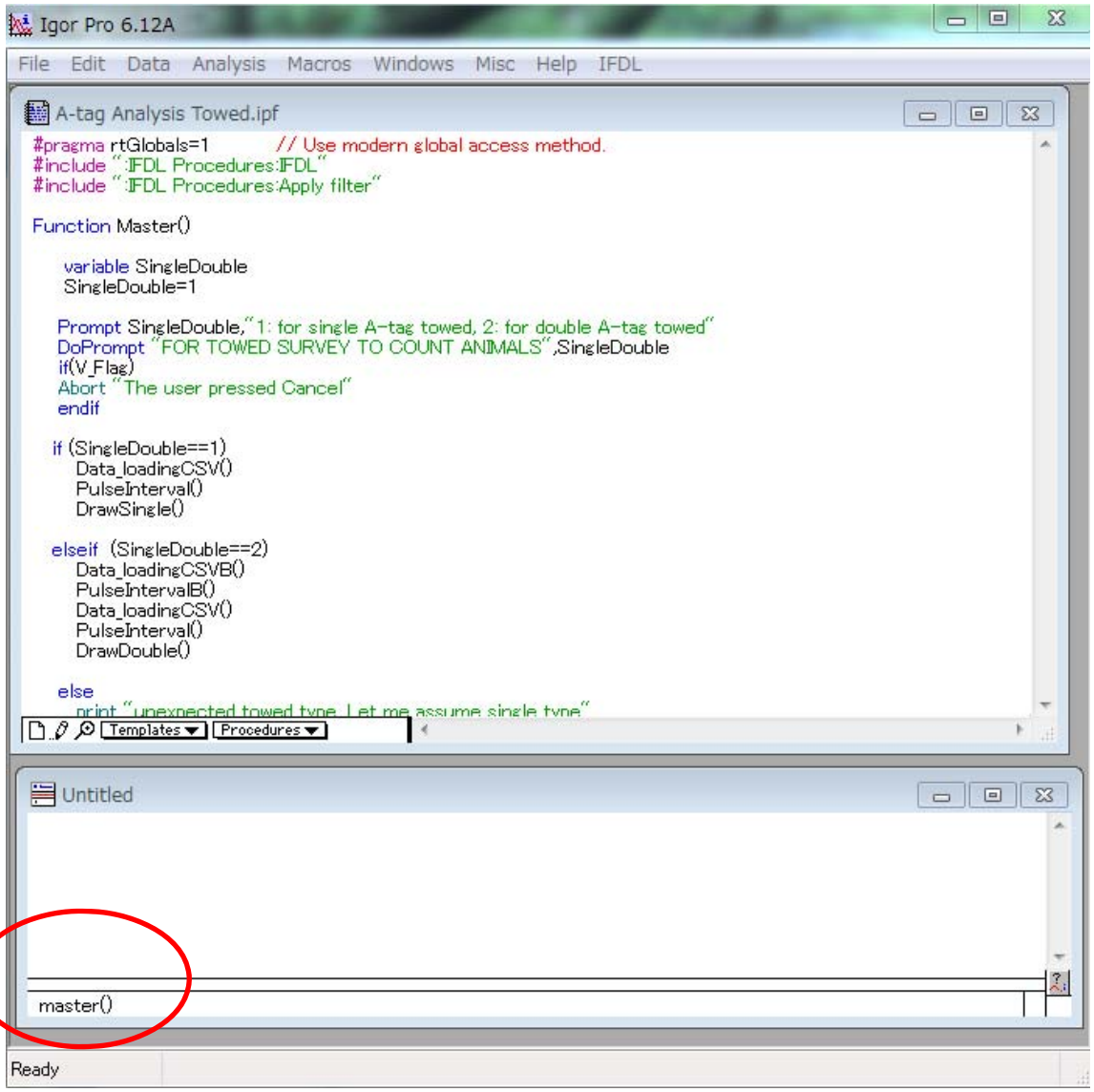
1. Numbers of acoustically detected animals with time
2. Perpendicular distance from the cruise line



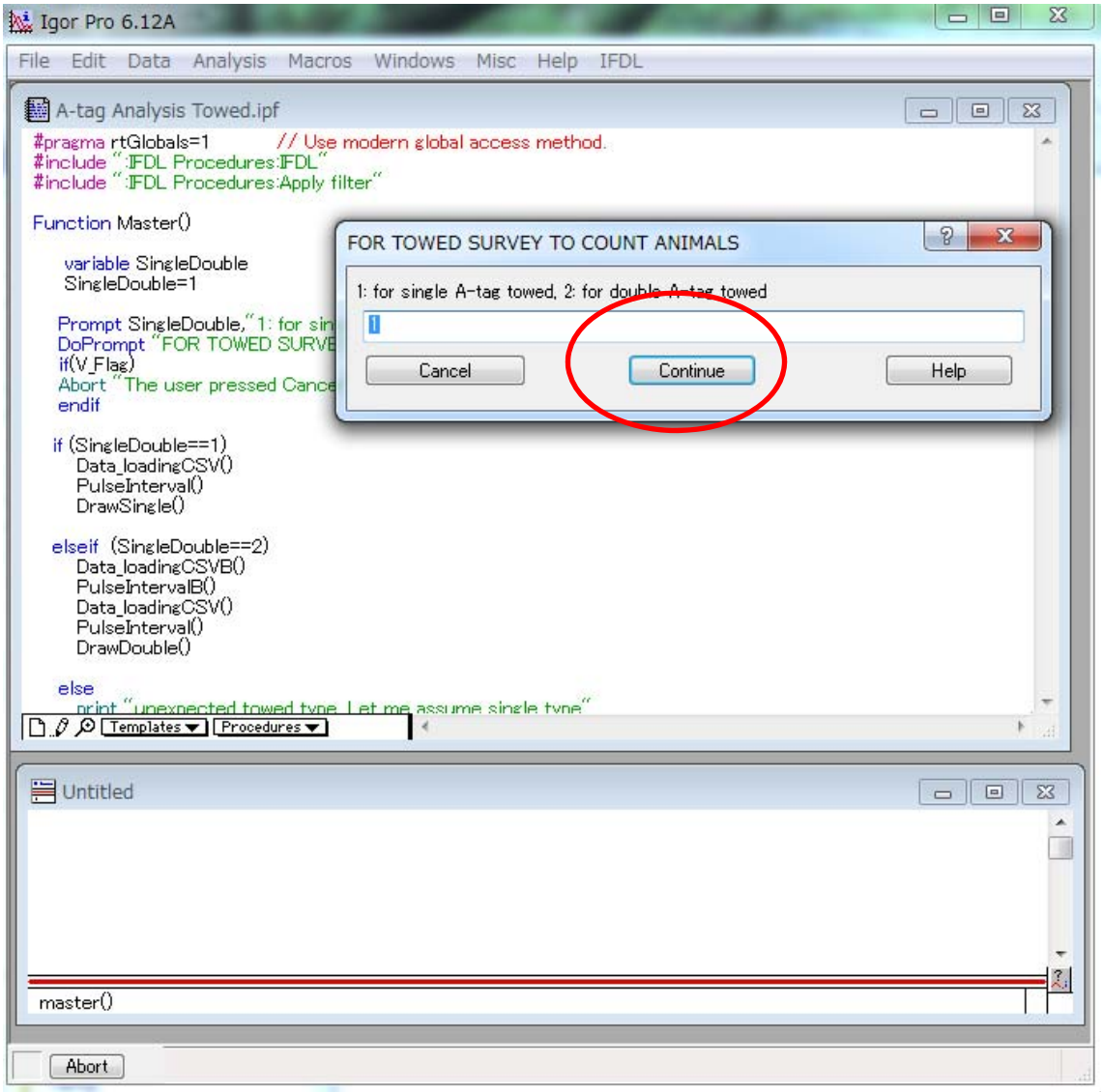
2. Data visualization of single towed A-tag

Click **A-tag Analysis Towed.ipf**

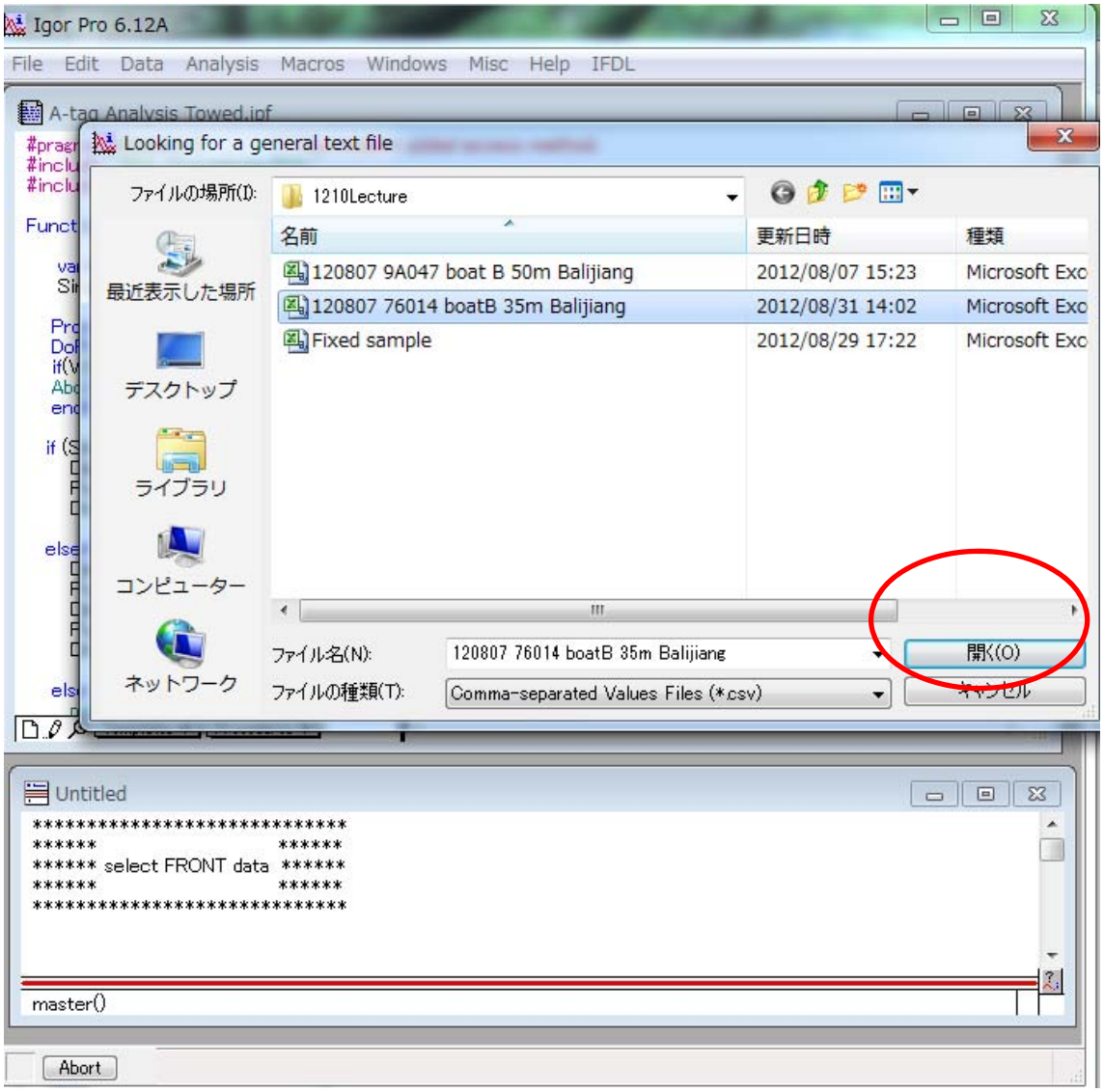
Type **master()** on the command line of Igor and press RETURN KEY



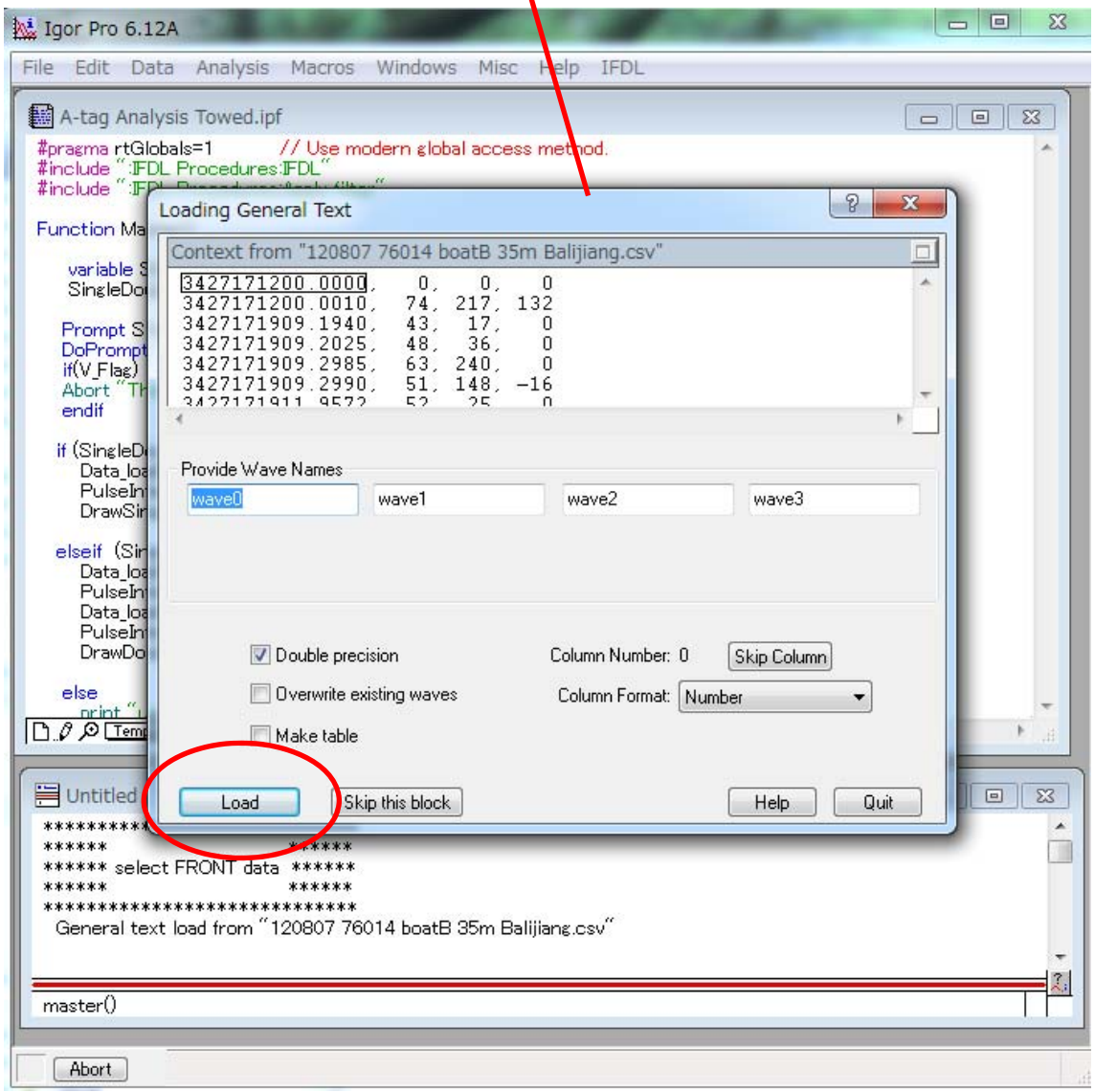
Select **Single(1)** or Double (2) towing typeand click **Continue**.



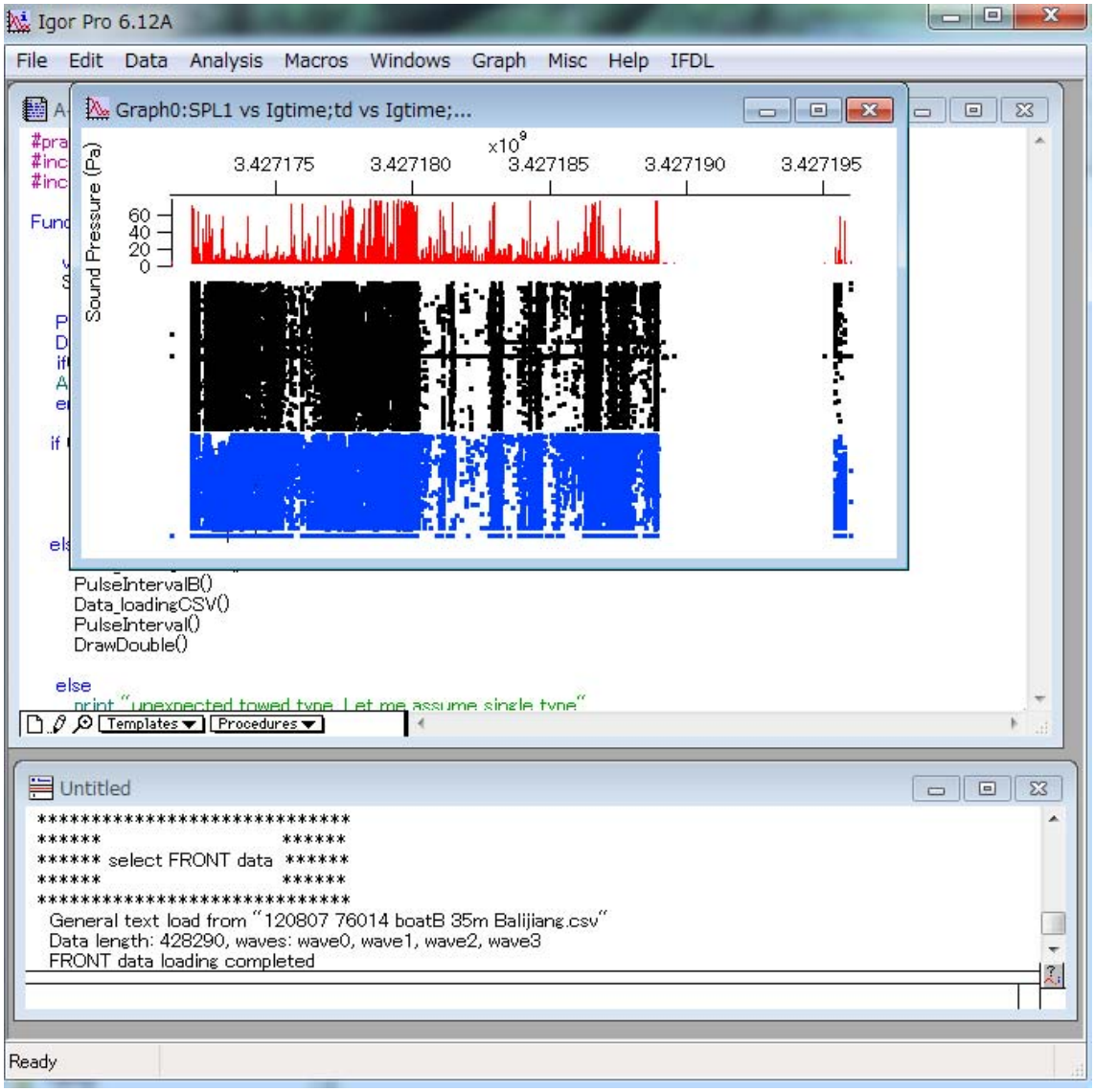
Assuming you choosen Single type (1), select data file you wish to analyse and click **OPEN**
The data file is created by Logger Tools>CSV file.



Wait for a while until dialog box below appears.
Click **Load** and wait for several minutes.
DO NOT change wave names

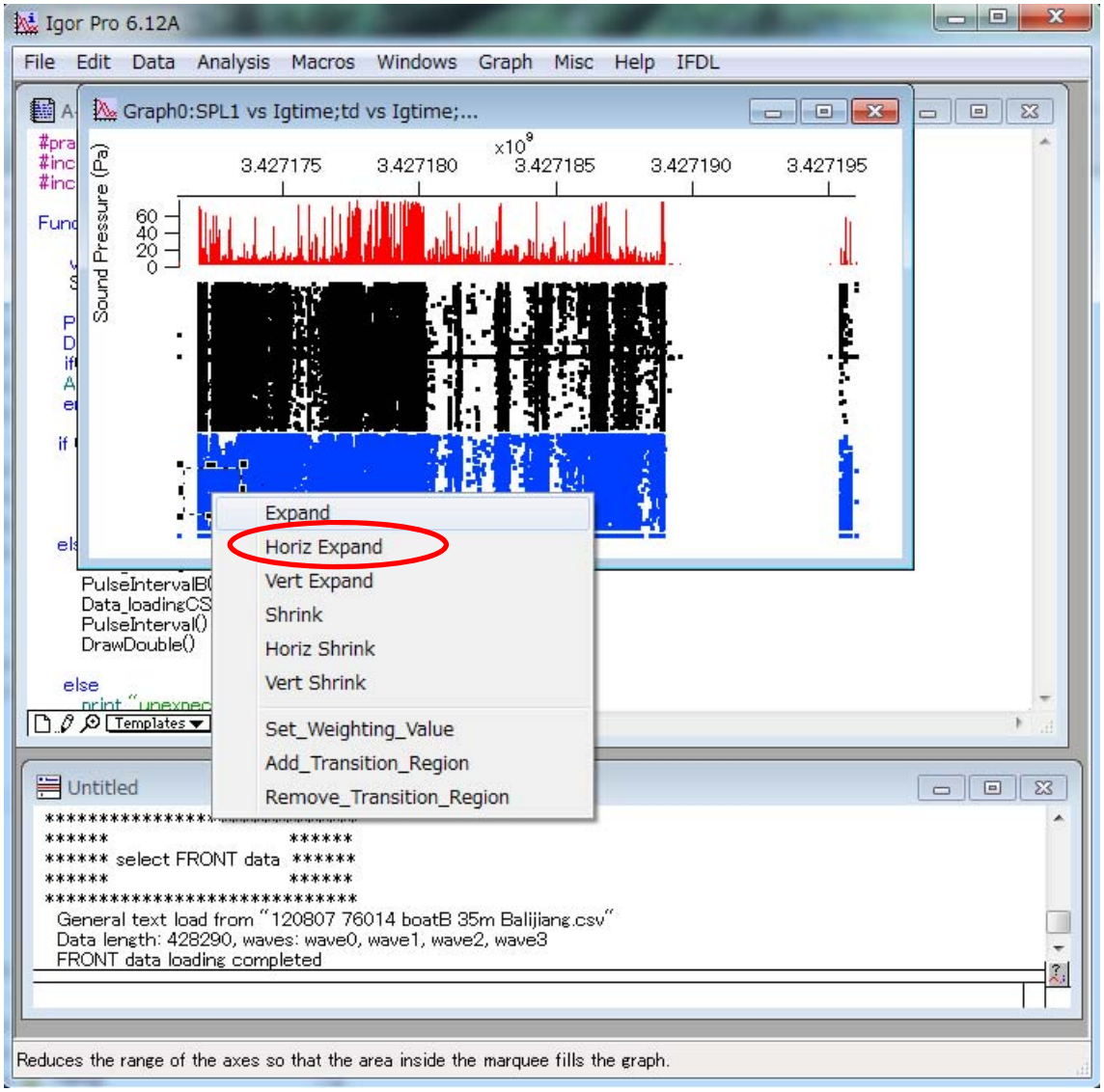


Analysis finished. Ready for animal counting.

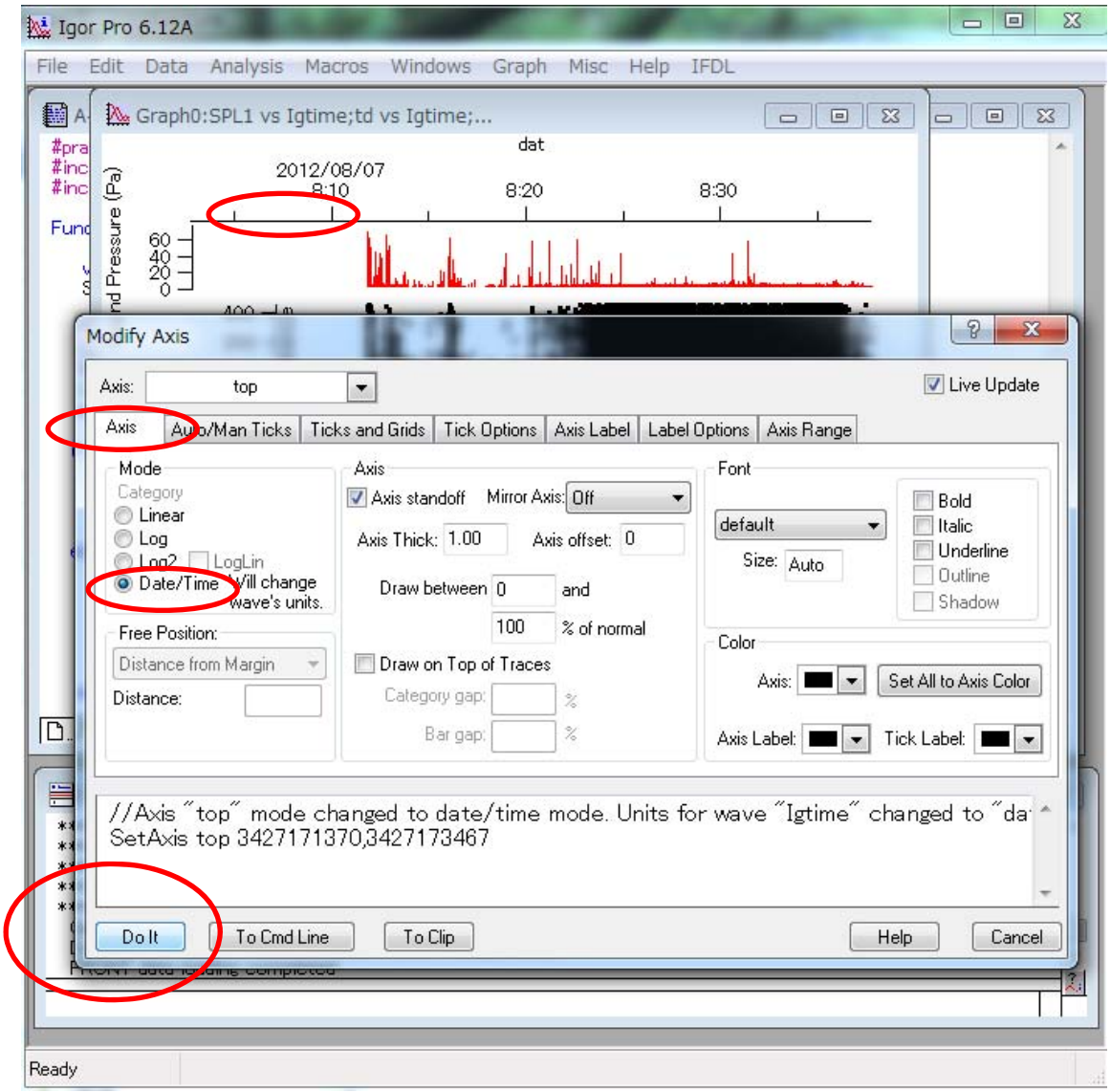


3. Manual counting of animals

To expand image for detail manual examination,
Select small area in the figure > right click > Horiz Expand

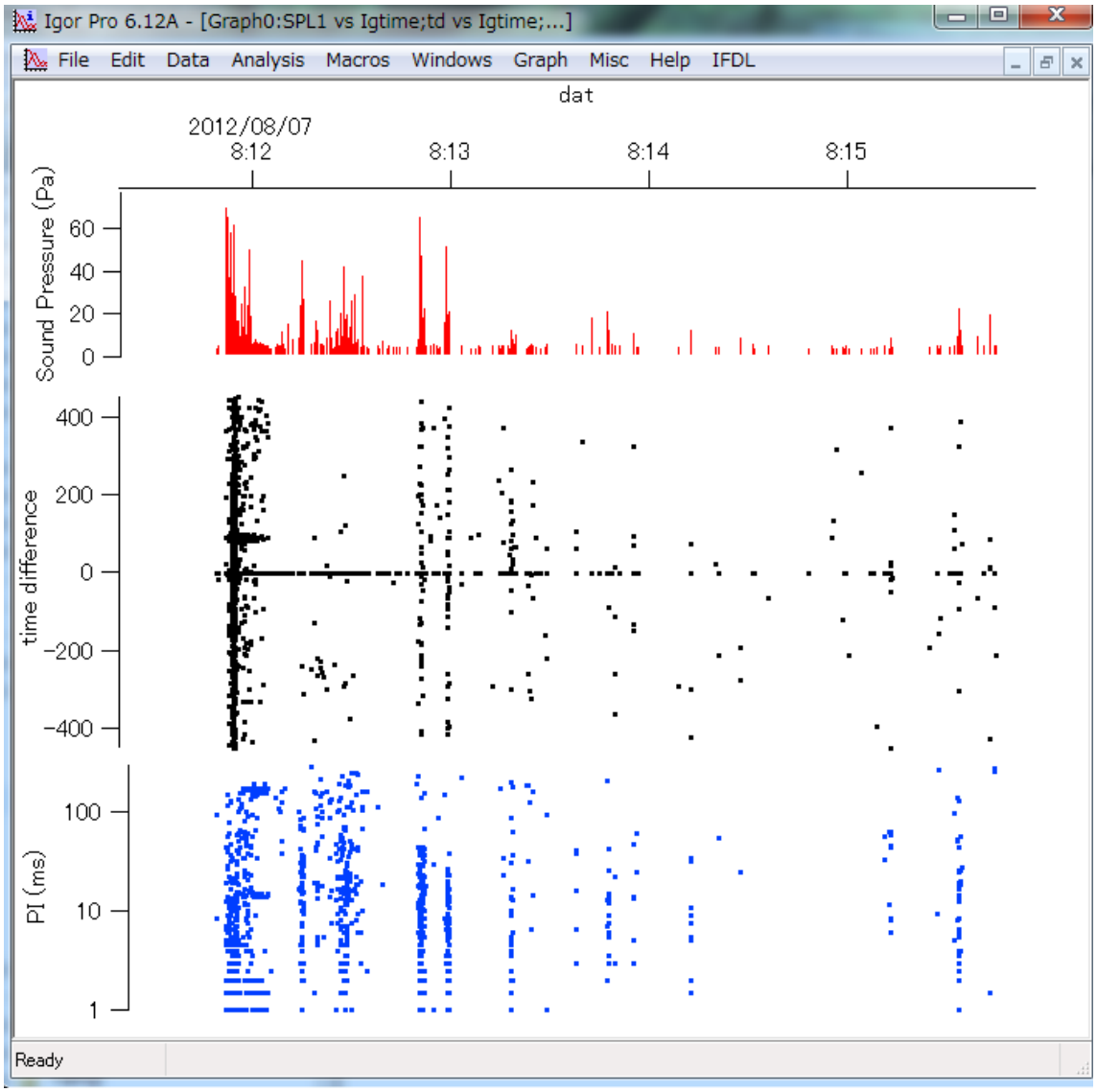


Change X axis caption YY/MM/DD HH:MM
Double click X axis > Axis TAB > Date/Time > Do it



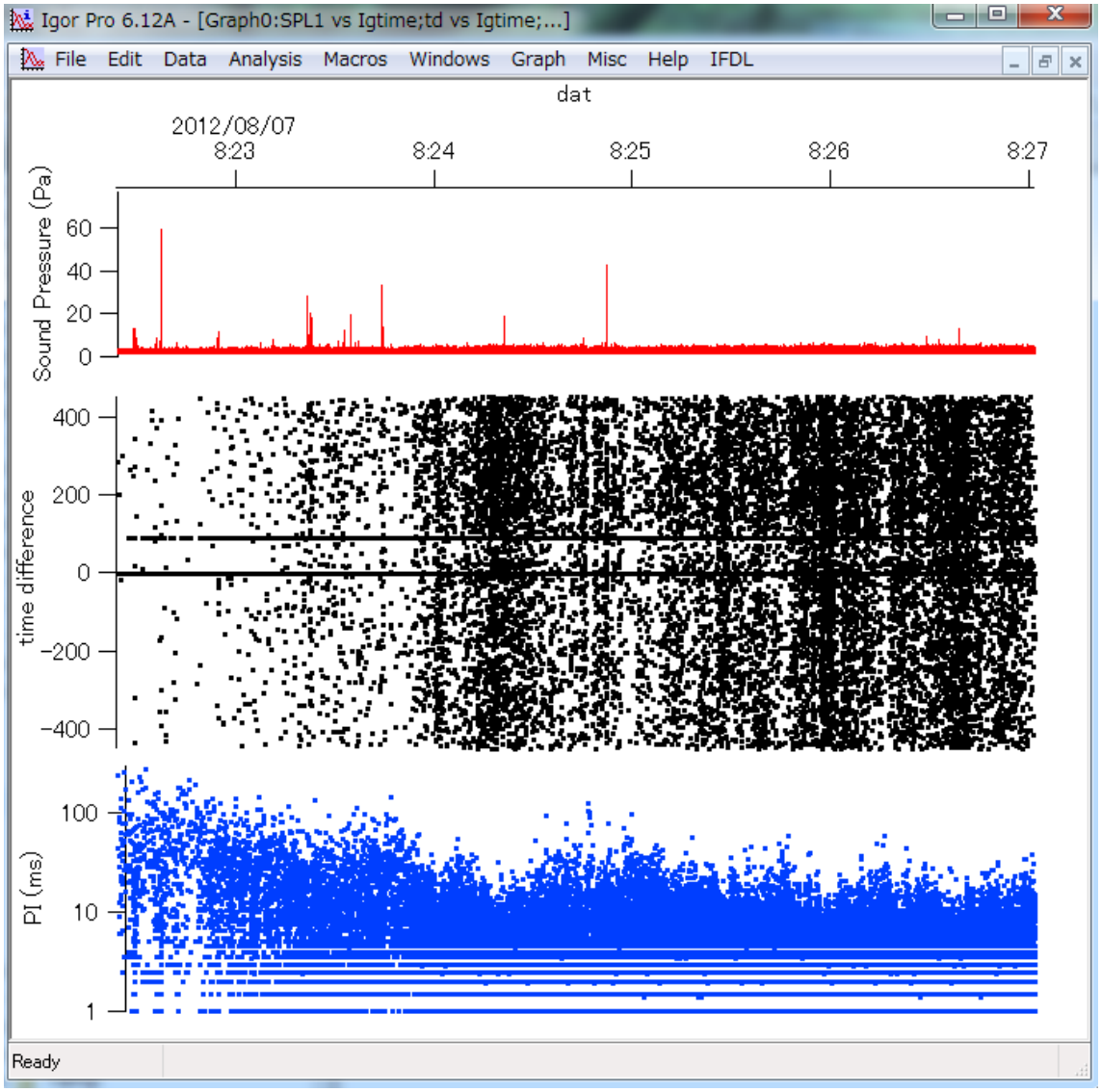
Expand at the beginning of the Graph. You can visualize the data.

These seems to be noise because the sound source direction (time difference varied and pulse interval (PI) is random. They could be bubble noise behind own boat. The initial noise at 8:12 happened when an observer put A-tag into water.



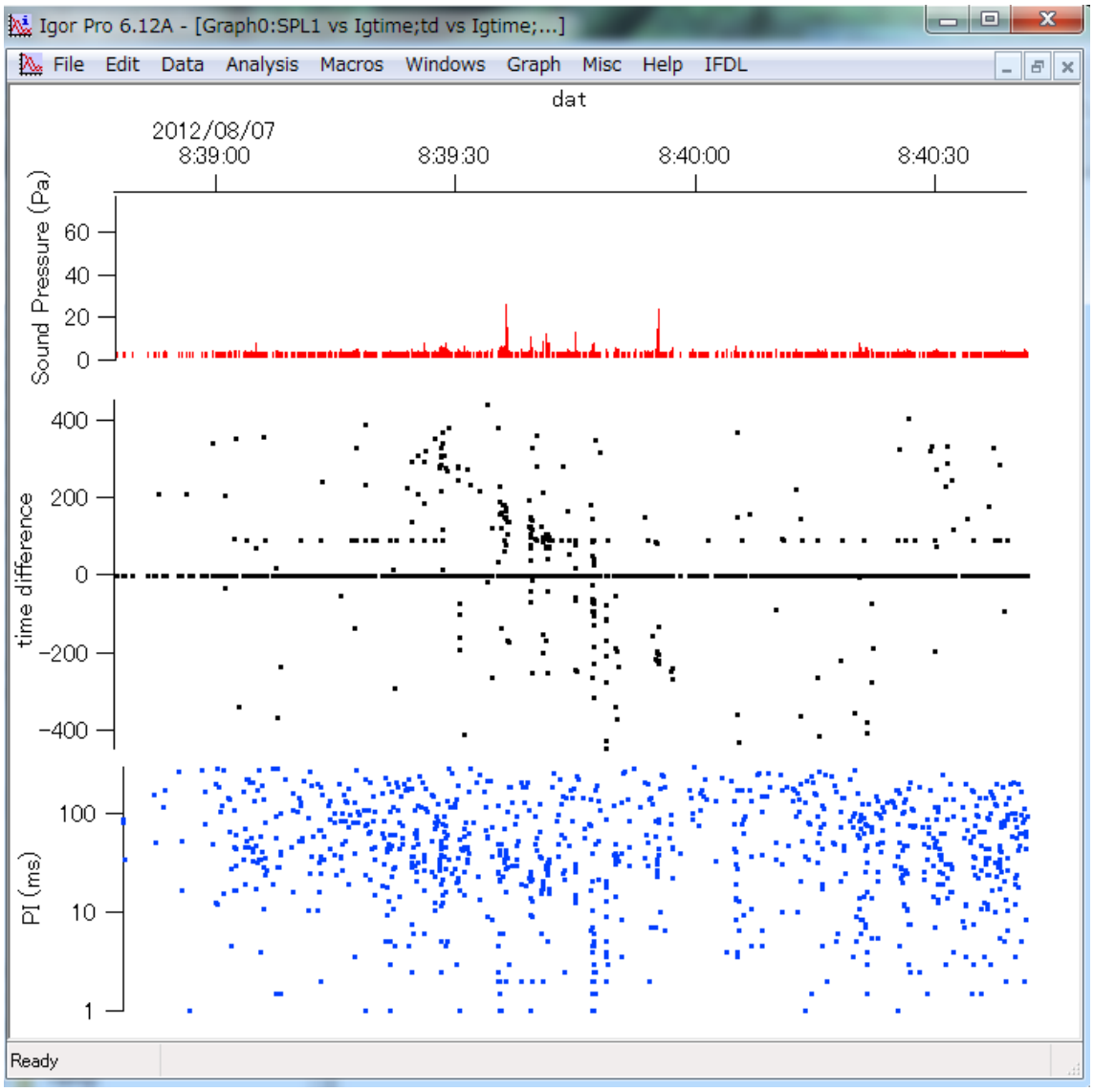
SHIFT+ALT and drag image, you can see different time of the file.

This image shows heavy ship noise contamination. Numbers of pulse sounds were detected from all direction. Pulse interval is quite small and random. Many bubbles created by a ship create pulse sounds all around the A-tag.

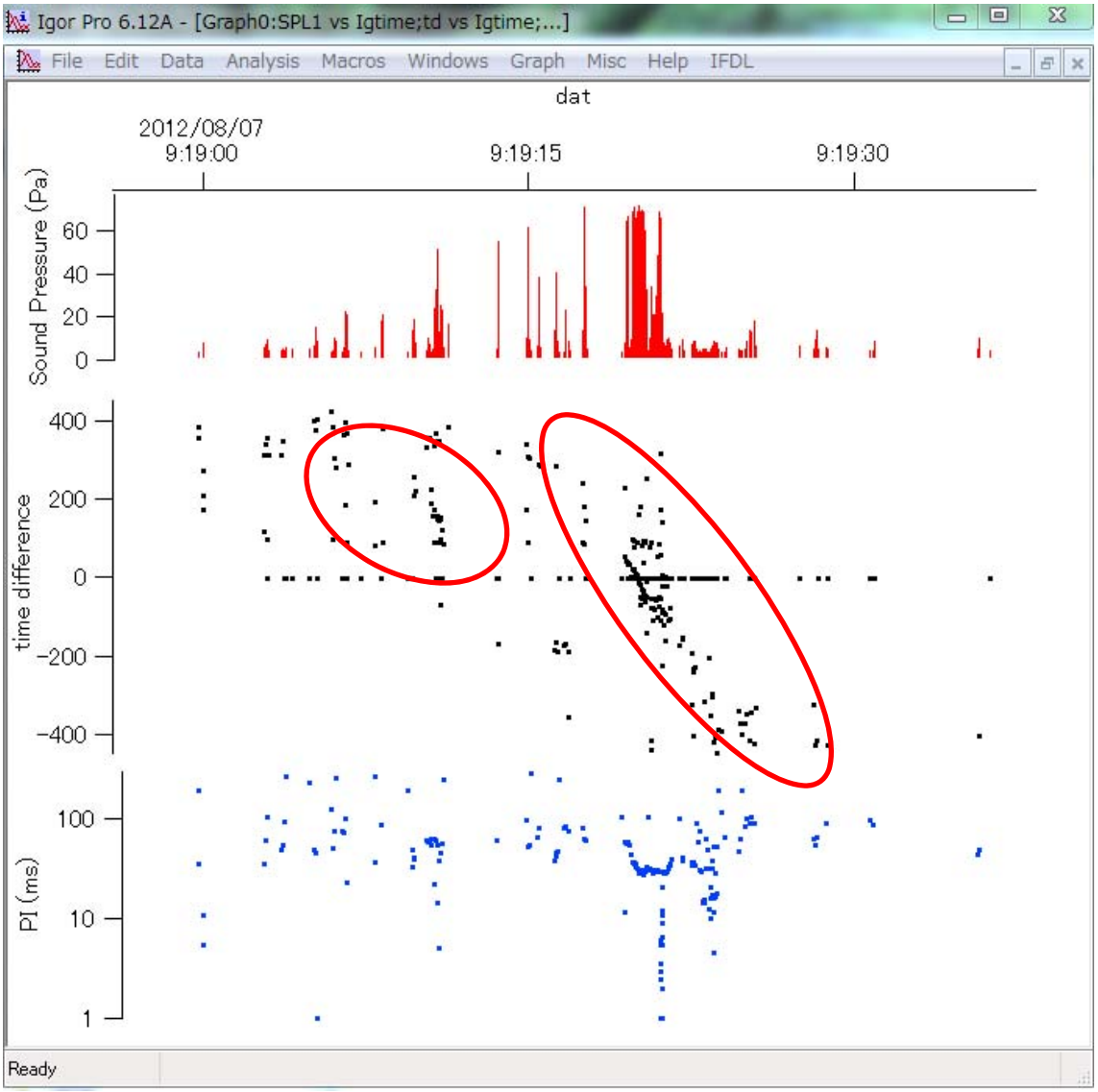


Continue to exam

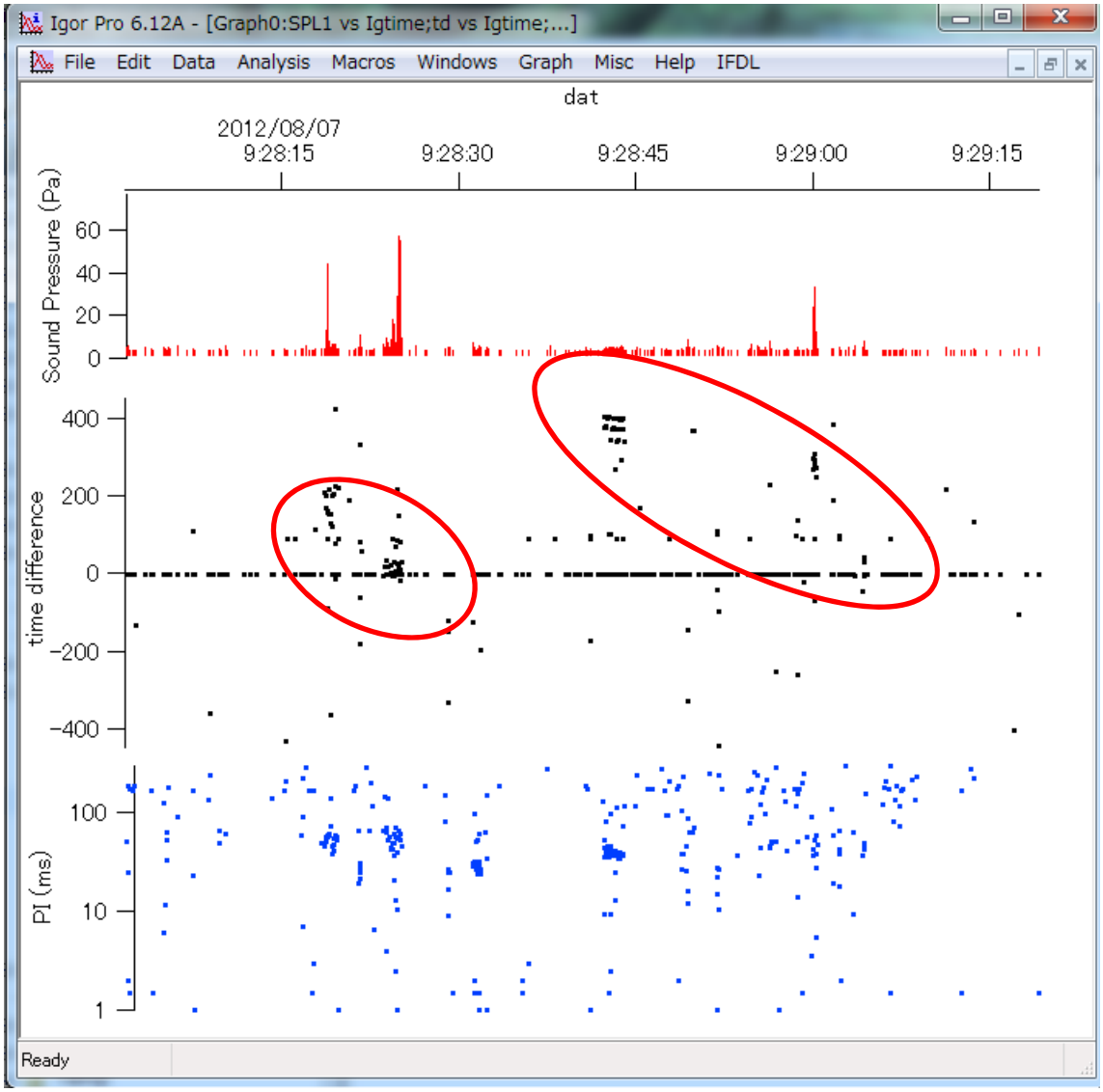
A ship passed by. Sound source direction (time difference) is NOT random. It passed from bow to stern. However, PI is random. It is not the feature of biosonar clicks.



Two porpoises passed by. Sound came from specific direction and PI ranged several tens ms to 100 ms that is typical feature of biosonal clicks. Take a note that first encounter happened at 9:19:13 on August 7, 2012 and second encounter at 9:15:18.

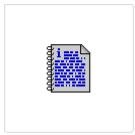


At least two porpoises. Note that a porpoise can't catch up with survey boat since the boat speed is faster than porpoises. A porpoise moved for stern (negative time difference) side would not appear again in bow 8positive) side. Sound detected 9:28:43 came from bow side than the direction of previous clicks at 9:28:20. Take a note that third encounter happened at 9:28:20 and 4th encounter at 9:29:00.



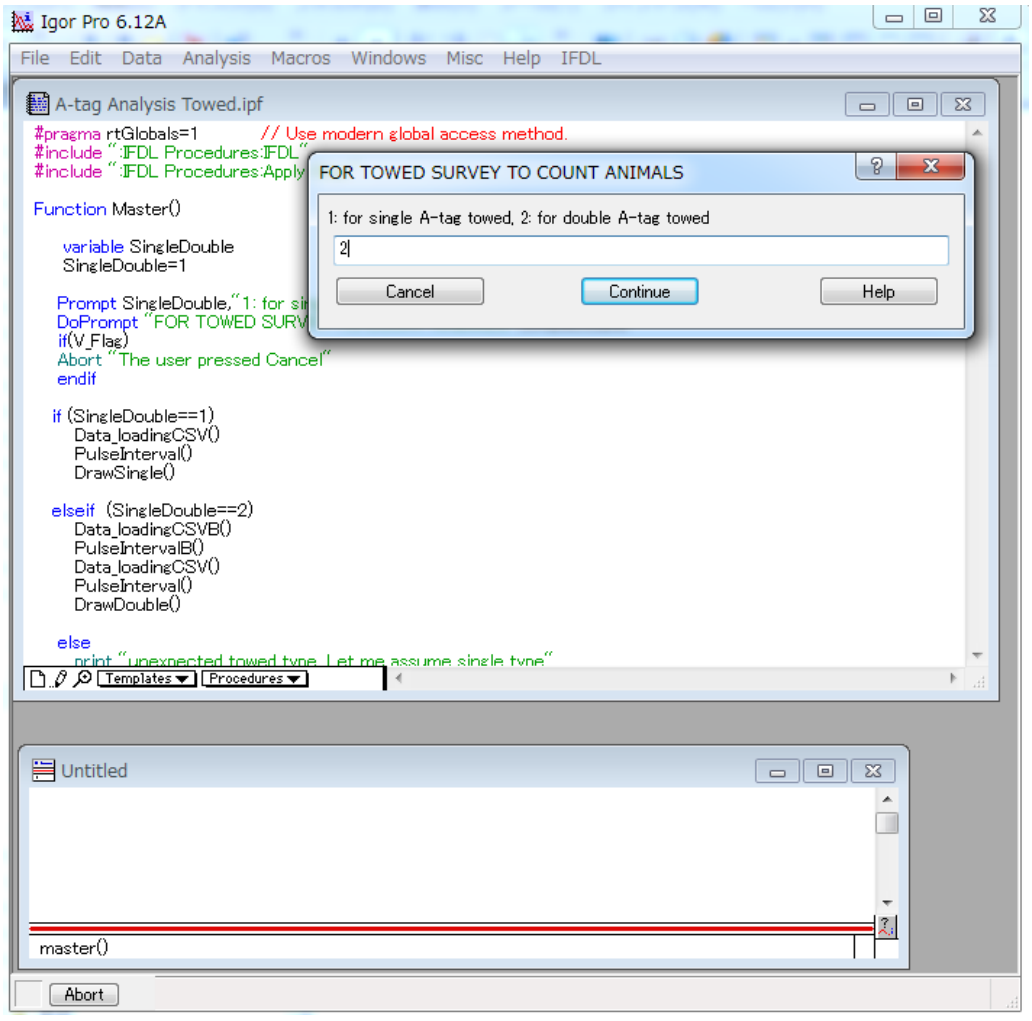
4. Time synchronization of double A-tags

In case you towed two or more A-tags simultaneously, you can measure the perpendicular distance to the animal in some of the encounters. Close Igor and start from beginning to click A-tag Analysis Towed.ipf.

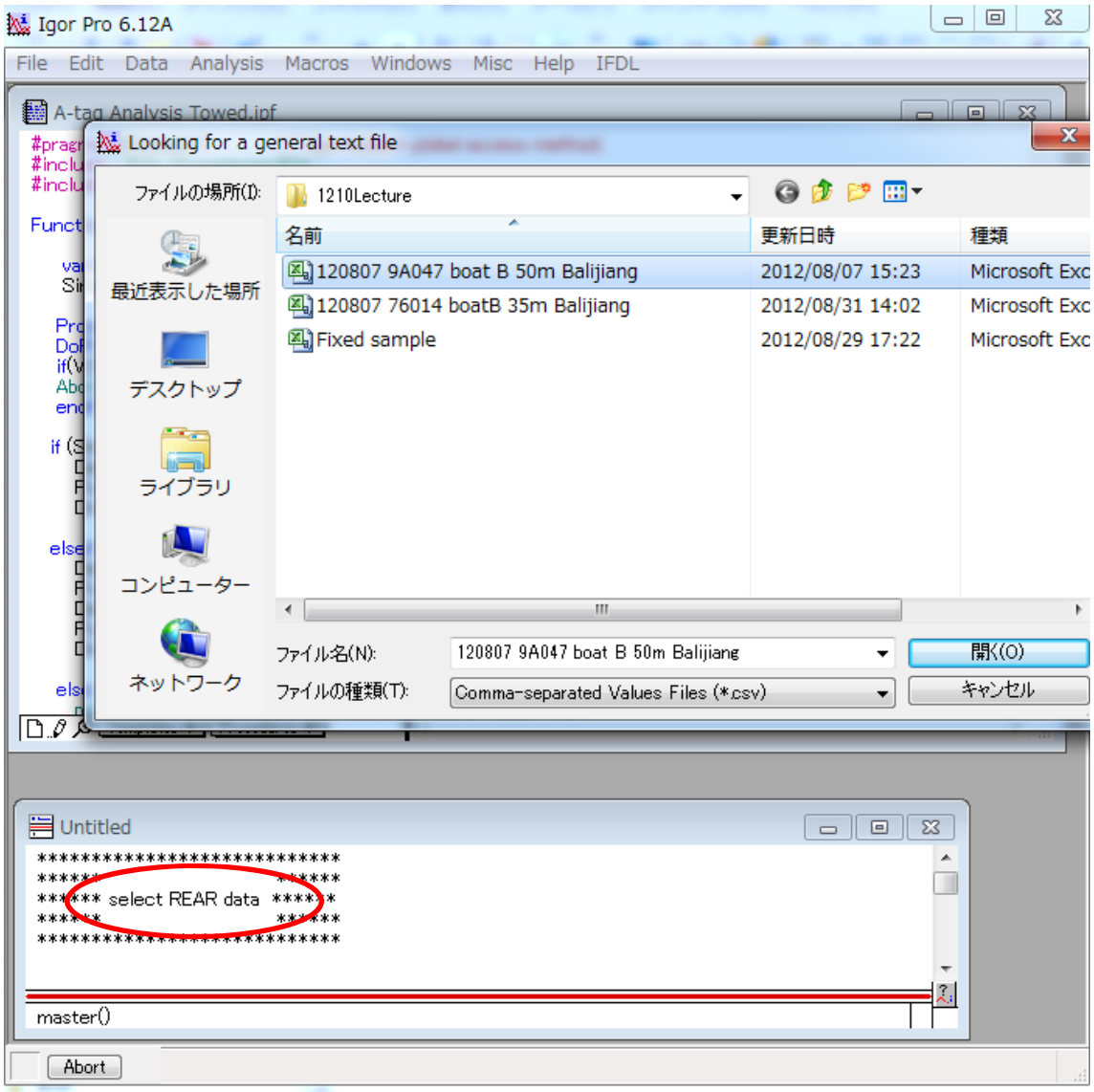


A-tag Analysis Towed.ipf

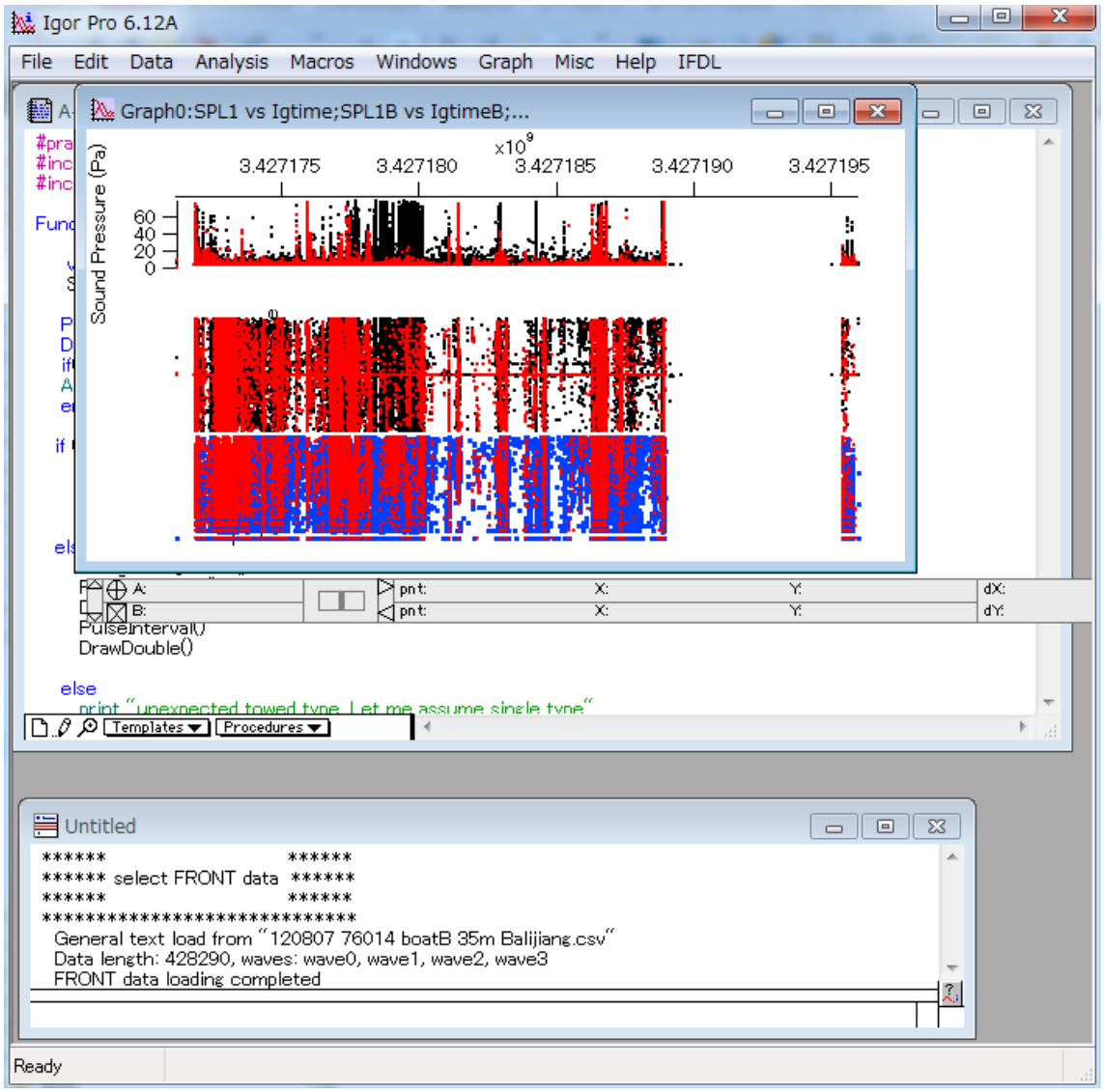
And select Type **2**, click **Continue**



Select REAR data first. Following same manner, load FRONT data second.



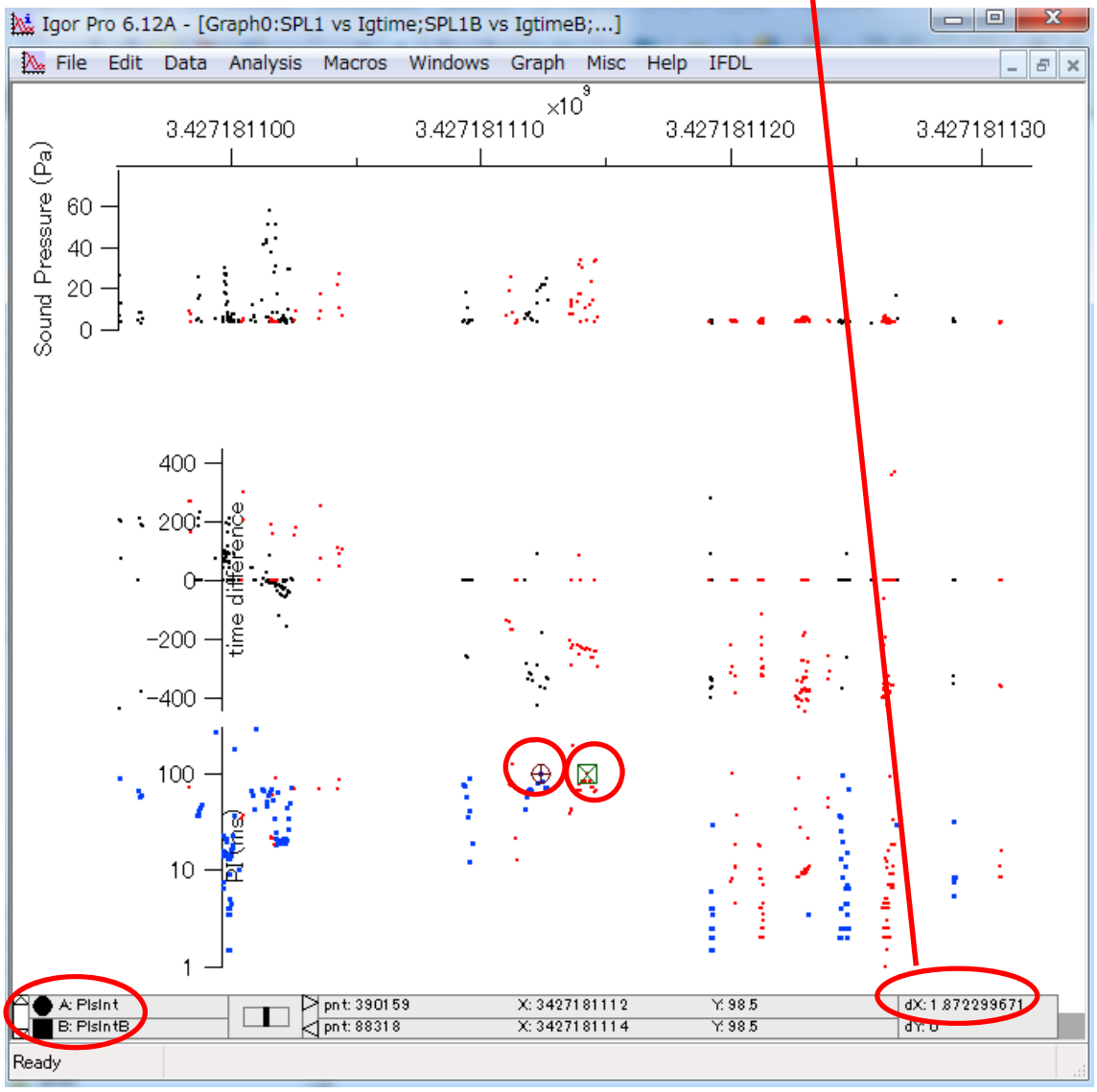
Double view of A-tag recordings appears



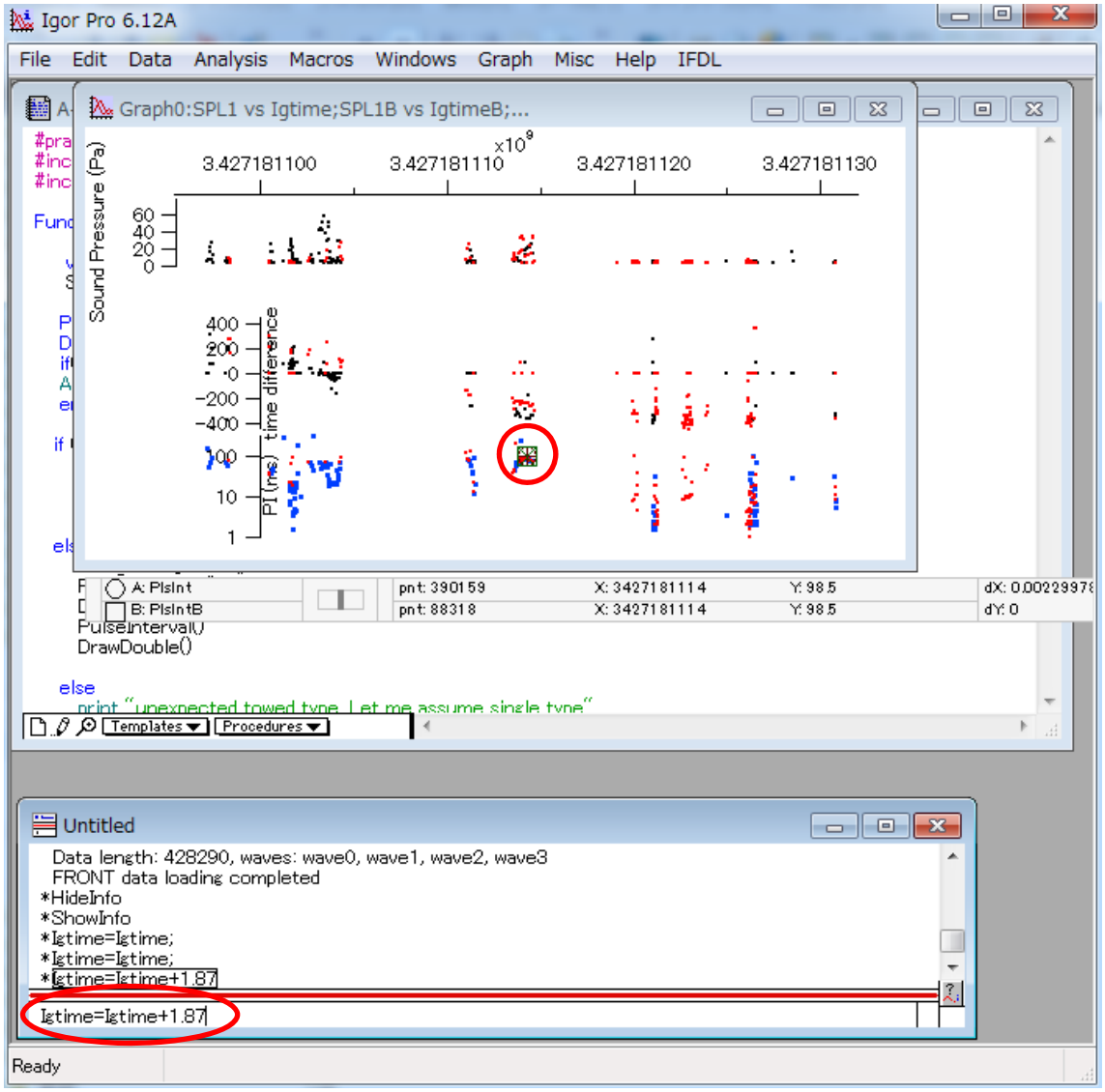
REAR data shown as red dotts.

Select clear biosonar sounds. And find same up-and-down pattern of IPI (inter-pulse interval). Sound arrives nearly simultaneously to the both A-tag. So IPI patterns should be synchronized. In the graph below 1.87 second difference could be found.

Note that Graph > Show Info provide an additional window below. Drag and place● and■ on the same IPI pattern of REAR and FRONT data. You can see time difference dx-1.87229 at the right corner.

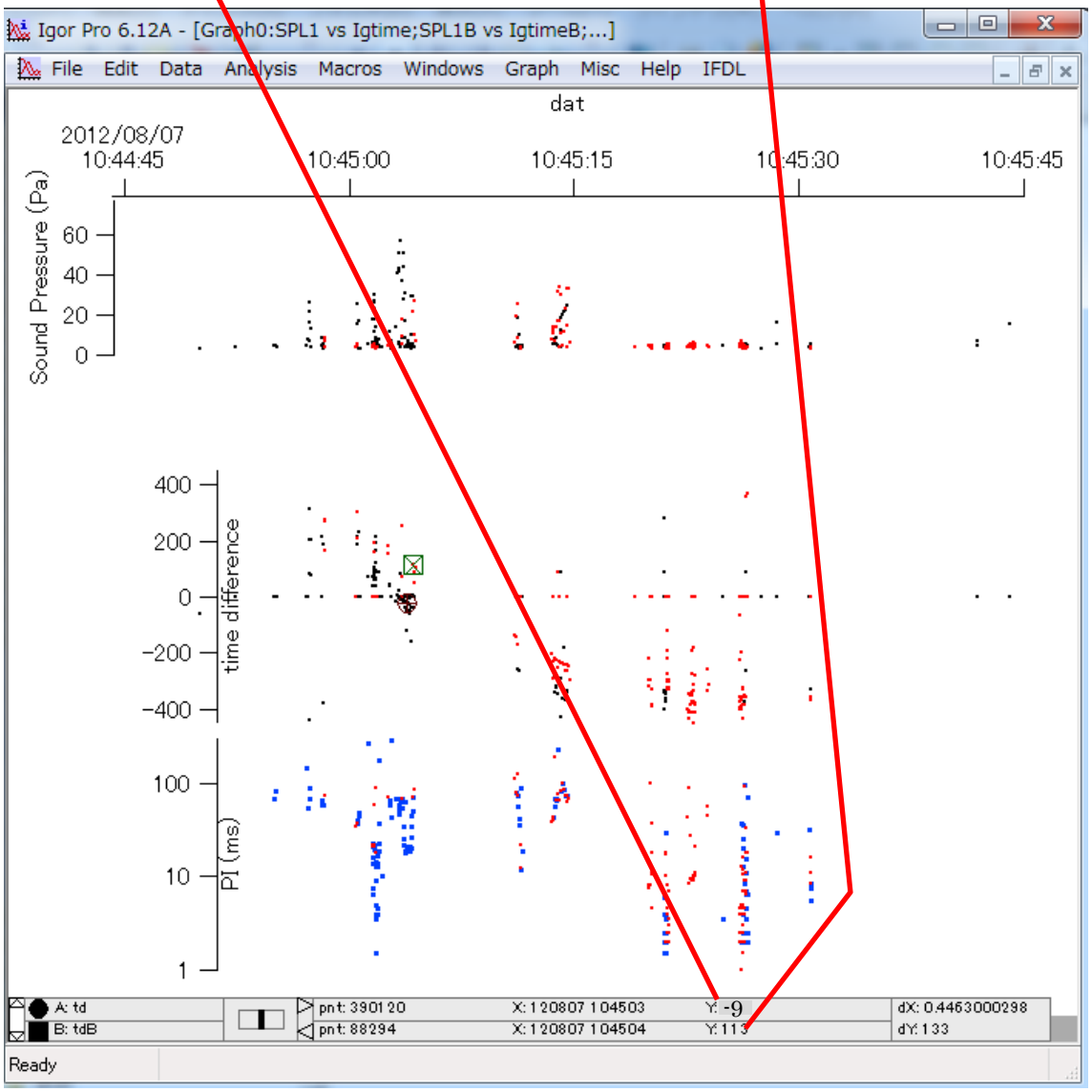


Type Igtime=Igtime+1.87 in the command line and RETURN, you can see two data are synchronized.

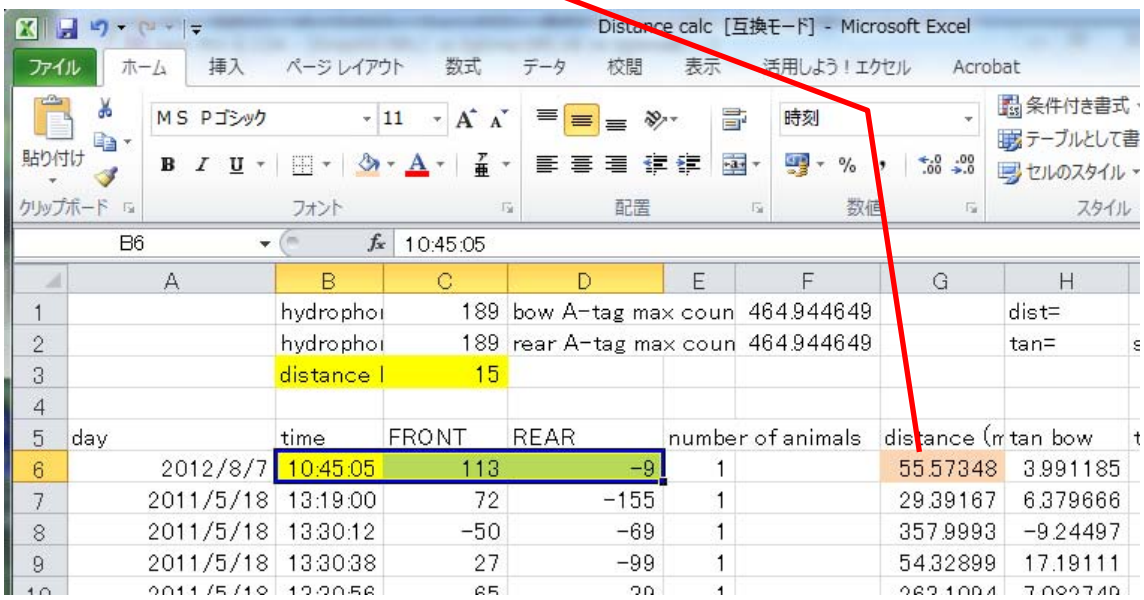


5. Distance measurement

Even after synchronization, time difference of two A-tag is existing, which is the acoustic parallax from two A-tags. They were -9 counts for FRONT A-tag and +113 for REAR A-tag observed at 10:45:05. Note that time difference of FRONT always smaller than REAR's. Because the animal passes by FRONT A-tag earlier.



Open Distance cal.xls and type time and counts of FRONT and REAR. In addition, type the distance between two A-tags at C3. Perpendicular distance (55.57m) appears in G row.



	A	B	C	D	E	F	G	H
1		hydrophor	189	bow A-tag max coun		464.944649		dist=
2		hydrophor	189	rear A-tag max coun		464.944649		tan=
3		distance l	15					
4								
5	day	time	FRONT	REAR	number of animals		distance (m	tan bow
6	2012/8/7	10:45:05	113	-9	1		55.57348	3.991185
7	2011/5/18	13:19:00	72	-155	1		29.39167	6.379666
8	2011/5/18	13:30:12	-50	-69	1		357.9993	-9.24497
9	2011/5/18	13:30:38	27	-99	1		54.32899	17.19111