

LOPC Post-Processing -2009-05-12 (Standard LOPC)

Program Files

Both program files LOPC_PP and LOPC_PostPro are emailed or downloaded without extensions since most servers will block '.exe' files. To render these program files operable - the user must add '.exe' extensions to each of these files as shown in Figure 1. The executable LOPC_PostPro.exe processes data while the executable program LOPC_PP.exe passes input data parameters to the former. Whenever LOPC_PP.exe is executed – it searches for LOPC_PostPro.exe in the same folder -therefore both program files must reside in the same folder as seen in Figure 1 below.

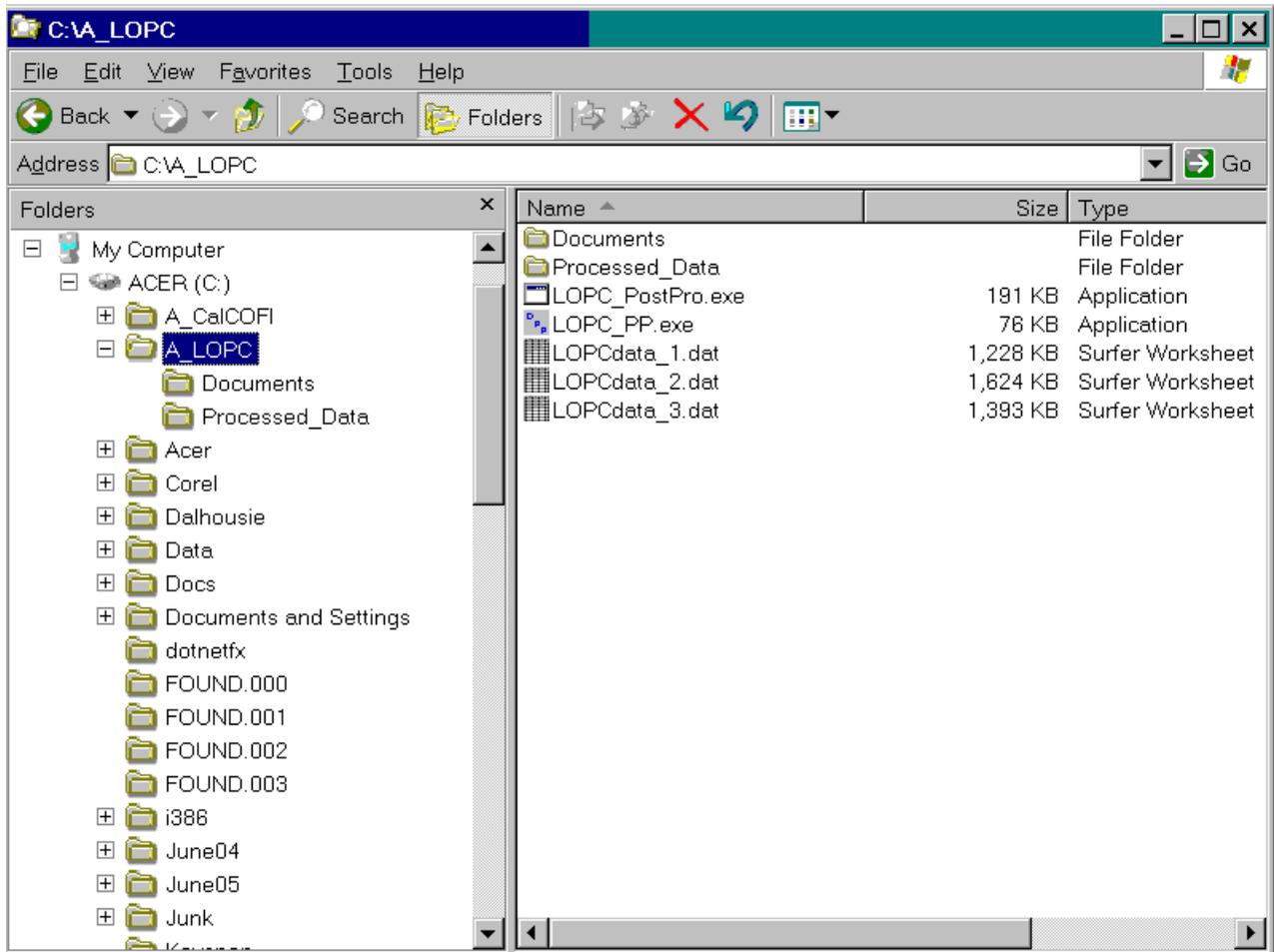


Figure 1

Data Files

LOPC data files (*.dat) can be stored in any directory/folder that will be specified by the user. In this case (Fig.1), data files 'LOPCdata_1.dat, LOPCdata_2.dat & LOPCdata_3.dat' have been stored in the directory 'C:\A_LOPC\'.

LOPC files with format '*.dat' are text files and can be opened with any word processor/text editor. A sample section of the data file LOPCdata_1.dat is shown in Fig. 2. The data file shows several data forms: 1) binned size data, lines L1-L4, containing counts per 15um bin and listed every 0.5 sec, 2) MEP data beginning with 'M', and 3) CTD data beginning with 'C' (Note – depth ~47m). The 3rd data in the line L5 is '50' and refers to the sample time count which separates each 'L1-L5' group by 0.5 sec. The data files (LOPCdata_1.dat...LOPCdata_3.dat) supplied here represent a single cycle of an MVP (Moving Vessel Profiler) consisting of a 'down & up' profile.

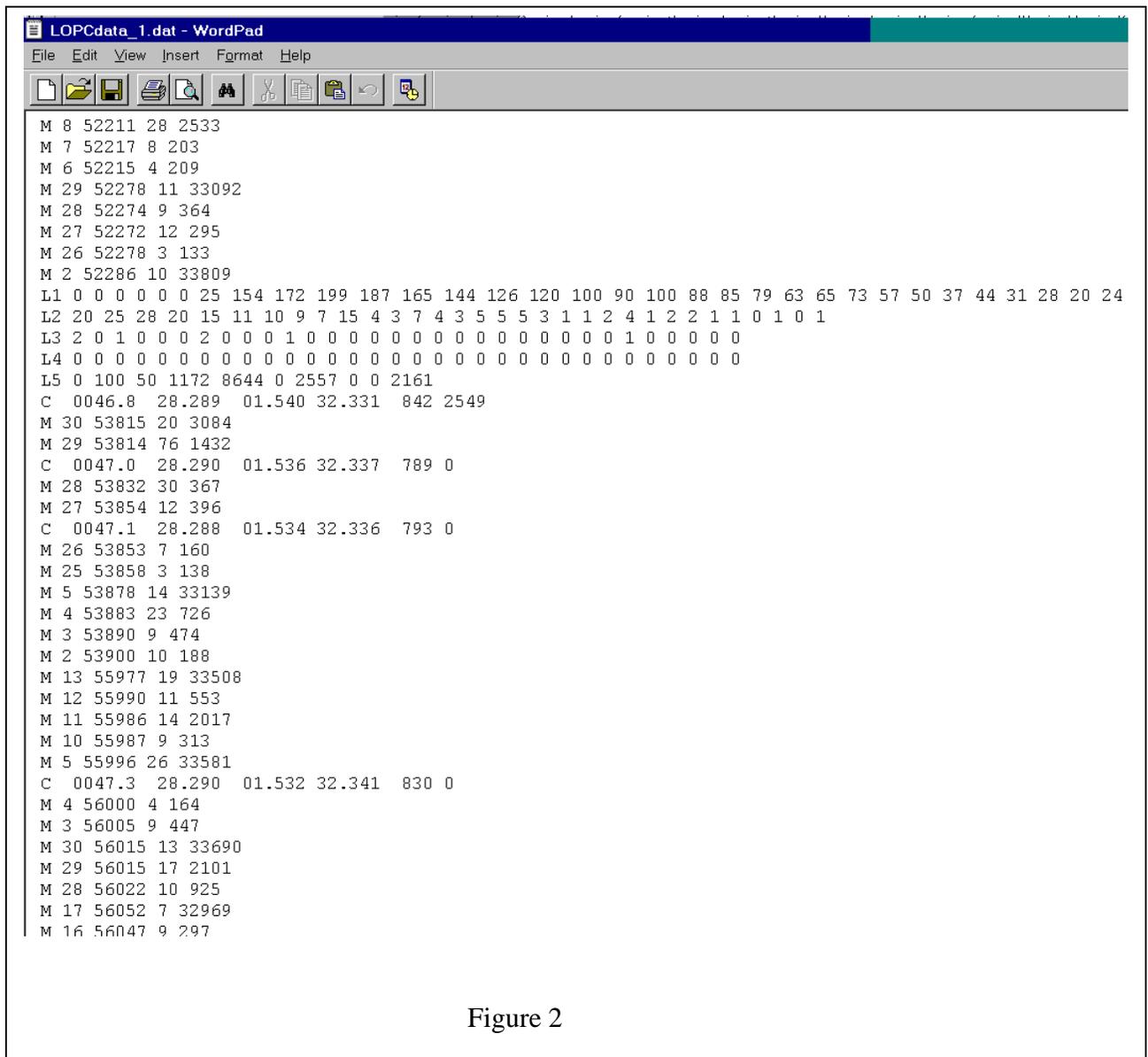


Figure 2

LOPC - Data Processing

Figure 3 shows the input data window corresponding to LOPC_PP.exe. The following describes the input data line-by-line:

1) Source File: represent the path directory where the LOPC data files (*.dat) will be found, ie., in this case, LOPCdata_1.dat.....LOPCdata_3.dat in directory 'C:\A_LOPC\' (Fig.1). The program LOPC_PP.exe is capable of processing a single data file or batch-file processing, that is, processing any number of files numbered sequentially. Files have a 'root name' to which file numbers are added. For example in the source file path below (Figure 3), the root file is 'LOPCdata_' with an extension '.dat' and is displayed as

(No spaces permitted in paths or filenames!!)

Source File: C:\A_LOPC\LOPCdata_.dat [Browse]

Destination Folder: C:\A_LOPC\Processed_Data\ [Browse]

Process Data by...: Depth → Start Depth: 10, End Depth: 90, Process Number: 1

Using CTD Data?: YES, Scan Rate (Hz): 25, CTD Data String: D C T A1 A2 A3 N N N N N, Profile Direction: Descending

Expected Speed (m/s): 2.5, Use LOPC Speed?: Yes, Ellipsoid Ratio: 3.0, Tunnel Area: Standard (7 x 7cm)

FILTER MEP PLANKTON COUNTS:						
	A min	A max	B min	B max	C min	C max
Length (mm)	0.6	10.0	0.3	1.3	0.9	2.3
Diameter (mm)	0.1	0.3	0.6	3.0	2.0	10.0
Length/Diameter	2.0	100.0	1.0	6.0	2.5	7.0

FILTER (SEP & MEP) COUNTS & BIOMASS:					
A min	A max	B min	B max	C min	C max
100	350	351	750	751	1300
1301	2800	2801	3500	(microns)	
D min	D max	E min	E max		

Optional 2: 2, Optional 4: 0, Optional 6: 0, Optional 3: 2, Optional 5: 0

Generate Shape File?: No

[PROCESS] [Exit]

Figure 3

'LOPCData_.dat'. File numbers can be added beginning with a 'Start file #' and finishing with an 'End file #' and these are listed in the data blocks labelled 'Optional 2' and 'Optional 3' located in the bottom left corner of the window in Figure 2. In the

example shown in Figure 2, we wish to process only one data file 'LOPCdata_2.dat' –and therefore the starting file # is '2' and the end file # is '2'. These numbers are added to the root file to create a start file 'LOPCdata_2.dat' and the end file with the same name 'LOPCdata_2.dat' – found in the source file directory.

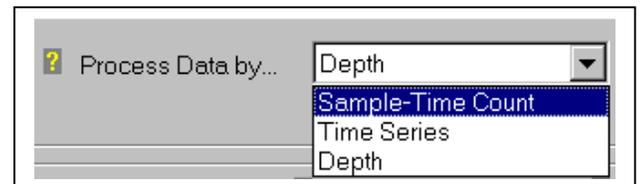
If the user wishes to process batch files, say 3 files – 'LOPCdata_1.dat' through to 'LOPCdata_3.dat', for example, then both 'Start file' should be labelled '1' and the 'End file' should be labelled '3' and therefore inserted in data blocks 'Optional 2' and 'Optional 3' - as shown in Figure 3.

2) Destination Folder: path directory where the output files are to be stored, ie 'C:\A_LOPC\Processed_Data\'

3) Process Data by.. :

There are 3 choices for processing LOPC data:

- **Sample-Time Count:** the user can process LOPC data between any 2 sample-time counts (from L5). The data file must contain CTD data (ie., C-lines)
- **Time Series:** the user can process LOPC data between any 2 sample-time counts (from L5), however there is no CTD data in the file. This is typically used for LOPC data obtained from a lab circulator.
- **Depth:** user can process LOPC data between any 2 depths of a profile.



i) Sample-Time count:

Figure 4 show LOPC_PP.exe set for processing data is processed from a 'Start Count' and a "End Count" found in the .dat file (note: it assumes there is CTD data present). The 1/2 sec. time count is found in the L5 line of the data file, eg., the 3rd data number:

```
L5 0 100 50 1172 8644 0 2557 0 0 2161
```

- in this case '50'. The start & end count can be selected by opening the .dat file using a word processor, eg. WordPad, and scrolling through the data. Typically, the user can choose the start time count at or near the beginning of the data file and the end time count at or near the end of the data file. Note: extremely large files may not fit into the program buffers and may not execute (ie. >15Mb). Once executed, the program will then process file 'LOPCdata_1.dat' between the time-counts '28 & 65'.

It is possible to batch-process files in the 'Sample-Time Count' mode using multiple files, say, from 'LOPCdata_1.dat....LOPCdata_3.dat'. However it may not be feasible to use the same 'Start & End Count' for all 3 files. User can then choose extreme values such as those shown in Fig. 5 from '1-100000'. If the program cannot find these values, it will simply choose the 'Start & End' count from the first and last L5 line found in the

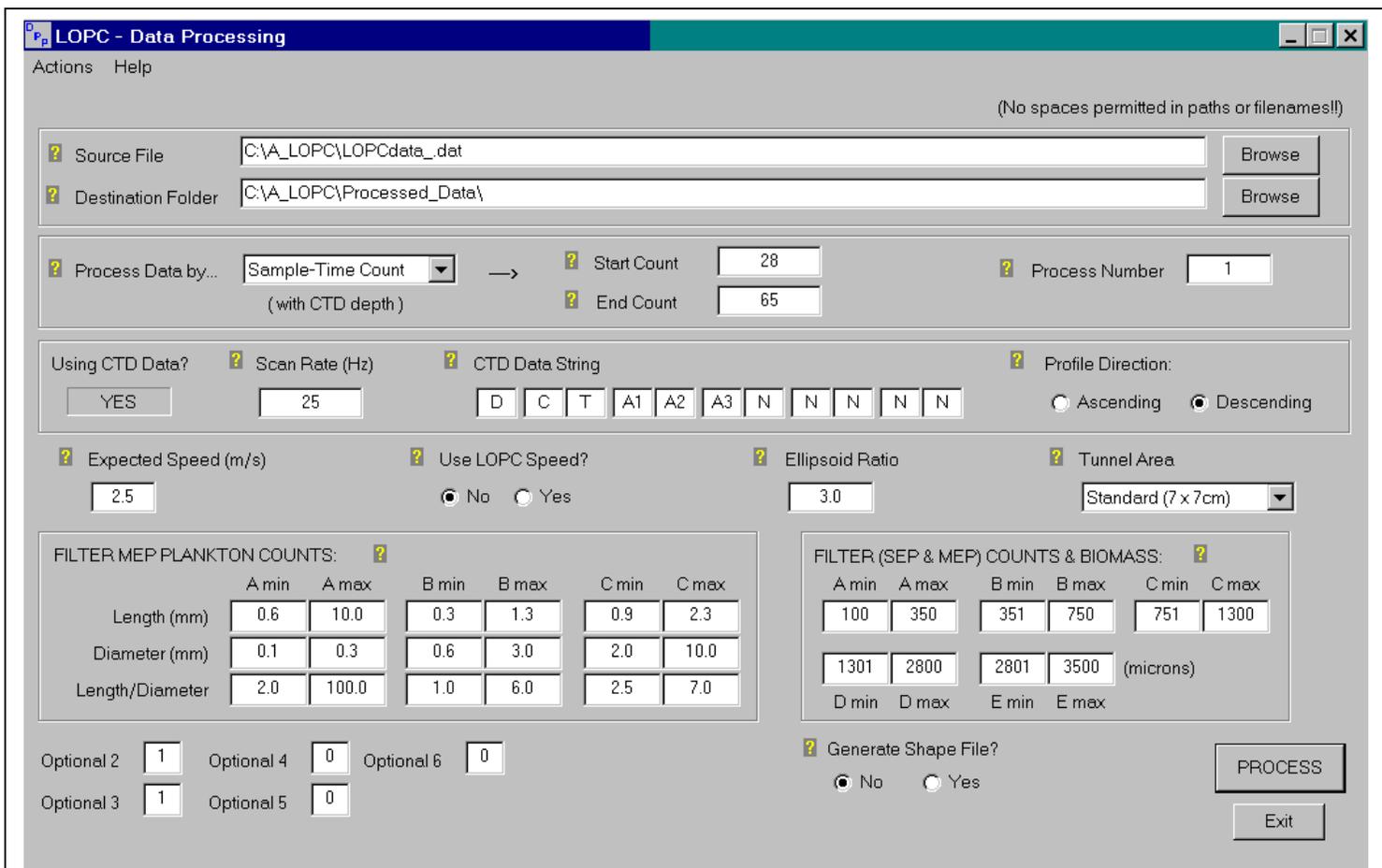


Fig. 4

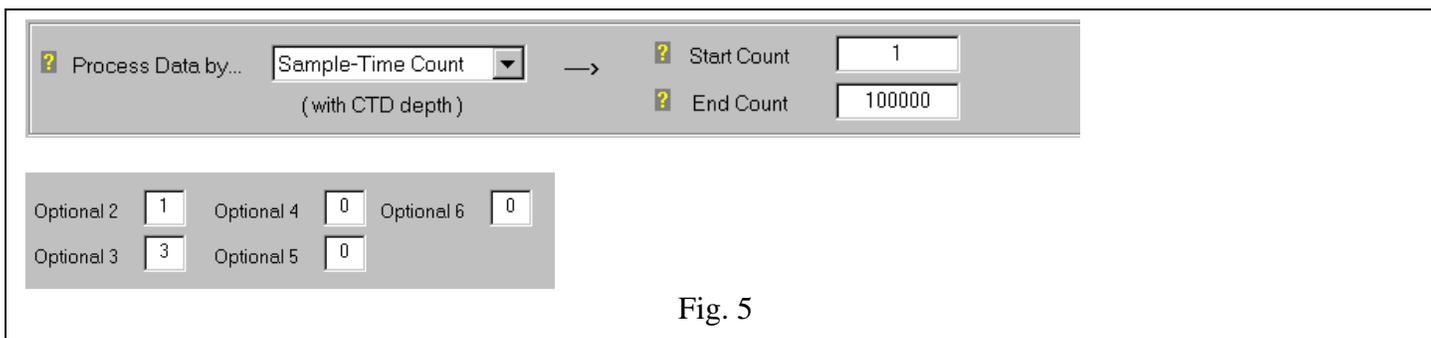


Fig. 5

data files. (Note:- the user must also be wary of such analyses since there may be ‘excessive’ or ‘false’ data present in, say, the first few time counts of the file where: i) near-surface bubbles may be present or ii) there may have been an MEP buffer dump upon starting the file.) Note also that the first and last data file #'s ‘1 & 3’ were inserted into the slots ‘Optional 2 & Optional 3’ in order to process all 3 files.

Note that this processing mode is meant to process a profile in one direction only, either ascending or descending. It cannot correctly process both directions. So user must select a sample-time count range that will include all or part of the profile for the descent or the ascent only.

ii) Time Series:

Figure 6 shows LOPC_PP.exe set for processing data is processed from a 'Start Count' and a 'End Count' found in the .dat file (note: it assumes there is no CTD data present and CTD parameter entry options are blanked out – see Fig. 6). The 1/2 sec. time count is found in the L5 line of the data file, eg., the 3rd data number:

```
L5 0 100 50 1172 8644 0 2557 0 0 2161
```

- in this case '50'. The start & end count can be selected by opening the .dat file using a word processor, eg. WordPad, and scrolling through the data. Typically, the user can choose the start time count at or near the beginning of the data file and the end time count at or near the end of the data file. Note: extremely large files may not fit into the program buffers and may not execute (ie. >15Mb). Once executed, the program will then process file 'LOPCdata_1.dat' between the time-counts '28 & 65'.

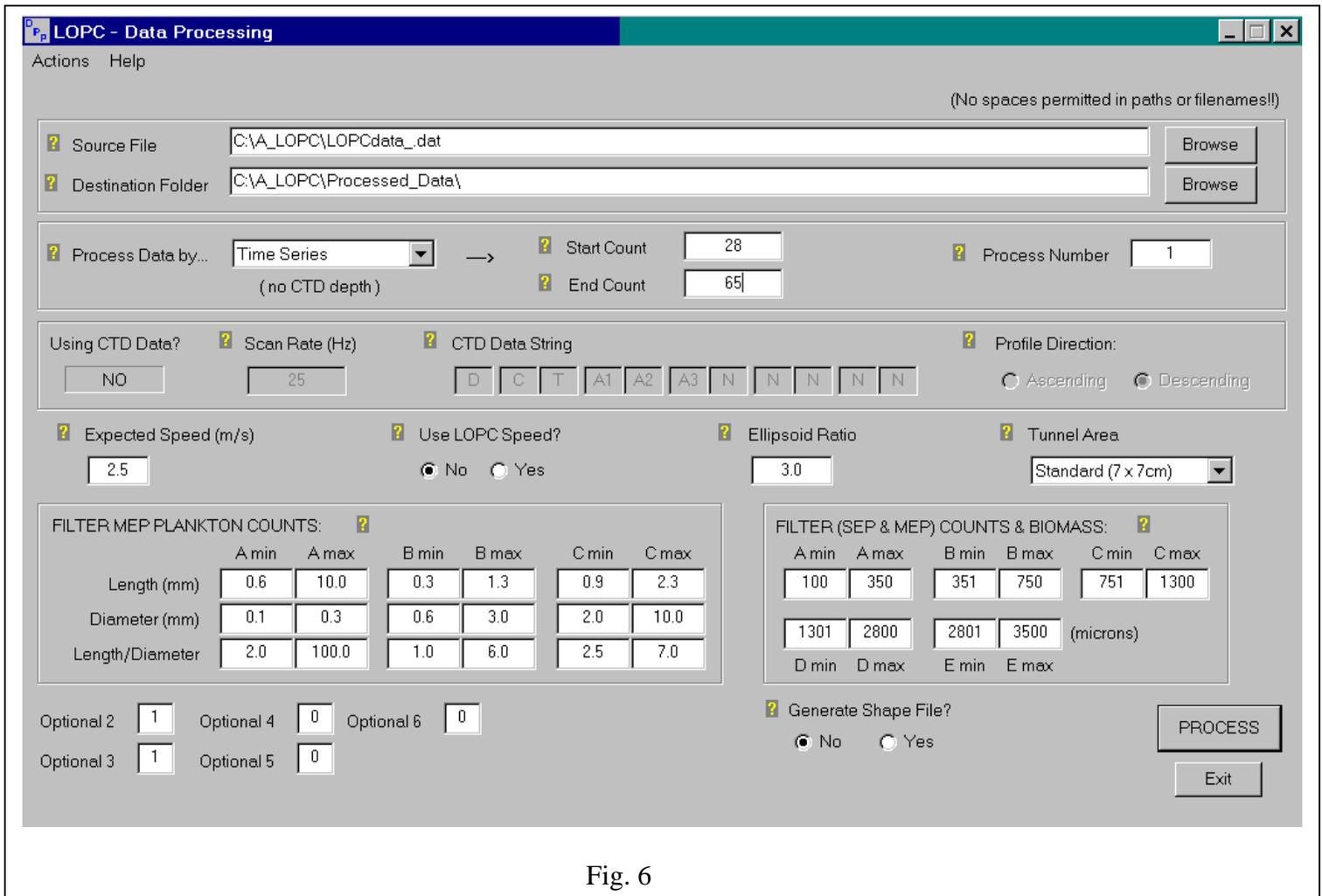


Fig. 6

It is possible to batch-process files in the ‘Sample-Time Count’ mode using multiple files, say, from ‘LOPCdata_1.dat.....LOPCdata_3.dat’. However it may not be feasible to use the same ‘Start & End Count’ for all 3 files. User can then choose extreme values such as those shown in Fig. 5 from ‘1-100000’. If the program cannot find these values, it will simply choose the ‘Start & End’ count from the first and last L5 line found in the data files. (Note:- the user must also be wary of such analyses since there may be false data present in, say, the first few time counts of the file where: i) near-surface bubbles may be present or ii) there may have been an MEP buffer dump upon starting the file.) Note also that the first and last data file #'s ‘1 & 3’ were inserted into the slots ‘Optional 2 & Optional 3’ in order to process all 3 files.

iii) Depth:

Figure 7 shows the ‘LOPC_PP.exe’ input window for ‘Process Data by....Depth’. In this

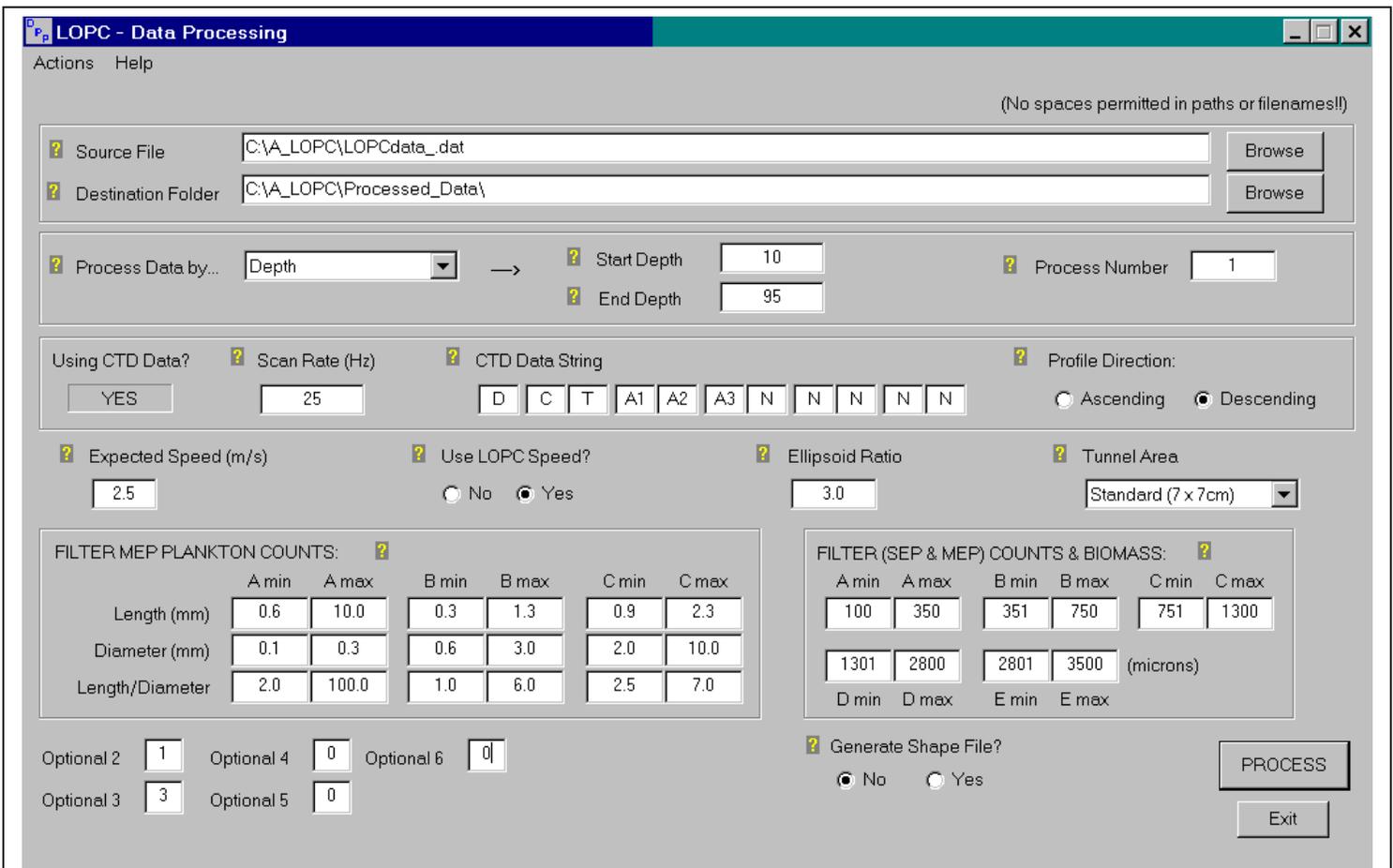


Fig. 7

example, the ‘Start & End Depth’ was selected as ‘10’ & ‘95’ meters. Since the data file contains both descending & ascending profiles, the user must select the profile direction

of sampling. In this case, ‘Descending’ was chosen, as shown in Fig. 8. As a result, data will be processed between 10-95m - for 3 files - on the descending profile only. Note that, when either ‘Ascending or Descending’ is selected, the ‘Start Depth’ always refers to the near-surface depth ($\geq 4\text{m}$) and ‘End Depth’ always refers to bottom depth of the dive.

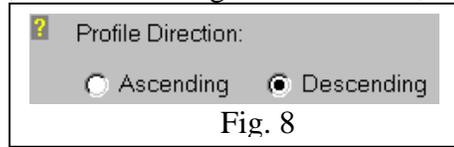


Fig. 8

Other processing selections are also available. Since the program will not process data at depths $< 4\text{ m}$, the selection of ‘1’ - as shown in Fig. 9 – directs the program : i) at the ‘Start Depth’, to begin analyses at the top of the dive when the LOPC/fish (or vehicle) reaches a fall speed of $> 0.5\text{m/sec}$, and ii) at the ‘End Depth’, to end the analyses when the LOPC/fish turns around and begins ascending. Note that, when either ‘Ascending or Descending’ is selected, the ‘Start Depth’ always refers to the near-surface depth ($\geq 4\text{m}$) and ‘End Depth’ always refers to bottom depth of the dive.

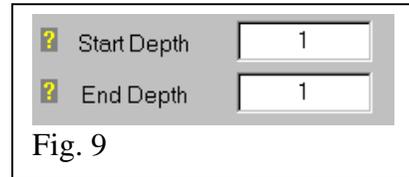


Fig. 9

Other selections are available as shown in Fig. 10. In the first example, 15m is the near-surface depth selection while the ‘End Depth’ will be the depth at which the fish turns around. In the second example (Fig. 10), the ‘Start Depth’ will be the depth at which the fish begins to descend ($> 0.5\text{m/sec.}$) while the ‘End Depth’ will be at 85m.

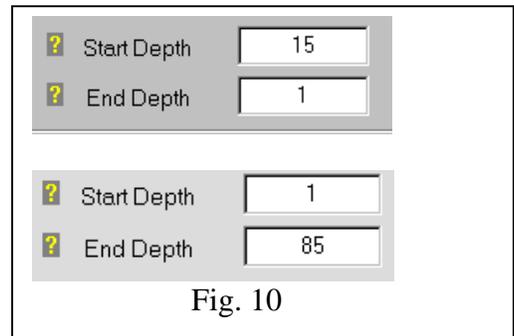


Fig. 10

4) Start & End Count (Depth):

As described above (Figs. 5, 9, 10)– the input entries for the start & end counts (depth) for processing data.

5) Process Number:

As shown in Fig. 11, an ID tag added to the output data file. For example, if the 2nd file ‘LOPCdata_2.dat’ is processed, the output data file will be specified as ‘LOPCdata_2_1_Data.csv’ where the ID tag ‘1’ is added to the end. The ID tag is useful for identifying output files which differ in choices of analysis parameters.

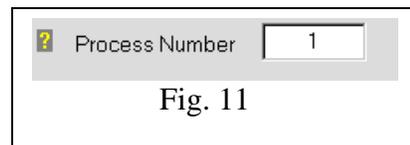
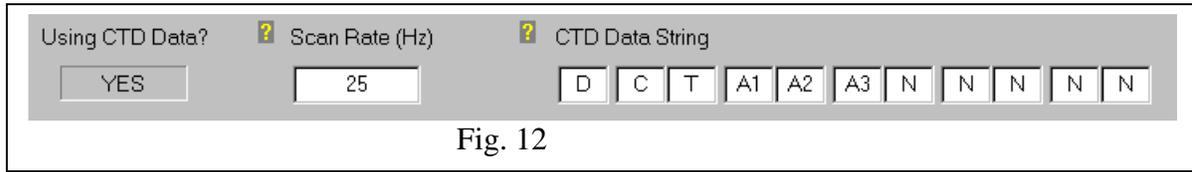


Fig. 11

6) Using CTD Data?:

This is automatically selected by the program as ‘Yes or No’ (Fig. 12) based on the choice of ‘Time Series (No) – Sample-Time Count (Yes), - or Depth (Yes).



7) Scan Rate:

Insert the scan rate of the CTD used – in these examples the scan rate is 25 Hz

8) CTD Data String:

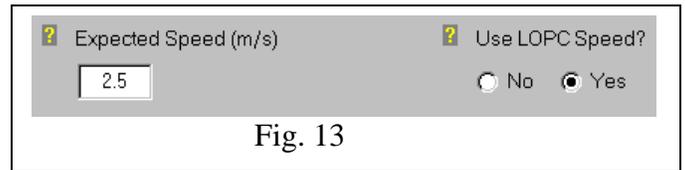
Instructs the program as to what data (& their order) in the CTD string will be encountered in the C-line when reading the file. For example, in the data file shown in Fig. 2, the first 3 data encountered are depth, conductivity, and temperature and are denoted as D, C, T as shown in Fig. 12 (D, C, T must be denoted in their correct order). The remaining 3 numbers are additional analog data denoted by A1, A2, A3 and may be unspecified (in fact, the 4th data number is calculated salinity –but there is no ‘S’ notation). The remaining squares are occupied by ‘N’ – denoting ‘no data’. Since there are 6 data numbers in the C-line, there must be 6 data squares denoted in Fig. 12.

9) Profile Direction:

As described above in Fig. 8.

10) Expected Speed:

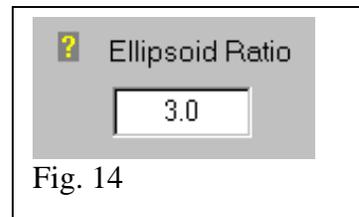
Always select an expected flow speed based on the LOPC speed (Fig. 13). This speed is used to calculate water volume sampled and ‘shape’ images of MEPS. If the LOPC flow speeds are not reliable in sampled region, the user may choose ‘No’ for ‘Use LOPC Speed?’ and the program requires an ‘Expected Speed’ to do calculations. Even if ‘Yes’ is selected for ‘Use LOPC Speed?’, always select a value for ‘Expected Speed’.



11) LOPC Speed?: (Fig. 13). Does the user wish to use LOPC speed? If so – it will be calculated from parameters in L5. If not, program will use ‘Expected Speed’.

12) Ellipsoid Ratio:

Biomass is calculated based on an average particle shape. If a spherical shape is used, then the biomass is over-estimated. A mean particle shape is assumed as ellipsoidal and the parameter can be set as the ratio of the major-to-minor axis.



13) Tunnel Area

The tunnel area is selected here and the cross-sectional area is used in flow volume calculations.

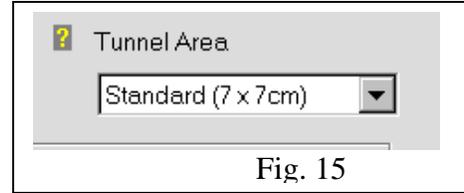


Fig. 15

14) Filter MEP Plankton Counts

The program creates shape images based on MEP data. This function attempts to assign length & width to each MEP and sometimes provides identification of specific particles. The most practical application of this analysis is for large particles such as euphausiids.

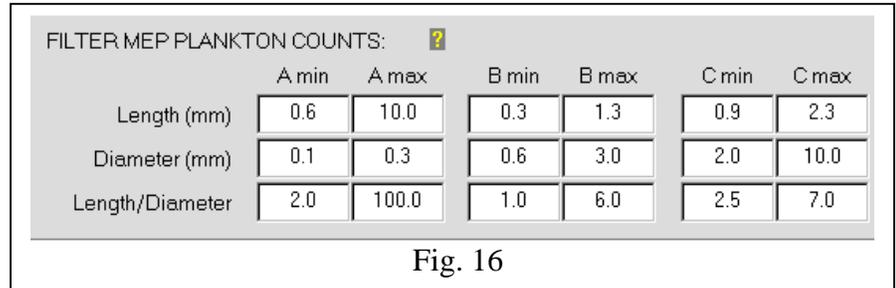


Fig. 16

15) Filter (SEP & MEP) Counts & Biomass

This function separates all counts & biomass data (total and /m³) based on 5 selected size range listed in Fig. 17 and reports these in the output data file.

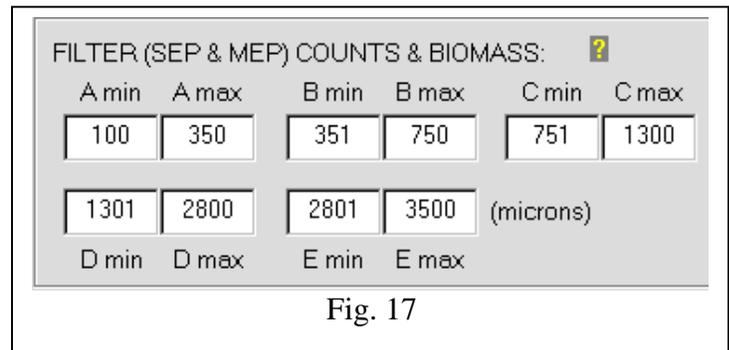


Fig. 17

16) Optional 2, 3, 4, 5, 6

As described in Section 1 'Source File; and in Fig. 3, 'Optional 2 & 3' are used to specify the file numbers to be analyzed from first to last. 'Optional 4, 5, 6' are experimental only and must be set at '0' by the user.

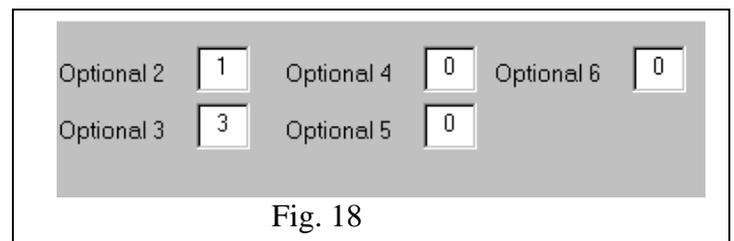


Fig. 18

17) Generate Shape File

This function will generate a csv file containing shape image data calculated from the MEP data. The instructions for working with this data are provided separately.

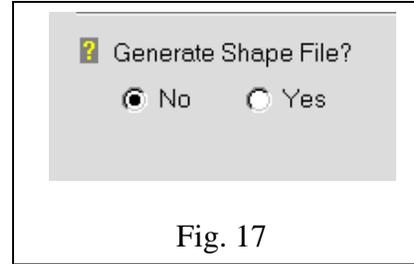


Fig. 17

18) Process

By clicking on 'Process', the file 'LOPC_PP.exe' is executed, call upon program 'LOPC_PostPro.exe' begins processing data, and display a DOS command window as shown in Fig. 19.

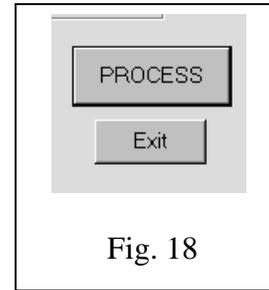


Fig. 18

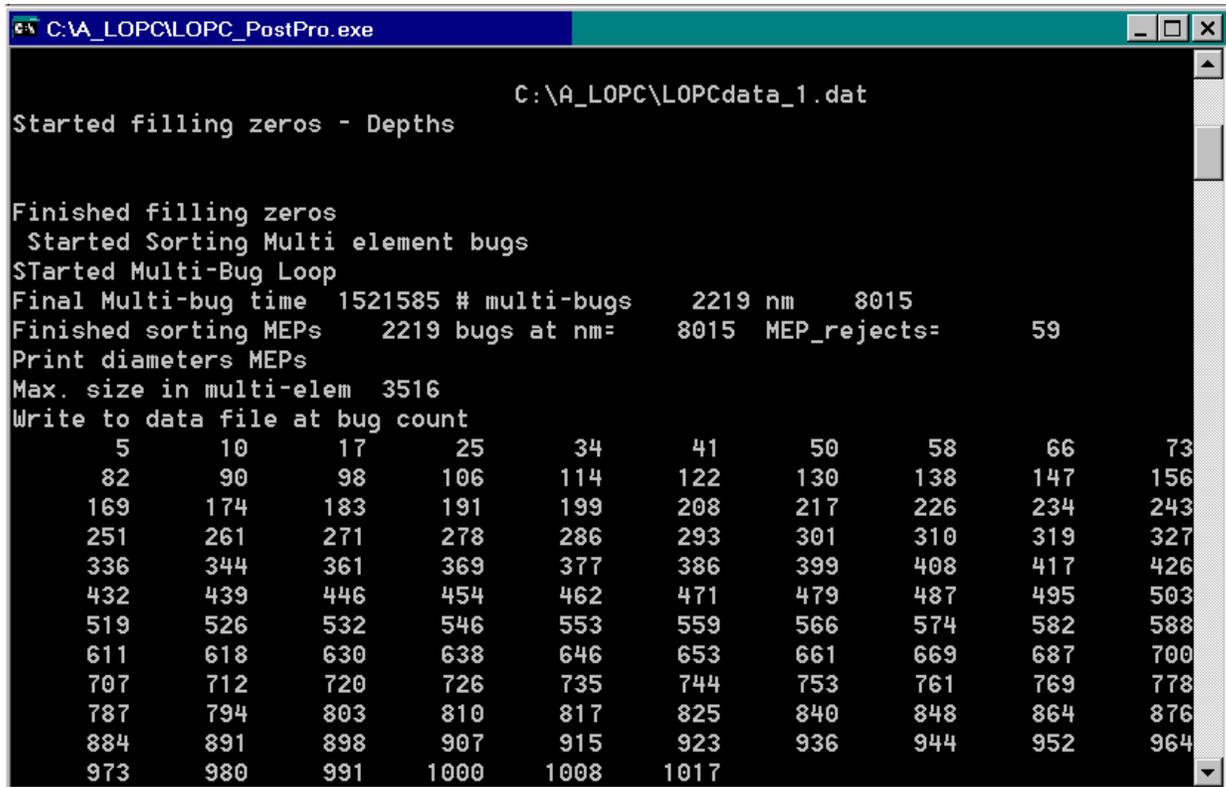


Figure 19