HOW TO BUY A SMART MULTICHANNEL COUNTER
AND GET A FREE MICROCOMPUTER

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We count a lot of benthos samples in our lab. One way that we have made this job easier has been to use mechanical or electronic count accumulators to keep track of the most abundant organisms. These devices are expensive and have only a limited number of keys. A few models we have tried are unreliable. We have recently found a way to take advantage of the explosion in microcomputer technology to make a counter that is inexpensive, highly reliable, intelligent, interfacable, easy to use, and can have many input keys.

A standard electronic count accumulator increments a storage register each time a particular button is pushed. Microcomputers equipped with BASIC language define a new incrementable storage register every time a new variable is mentioned in a program. I have taken advantage of this to write the following BASIC program that turns a microcomputer into a multichannel counter that has as many storage registers as it has keys. This edition is written in Microsoft BASIC and illustrates the principal of operation:

```
5 DIM X%(12,12)
10 PRINT"NEXT OBSERVATION? (? FOR PRINT)"
20 IF A$="?" THEN 110
30 PS=""$1
40 A$=INPUT$(1)
50 PRINT A$
60 Q1%=ASC(A$)
70 T%=INT(Q1%/10)
80 O%=Q1%-(10*T%)
90 X%(T%,O%)=X%(T%,O%)+1
100 GOTO 10
110 PRINT"PRINT WHAT KEY CONTENT? (/ FOR ENTER OBS)"
120 A$=""
130 IF PS="/" THEN 10
140 PS=INPUT$(1)
150 Q1%=ASC(P$)
160 T%=INT(Q1%/10)
170 O%=Q1%-(10*T%)
180 PRINT X%(T%,O%)
190 GOTO 110
200 END
```

Each time a key is pressed a storage register corresponding to that particular key is incremented by 1. The cumulative count total for each key can be viewed by pushing "?" and a subsequent return to the counter mode is made by pushing "/". The heart of the program is at line 60 where the ASCII integer value for each character on the keyboard is generated. These are integers between about 33 and 127. When a key is pressed, the integer value for that
key is returned, it is decomposed into matrix coordinates (rows & columns) corresponding to the "tens" and "ones" places of the ASCII integer value (lines 70 & 80), and that cell of the storage matrix (established in line 5) is incremented (line 90). For example, the ASCII integer value for "G" is 71, corresponding to row 7, column 1 of the storage matrix. When "G" is pushed, row 7, column 1 of the matrix is incremented by 1. The cell is viewed by generating the ASCII integer value's matrix coordinates and printing the contents of the corresponding matrix position. This program is rudimentary and will run (with minor modification) on most microcomputers.

We have found that the family of handheld micro's are especially well suited for use as counters provided that their keys are large enough to be labelled with the name of the organism and pushed conveniently. Portable Computer lists more than a dozen models of handheld computers available at prices ranging from $70 to $480 (US). We use Sharp™ 1500A's (list $220 US; much lower by mail-order) because it has large keys that are well separated, has ample memory, can easily be connected to a dedicated printer or storage device, and maintains memory even when turned off or AC power fails. I have written a full menu-driven program for this model. This program includes a decrement function for correcting errors, provides an audible safeguard against inadvertent clearing of memories, and can be used with a printer. Entry of a count is verified both on the screen and by audible tone. Key sensitivity can also be adjusted. A free copy of this program is available from me on request.

We have found that microcomputers used as counters are efficient, reliable, easy to use, and make counting a bit less dreary.