APPENDIX A. Terms and variables

ΔL	-	length increment; or - width of length class in grouped data; or difference between two successive mean lengths
$\Delta L/\Delta t$	-	growth rate expressed as difference
Δt	-	time difference, e.g., the time needed by an average fish to grow from the lower to the upper limit of a length class
$\Delta\delta$	-	difference between two successive standard deviations
δ	-	standard deviation of variates, used as a measure of their dispersion
δ^2	-	variance; the square of δ
$	-	US dollars, or any other monetary unit
Σ	-	summation sign
π	-	pi = 3.1415...
ø	-	phi, i.e. a weight-based index of growth performance ($ø = \log_{10}(K) + 2/3 \log_{10}(W_\infty)$)
ø'	-	phi-prime, i.e. a length-based index of growth performance ($ø' = \log_{10}(K) + 2\log_{10}(L_\infty)$)
a	-	Y-intercept in a Type I, or AM linear regression, or - multiplicative term in a length/weight relationship
a'	-	Y-intercept in a Type II, or GM linear regression
AM	-	arithmetic mean; used to characterize "Type I" regressions
ASP	-	"Available Sum of Peaks"; the sum of available "points" in a file restructured for analysis with the ELEFAN I routine
B	-	biomass, or stock size in weight

b	-	exponent of a length-weight relationship, or - slope of Type I (AM) linear regression
b'	-	slope of a Type II (GM) linear regression
B/R	-	biomass per recruit
B'/R	-	relative biomass per recruit
C	-	refers to fields that will accept alpha-numeric entries when used to describe the characteristics of a field, or - catch in numbers, or - parameter expressing the amplitude of seasonal growth oscillation in the VBGF, or - a constant
c	-	the fraction L_c/L_∞
C.V.	-	coefficient of variation, i.e. C.V. = δ/X (also expressed in %, i.e. C.V. = δ · 100/X)
C/f	-	catch per unit of effort (also: CPUE)
c1, c2	-	multipliers for estimating Z and its standard error using one of Hoenig's methods
CGA	-	Colour Graphic Adapter
Ch	-	refers to limited choice fields (i.e. users have to choose from a list).
$C_{Li,\infty}$	-	cumulative catch in numbers from length i to L_∞
$C_{i,A}$	-	cumulative catch in numbers for mesh size m_A
$C_{i,B}$	-	cumulative catch in numbers for mesh size m_B
cm	-	centimetre
C_t	-	terminal catch, as used in VPA
D	-	Fraunhofer diffraction function in Shepherd's method, or - dimension, as in "2D", "3D"
DD	-	two digit number denoting the day of a month, or - degrees latitude
DDD	-	three digit number denoting the degrees longitude

d.f. - degrees of freedom, i.e. the "real" number of cases available for testing a statistical hypothesis

e - base of the natural (or Napierian) logarithms; e = 2.71828...

E - exploitation rate; E = F/Z

$E_{0.1}$ - level of exploitation at which the marginal increase in yield per recruit reaches 1/10 of the marginal increase computed at a very low value of E

$E_{0.5}$ - exploitation level which will result in a reduction of the unexploited biomass by 50%

E_{max} - exploitation level which maximizes Y/R or Y'/R

EGA - Enhanced Graphic Adapter

EPSON - registered trademark of Seiko Epson Corp., Japan

ESP - "Explained Sum of Peaks"; the points "explained" (or hit) by a growth curve traced by the ELEFAN I routine

EXP - exponent

F - instantaneous rate of fishing mortality

f - fishing effort

f-factor - factor used as a multiplier to simulate a change in effort level, for a defined fishing regime

fl - index for fleet

F_t - terminal fishing mortality, as used in VPA and cohort analysis

g - gram

GM - geometric mean, used in Type II regression

HD disk - High-density disk with a capacity of 1.44MBytes for 3½" disk and of 1.2MBytes for 5¼" floppy disk.

HERCULES - Hercules graphic adapter for monochrome screens, with a resolution of 729 by 348 pixels.

HP - registered trademark of Hewlett-Packard Co., USA

i - symbol or subscript used for counting items (samples, means, etc.)

IBM - Registered trade mark of International Business Machines, Corp., USA

K - curvature parameter of the VBGF

k - the number of parameters estimated by a given procedure

L - "length" of a fish, shrimp, etc. (length itself is defined differently, depending on what is measured, see TL, SL, FL, etc.)

$\bar{L}$ - mean length of fish, computed from L' upward, or
- mean of two or more lengths, e.g., mean of length at tagging and at recapture

L' - a length not smaller than the smallest length of fish fully represented in catch samples; used to compute L

L* - largest observed specimen in a sample

L/F - length-frequencies or length-frequency sample

L_{25} - length at which 25% of the fish will be vulnerable to the gear (left-hand selection)

L_{50} - length at which 50% of the fish will be vulnerable to the gear (left-hand selection)

L_{75} - length at which 75% of the fish will be vulnerable to the gear (left-hand selection)

LAN - Local Area Network

L_c - mean length of fish at first capture; equivalent to L_{50}

L_m - length at tagging or marking

L_{mass} - mean length at first maturity (or "massive maturation")

L_{max} - maximum length reached by the fish of a given stock; may also be predicted from the largest specimens of several samples using the extreme value theorem

L_{min} - smallest length represented in one or several samples

ln - $\log_e$, logarithm of base e

log - $\log_{10}$, logarithm of base 10

L_r - length at recapture, or
- mean length at first recruitment

L_r' - computed length at recapture given growth parameters (L_∞ and K) and length at marking

L_A - optimum length for mesh size m_A

L_B - optimum length for mesh size m_B

L_t - (mean) length at age t

L_∞ - asymptotic length, i.e. the (mean) length the fish of a given stock would reach if they were to grow forever

M - instantaneous rate of natural mortality, i.e. due to all causes except fishing

m - mesh size, or
- metre

m_A - gillnet mesh size

m_B - another gillnet mesh size, with $m_B > m_A$

ML - "mid-length" or length class midpoint

MM - two digit number denoting the month of a year, or
- minutes in latitude and longitude

MPA - modal class progression analysis

MS DOS - disk operating system for IBM PCs or its compatibles, or
- registered trademark of Microsoft Corp., USA

n - number of items in a sample, number of cases investigated, etc.

N - number of fish in a given size class of a catch sample, or

- refers to numeric fields, i.e. indicates that only numbers can be entered;

N_t - number of fish in the oldest age group of a cohort or population ("terminal population")

P - probability of capture or occurrence on the fishing ground

P_L - probability of capture for length (or mid-length) L

P_1 - first point of a length-converted catch curve included in the computation of Z; this point is by definition the first where the probability of capture is 1

PC - Personal Computer; also microcomputers

Prompt - a software message or signal inviting the user to enter data, or to perform an operation

r - product-moment correlation coefficient

r^2 - coefficient of determination

R_{50} - length at which 50% of the fish will no longer be vulnerable to the gear (right-hand selection, or deselection)

R_{75} - length at which 75% of the fish will no longer be vulnerable to the gear (right-hand selection, or deselection)

RAM - Random Access Memory; a part of the memory of the computer where the program and the data are loaded.

R_n - "goodness-of-fit" index of the ELEFAN I routine ($=10^{ESP/ASP}/10$)

S - score function in Shepherd's method

SF - selection factor

SI - separation index

SL - starting length; one of the two coordinates used to locate a growth curve in the ELEFAN I routine

SS - starting sample; the other coordinate used to locate a growth curve in the ELEFAN I routine. Jointly, SL and SS define the

		location of a pre-selected point of a growth curve, or
	-	seconds in latitude and longitude
s.e.	-	standard error of a statistic
S_1, S_2, S_3, S_4	-	variables used for estimating the probability of capture under the logistic model
S_{max}	-	maximum score in Shepherd's method for a range of L_∞ and K parameters
SSE	-	sum of squared errors; a measure of dispersal from the mean
t	-	a given time or age (normally expressed in years) , or
	-	absolute age of a fish, e.g., as estimated from daily otolith rings, or
	-	age corresponding to L_t
T	-	mean annual habitat temperature, in °C
t'	-	relative age of a fish, defined as $t' = t - t_o$
t_c	-	mean age at first capture, corresponding to L_c
t_i	-	mean age at length i
t_m	-	age at marking, corresponding to L_m
t_{mass}	-	mean age at massive (≈ first) maturity
t_{max}	-	longevity (in the wild)
t_o	-	the "age" fish would have had at length zero if they had always grown according to the VBGF; t_o generally has a negative value, but does not usually express "prenatal growth"
t_r	-	mean age at recruitment
t_s	-	parameter of the seasonally oscillating version of the VBGF (see WP)
t_z	-	in Shepherd's method: origin of the VBGF in calendar time, (expressed as fraction of a year); here replaced (without affecting other results) by a starting point, defined by SS and SL
v_i	-	total of estimated value at length i
VBGF	-	von Bertalanffy Growth Function, either in original or seasonally oscillating form
VGA	-	Virtual Graphic Array

VPA	-	Virtual Population Analysis
W	-	mean weight of fish in catch samples, computed from W' upward
w	-	mean weight of fish within a given length class
WF	-	weighting factor assigned to an observation
WP	-	"Winter Point"; in the seasonalized VBGF, the time of the year when growth rate is slowest; equivalent to t_s + 0.5 year
WC	-	total weight of the catch
WS	-	total weight of the sample
W_∞	-	asymptotic weight, i.e. the (mean) weight the fish of a given stock would reach if they were to grow forever
x	-	any variable (often used for the abscissa in 2-dimensional plots)
x^2	-	chi-square statistics
Y	-	yield, catch in weight
Y_i	-	yield at length i
y	-	any variable (often used for the ordinate in 2-dimensional plots)
YY	-	two-digit number denoting the year
Y/R	-	yield per recruit
Y'/R	-	relative yield per recruit
Y/R_{max}	-	maximum yield per recruit achievable under a given fishing regime
Z	-	instantaneous rate of total mortality

APPENDIX B. References

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