APPENDIX A

Questionnaire for Life History Survey of California Nearshore Fishes

Note: Questionnaire is organized in outline form. Roman numerals, capitalized letters, Arabic numerals, and lower case letters do not correspond to MICROSOFT® EXCEL worksheet cell numbers or letters.

I. TAXONOMY
   A. Family Name
   B. Scientific Name (*include synonym, if systematics currently in question or other valid name*)
   C. Common Name(s): **BOLD** = Primary name or most common

II. RANGE
   A. Geographic Range
      • What is the geographic range of occurrence (specific area in parentheses)?
   B. Observed Depth Range (£m; minimum and maximum)
      • What is the depth range of occurrence (specify units of measure)?

III. AGE & GROWTH
   A. Length to weight equation
      • What is the length-to-weight equation (eg. \( W = aL^b \); specify length used and units of measure)?
   B. Length conversion equations (eg. SL converted to TL equation)
   C. Maximum recorded length
      • What is the maximum recorded length? (specify units of measure and length: eg. standard length, total length, disk width, or other)?
   D. von Bertalanffy Growth Parameters
      1. Geographic Area (length measurement)
         • Studies are listed from North to South (top to bottom)
      2. \( L_{\text{inf}} \) [Maximum length predicted by VB equation; specify unit of measure(SE)]
      3. \( k \) [growth coefficient; no units (SE)]
      4. \( t_0 \) [age at which the fish would theoretically have been size zero; (SE)]
      5. \( r^2 \) [coefficient of determination]
      6. Ageing Structure / Method used? e.g. otolith/break-and-burn
      7. Is this estimate validated (method)? e.g. radionuclides
8. Is this estimate verified (method)? e.g. between readers (intrareader)
9. Other references: List other papers that include growth equations, rates, or coefficients that were not listed above (e.g. Gompertz)

E. Longevity
- What is the known maximum age (specify fish length & units of measure; note differences between sexes when available)?

F. Age Composition Information
- List references where age-at-size class info and/or average age of the population is available

IV. REPRODUCTION
A. Sexuality (Gender System)
- Monoecious
- Hermaphrodite
  - Sequential Hermaphrodite
  - Protandrous (male-->female)
  - Protogynous (female-->male)
- Simultaneous Hermaphrodite
- Dioecious

B. Mating System
- Promiscuous
- Polygamous
  - Polyandrous
  - Polygynous
  - Monogamous

C. Breeding “Behavior”
1. Mode of Reproduction

<table>
<thead>
<tr>
<th>Possible terms listed below (use specific term if noted in literature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. following Wourms et al. (1988), Table III, p 31; Wourms 1991; and Hamlett and Koob (1999)</td>
</tr>
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- Oviparity
  - Ovuiparity
- Viviparity (Elasmobranchs: aplacental viviparity (ovoviviparity) and placental viviparity)
  - Lecithotrophy (Osteichthys: ovoviviparity)
  - Matrotrophy
    - Oophagy, adelphophagy, and matrophagy
    - Trophodermy
    - Placentotrophy
      - Buccal and branchial placenta
      - Yolk-sac placenta
      - Follicular placenta
      - Trophotaenial placenta |
2. Parental Care
   • Note care given (sex specific; e.g. Male: guard nest)

D. Sexual Dimorphism
   • Male : Female Standard Length ratio
     • (Is one sex larger?)
   • Secondary characteristics
     • e.g. Are there different color morphs between sexes (dichromatism)?

E. Maturity
   1. Length and Age at 1\textsuperscript{st} Maturity (Male and Female)
      • What is the length and/or age when fish mature (specify length and units of measure)?

   2. Length and Age at 50\% Maturity (Male and Female)
      • What is the length and/or age when 50\% of population mature (specify length and units of measure)?

For maturity studies, include age info (list in corresponding rows). Inclusion criteria (in order of importance): validated studies; “reliable” ageing structure; large sample size; most recent.

   a. Ageing Structure/Method used? e.g. otolith/break-and-burn
   b. Is this estimate validated (method)? e.g. radionuclides
   c. Is this estimate verified (method)? e.g. between readers (intrareader)
   d. Other references: List other papers that include growth equations, rates, or coefficients that were not listed above

F. Geographic Spawning Area (for the following fertilization and spawning period studies)

G. Fertilization & Spawning Period
   • Months color-coded for spawning females (blue), fertilized eggs (yellow), and both reproductive states present (green); Denote month periods begin or end
   • Peak reproductive months denoted with symbols (corresponding to row-specific reference): asterisk (*) = peak spawning/birth; hat (^) = peak fertilization; number (#) = suspect record

H. Spawning Frequency
   • How often does the fish spawn?
   • Single spawning season (total spawner)
   • Multiple spawning seasons (repeat, batch, or serial spawner)
I. Fecundity
   1. Mean fecundity [Number of eggs per gram female body weight (eggs/g); note weight range]
   2. Number of eggs at specified length (specify length measurement and units)
   3. Specific fecundity at length equation [e.g. $F = a(L)^b$; note length or weight range used to construct equation]

V. DISPERAL & RECRUITMENT
   A. Egg Duration
      • What is the duration of the egg period/stage?
   B. Larval Duration
      • What is the duration of the larval period/stage?
   C. Size at settlement & location (specify length, unit of measure, and age if provided)
   D. Annual cohort success
      • How many fish survive of the same pulse in a new habitat?

VI. HABITAT ASSOCIATION & TROPHIC INTERACTIONS
    (For each life history stage address categories below)
   A. Eggs
   B. Larvae
   C. Juveniles
   D. Adults

1. Fish Size
   • What is the fish size range at life history stage?

2. Habitat
   • Is the life history stage associated with specific habitat? If so, where is the stage found? What substrate is the life stage associated with (e.g. pelagic, benthic, kelp canopy)?

3. Food Habits (eggs excluded)
   a. Foraging Guild
      • Is the fish a planktivore, an herbivore, a carnivore (piscivore, other), an omnivore (List major food items in diet)?
   b. Foraging Method
      • How does the fish capture prey (e.g. pursuer, stalker, ambusher, strainers, pickers, browsers, grazers)
   c. When / Frequency
      • At what time of day does the fish eat?
• How many hours/days/months are in between each feeding?

4. Predators
• Who are the predators of the fish?

VII. GENETICS
A. Genetic Variance
1. Substocks (The division of a fish population into two groups due to genetic differences)
2. Nucleotide Diversity [Enter #]
3. Mean number of allele per loci [Enter # (SE)]
4. % Polymorphic loci [Enter %]
5. Mean heterozygosity [Enter # (SE)]
   a) Expected (SE)
   b) Observed (SE)
6. Approach (e.g. allozymes, microsatellite DNA, or mitochondrial DNA)
7. Effective population size [Enter #]

VIII. RECRUITMENT INTO FISHERY
A. Length (and age) first recruited to fishery; [denote fishery (sport or commercial), and length measurement and units]
B. Length (and age) fully recruited to fishery; [denote fishery (sport or commercial), and length measurement and units]
C. Sampling gear used to collect recruitment info
   1. Ageing Structure/Method used? e.g. otolith/break-and-burn
   2. Is this estimate validated (method)? e.g. radionuclides
   3. Is this estimate verified (method)? e.g. between readers

IX. MORTALITY
A. Mortality Estimates (specify male, female, both sexes):
   1. Natural Mortality (M; Instantaneous rate of natural mortality)
   2. Fishing Mortality (F; Instantaneous rate of fishing mortality)
   3. Total Mortality (Z; Instantaneous rate of total mortality)
   4. How was mortality estimated (e.g. catch curves, tag-recapture)?
   5. Age range used to calculate mortality

B. Rate of Exploitation (Ricker 1975)
   1. u (Rate of exploitation; FA/Z)
      • A = annual (or seasonal) mortality rate
• The fraction, by number, of the fish in a population at a given time, which is caught and killed by man during the year immediately following.

2. E (Exploitation ratio; F/Z)
   • The ratio of fish caught to total mortality.

X. BEHAVIOR
   A. Competition
      • If yes, note type: food, habitat, reproduction
   
   B. Interactions with others
      • Does the fish have any known symbiotic, mutualistic, or parasitic relationships? Note other species involved and interaction
   
   C. Movement
      1. Tagging studies
         • What is the movement of the fish (specify distance and number, or percent, of recaptures moved)
      
      2. Resident or Transient
         • (Specify location where either occurs)
   
      3. Homing and Home Range
         • Do they demonstrate a homing ability? (Yes, No)
         • Do they have a home range? What is the estimated perimeter of the home range (specify perimeter/area)
   
      4. Schooling
         • (YES, NO, NF)
   
   D. Territoriality
      • Specify which sex is territorial and what territorial of (e.g. habitat, food, nest)
ABBREVIATIONS USED IN DATABASE

SE: Standard Error
SL: Standard Length
FL: Fork Length
TL: Total Length
BL: Body Length
DL: Dressed Length
NL: Notocord Length
?L: measurement not defined
m: meters
cm: centimeters
mm: millimeters

If information is not provided, the following abbreviations should be used to explain why

NA: Not Applicable (Refers to a life history parameter that is not valid for a species; e.g. egg stage not applicable for embiotocids).

NG: Not Given (Refers to a study where similar parameters are provided but not for the specified parameter; e.g. a maturity study with age at first maturity but not age at 50% maturity; an age and growth study where von Bertalanffy growth parameters are provided for males and females, but not for the sexes combined.)

NF: Not Found (Refers to a parameter where no information was found; either it does not exist, or we could not find the information.)

LITERATURE CITED


