A Program for the Identification of the Pelagic Eggs of Black Sea Fishes*

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Abstract

A computer program was developed for the identification of the teleost fish eggs that may be found in the pelagic zone of the Black Sea. This program identifies eggs of 70 species, using up to 28 descriptive characters, and may be adapted for use outside of the Black Sea.

Introduction

The identification of fish eggs is of crucial importance for fishery research, i.e. for determination of spawning seasons and areas, spawning stock estimations, etc. Usually, members of the same family inhabit the same area and often spawn at the same time. This makes identification of the eggs more complex, because eggs of the same family are very similar in their early stages. Therefore, knowledge on the eggs and larvae of all allied species is required even when one works on a single species.

In order to ease the difficulties encountered therein, a computer program for the identification of fish eggs has been developed. In this first version, only teleost fish eggs which may be found in the pelagic zone of the Black Sea were taken into consideration.

Species List of Interest

The Black Sea fauna contains 165 species of teleost fish (Ivanov and Beverton 1985); however, only a few of them are known to spawn in this sea and to have pelagic eggs (Slastenenkko 1956). Beside the pelagic eggs, some demersal eggs, which normally stick to a substrate, may also be found in the pelagic zone. This is especially the case for the eggs of Labridae, which may easily be detached by waves and strong currents. Therefore, although they are known to have demersal eggs, members of the Labridae family were included in the species list incorporated in the program (Table 1).

Identification Algorithm

There is a long list of diagnostic characteristics that could be used for the identification of pelagic eggs. This long list, proposed by several authors is reduced, however, when one deals with teleosts; thus, 28 distinctive features were selected through a literature survey on the studies carried out along the Mediterranean and especially in the Black Sea (Vodyanitski and Kazanova 1954; D'Ancona 1956; Arim 1957; Demir 1959, 1969, 1974; Dekhnik 1973; Mater 1981). For each character, all possible alternatives were determined and numerically coded. For each species, relevant codes of 28 characters are stored in the program in the form of 70 x 28 matrix. The characters used by the program to identify Black Sea fish eggs are as follows:

Characters of egg

- shape (ovoid or spherical);
- membrane (smooth or sculptured surface);
- thickness of the membrane (thin or thick);
- size of perivitelline space (narrow or wide);
- presence or absence of oil globules;
- position of the oil globule (centric, anterior or posterior);
- homogeneous, partly segmented or fully segmented yolk sac;
- appearance of egg sac (opaque or hyaline);
- presence or absence of pigmentation on yolk sac or oil globule; and
- size of the egg and oil globule.

Characters of the eggs with embryo

- pigmentation pattern on the embryo (apparent or weak);
- degree of pigmentation of the head, eye, dorsal part, anus and tail; and
- width of the embryo (thin or thick).

Other features

- location of the sampling area (offshore or coastal); and
- date of the occurrence (specifies spawning season).

When using the program, one need not complete the whole set of definitions. In this way, users or scientists

with little experience with teleost eggs are not obliged to answer all questions (which may be difficult). Also, for some species having unique diagnostic characters (such as the anchovy, which has ovoid eggs), it is not necessary to define all items given in the program. When the characters are selected and defined, the program stores the values in an array, which we called "user's array". In any step of the program, the user may initialize the identification. In this case, the user's array is compared with the matrix with the coded diagnostic characters of the 70 species in Table 1. The user's array acts as a filter and each column of the matrix in which the coded characters of a species are stored, is compared with the codes in the user's array. The columns having exactly the same codes to that of the array are filtered and listed on the screen.

The number of possible species, listed on the screen, depends on the number of characters defined by the user. The more characters are defined, the fewer species will be listed on the screen. After each trial, to give more flexibility to the character definition, the program loops the user back to change or revise previously defined characters.

Program Limitations

The program was developed solely for the pelagic eggs of the Black Sea fishes. Most of the characters are categorical for the species; however, some other characters, especially those defined by time and dimension (such as spawning season and diameters of oil globule), show regional variations. It should be kept in mind that, in comparing with the other surrounding seas, Black Sea has physical peculiarities, such as low temperature and salinity, which may alter the size and morphological structure of the eggs of the resident species. Reliable use of this program, in its unmodified form, should therefore be limited to the Black Sea. However, it can still be applied to the other seas if characters, which may vary regionally, are avoided.

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Table 1. List of Black Sea teleost species whose eggs can be identified using the software described here.

Bothidae	Pomatomidae
Arnoglossus kessleri	Pomatomus saltatrix
Callionymidae	Sciaenidae
Callionymus fasciatus	Sciaena umbra
Callionymus lyra	Umbrina cirrosa
Callionymus pusillus	Scomberidae
Callionymus risso	Euthynnus alletteratus
Carangidae	Sarda sarda
Trachurus mediterraneus	Scomber japonicus
Trachurus trachurus	Scomber scombrus
Centracanthidae	Thunnus thynnus
Spicara maena	Scophthalmidae
Spicara smaris	Psetta maxima
Clupeidae	Scophthalmus rhombus
Sardina pilchardus	Scorpaenidae
Sardinella aurita	Scorpaena notata
Sprattus sprattus	Scorpaena porcus
Engraulidae	Serranidae
Engraulis encrasicolus	Serranus cabrilla
Gadidae	Serranus hepatus
Gaidropsarus mediterraneus	Serranus scriba
Merlangius merlangus	Soleidae
Labridae	Buglossidium luteum
Coris julis	Solea nasuta
Ctenolabrus rupestris	Solea vulgaris
Labrus viridis	Sparidae
Symphodus cinereus	Boops boops
Symphodus ocellatus	Dentex dentex
Symphodus roissali	Diplodus annularis
Symphodus rostratus	Diplodus puntazzo
Symphodus tinca	Diplodus sargus
Lophiidae	Lithognathus mormyrus
Lophius piscatorius	Oblada melanura
Merluccidae	Pagellus erythrinus
Merluccius merluccius	Sarpa salpa
Moronidae	Sparus auratus
Dicentrarchus labrax	Sphyraenidae
Mugilidae	Sphyraena sphyraena
Liza aurata	Trachinidae
Liza ramada	Trachinus draco
Liza saliens	Triglidae
Mugil cephalus	Chelidonichthys cuculus
Mullidae	Eutrigla gurnardus
Mullus barbatus	Trigla lucerna
Mullus surmuletus	Uronoscopidae
Ophidiidae	Uranoscopus scaber
Ophidion rochei	Xiphiidae
Pleuronectidae	Xiphias gladius
Platichthys flesus luscus	Zeidae
	Zeus faber

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