



Observations about Not Invasive Method for Individual Identification of Small Spotted Catshark (*Scyliorhinus canicula*, Linnaeus 1758) in Controlled Conditions

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Short Communication

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Much of the knowledge we have on the elasmobranchs was built by research carried out within the aquaria in controlled conditions [1-7]. The small spotted catshark (*Scyliorhinus canicula*, Linnaeus 1758) is a common host of many aquaria through Europe. It is a widespread elasmobranch in the North East Atlantic Ocean: from Norway to Senegal, including the Mediterranean Sea [8]. It is a species of significant commercial importance in countries like the UK where it is abundant and used for fish meal [9]. In other areas, this benthic shark is a catch accessory, and used as a fresh product or in salt and to produce oil.

S. canicula is a hardy and prolific species with least concern for its conservation [10,11]. It has a successful reproduction, spawning even in captivity. These features make it an ideal and useful model for research in controlled conditions along with their capacity to recover after an emersion event [12]. The stress resistance is a significant feature for many scientific studies. For instance, the nutritional ones where weighting and length measurements out of the water are frequent.

While most people have no trouble in recognizing a specimen of *S. canicula*, the individual animals are much more difficult to distinguish [13]. The specimens show variation in size and cryptic colors of the spots on the skin (black, white and brownish) [14]. Unless adopting invasive techniques such as the fin and subcutaneous tags [15], most of the animals remain unidentified. Tagging studies have many limitations and practical issues, linked to their short lifetime

and detrimental effects to individual fitness and natural behavior [16]. Lethal effects on fragile young individuals are possible [15]. An effective and no invasive identification technique becomes of paramount importance in many behavioral and nutritional experiments in aquarium as in much individual treatments and therefore discrimination of each specimen is crucial. As far as the authors are aware, the ethological investigations are scarce, and the only one on social behavior was the Jacoby and colleagues' work (2012) using invasive methods.

The Shark Studies Center – Scientific Institute in Massa Marittima (Tuscany, Italy) hosts several adult specimens of *Scyliorhinus canicula*. The sharks spawn eggs throughout the year. We used young newborns of *S. canicula* as model species to test a no invasive technique that could be effective in the distinct experiments to identify the shark specimens. The classic naturalistic drawing [17] and the digital photography approach [18] were combined.

We chose four specimens of which three have survived until the end of the experiment. The observations were carried out for three months. The search of marks was directed to the typical dorsal spots of *S. canicula*. They are extensively used in literature as permanent marks on other species too [19-21].

For the identification the technique of naturalistic drawing was chosen, as it is an efficient method to allow the viewer to grasp the details and memorized them. The

design has repeatedly played a significant role in naturalistic observations [17]. The photographic camera was combined to catch the mark shapes better and to use the pictures as a reference in case of uncertainty in the discrimination.

After careful observation of various physical features, black points were identified in the dorsal part at the end of the head and behind the gills. These marks allowed us to distinguish each animal in the nursery tank during the

experimental activities. The specimens were named Alfa, Beta and Delta. The point disposition that helps us to discriminate and carry out observations on the sharks are highlighted in the drawing (Figure 1). These spots were present since birth and did not disappear during the experimental period, rather they increase in number and size with the age. Long-term follow-up of juvenile individuals until adult stage is needed to be tested for permanent character of the marks.



Figure 1: Pictures (above) and draws (bottom) of black dorsal identification spots of three *S. canicula*: A) specimen "Alfa"; B) "Beta"; C) "Delta".

This non-invasive and not stressful method allowed experiments with closely grouped individuals. This study offers many applications in social behavioral and nutritional studies (e.g. with the less studied juveniles). A computer-based graphic analysis and automated recognition programs could further improve the method. This tendency must always be joint with procedures that improve the research ability of individual discrimination (the naturalistic drawing). In fact, in these works the only use of photographic identification is pointless. The researchers need to distinguish the mobile or elusive individuals during the observation time, and not in postproduction.

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