CSI: Noumea!
Can anyone identify this mysterious fish? Episode 1

Part of the fisheries laboratory work at the Pacific Community (SPC) focuses on the taxonomy of living pelagic organisms from all parts of the Pacific such as squid (Figure 1), crustaceans (Figure 2), gelatinous plankton (Figure 3) and fish (Figure 4).

What is taxonomy?

Taxonomy is the science of describing organisms and classifying them into units known as taxa (singular taxon), which makes the identification and naming process of organisms possible. A taxon or taxonomic group covers species that share specific criteria. Taxonomic classification is organised in the shape of a tree that starts at the broadest level (trunk) and separates into successive divisions (branches) followed by the most descriptively precise level (leaves). The broadest level is known as the 'kingdom' (e.g. the animal kingdom or the plant kingdom, which cover all animals and all plants, respectively). The species, together with its genus, is the most precise level. There are many taxonomic levels that lie between kingdom and species (see figure 5) – these are phylum, class, order, family and genus. These levels cover fewer and fewer species as the classification of an organism becomes more particular. All taxa are given names in Latin so that they can be recognised internationally (i.e. a species always carries the same scientific name, whether it is in Mexico or Fiji). Figure 5 shows two examples of marine species classification.

Taxonomy concentrates mainly on morphological and anatomical criteria but also distinguishes one species from all others due to a whole set of characteristics including anatomy, biology, physiology, and others. Certain reference documents condense and rank this type of information and offer a series of alternatives known as dichotomous keys that cover the morphological characteristics of a specimen.

In such keys, a very wide range of criteria are taken into consideration such as the position of the fins, the number of spines and rays, the shape of the jaw, the shape and number of teeth, the shape and number of scales, whether or not there are photophores, the shape of the gills and the number

Figure 1. *Liocranchia reinhardti.*

Figure 2. *Oplophorus spinosus.*

Figure 3. Anthomedusae.

Figure 4. *Bathysaurus ferox.*

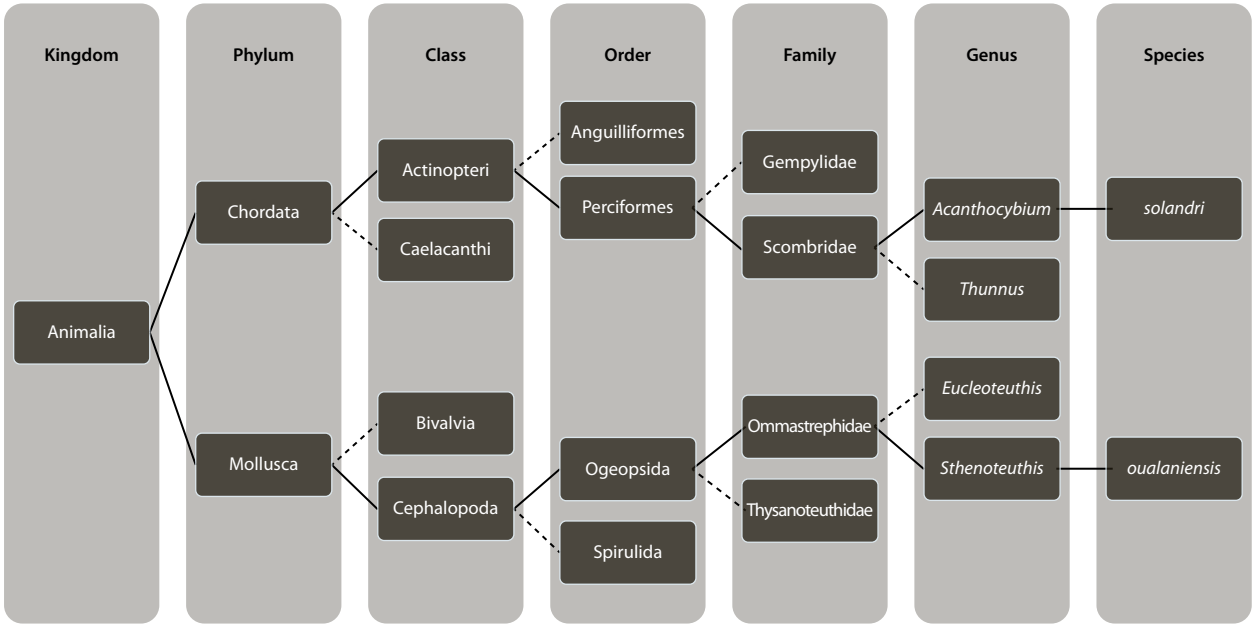

Figure 5. The pathways used to classify two marine species: *Acanthocybium solandri* (wahoo) and *Sthenoteuthis oualaniensis* (purpleback flying squid).

Figure 6. Sample NEC3018/M098/03 (length: 61.7mm SL).

of gill rakers (small spines located on the gill arches), the shape and number of vertebrae, etc. Very detailed observations of such criteria make this work rather complicated.

Most of the time, the specimens that are analysed in the laboratory are already known to science, but occasionally difficulties arise during identification and, therefore, classification.

In February 2016, as taxonomist for SPC's Oceanic Fisheries Programme, I was in charge of identifying a fish that came from a sea expedition in the waters off New Caledonia. This small fish, about 6 cm long, appeared to be a well-known fish but certain details raised questions.

So, an in-depth study was made of its morphology; i.e. all the visible parts of the fish were measured (total length of

Figure 7. Location of ventral fin.

Figure 8. Ventral fin.

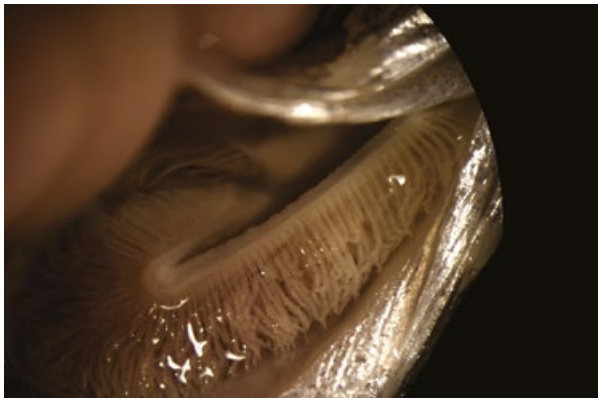

Figure 9. First gill arch.

Figure 10. Gill spines of the first gill arch.

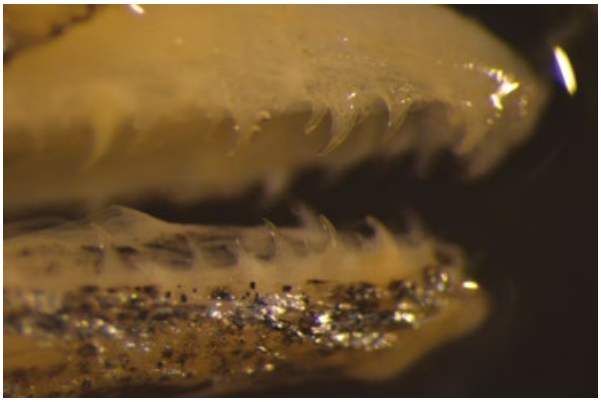

Figure 11. Upper and lower jaw.

the fish, size of its head, snout, all the fins, etc.) and all the fins' rays and spines were counted.

Special attention was paid to details so as to note specific features such as, for example, the shape of the jaw and the teeth. Photos were taken of all the external parts (see Figures 7–11).

However, even with all the information that was collected on the fish's external morphology and dichotomous keys, a precise species was unable to be identified.

Only a few species have dorsal-fin spine and ray counts similar to this specimen; i.e. Scombridae (tuna and wahoo family, among others) and Gempylidae (escolar family).

But the shape of the jaws, the lack of a lateral line, and the specimen's long canines are not characteristic of Gempylidae.

This fish did have a long snout and jaws that looked like a beak, its gill spines were small and its ventral fin was well-developed like the species *Acanthocybium solandri*. However, other criteria did not correspond to that species, such

Figure 12. X-ray of specimen NEC3018/M098/03.

as, for example, the existence of two anal spines whereas *A. solandri* doesn't have any. The shapes of its anal and dorsal spines were different, too.

This is probably a juvenile fish and certain characteristics can change as fish grow. It is very hard to find dichotomous keys or even studies relating to juvenile fish; most available keys only make it possible to identify fish at the larval or adult stages.

Therefore, another important criterion for identification was applied: the number of vertebrae. In order to get that information, fish are often dissected. In this precise case, it was impossible to carry out a dissection given that there was only a single specimen and so it was important to keep it intact and not to harm it in any way. For all those reasons, this strange fish specimen was taken to a radiology clinic to be x-rayed. Thanks to the very clear image obtained (see Figure 12), 64 vertebrae could be counted. Two Gempylidae species have the same number of vertebrae but they differ from the specimen on a lot of other points. *A. solandri* also has 64 vertebrae, but it was already know that it is not that species.

The x-ray helped round out the information about this mysterious fish. However, the combined internal and external morphological criteria still did not allow us to identify the fish. Therefore, world specialists were contacted and provided with this information along with questions about the initial morphological description that was obtained. They all had their doubts and none of them offered any possible names.

The decision was then made to continue the investigation through DNA testing, which could help us pinpoint a family, a genus or a species. Then by compiling all the information, it may be possible to connect this specimen to a known species ... or determine that an unknown species is involved, which would then need to be described and named.

The tests are currently being analysed and we are impatiently awaiting the results.

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