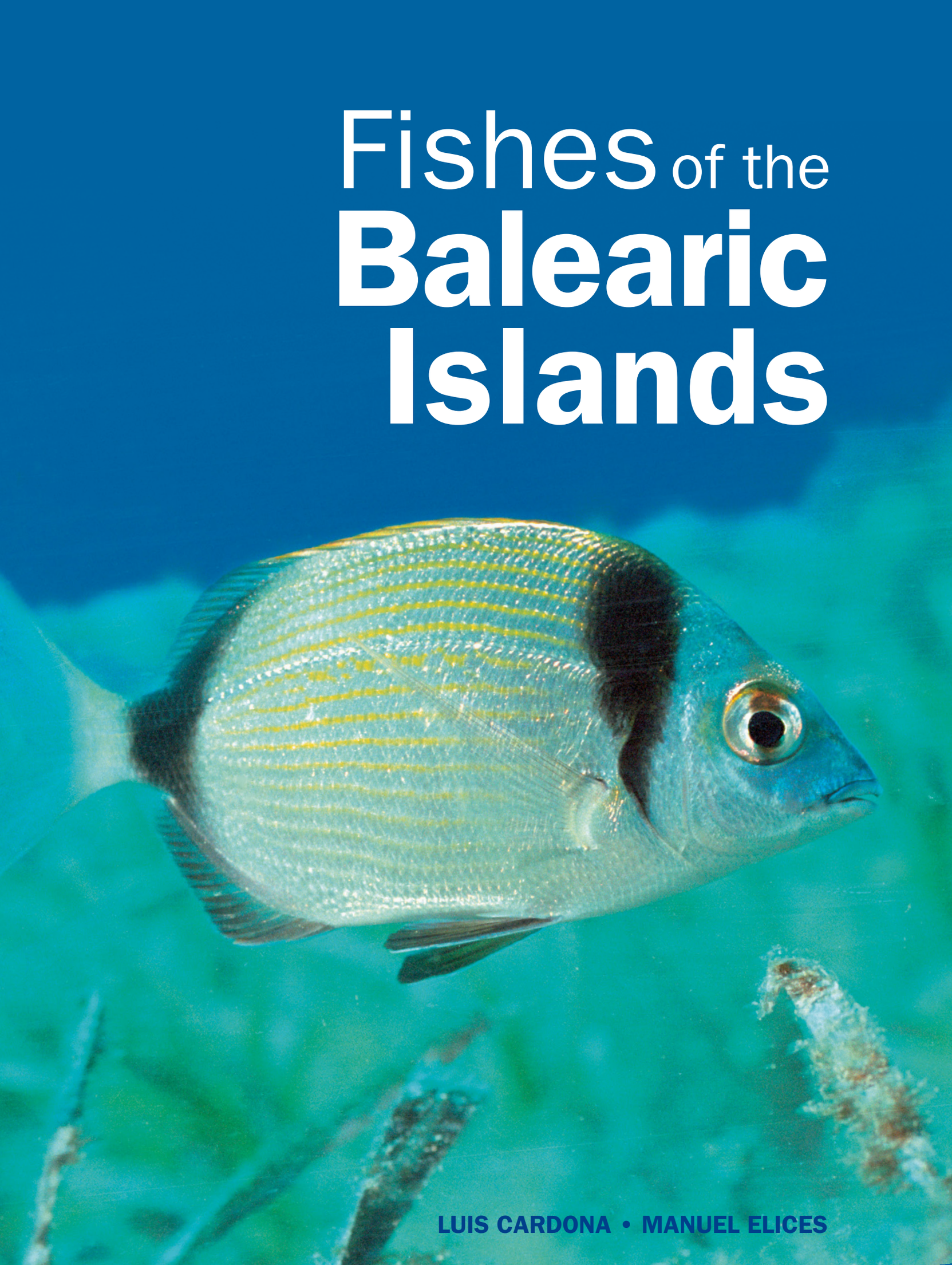
Fishes of the Balearic Islands



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Fishes of the **Balearic Islands**

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CHAPTER 1

INTRODUCTION

1. FOREWORD

Dear reader, the book that you hold in your hands is the fruit of the love and passion that the authors have for the world of fishes and their desire to share this love with all who have a curiosity for this fascinating world.

The book has various objectives: firstly, it is aimed at anyone who has a curiosity about fish, who would be amazed to know that the eel and the sardine are cousins or that some fish change gender during their lives. It is also aimed at those who love to fish and who would like to identify and know more about their catches. Those with an interest in biogeography and the structure of the fish communities in the Balearic Islands will find abundant information in the last chapters. Incorporating such wide-ranging subject matter in a single book has not been an easy task, but we have tried.

To the casual reader, you may be taken aback by the many technical terms that appear in this text; such as pelagic, demersal, benthic or neritic, but as you advance through the pages they will soon become familiar and comprehensible. You will be surprised by the hermaphroditism of many species; there are species that start off life as males later becoming females (protandrous), like the gilt-head bream (*Sparus aurata*) which begin life with a weight of half a kilo as male but change gender when they reach two kilos, while others start out as female and later become male (protogynous), such as the Mediterranean rainbow wrasse (*Coris julis*) (Figure 1.1). In some cases the classification of fish may seem confusing but you shouldn't let this worry you because it is confusing for the experts too, due to the difficulty that convergent evolution has posed to fish classification, which has only recently started becoming clearer thanks to molecular biology techniques.

To the expert reader, versed in these techniques, it may be of more interest to learn why in one island some fish species are missing which are present in another, or what is the origin of the fresh water fishes of the Balearic Islands. You will also find answers to how populations are distributed by day and by night in the Neptune seagrass or regarding the effectiveness of artificial reefs.

Fishes form the group of vertebrates with the most evolutionary success with more than 33,000 species, through 564 families and 64 orders, according to recent data. All of this represents more diversity than all the mammals, birds, reptiles and amphibians put together. When we refer to fishes we are talking about 60% of all the vertebrate species that inhabit the world.

This incredible variety means that fishes have a very important role in most habitats. In addition to living in almost all known aquatic habitats, fishes occupy almost all possible niches in the ecosystem; some species can colonise temporary ponds due to the ability of their eggs to survive buried for months in the dry mud.

The density of fish populations can be so high that, in many cases, humans can exploit them directly, a fact that has made fishing a very important activity in almost all parts of all the oceans, both economically and socially.

Fishs are the most beautiful expression of underwater life. As we start to know them better, whether it be by their behaviour or their evolution, our compassion for them will continue to grow.

Fig. 1.1 *The Mediterranean rainbow wrasse* (Coris julis) *has a strong sexual dichromatism. Each photograph shows a pair of rainbow wrasses: a secondary male and a female (or a primary male, see chapters 2 and 4 for details), The terminal phase colouration of secondary males, brightly coloured and with a black area in the side, differs from the initial phase colouration of females and initial males, with brown back, white belly and devoid of the black area. These colour patterns are so different, that for a long time they were thought to be different species.*

2. BOOK CONTENT AND STRUCTURE

The content of this book is divided in three main areas:

The first 3 chapters **–anatomy, physiology and ethology–** can be considered a brief introduction to the life of fish; how they are and how they interact with each other.

Traditionally the anatomical characteristics have served as the means for fish classification; the shape of the scales, for example, is used to identify one species from another and, in some cases, to understand the age of its ancestors. The dorsal fin can also be used for classification, depending on whether there are spines or not.

Fish, to survive, must find food that provides them with sufficient energy for all their needs, to swim, to grow and to reproduce. Physiology is a study of how they achieve this balance of energy.

The life of fish revolves around three activities, eating, avoiding being eaten and finding a mate for reproduction. Ethology is the study of various aspects related to these activities. To these ends, fishes have developed surprising sensory organs, swimming techniques that serve as a model for ship builders and camouflage systems, like the wide–eyed flounder *(Bothus podas)* which has an amazing capacity to change its colour to that of its environment. The reproduction strategies can be very ingenious and we discuss this briefly in chapter 4.

The fifth chapter is a **catalogue** of all the fishes present around the Balearic Islands. The species are listed following an **evolutionary criteria.** Data for classification by size, diet, habitat and population size is included for each species.

Frequently, the common understanding of fishes is limited to the perception of those from professional and amateur fishing. Most know reasonably well the edible species and some people can also identify those inedible species that are commonly caught by amateur fishers. Serious fishers will know the Annular seabream, the common two-banded sea bream, the Mediterranean rainbow wrasse, the greater amberjack, the European barracuda and other nearshore fishes. They know the correct bait, the best time of year and the best areas for fishing each species. But few know that in the Balearic Islands there are six types of grey mullets or more than a dozen species of gobies. Even fewer have heard of the combtooth blenny or that the wrasse makes nests like a bird (Figure 1.2). And almost nobody knows the fishes that live at depths of more than 1000 metres. Divers will often only notice the largest or most colourful fishes that live in the rocky depths. Few pay attention to the little combtooth blennies that live in the vertical rock faces, and even fewer to those that live in the sandy sea floors where little known species like the Thinlip conger and the dragonet are found.

The last two chapters, 6 and 7, are dedicated to the **biogeography** and the **community ecology.** Biogeography is a study of the geographical distribution and looks to explain why the fauna and flora of a particular region is how we know it to be and not something else. The community ecology focuses on trying to understand the characteristics and organisation of the communities and, in this case, of the fish of the Balearic Islands.

The presence of biogeographic barriers in the sea and the climatic history have driven the distribution and evolution of the fish in the Mediterranean. The current ichthyofauna (biodiversity of fish species) in the Mediterranean is less than five million years old, due to the great Messinian salinity crisis and all of the current endemic species found here have evolved since then. The appearance of new species is associated with the impossibility of members of two populations of the same species to mix freely and this phenomenon of isolation, perhaps, has been a consequence of the strong climatic oscillations recorded during the Quaternary period.

In the last chapter we discuss the characteristics of the communities of fish by the regions of the continental shelf; whether they are mediolittoral, infralittoral or circalittoral. And also on their location within the water column, that is to say whether they are epipelagic, mesopelagic or bathypelagic. The book finishes with a brief round-up of fish communities in lakes, coastal lagoons, streams and caves.

Fig. 1.2 *The construction of nests by some fish is a little–known fact. The photograph shows a nest made by the grey wrasse* (Symphodus cinereus) *with a male inside the nest and the female outside. You can tell the male and female apart as the male has a dark mark on the back of the caudal peduncle and the female has a dark genital papilla.*

3. FISHES OF THE BALEARIC ISLANDS

The current distribution of species found in the Mediterranean is less than five million years old.

Until the middle of the Miocene –20 million years ago– the Mediterranean was connected to the west via the Atlantic ocean and to the east via the Indian (Figure 1.3a). Later –14 million years ago– the Arabian Peninsula closed the Mediterranean in the East (Figure 1.3b). And later still –6 million years ago– the rotation toward the east of the Iberian Peninsula closed the Strait of Gibraltar. The climate at this time was similar to the current climate and the Mediterranean sea lost more water to evaporation than it received from rivers. In a short space of time the Mediterranean was reduced to a series of hypersaline lakes situated in the deepest parts of the ocean basin (Figure 1.3c). Under these conditions the old Mediterranean fauna inherited from Tethys Sea disappeared. This phenomenon, known as the Messinian salinity crisis, is discussed in some detail in chapter 6.

When the Strait of Gibraltar reopened –5.3 million years ago– the Mediterranean was recolonised by creatures from the Atlantic. Some newly arrived species had relatives in both the Eastern Atlantic and in the Indian oceans. Others were endemic only to the Eastern Atlantic. Some of them, when they arrived to the Mediterranean, started the process of speciation that eventually gave rise to the current endemic species of the Mediterranean.

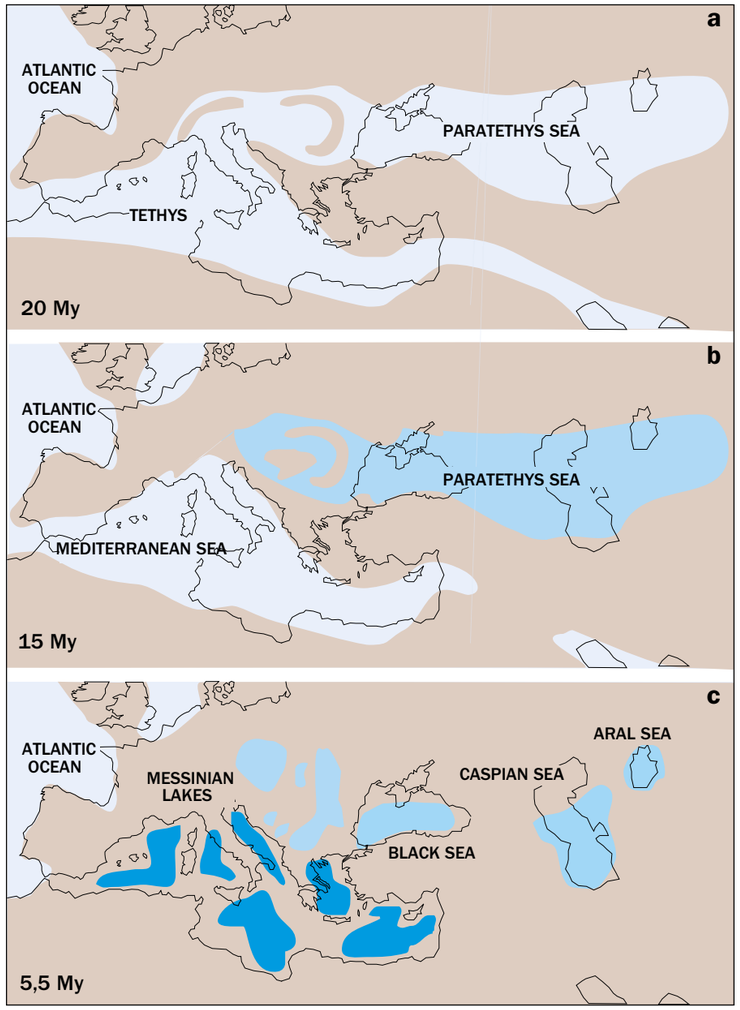

Fig. 1.3 *The Mediterranean sea maintained a connection with the Atlantic and Indian oceans until the middle of the Miocene (a). The connection to the Indian ocean was permanently lost 15 million years ago (b). The connection with the Atlantic was lost temporarily between 6 and 5.3 million years ago. The result was the Messinian Salinity crisis, during which most of the ocean basin became dry, leaving only some hypersaline lakes in the deepest parts (c). This resulted in the extinction of most of the fish inherited from the Tethys Sea, except for those capable of surviving in the salty waters of the Black Sea. When the connection to the Atlantic ocean was re–established the sea level rose and some of these species returned back into the Mediterranean Sea.*

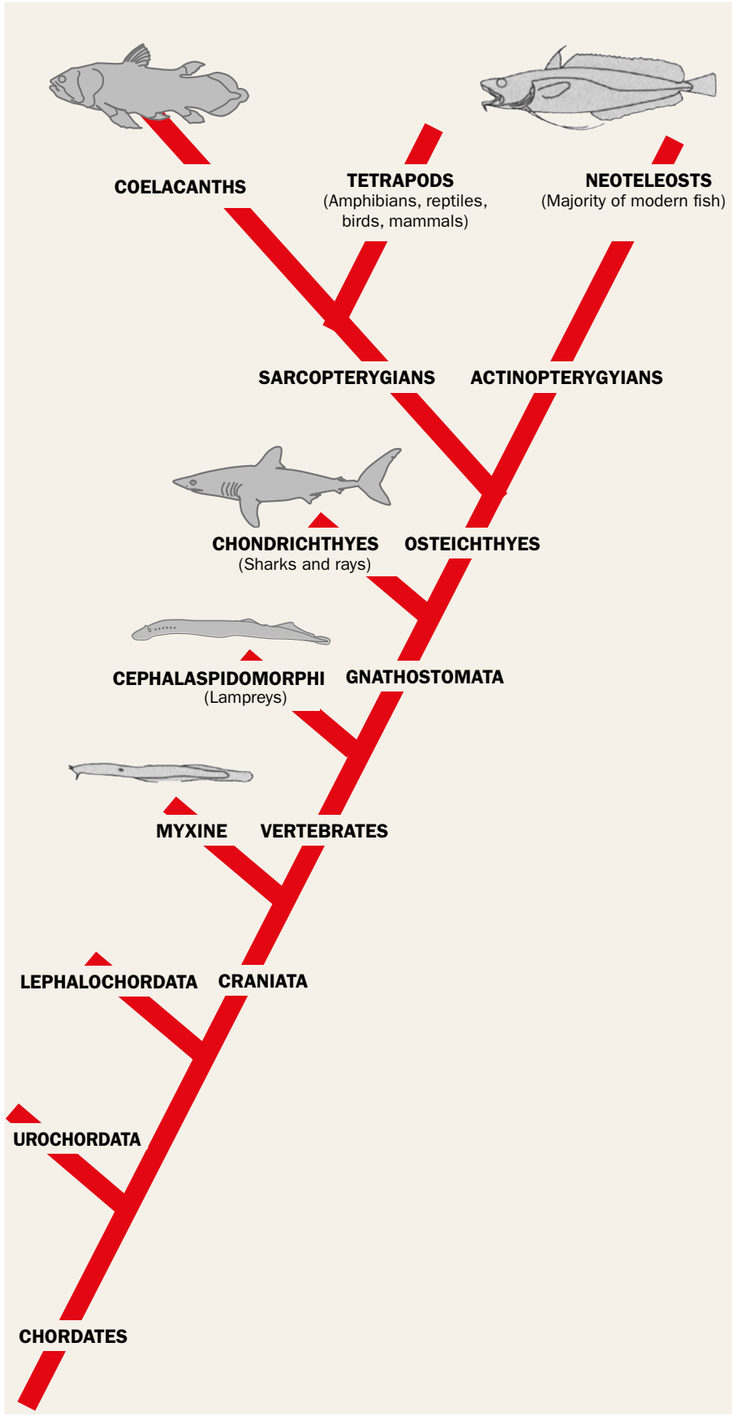

Fig. 1.4 *In the diagram there is a summary of the relationships between different groups of chordates. The **chondrichthyes** and **osteichthyes** are highlighted and within these two last groups the tetrapod group emerges (from which came amphibians, reptiles, birds and mammals) and the **neoteleosts** (to which the majority of modern fish belong).*

The story of fishes is a very old one. There is evidence from the Cambric period –around 490 million years ago– that the first primitive fish had already appeared, the **Agnatha** (mouth lacking jaws), with a round mouth. The modern Agnatha are limited to the lampreys and hagfishes. In the Silurian –roughly 440 million years ago– the first fish with articulated jaws emerged, the **Gnathostomata** (mouth with jaws), a characteristic that gave them many advantages. Also, during the Silurian, the **chondrichthyes** appeared, the ancestors of the sharks and rays, with a cartilaginous skeleton and with teeth not connected to the jaws but to the skin, which could be replaced as required as they became worn or lost. The **osteichthyes,** with a bony skeleton, arrived toward the end of the Silurian –about 410 million years ago– and went on to diversify during the Devonian and Carboniferous periods. In this last group of fishes we find the most complex evolutionary step in the history of the vertebrates; how does a fish, dependant on dissolved oxygen in water to breathe, end up transforming into a land animal with lungs, arms and legs (Figure 1.4).