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The Coelacanth in FishBase[1]

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Abstract

The recent discovery of a coelacanth population in Indonesia has renewed interest in this living fossil. Until this discovery, the coelacanth was thought to occur only in the Comoro archipelago. Recent studies show that the species is highly vulnerable to extinction. This paper presents a summary of the information available on the coelacanth in FishBase. It also highlights the utility of FishBase, both as a repository of scientific information and as an analytical tool for research.

Introduction

The recent discovery of a population of the coelacanth (*Latimeria chalumnae*, Smith 1939) off Manado Tua, north Sulawesi, Indonesia has renewed interest in this living fossil. Up until this discovery, the coelacanth had been thought to have its natural range in the Comoro archipelago in the western Indian Ocean, about 10 000 km from the site of the new discovery. The coelacanth is a primitive fish once thought to have become extinct 70 million years ago until a specimen was trawled at a depth of about 70 m several kilometers off the mouth of the Chalumna River, South Africa in 1938. The coelacanth's unique morphological characteristics place it close to the ancestry of terrestrial vertebrates, and it was once thought to be a distant ancestor of humans (Balon et al. 1988). Since the first specimen was discovered in 1938, numerous expeditions have set out to collect specimens or live individuals and study the fish in its natural habitat (Fricke 1997). These efforts had varying success, with some of them not finding a single specimen. Nevertheless, they resulted in more research and valuable scientific information (Fricke 1997). Using a manned submersible, scientists successfully filmed coelacanth behavior in their natural environment in 1987. This and subsequent sorties gave new insights into the ecology of the species and its preferred habitat (Balon et al. 1988; Fricke et al. 1991a, 1991b; Fricke and Hissmann 1992; Hissmann and Fricke 1996).

Most of the recorded landings of coelacanths came as bycatch from fishers using hooks and lines to catch the oilfish, *Ruvettus pretiosus*, which occurs at about the same depths as the coelacanth. About 200 specimens have been caught around the Comoro Islands and the Mozambique Channel. Efforts to locate specimens in nearby areas have failed and, except for a few individuals that were considered strays, most were taken off the Grand Comoro and Anjouan islands (Bruton and Coutouvidis 1991; Schllewen et al. 1993).

The Discovery in Indonesia

The Indonesian population was discovered accidentally by Dr. Mark Erdmann and his wife Arnaz in September 1997. They found the first specimen in a fish market. They took pictures of the fish but were not able to acquire the specimen. On July 30, 1998 a second specimen was caught and brought live to Dr. Erdmann. The fish was 124 cm long and weighed 29.2 kg. Preliminary examination of its external morphology showed that it differs in coloration from the Comorian coelacanth. The fish was brown with white mottling and striking gold flecks over the entire dorsal surface of the body and fins, as opposed to the steel blue with white mottling coloration of the Comorian coelacanth. It was caught by fishers fishing for sharks using a deep-set gillnet at a depth of 100-150 m off the volcanic island of Manado Tua, north Sulawesi. The site was at the base of a steep volcanic slope known to have many caves and crevices similar to the habitat reported for the Comorian population (Bruton and Stobbs 1991). Efforts to keep the fish alive failed and it died after about 3 hours (Erdmann et al. 1998). This, however, confirmed the find and led to the press release in the 24 September 1998 issue of *Nature* and subsequent worldwide attention.

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The Coelacanth in FishBase

Much of what is known about the coelacanth came from studies done on about 200 specimens collected since the species' discovery in 1938. The use of manned submersibles in the late 1980s provided valuable information on the species' habitat requirements and behavior. Fricke (1997) showed close coincidence of 4 major events and maxima in the number of publications on the species: (i) the discovery of the first coelacanth in 1938; (ii) the discovery of the second specimen in 1952; (iii) the American, British and French expeditions in 1972-75; and (iv) the expeditions of the Smith Institute and the German Max Planck Institute in 1987 which marked the beginning of intensive submersible research.

FishBase is a large biological database on finfish and holds a range of information on the various aspects of the biology of over 20 000 species (Froese and Pauly 1998). This information is gleaned from journal articles and scientific reports. Currently, FishBase contains information pertaining to the coelacanth from 27 references. This information can be viewed in several tables in FishBase. A map showing the reported occurrences of the species can be generated from the occurrence information in the database (Fig. 1). Pictures and drawings of the species are also available (Fig. 2).

A printed species synopsis that can be used as a working document can be generated from the database. The species synopsis includes information on taxonomy, occurrences, morphology, genetics, reproduction, growth, food and diet among others. Table 1 presents general information on *Latimeria chalumnae* condensed from the species synopsis. The species synopsis also includes the list of references used and the list of collaborators who have contributed or verified information presented in it. This allows FishBase users to trace the source of the information presented and to correspond directly with FishBase collaborators working on the species.

Fig. 1. Map of the reported occurrences of Latimeria chalumnae *generated from records in FishBase (number of records = 139).*

Current Status of the Coelacanth

Up until the discovery of an Indonesian population, coelacanths were known to occur only in the Comoro Islands in the western Indian Ocean. The specimens caught off eastern Africa, including the first one trawled in the vicinity of the mouth of the Chalumna river, were considered strays. Mitochondrial DNA sequence analysis on a specimen caught along the coast of Mozambique showed that it belongs to the same population as those caught in the Comoro archipelago (Schllewen et al. 1993). There is evidence that suggests that there is little genetic variation among the Comorian coelacanths (Setter and Brown 1991). From a fitness standpoint, a lack of genetic variability is disadvantageous and may indicate restricted capacity for adaptation. Recent population estimate showed a drastic decrease in the number of coelacanths off the Grand Comoro Island – from about 500 in 1991 to less than 200 in 1994 (Plante et al. 1998). This decline was thought to be most likely due to increased fishing pressure brought about by changes in the fishing pattern around the island (Fricke et al. 1995; Plante et al. 1998). The low estimated population and the low fecundity of the species make it highly vulnerable to extinction. A paper in preparation (Froese and Palomares) indicates that coelacanths grow very slowly, mature at about 20 years,

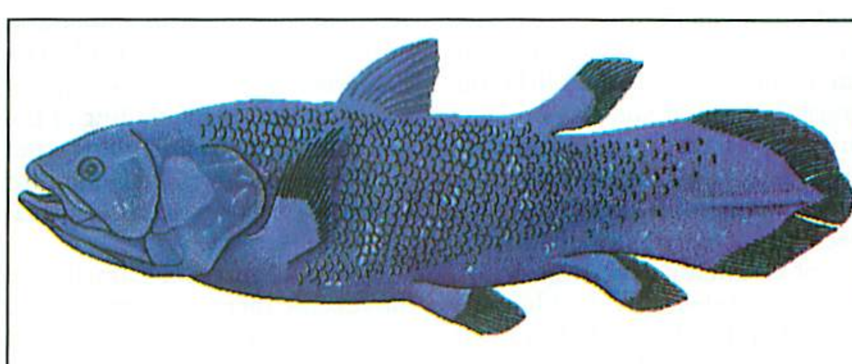

Fig. 2. Drawing of Latimeria chalumnae *available in FishBase.*

Table 1. General information on* Latimeria chalumnae *Smith 1939 in FishBase.

Classification		Reference
Class	Sarcopterygii (lobe-finned fishes)	Smith 1986
Order	Coelacanthiformes (coelacanths)	Smith 1986
Family	Latimeriidae (Gombessa)	Smith 1986
Species	*Latimeria chalumnae*	Smith 1986
Author	Smith 1939	Smith 1986
Environment		
Freshwater	No	Smith 1986
Brackish	No	Smith 1986
Saltwater	Yes	Smith 1986
Habitat	Demersal	Smith 1986
Migrations	Non-migratory	Smith 1986
Depth range	17 to 600 m	Smith 1986
Importance		
Main source of landing	Bycatch in hook and line fishery	Fricke 1997
Importance to fisheries	Of no importance; Target of curio trade	Fricke 1997
Main catching method	Hooks and lines	Fricke 1997
Other methods	Trawls	Fricke 1997
Size and age		
Longevity (wild)	10 y	Smith 1986
Max length (male/unsexed)	160 cm (TL)	Smith 1986
(female)	200 cm (TL)	Smith 1986
Max weight (male/unsexed)	95 000 g	Bruton 1995

Description

A large metallic blue fish with irregular white spots. Intracranial joint present. Bases of pectoral, second dorsal, pelvic and anal fins lobed. Medial lobe present on caudal fin (Bruton 1995).

Distribution

Indian Ocean and western central Pacific: well known off the islands of Grand Comoro and Anjouan in the Comoros. Other reports from South Africa (Heemstra 1995), Madagascar (Bruton 1995), Mozambique (Forey 1998) and Indonesia (Erdmann et al. 1998). Trade restricted (CITES I). Latitudinal range: 5°N – 35°S. Temperature range: 16–23°C.

Remarks

Known as the living fossil. Inhabits steep rocky shores, sheltering in caves during the day (often in groups) and foraging singly over open substrates at night (Bruton 1995). A slow-moving species, it drifts passively with the current or swims slowly with its second dorsal and anal fins. May travel as much as 8 km at night searching for food and retreats to the nearest cave before dawn (Heemstra 1995). Preys on fishes and squid (Bruton 1995). *Beryx, Polymixa, Symphysanodon*, apogonids, a skate, an eel and a swell shark have been known to be eaten (Heemstra 1995). Its main enemies are likely to be large sharks (Bruton 1995). Ovoviviparous, with as much as 5 young (Heemstra 1995).

and have a gestation period of 3 years, the longest among vertebrates. The main threat to the species appears to be human predation. Although the fish is considered inedible and has no commercial value, demand for specimens from collectors and even from the scientific community has been an incentive for fishers to attempt to catch coelacanths or discouraged release of accidentally caught individuals (Balon et al. 1988; Bruton and Stobbs 1991). The species is currently included in Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), of which the Comorian Government is a signatory. This makes the trading of the species subject to particularly strict regulation and even collection for scientific purposes requires special permits.

Given the threat of extinction of the species, there is an urgent need to carry out research that would yield the crucial information useful for its conservation and management. The compilation of information in FishBase is useful as it is widely available and easily updated and allows for interaction and collaboration among researchers. New versions of FishBase are released annually, incorporating information and new features added since previous releases.

Conclusion

There is little published information on the Indonesian coelacanth. DNA analysis will show whether they and the Comorian population are genetically distinct or not. Given the considerable distance between the Comoros and Sulawesi and the prevailing current patterns, it is unlikely that the coelacanths caught in Indonesia are strays from the Comorian population (Forey 1998). If so, the coelacanth may be more widespread and abundant than was previously assumed. Thus, we might expect a strange-looking fish turning up every so often in some fish market in some sleepy fishing village or town just waiting to be noticed.

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References

Balon, E., M. Bruton and H.W. Fricke. 1988. A fiftieth anniversary reflection of the living coelacanth *Latimeria chalumnae*: some interpretations of the natural history and conservation status. Environ. Biol. Fish. 23: 241-280.

Bruton, M.N. 1995. Threatened fishes of the world: *Latimeria chalumnae* Smith, 1939 (Latimeriidae). Environ. Biol. Fish. 43:104.

Bruton, M.N. and S.E. Coutouvidis. 1991. An inventory of all known specimens of the coelacanth

Latimeria chalumnae, with comments on trends in the catches Environ. Biol. Fish. 32:371-390.

Bruton, M.N. and R.E. Stobbs. 1991. The ecology and conservation of the coelacanth *Latimeria chalumnae*. Environ. Biol. Fish. 32:313-339.

Erdmann, M.V., R.L. Caldwell and M.K. Moosa. 1998. Indonesian "King of the Sea" discovered. Nature 395:335.

Forey, P. 1998. A home from home for coelacanths. Nature 395:319-320.

Fricke, H. 1997. Living coelacanths: Values, eco-ethics and human responsibility. Mar. Ecol. (Prog Ser.) 161:1-15.

Fricke, H. and K. Hissmann. 1992. Locomotion, fin coordination and body form of the living coelacanth *Latimeria chalumnae*. Environ. Biol. Fish. 34:329-356.

Fricke, H., J. Schauer, K. Hissmann, L. Kasang and R. Plante. 1991a. Coelacanth *Latimeria chalumnae* aggregates in caves: first observations on their resting habitat and social behavior. Environ. Biol. Fish. 30:281-285.

Fricke, H., J. Schauer, K. Hissmann, O. Reinicke, L. Kasang and R. Plante. 1991b. Habitat and population size of the coelacanth *Latimeria chalumnae* at Grand Comoro. Environ. Biol. Fish. 32:287-300.

Fricke, H., K. Hissmann, J. Schauer and R. Plante. 1995. Yet more danger for coelacanths. Nature 374 (6520):314.

Froese, R. and M.L.D. Palomares. Growth, length-weight relationship, maximum length and length at first maturity of the coelacanth *Latimeria chalumnae*. (In prep.)

Froese, R. and D. Pauly, Editors. 1998. FishBase 98: concepts, design and data sources. ICLARM, Manila, Philippines. 293 p.

Heemstra, P.C. 1995. Additions and corrections for the 1995 impression, p. v-xv. *In* M.M. Smith and P.C. Heemstra (eds.) Revised Edition of Smith's sea fishes. Springer-Verlag, Berlin.

Hissmann, K. and H. Fricke. 1996. Movements of the epicaudal fin in coelacanths. Copeia 1996(3):606-615.

Plante, R., H. Fricke and K. Hissmann. 1998. Coelacanth population, conservation and fishery activity at Grande Comore, West Indian Ocean. Mar. Ecol. (Prog. Ser.) 166: 231-236.

Schllewen, U., H. Fricke, M. Schartl, J.T. Epplen and S. Paabo. 1993. Which home for the coelacanth? Nature 363 (6428):405.

Setter, A.L. and G.W. Brown, Jr. 1991. Enzymes of the coelacanth *Latimeria chalumnae* evidenced by starch gel electrophoresis. Environ. Biol. Fish. 32:193-198.

Smith, M.M. 1986. Latimeriidae, p. 152-153. *In* M.M. Smith and P.C. Heemstra (eds.) Smith's sea fishes. Springer-Verlag, Berlin.

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NTAFP News

ABSTRACT

A. Uma

Uma, A. 1995. Influence of probionts on the growth and survival of penaeid shrimp in nursery phase, M.F.Sc. Thesis, Department of Aquaculture, Fisheries College and Research Institute, Tanuvas, Tuticorin, India.

The effectiveness of the probiotic microorganism, *Lactobacillus plantarum* and a probiotic feed supplement to improve the growth, survival and immune status of the white shrimp, *Penaeus indicus* H. Milne Edwards were assessed. In addition, biocontrol of shrimp larval pathogen, *Vibrio harveyi*, in shrimp larvae was attempted.

The growth and survival of the shrimp juveniles and immune status improved significantly when fed with commercial shrimp feed containing a probiotic feed supplement, "Lacto-sacc" at 3 different levels, viz., 2.5, 5 and 7.5 g/kg feed. The best performance was observed at 2.5 g/kg feed level.

Addition of probiotic, *L. plantarum*, to the larval rearing medium at 10^6, 10^5, 10^4 and 10^3 CFU/ml level significantly enhanced the growth and survival of *P. indicus* postlarvae. The highest growth and maximum survival were recorded in 10^6 CFU/ml concentration. There was a slight improvement in the immune status of the shrimps as confirmed by the pathogenic bacterial challenge.

Significant enhancement in the growth and immune status of the shrimp larvae was observed by feeding *L. plantarum* bioencapsulated in *Artemia* nauplii at concentrations of 10^2, 10^3, 10^4 CFU/g of *Artemia*. The shrimp larvae fed with bioencapsulated *L. plantarum* at 10^4 CFU/g of *Artemia* performed better than other concentrations. The survival of shrimp larvae fed with different concentrations of bioencapsulated *L. plantarum* did not differ significantly.

A beneficial bacterial strain, *Pseudomonas/Alteromonas* TJP-$_7$, was found to enhance the survival of shrimp larvae by controlling the pathogenic *Vibrio harveyi*.