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**FIRST RECORD OF *ANGUILLA* GLASS EELS FROM AN ATOLL OF
FRENCH POLYNESIA: RANGIROA, TUAMOTU ARCHIPELAGO**

BY

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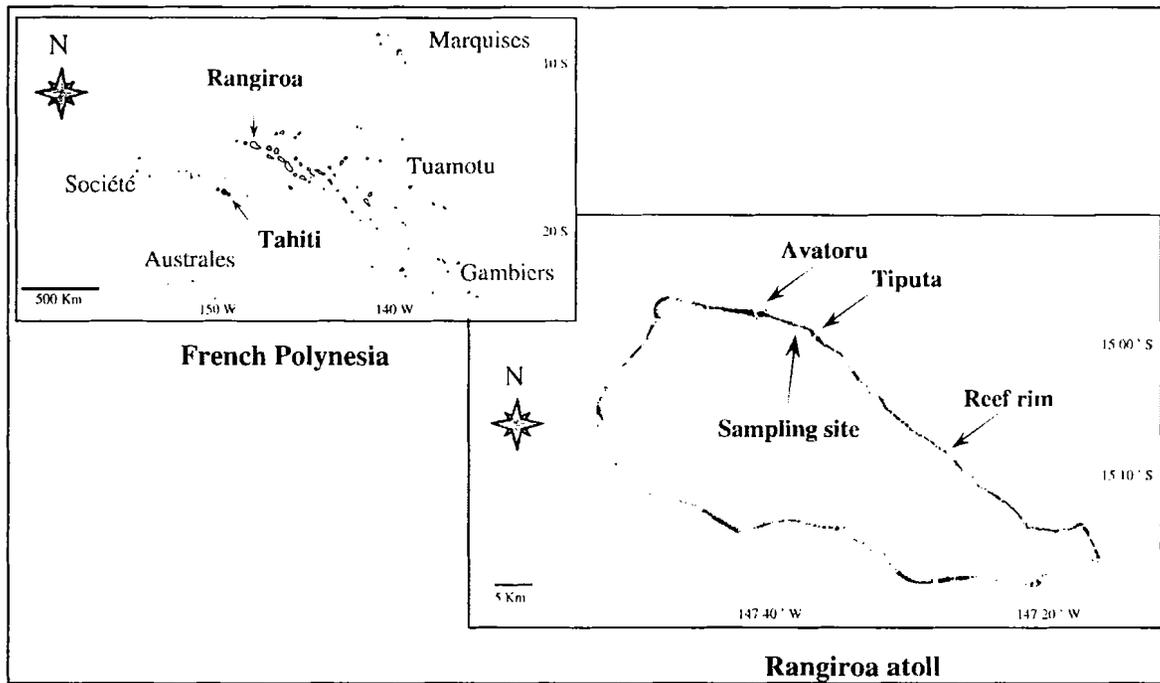


Figure 1. French Polynesia with Rangiroa Atoll, Tuamotu archipelago.

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ABSTRACT

Few observations of glass eels in French Polynesia have been recorded. While conducting a reef-fish larvae survey off the Rangiroa Atoll rim flat, two glass-eel species were caught for the first time: *Anguilla marmorata* and *Anguilla obscura*.

INTRODUCTION

Several records exist of glass eels caught during their migration to the freshwaters in Pacific islands. Migration of glass eels is well known in islands such as Tahiti (Marquet, 1992) but a lack of information about it still remains in atolls .

Rangiroa Atoll is one of the largest atolls in the world and the most important of Tuamotu Archipelago (Ricard, 1985). It is 70 km long and 30 km wide. The peripheral rim is 225 km long and one-third of the rim is above the sea surface (500 to 800 m wide). Lagoon waters flow out through two passes (Tiputa and Avatoru: Fig 1) and oceanic waters flow into the lagoon through channels, called hoas, over the atoll rim.

Studies on larval species, larval flux and recruitment processes of coral-reef fishes in French Polynesia have been undertaken for 10 years on Moorea Island. The colonization of fish larvae in lagoons of atolls or islands occurred only at night during moonless periods (Dufour, 1992). A comparison of the colonization has been made on Rangiroa Atoll since 1989 (Lo-Yat, per. com.) according to Dufour's method (1992). This is the first record and study of glass eels from an atoll.

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Figure 2. Mediolateral pigmentation in caudal region of *Anguilla marmorata* -A- and *Anguilla obscura* -B-.

METHODS

Coral reef larvae were collected off the northern coast of Rangiroa Atoll (15°S, 147°W) at night with a crest net (Dufour, 1992) that filtered the water coming from the ocean into the lagoon. It was located in a channel (hoa) over the atoll rim, midway between two passes (Fig. 1). Sampling was made from January to April 1998. Animals were preserved in 95% alcohol. Eel traps were put in the two passes, but no glass eels were caught. Moreover, during the daytime, no glass eels were caught in the traps or in the crest nets.

Eel identification is based on characters defined by Ege (1939), Marquet (1992) and Budimawan (1997). Morphological criteria (total length, distance between origins of dorsal and anal in percent of total length) and caudal pigmentation were used (Elie *et al*, 1982; Marquet, 1992; Budimawan, 1997). Total body length was measured to the nearest mm. Vertebrae were counted using micro-X ray (Sigma 2060).

Table 1. Glass eels morphometric data. TL=total length in mm, AL-DL/TL=ano-dorsal length in percent of total length, *A. obsc*=*Anguilla obscura*, *A. mar.*=*Anguilla marmorata*.

Date	TL mm	AL-DL/TL%	Species
24/01/98	45	4.1	<i>A. obsc.</i>
03/02/98	50	20.0	<i>A. mar.</i>
	50	20.0	<i>A. mar.</i>
28/02/98	52	15.3	<i>A. mar.</i>
	50	4.0	<i>A. obsc.</i>
	50	2.0	<i>A. obsc.</i>
	48	4.2	<i>A. obsc.</i>
	49	4.08	<i>A. obsc.</i>
	53	16.9	<i>A. mar.</i>
27/03/98	48	16.7	<i>A. mar.</i>
21/04/98	52	17.3	<i>A. mar.</i>
	54	15.0	<i>A. mar.</i>
	50	15.0	<i>A. mar.</i>

RESULTS

A total of 13 glass eels were sampled. All specimens sampled were glass eels at VB stage (according to the pigmentation scale of Elie et al., 1982), the first "continental" stage of the eel. Measurements of the morphological characters (Table 1), the tail pigmentation (Fig. 2), and the vertebrae number (106.2 ± 2.8) indicated that two species were present: *A. marmorata* and *A. obscura*. The total length at arrival varies from 45 mm to 54 mm. Glass eels migrate at night towards the lagoon through the channel.

DISCUSSION

The life cycle of eels is believed to conform to the following patterns. Spawning occurs in the ocean. The first larvae, known as leptocephali, migrate across the ocean towards coastal waters. The leptocephali transform into glass eels and cross the interface between the ocean and the continents to begin their growth period mainly in fresh or brackish waters. At this stage the glass eels become pigmented, complete their metamorphosis and turn into elvers and then yellow eels. Once these eels approach maturity, they turn into the so-called silver stage, cease feeding and migrate back to the spawning grounds. Many studies have been published mostly on the species *Anguilla anguilla*, *A. rostrata*, *A. japonica*, *A. marmorata*, *A. bicolor*. Their spawning areas are now more or less well-known (Schmidt, 1922; Jespersen, 1942; Tsukamoto, 1992; Budimawan, 1997). In contrast, breeding areas for the other species are still hypothetical.

The biodiversity of the *Anguilla* genus is maximal in the Pacific with 16 species present out of a total of 19 (Ege, 1939). French Polynesia covers a vast oceanic area located at the eastern limit of the Indo-Pacific ocean. Five archipelagoes form French Polynesia, an area of 4,000 km² scattered over 2,500,000 km² of ocean and made up of 34 high volcanic islands and 84 low coral atolls. According to Marquet and Galzin (1991), three eel species are present in French Polynesia: *Anguilla marmorata* (Quoy and Gaimard, 1824), *A. megastoma* (Kaup, 1856) and *A. obscura* (Gunther, 1871). Previous to this report, the known eels from Rangiroa Atoll consisted of two species described from adults (Marquet and Galzin, 1991). *A. marmorata* and *A. obscura* found only in stagnant waters, the Vaimate lagoon and on the site of the disused fish-breeding station of Pavete near Avatoru. *A. marmorata* is one of the most common species of Indo-Pacific tropical eels. It is widespread in the Indo-Pacific archipelagoes (Ege, 1939; Jespersen, 1942; Tesch, 1977; Delsman, 1929; Takahasi, 1915; Chevey, 1936; Jubb, 1964; Kiener, 1981; Marquet and Galzin, 1991; Marquet *et al.*, 1997). *A. obscura* inhabits only the Pacific ocean (Ege, 1939). Adult specimens of these two species were caught in different sites in French Polynesia. Both species are found respectively in Austral, Gambier, Society and Tuamotu Archipelagoes, and only *A. marmorata* in Marquesas Archipelago (Marquet and Galzin, 1991).

Several records exist of tropical glass eels (*A. marmorata*, *A. megastoma*, *A. obscura*) during their anadromous migration to the island of Tahiti (Marquet, 1992). There are no similar reports for migration to atolls. This is the first record of glass eels

not only from an atoll of French Polynesia but from any atolls in the Pacific. Despite the low number of glass eels, this record provides important ecological information on the process of inshore migration of tropical eels. Glass eels enter the lagoon over the reef rim by the channel (or *hoa*) like the other coral fishes (Dufour, 1992) at night. The short length of the new glass eels indicates the existence of a spawning area not far from the atoll. The spawning sites could be situated east of the Tuamotu Archipelago according to Jespersen (1942), Marquet (1992), and Budimawan (1997). Our first record of glass eels in this region seems to corroborate this hypothesis. However, the lack of data on glass-eel migrations and the small number of specimens preclude definite conclusions.

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