

## Some ascidians (Tunicata) from the Clipperton Island

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**Abstract:** A zoological and botanical inventory was carried out around Clipperton Island, a small, isolated Pacific island, west of Mexico, during the first three months of 2005, directed by Jean-Louis Etienne. The difficult coastal approach of this atoll and the strong waves have limited the number of SCUBA dives. But several specimens of four ascidian species, never recorded there, were collected. Two of them are new species described here: *Eudistoma etiennae* (Polycitoridae) and *Ascidia lambertae* (Asciidiidae).

**Résumé :** *Ascidies (Tunicata) de l'îlot Clipperton.* Une mission d'inventaire faunistique et floristique de l'îlot Clipperton, isolé à l'ouest du Mexique dans l'océan Pacifique, s'est déroulée au cours du premier trimestre 2005, dirigée par Jean-Louis Etienne. Les accès difficiles à ce petit atoll et la forte houle n'ont permis qu'un nombre limité de plongées effectuées sur des tombants très raides. Plusieurs exemplaires de quatre espèces d'ascidies ont été récoltés dans ce secteur où elles étaient inconnues. Deux sont nouvelles et décrites ici : *Eudistoma etiennae* (Polycitoridae) et *Ascidia lambertae* (Asciidiidae).

**Keywords:** Clipperton • Systematics • Ascidians

### Introduction

Clipperton Island is a small atoll located in the Pacific Ocean 1300 km west of the Mexican coast. It represents the single emerged land of a rift with underwater volcanoes. Consequently it is very isolated. Situated at the limit of the north and south large oceanic currents, the sea water temperature varies from 26° to 28°C. This atoll is in the shape of a closed ring 12 km in circumference around a

deep lagoon, with a very low salinity. The island itself is flat but the nearby continental slope is very abrupt beyond a narrow shelf. Much coral debris has accumulated along the slope.

The island is not inhabited but only temporarily visited by scientific expeditions and French military missions. Some groups of marine invertebrates have been reported there but ascidians were never mentioned. During the "Clipperton" expedition, the SCUBA divers have estimated that the sessile marine fauna was poor compared to the populations of the continental coast at the same latitude. They did not see large solitary ascidians and have only collected discrete and small species, settled on coral rubble.

Two species are new, two others have a wide distribution and may be of anthropogenic origin.

## Systematics

### FAMILY POLYCITORIDAE

*Eudistoma etiennae* sp. nov.

(Fig. 1)

#### Material

Holotype: 10°17'31N-109°12'19W, 17/I/2005, 13 m (MNHN A3 EUD 333).

Paratype: 10°18'49N-109°14'1W, 10/I/2005, 17 m (MNHN A3 EUD 332).

Both colonies were settled on dead coral. The largest is 42x38x4 mm (Fig. 1A). The species is encrusting and strongly adherent to the substrate and its cavities. The tunic is gelatinous but firm at the surface without sediment inclusions or faecal pellets. In living colonies the zooids with their black thoraces are visible through the colourless, transparent tunic (Fig. 1A & B). Some individuals were expelled from the common test during collection, but the remaining appears to be irregularly distributed without systems. The zooids would normally be perpendicular to the surface but in these colonies which were not relaxed before fixation most are distorted by contraction; the largest zooids are only 2 mm in length (Fig. 1C & D) The thorax is black or dark brown, the lobes of the siphons are black (Fig. 1B), and the abdomen is colourless. The pigment remains in formalin.

Both siphons have six short lobes; the cloacal siphon is sometimes longer than the oral one. The thorax is rectangular and short (Fig. 1C & D), not constricted before the abdomen. The transverse and longitudinal muscles are regularly spaced and dense. All thoracic tissues are deeply pigmented. The small size of the thorax has prevented its dissection and the number of oral tentacles is unknown but low. There is no unperforated area anterior to the branchial tissue. The first row of stigmata is slightly curved dorsally. About 12 stigmata were counted in the first row and 10 in the second row on each side. The abdomen (Fig. 1D) is short without pigment cells, retracted by two muscle bands extending down beyond the digestive loop and the heart. The short globular smooth-walled stomach is followed by a narrow segment that widens in a bulge (Fig. 1D); following this the intestine is narrow, curved, entering in the rectum with two caeca. The ascending limb makes a curve at the stomach level but this may be due to contraction. A pyloric gland was not seen. A maximum of 10 round testis vesicles and a central ovary are located inside the intestinal loop (Fig. 1C & D).

The larvae (Fig. 1E & F) are incubated into the peri-

branchial cavity without deformation of the thorax wall. Generally one larva occupies the total length of the thorax, sometimes accompanied by a young embryo. The larval trunk is 0.42 mm long, the tail wound in 3/4 of a turn. Three wide adhesive papillae diverge, alternating with four median ampullae (Fig. 1E & F). Stained with hemalum, thin thread-like structures appear between the anterior papillae (Fig. 1F). Below the ocellus and otolith are two long stigmatal rows separated by a third half row.

This species is remarkable by its vitreous colony spotted with black zooids, small individuals and larvae, and a peculiar larval structure. As this species is easily seen by divers, it probably has not the wide geographic distribution encountered for other ascidians of the present collection.

*Eudistoma etiennae* is dedicated to Jean-Louis Etienne, chief of the "Clipperton" expedition.

### FAMILY POLYCLINIDAE

*Aplidium lobatum* Savigny, 1816

(Fig. 2)

#### Synonymy

*Aplidium lobatum* Savigny, 1816: 182 pl.3 fig.4 pl. 16 fig.1, Suez; Michaelsen, 1920: 22 pl.1 fig.11-12, Mer Rouge; Van Name, 1945: 28 fig.3, West Indies; Tokioka, 1967: 22 fig.1a-f ; Nishikawa, 1984: 109, Truk island; Monniot & Monniot, 1984: 571, Guadeloupe, 1987: 73, Polynésie; Monniot F., 1987: 73, Nouvelle Calédonie; Sluiter, 1895:170 pl.7 figs 6-8, Torres Strait.

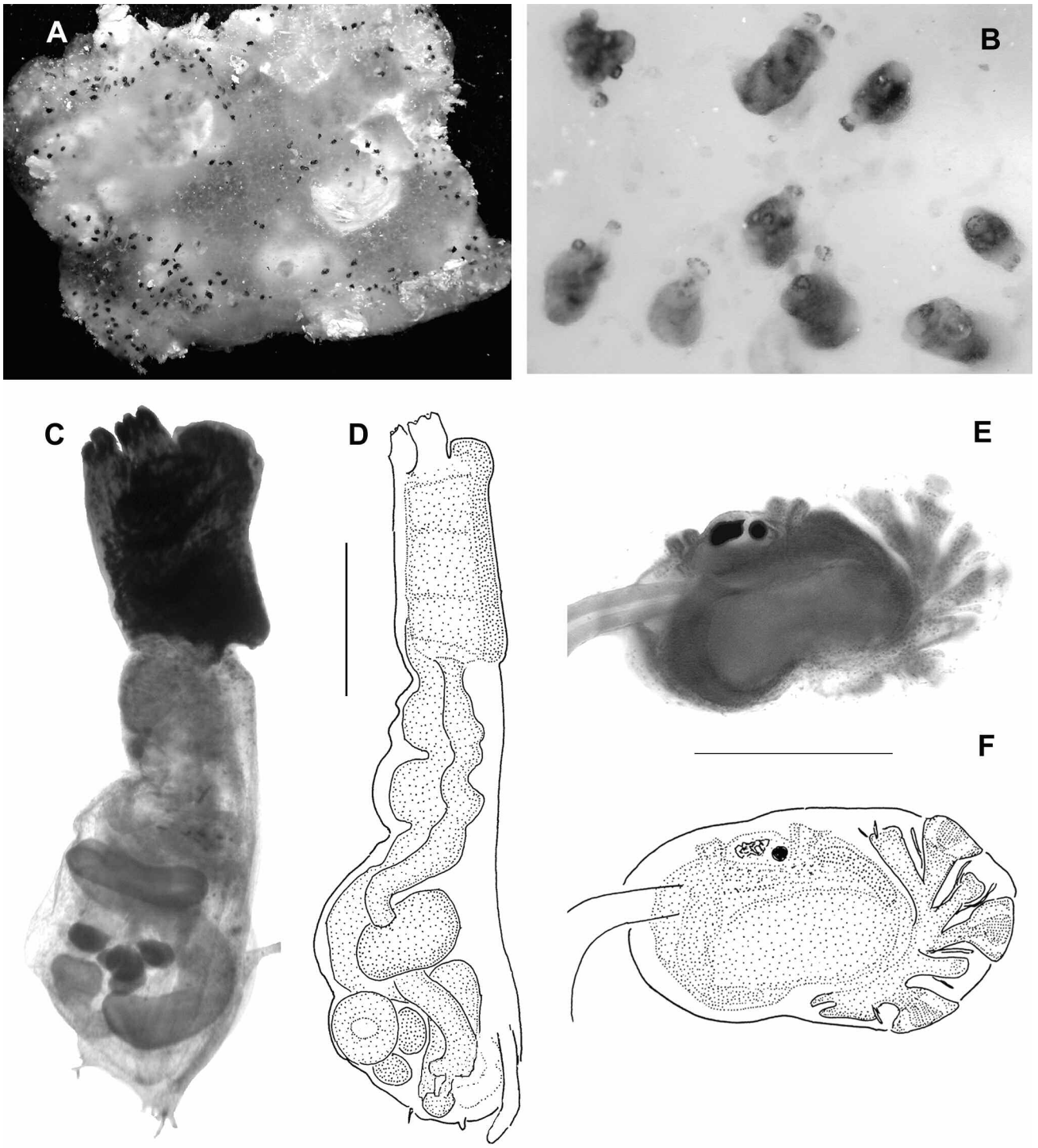
?*Amaroucium ritteri* Sluiter, 1895 (ZMA TU 189)

*Aplidium ritteri*: Kott, 1992: 581, Kott, 2004: 48, Australia.

#### Material

10°18'49N-109°14'1W, 10/I/2005, 17 m , 3 female colonies; 10°18'81N-109°12'27W, 25/I/2005, 18 m, 2 male colonies; 10°19'34N-109°13'40W January 2005, 10 m, 1 male colony (MNHN A1 APL.B 497).

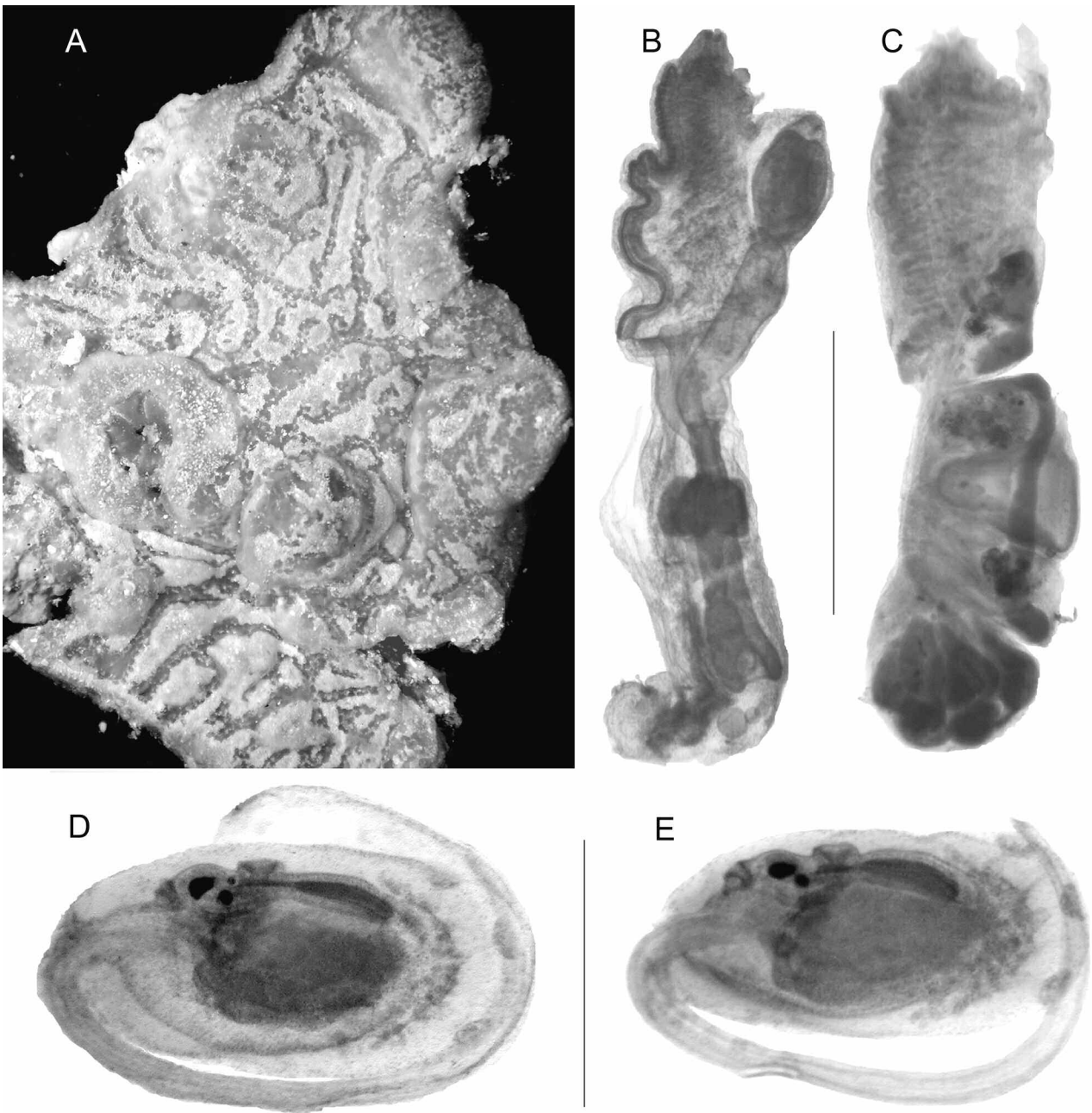
The largest colony is 5 cm in the largest diameter (Fig. 2A). The general shape is in crusts of irregular outline and thickness, depending on the shape of the dead coral on which it is settled. The tunic is vitreous, encrusted with sand and with meandriform systems in double rows along cloacal channels (Fig. 2A). The surface layer of the tunic is rather tough, the interior softer. The zooids (Fig. 2B & C) are contracted. The narrow oral siphon has six lobes. The dorsal rim of the atrial opening has a languet which may be simple or trilobate with a prevalence of one or the other form according to each colony. There are 9 to 10 rows of stigmata and an average of 8 to 10 stigmata in a half row, difficult to count because of the contraction. The stomach has five folds. The rectum begins with two caeca. The post-abdomen is especially short, most often folded under the



**Figure 1.** *Eudistoma etiennae* sp. nov. **A.** Colony. **B.** Detail of the colony surface. **C, D.** Zooid. **E, F.** Larvae. Scale bars: **C, D** = 0.5 mm; **E, F** = 0.2 mm.

**Figure 1.** *Eudistoma etiennae* sp. nov. **A.** Colonie. **B.** Détail de la surface de la colonie. **C, D.** Zoïde. **E, F.** Larves. Echelles : **C, D** = 0,5 mm; **E, F** = 0,2 mm.





**Figure 2.** *Aplidium lobatum* Savigny, 1816. **A.** Colony. **B.** Female zooid. **C.** Male zooid. **D, E.** Two larvae. Scale bars: **B, C** = 1 mm; **D, E** = 0.3 mm.

**Figure 2.** *Aplidium lobatum* Savigny, 1816. **A.** Colonie. **B.** Zoïde femelle. **C.** Zoïde mâle. **D, E.** Deux larves. Echelles : **B, C** = 1 mm; **D, E** = 0,3 mm.

abdomen. Among several colonies observed, zooids have either a testis (Fig. 2C) or an ovary (Fig. 2B) but never both of them. The presence of only one sex in each colony is apparently characteristic of the species; it has been reported by several authors (Michaelsen, 1920; Van Name, 1945).

The larval trunk is 0.6 mm long (Fig. 2D & E). The three

adhesive papillae, each at the end of a slender stalk are surrounded by a crescent of numerous small round vesicles, in a variable number according to the larva (Fig. 2D & E).

The above characters conform to previous descriptions for specimens collected at far distant geographic areas. We have compared the present specimens with collections in

the MNHN: Suez, Mediterranean Sea, west part of the Indian Ocean, west Pacific and Caribbean islands, and no differences were found either in colonies, zooids or larvae.

The type specimen of *Amaroucium Ritteri* Sluiter, 1895 was examined. It consists of two small pieces, probably of one colony, in poor condition (they seem to have dried out before storage in alcohol). Isolated zooids have a very short post-abdomen with only testis vesicles. The general aspect of both colony and zooids suggests a junior synonym of *Aplidium lobatum*.

***Polyclinum pute* Monniot & Monniot, 1987**

(Fig. 3)

*Synonymy*

*Polyclinum pute* Monniot C. & Monniot F., 1987: 84 fig.30, Polynesia; Monniot F., 1987: 514, Nouvelle Calédonie; Monniot F. & Monniot C., 1996: 144 fig. 5 Palau.

non: *Polyclinum tsutsuii* Tokioka, 1954 : 240

non: *Polyclinum corbis*, Kott, 2003 :1626.

non: *Polyclinum tsutsuii*: Kott, 1992 : 463 fig. 34.

*Material*

10°18'49N-109°14'1W, 10/I/2005, 17 m, 1 colony;  
10°17'31N-109°12'19W, 17/I/2005, 13 m, 2 colonies;  
10°18'01N-109°13'87W, 23/I/2005, 1 m, 3 colonies;  
10°18'81N-109°12'27W, 25/I/2005, 18 m, 2 colonies;  
10°18'58N-109°12'05W, 30/I/2005, 20 m, 3 colonies  
(MNHN APL. B 96).

The largest colony is a cushion 23x17x3 mm (Fig. 3A). The arrangement of the zooids in circular systems is obvious (Fig. 3B). There are six to 11 individuals per system. The tunic is translucent. Black pigment is present inside the tunic around the oral openings and in the oral siphons (Fig. 3B). Other colonies are more or less dark. The clumps of sand encrusting the surface layer around the rings of zooids (Fig. 3B) may be an artefact of collection. The internal anatomy exactly corresponds to previous descriptions of this species (Monniot & Monniot, 1987; Monniot & Monniot, 1996).

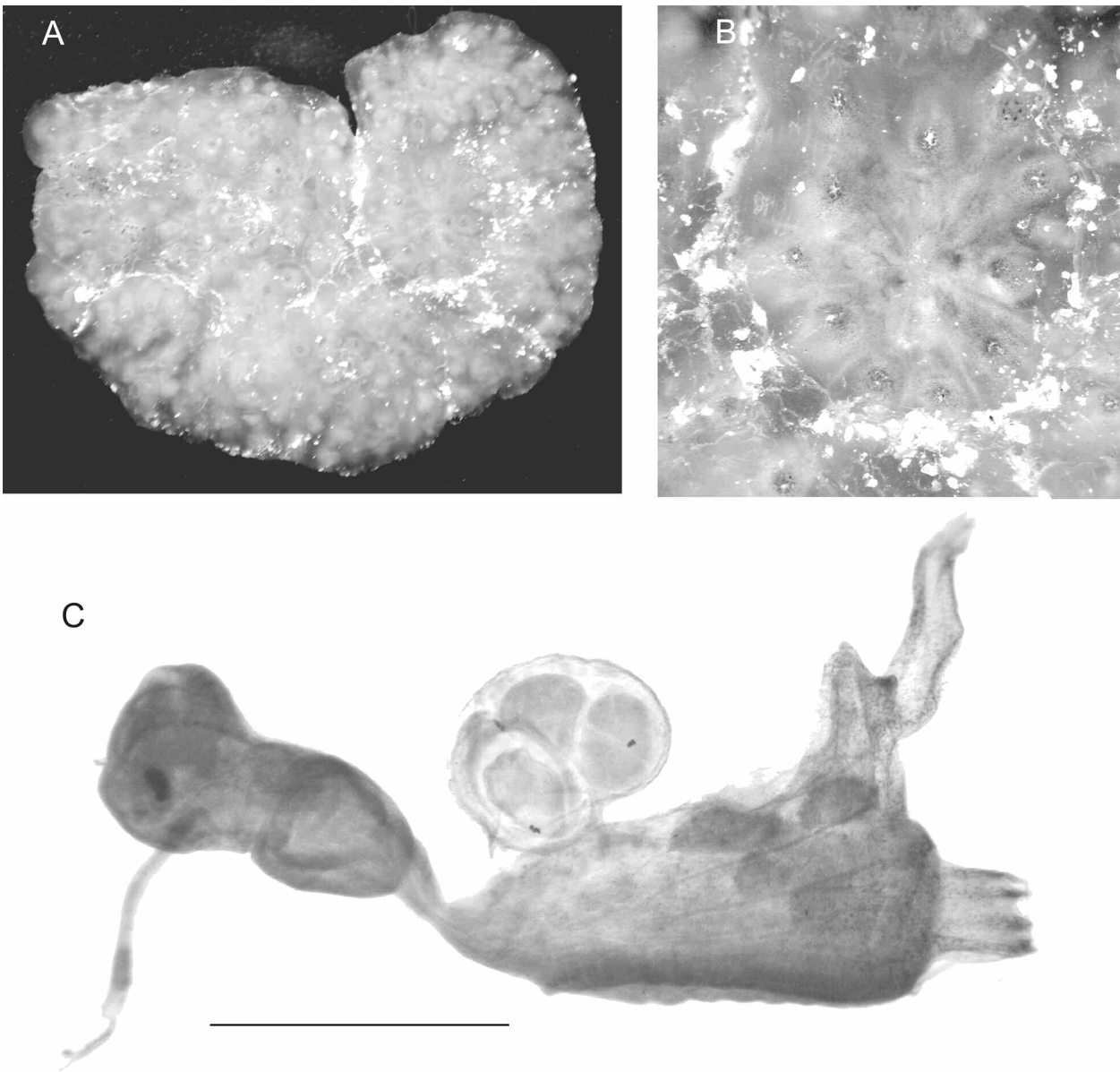
The oral siphon has six sharp lobes. The cloacal languet distinctly arises from the dorsal rim of the atrial aperture (Fig. 3C). A dorsal papilla is well developed posterior to the aperture (Fig. 3C). Eight thin muscles extend posteriorly on each side of the thorax. The branchial sac has 12 rows of stigmata. A rounded incubatory pouch containing several embryos at different development stages is appended to the thorax with a short narrow peduncle (Fig. 3C). The trunk of mature larvae is 0.45 mm in length with four pairs of ampullae on each side of the three adhesive papillae and a group of small vesicles dorsally and ventrally, as figured by Monniot & Monniot (1996, Fig. 5C).

*Polyclinum pute* has a constant structure in all localities:

Polynesia, New Caledonia, Palau and now Clipperton. Always of small size and discrete by their colour, they have been always collected by SCUBA only.

The successive synonymies with *Polyclinum tsutsuii* Tokioka, 1954 given by Kott (1992, 2003 & 2004) cannot be retained. The type specimen of *P. tsutsuii* was examined; it has no larvae, the gonads are poorly developed with few male vesicles and a very small ovary. The post-abdomen has a long pedicle. The cloacal languet arises from the rim of the aperture, the dorsal button is small. There are 11 rows of stigmata with the anus opening at the level of the third stigmata row. This specimen labelled "type" does not correspond to Tokioka's figure (1954 pl. 8 fig. 2) showing a languet inserted above the cloacal siphon and an embryo inside the peribranchial cavity. It is possible that the type colony was chosen among several similar ones but different by Tokioka. Effectively in 1967 Tokioka identified samples of several origins as *P. tsutsuii* which may actually correspond to two species: in one colony he describes an incubatory pouch appended at the level of the seventh row of stigmata, and the anus situated in front of the sixth branchial transverse vessel. This corresponds to *P. pute*. Later, in the same paper, he describes a specimen that he thought different, with an anus more anterior, the location of which corresponds to the examined type specimen.

Kott (1992) described as *P. tsutsuii* a specimen with incubatory pouch, larva with odd vesicles between the adhesive papillae and cloacal languet independent from the atrial aperture. This specimen from Queensland (GH 5609) has been examined; the colony is in a poor state, totally filled with sand; one of the zooids had a cloacal languet in continuity with the rim of the aperture, and one larva in an incubatory pouch. In 2003 Kott created *Polyclinum corbis* sp.nov. for specimens from north-western Australia in which larvae, contained in an incubatory pouch, have odd vesicles between the adhesive papillae and four pairs of ectodermal ampullae. In this species the cloacal languet is located above the aperture. These characters justify this species to be new. Later, Kott (2004: 47) united *P. tsutsuii*, *P. pute* and *P. corbis* in a single species under the name *P. tsutsuii* after seeing a newly collected specimen from Ashmore Reef. We have borrowed this colony from the Museum of the Northern Territory in Darwin (NTME 273). The colony shows circular systems with central common cloacal apertures in protruding funnels. The zooids have an atrial languet issuing from the rim of the atrial aperture, 14 rows of stigmata and no incubatory pouch. Numerous embryos are incubated in a wide oviduct which distends the body wall, but remains entirely inside the peribranchial cavity and does not form a pouch. The thoracic wall is particularly thin at this level and easily breaks during dissection, allowing a part of the oviduct "to project out from the body" (Kott, 2004), the distal part remaining in the



**Figure 3.** *Polyclinum pute* Monniot & Monniot, 1987. **A.** Colony. **B.** Detail of one system of the colony. **C.** Zooid. Scale bar: **C** = 1 mm.

**Figure 3.** *Polyclinum pute* Monniot & Monniot, 1987. **A.** Colonie. **B.** Détail d'un système de la colonie. **C.** Zoïde. Echelle : **C** = 1 mm.

peribranchial cavity. The larvae, 0.45mm in length, have 4 lateral vesicles along each side of the 3 adhesive papillae and ventral lines of small vesicles. This sample only differs from *P. pute* by the erect common cloacal apertures and the absence of a pedunculate brood pouch.

Three different species may coexist in the Pacific Ocean; more abundant collections would be necessary to evaluate a possible specific variability and determine the limits of each species. Within the genus *Polyclinum* in general, few

characters discriminate the species.

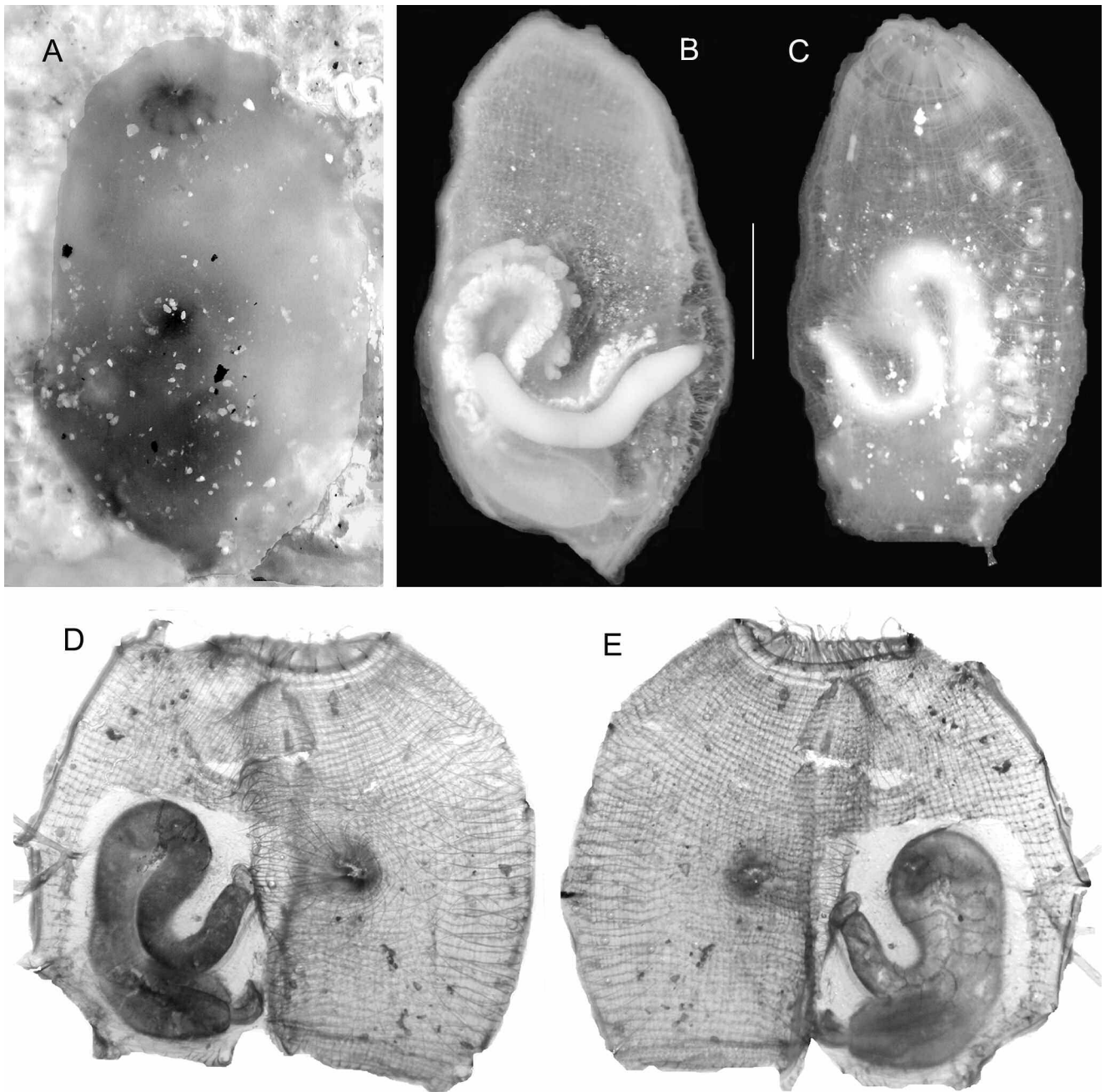
#### FAMILY ASCIDIIDAE

#### *Ascidia lambertae* sp. nov.

#### Material

Syntypes: 10°18'81N-109°12'27W, 25/I/2005, 18 m, 2 specimens (MNHN P5 ASC A 367); paratypes: 10°17'50N-





**Figure 4.** *Ascidia lambertae* sp. nov. **A.** Specimen settled on coral. **B, C.** Left and right sides of a specimen removed from tunic. **D, E.** External and internal sides of the dissection of another specimen stained with hemalum. Scale bar: **B, C** = 4 mm.

**Figure 4.** *Ascidia lambertae* sp. nov. **A.** Un spécimen fixé sur du corail. **B, C.** Faces gauche et droite d'un spécimen sorti de sa tunique. **D, E.** Faces externe et interne de la dissection d'un autre spécimen coloré à l'hémalun. Echelle : **B, C** = 4mm.

109°13'55W, 22/1/2005, 20 m, 1 specimen; 10°19'01N-109°13'76W, 28/1/2005, 17 m, 1 specimen; 10°18'58N-109°12'05W, 30/1/2005, 20 m, 1 specimen (MNHN P5 ASC A 368).

All samples were fixed by their ventral side; the largest

measures 3 cm. The light brown tunic is darker at the siphons. Longitudinal dark lines are on the oral siphon (Fig. 4A) and six or eight black spots between the oral lobes. Black spots are also present between the lobes of the atrial siphon. Both siphons are short with the atrial located about

midway to the posterior end of the animal. The tunic is translucent (Fig. 4A). The body wall is transparent (Fig. 4B & C). The transverse muscles only occupy a half of the right body side (Fig. 4C-E). An irregular loose meshwork of thin fibres lies in the middle of the right side. The oral tentacles are long (Fig. 4E), about 60 inserted on a crest. The space between the tentacles and the peripharyngeal band is narrow with minute papillae. The dorsal tubercle opens in a small simple C inside a slightly curved peripharyngeal band. The dorsal lamina is doubled on the distance between the dorsal tubercle and the neural ganglion and below become a high blade with denticles in front of the branchial ribs; it extends on the left at the side of the oesophagus entrance and forms long papillae on the right. The branchial sac occupies the whole body length (Fig. 4D & E). In a specimen two centimetres long there are 29 longitudinal vessels on the left and 38 on the right. The gut (Fig. 4B, D & E) begins with a short narrow oesophagus. The stomach is wide, with two or three internal folds, giving in an intestine curved in a double loop. The anus is widely open without lobes. The whole digestive tube is included into the body wall. The gonads (Fig. 4E) are linked to the gut with the testis spread over the intestine; the ovary is ramified placed internally over the primary loop. In mature specimens the lobes of the ovary overpass the external outline of the gut loop (Fig. 4B). The sperm duct and oviduct open together at the level of the anus.

#### Remarks

The specimens of *Ascidia lambertae* sp. nov. have many characters in common with *Ascidia ceratodes* (Huntsman, 1912): brown pigment, well separated siphons, numerous oral tentacles, a branchial sac extending below the gut, the gut and gonads of similar shape. We have compared our specimens with several individuals of *A. ceratodes* of the same size, some recently collected in California and others from the MNHN collections. *A. ceratodes* differs from *A. lambertae* in having: a dark tunic; long protruding siphons without longitudinal brown lines; a dense musculature on the whole right side; a thick body wall. The neural ganglion is at a shorter distance to the dorsal tubercle which is larger with rolled horns. The top of the primary gut loop is higher. *Ascidia ceratodes* has a wide distribution along the Pacific coast from Canada to Costa Rica, but in colder waters.

#### Aknowledgments

The new *Ascidia* is dedicated to Gretchen Lambert who has given good suggestions for this manuscript and sent

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