

SOME OFF-SHORE MARINE SPECIES COMING TO LIGHT IN GALAPAGOS, ECUADOR

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SUMMARY

With the recent deployment of a Phantom XTL remotely operated submarine vehicle (ROV) with video camera it has been possible to investigate the Galapagos inshore marine environment below SCUBA-diving limits, between 40 and 150 m depth. Video recordings are rare of species at these depths and are shedding light on the presence, abundance and behavior of various species. The side-gilled opisthobranch mollusk *Berthella californica* and a nudibranch *Flabellina* sp. were recorded at depths where they had not previously been seen in Galapagos. Other species filmed by the ROV may be new records for the archipelago such as a squat lobster *Munida* sp. and an octocorallian of the family Aquaumbridae. Several other octocorallians, including *Virgularia* cf. *galapagensis*, *Cavernulina* cf. *darwini* and *Ptilosarcus* cf. *undulatus*, rarely seen since 1984, were recorded. The Sideblotch Bass *Serranus stilbostigma* has now been identified in seven new sites throughout the archipelago.

RESUMEN

Algunas especies marinas de profundidad media se revelan en Galápagos, Ecuador. Con la reciente utilización de un vehículo submarino de control remoto Phantom XTL con cámara de video ha sido posible investigar el medio ambiente de la costa submarina de Galápagos más allá de los límites de buceo, entre los 40 y 150 m de profundidad. Grabaciones de video de especies a estas profundidades son raras, y están revelando la presencia, abundancia y el comportamiento de varias especies. El opistobranquio *Berthella californica* y un nudibranquio *Flabellina* sp. fueron grabados a profundidades a las que no habían sido observados antes en Galápagos. Otras especies grabadas por el minisub podrían ser nuevos récords para el archipiélago, tales como un sastrer *Munida* sp. y un octocoralio de la familia Aquaumbridae. Varios otros octocoralios, incluidos *Virgularia* cf. *galapagensis*, *Cavernulina* cf. *darwini* y *Ptilosarcus* cf. *undulatus*, raramente vistos desde 1984, fueron grabados. El serránido *Serranus stilbostigma* ha sido identificado ahora en siete nuevos sitios a lo largo del archipiélago.

INTRODUCTION

The Phantom XTL remotely operated submarine vehicle (ROV), carried aboard the ship *National Geographic Endeavour* (hereafter *Endeavour*), has recently captured video footage of several marine species that had been recorded only a few times over the past few decades, and which were found in previously unknown sites or at previously unexplored depths. These included a number of gastropods, octocorals and fish, reported here.

METHODS

The Phantom XTL ROV has a cable connection allowing a maximum depth of 150 m and incorporates a Sony EVI-330/331/T standard-definition video camera. The cable connects to a distribution box that is in turn connected to the console for controlling the ROV. The pilot watches the camera output on a connected computer screen. Power comes from a 110 V generator connected via a small transformer to the distribution box, which passes power on to all components. Deployment of the ROV requires the assembly of the components inside a pilothouse that is subsequently lowered, along with the ROV itself, into

an inflatable outboard-propelled dinghy. The dinghy then proceeds as an autonomous unit to the selected area of investigation.

Sites were selected for their ease of access within the constraints of the schedule of the *Endeavour*. Following an itinerary approved by the Galapagos National Park, the *Endeavour* regularly travels a 15-day circuit within the Galapagos Islands, allowing for repeated visits to the selected sites. Before operating the ROV at each site, consideration is given to the depth, current and other sea conditions at the time. The ten sites chosen for routine exploration were: Punta Espinoza, Fernandina Island; Tagus Cove, Isabela Island; James Bay, Santiago Island and Bartholomew, off Santiago; Guy Fawkes Islets and the northeastern corner of Baltra, off Santa Cruz Island; Punta Cormorant and Post Office Bay, Floreana Island; León Dormido, off San Cristobal Island; Punta Suarez, Española Island. All video recordings were saved and later stored on an external hard-drive. The recordings were subsequently provided to both the Galapagos National Park and the Charles Darwin Research Station (CDRS).

The observations reported here were made during the period between April 2012 and May 2013.

RESULTS

Anthozoa: Octocorallia, Pennatulacea

Observations from the ROV have confirmed the presence of dozens of octocoral sea pens at several locations around the archipelago.

Cavernulina cf. darwini (Veretillidae). This Galapagos endemic was found at Punta Espinoza (Fernandina Island) at 43.2 m (Fig. 1, lower left), at James Bay (Santiago Island) at 39.9 m where over a dozen “individuals” (an “individual” coral meaning hereafter a colony of polyps) were repeatedly recorded over the year, and in Tagus Cove at 63.3 m, where there appear to be several dozen individuals spread over the floor of the cove.

Virgularia cf. galapagensis (Virgulariidae). Specimens very similar to this species were seen and filmed repeatedly over the year at NE Baltra Island at 75.2 m (Fig. 1, top), Guy Fawkes at 70.4 m and 80.1 m, Punta Cormorant (Floreana Island) at 42.6 m, James Bay at 39 m (Fig. 1, centre) and Tagus Cove at 55.7 m (Fig. 1, lower right) and 64.3 m. These individuals differed in coloration, from pale yellow or pink to deep red, and in the length of the polyp “leaves” off the central rachis, making the specimen appear either tall and slender or shorter and “bushy”.

Ptilosarcus cf. undulatus (Pennatulidae). Colonies resembling this rare species were found twice, in James Bay at 39.9 m on 27 February (Fig. 2) and at Bartholomew Island at 39.6 m on 21 March. The photographed specimens appeared to have peduncles of more slender dimensions than *Ptilosarcus undulatus* (Hickman 2008). The only sightings of this species since the 1982–3 El Niño were made off Wolf Island in 2006 (Hickman 2008b) and at Tagus Cove (Breedy et al. 2009).

Anthozoa: Octocorallia, Alcyonacea

Aquaumbra cf. klapferi (Aquaumbridae). The shallow sea floors off Bartholomew Island (86.8 m, 7 March; Fig. 3) and Punta Espinoza (99.6 m, 27 March) were found to have extensive colonies of an octocorallian of the order Alcyonacea resembling this species (G. Williams pers. comm.). The only previous specimens were recently collected from seamounts and canyons off Isla del Coco (Costa Rica) down to 400 m (Breedy et al. 2012). Our recordings come from a considerably shallower depth and further exploration will be required to determine whether they indeed represent *Aquaumbra klapferi*, or a new member of the Aquaumbridae.

Crustacea: Decapoda

Munida sp. (Munididae). Populations of *Munida* “squat lobsters” were found in abundance over a large area of the sea floor off Guy Fawkes at 74 m and 72.5 m on 6 and



Figure 1. *Cavernulina cf. darwini*, Pta. Espinoza, Fernandina Island (lower left) and three forms of *Virgularia cf. galapagensis*: NE Baltra Island (top), James Bay, Santiago Island (centre) and Tagus Cove, Isabela Island (lower right).



Figure 2. Sea pen (Pennatulacea) resembling *Ptilosarcus undulatus*, James Bay, Santiago Island.



Figure 3. *Aquaumbra* cf. *klapferi*. Bartholomew Island.

20 March respectively, and off Bartholomew Island at 86.8 m on 21 March (Fig. 4). Its abundance at such shallow depths is of particular note. These small animals (1–2 cm) had strikingly long, slender chelipeds that were banded orange and white. Three species of *Munida* were collected early on in the Galapagos: *M. hispida*, *M. mexicana* and *M. perlata* (Benedict 1902). Since then, *M. hispida* and *M. mexicana* have been found in the islands several times (Schmitt 1921, CAS 1995, Hendrickx 1999) at 165–500 m and 16.5–145 m depth respectively, with *M. mexicana* known as the most shallow-water species to date (Hendrickx 2000). Much deeper and rarer is *M. perlata*, of which only two specimens exist, one found in the Galapagos Islands (type specimen) and the other in the southern Gulf of California (Hendrickx 2000). Recently, more specimens of the Munididae have been collected by the CDRS in the islands and are currently under study (R. Calderón pers. comm.). Only the collection of specimens at the locations

where they were filmed by the ROV will clarify whether they belong to one of the three species already known in the islands (Hendrickx & Harvey 1999).

***Stenorhynchus debilis* (Inachidae).** A recording in Tagus Cove at 56.9 m showed what might indicate a commensal relationship of this species, the Panamic Arrow Crab, with a Blackfin Conger *Paraconger californiensis* (Fig. 5). For several minutes the crabs were filmed moving about, around and over the head and face of the eel, at times in direct contact with its eyes, eliciting no discernible reaction from the eel.

Gastropoda: Opisthobranchia

***Berthella californica* (Pleurobranchidae).** The uncommon Sidegill Slug was recorded twice: at 87.8 m off the coast of Bartholomew Island on 3 March 2013 (Fig. 6), and at Guy Fawkes Islets travelling across a sandy bottom at 72.5 m on 30 March 2013. With a Pacific Ocean distribution, *B.*

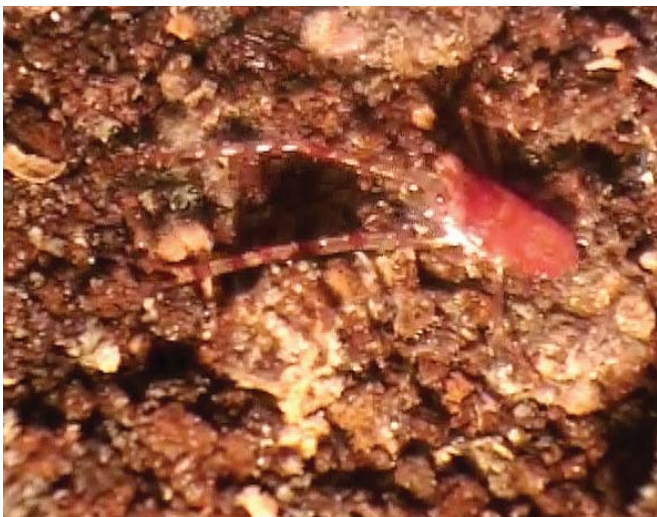


Figure 4. *Munida* sp., Bartholomew Island.



Figure 5. *Stenorhynchus debilis* on *Paraconger californiensis*, Tagus Cove, Isabela Island.



Figure 6. *Berthella californica*, Bartholomew Island.

californica has been recorded from Alaska to Galapagos, Russia and Korea, but almost exclusively in shallow waters (<<http://www.itis.gov>>, consulted 18 Apr 2014). Behrens (2004) considered its presence in Galapagos as tentative and only recently was it accepted for the islands (Hickman 2008a). It has not been recorded in recent marine surveys (S. Banks pers. comm.).

Flabellina sp. (Flabellinidae). A single recording was made of what appears to be a species of *Flabellina*, at 71.9 m off the Guy Fawkes Islets on 6 March 2013 (Fig. 7). Three species in the family (*F. telja*, *F. marcusorum* and an as yet undescribed species) are currently recognized as occurring in Galapagos (Hickman & Finet 1999), and *Flabellina* spp. are regularly recorded by CDRS annual marine biodiversity surveys (S. Banks, pers. comm.). The image captured by the ROV shows an individual with a pale rosy ground color and long cerata with pale cream-colored tips, rather than the more vibrant colors of the better-known *F. telja* and *F. marcusorum*, so it remains unidentified until further information or specimens are collected (T. Gosliner pers. comm.). The depth of this record might suggest a species other than *F. telja*, which is



Figure 7. *Flabellina* sp. Guy Fawkes Islet.

reported as having a rocky intertidal and shallow subtidal range (Hickman & Finet 1999).

Unidentified nudibranch. A large, bright red-orange nudibranch, possibly a *Dendrodoris* sp. (Dendrodorididae) (T. Gosliner pers. comm.) was recorded travelling across a sandy substrate at 65.2 m in Tagus Cove (Isabela Island), 26 February (Fig. 8). Three species of this family, in two genera, are provisionally registered in Galapagos (<<http://checklists.datazone.darwinfoundation.org/marine/>>, consulted 23 Jan 2014).



Figure 8. Unidentified nudibranch resembling *Dendrodoris* sp., Tagus Cove, Isabela Island

Chordata: Osteichthyes

Serranus stilbostigma (Serranidae). Over a period of one year starting in April 2012, the Sideblotch Bass was recorded seven times at four separate locations, with three islands providing repeated recordings. The first sighting was off the westernmost Guy Fawkes Islet at 74 m on 27 June (Fig. 9). Subsequently it was recorded off Bartholomew at 95.4 m on 28 June, in Tagus Cove at 64.3m on 26 February, off Pta Cormorant at 96 m on 4 March, again off the Guy Fawkes Islet at 71 m on 6 March, off Bartholomew at 100.5 m on 7 March, and once more in Tagus Cove at 73.1 m on 12 March. In the original description, Jordon & Bollman (1890: p. 159) wrote "color reddish brown (probably crimson in life), becoming paler beneath, breast somewhat orange". McCosker & Rosenblatt (2010) commented that they did not observe any of the red or orange coloration, and our video records mostly support this observation, although showing a slight pink tinge along the nape and on the ventral surface of the caudal peduncle. The ROV video also caught the "large creamy blotch" mentioned by McCosker & Rosenblatt (2010). This patch reflected the light from the ROV so brightly (Fig. 9, patch at mid-body; the anterior reflective area on the photo is the base of the pectoral fin) that it could be detected from a considerable distance, before



Figure 9. *Serranus stilbostigma*, Guy Fawkes Islet.

the rest of the body could be distinguished. The first specimen of *S. stilbostigma* (which was originally placed in *Prionodes*) was collected during explorations by the U.S. Fish Commission steamer *Albatross* in 1888 (Jordan & Bollman 1890). It was not seen again in Galapagos until 1995 when it was filmed by the untethered submersible Johnson-Sea-Link of the Harbor Branch Oceanography Institution. Over one seamount at 195–203 m depth, southeast of San Cristobal Island, several of these fish were photographed and filmed, and one collected (McCosker & Rosenblatt 2010). Since then, no further sightings had been made until those reported from the Endeavour ROV. *Serranus stilbostigma* is considered endemic to the Galapagos Islands. Although it was included in a list of Ecuadorian mainland marine fishes (Béarez 1996), this has since been considered to be based on a dubious record (Jiménez-Prado & Béarez 2004, P. Béarez pers. comm.).

DISCUSSION

With the regular deployment of the ROV, we have now been able to demonstrate that several species, previously thought rare, are present in several new locations and are possibly more numerous than previously thought.

The four species of Pennatulacea sea pens known in Galapagos (*Scytalium* sp., *Virgularia galapagensis*, *Ptilosarcus undulatus* and *Cavernulina darwini*) were not considered endangered prior to the 1982–3 El Niño event, yet in subsequent years only a few specimens have been found, in few locations (Breedy et al. 2009). The ROV has allowed us to record the benthic environment, population densities and distribution of *Virgularia* cf. *galapagensis*, *Cavernulina* cf. *darwini* and a species resembling *Ptilosarcus undulatus*, in several locations. The discovery of color and shape variations in what is provisionally identified as *Virgularia galapagensis* perhaps indicates the presence of other Pennatulacea in the waters of Galapagos. The genus *Cavernulina* has an Indo-Pacific distribution with

four recognized species. *C. darwini* is poorly known and its range within the archipelago just beginning to come to light. The recent ROV images suggest that its distribution is more extensive than previously known.

Berthella californica is not easily found in the archipelago and little is known of its range and ecology there. The new recordings by the ROV have added information not only about the geographical and depth range of *B. californica* within the archipelago but also of its habitat and behaviour. Similarly, despite the scarcity of previous records of *Serranus stilbostigma*, recordings by the ROV indicate that it can be found in many locations around the archipelago, with a range that extends from 64 m (this study) to at least 203 m (McCosker & Rosenblatt 2010), with preferences for sandy substrates around small rock outcrops.

One of the biggest benefits of capturing marine life on film is the discovery that the living organism is sometimes of a different coloration or pattern than was supposed from a preserved specimen, as with *Serranus stilbostigma* (McCosker & Rosenblatt 2010). Given the apparent differences of some of the organisms filmed by the ROV from the descriptions of the species with which they are provisionally identified here, future collection of Galapagos specimens of these organisms may reveal more cases of this phenomenon.

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ALF WOLLEBÆK AND THE GALAPAGOS ARCHIPELAGO'S FIRST BIOLOGICAL STATION

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SUMMARY

Much has been written on the human history of Floreana Island, but the story of its oldest standing building, a lava house in Post Office Bay, has remained untold. We determined, and demonstrate with photographs, that the structure, now 90 years old, was once a biological station: the archipelago's first. It was built by the 1925 Norwegian Zoological Expedition to the Galapagos Islands, led by Alf Wollebæk, then director of the Natural History Museum of the University of Oslo. The Galapagos portion of the expedition, which was preceded by short explorations of the West Indies and Colombia, spanned five months and five islands, and resulted in the collection of more than 500 biological specimens, the publication of over 20 articles and books, and the discovery or reclassification of several species, most notably the Galapagos Sealion *Zalophus wollebæki*. Wollebæk's accounts of the expedition were written in Norwegian, and are not well known outside Scandinavia. We provide a brief account of the expedition, a summary of Wollebæk's observations in the Galapagos, and a history of the biological station that Wollebæk and his assistant, Erling Hansen, built.

RESUMEN

Alf Wollebæk y la primera estación biológica en las Islas Galápagos. Mucho se ha escrito sobre la historia humana de la Isla Floreana pero la crónica de su edificio más antiguo aun en pie, una construcción de lava en la Bahía Post Office, permaneció en la oscuridad. Hemos determinado y demostramos con fotografías que esta estructura, que cumple ahora 90 años, fue alguna vez una estación biológica: la primera en el archipiélago. Fue construida por la Expedición Zoológica Noruega a las Islas Galápagos de 1925, bajo la dirección del entonces Director del Museo de Historia Natural de Oslo, Alf Wollebæk. El segmento de la expedición dedicado a Galápagos, que fue precedido por cortas exploraciones del Caribe y Colombia, abarcó cinco meses y cinco islas, resultando en la colección de más de 500 especímenes biológicos, la publicación de más de 20 artículos y libros, y el descubrimiento o reclasificación de varias especies, entre las cuales se destaca la del Lobo marino de Galápagos *Zalophus wollebæki*. Los relatos de Wollebæk acerca de la expedición fueron escritos en noruego y son poco conocidos fuera de Escandinavia. Proporcionamos un breve recuento de la expedición, un resumen de las observaciones de Wollebæk en Galápagos, y una crónica sobre la estación biológica que él y su asistente Erling Hansen construyeron.