

## **Merkel & Associates, Inc.**

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April 30, 2010  
M&A #07-046-02

Eileen Maher  
San Diego Unified Port District  
P.O. Box 120488  
San Diego, CA 92112

### **Re: Embarcadero Fishing Pier and Le Meridien Fish Enhancement Structures Final Quarterly Report**

Dear Eileen:

This letter reports the biological observations made at the Embarcadero Marina South (Figure 1) and Le Meridien (Figure 2) artificial reef sites. The reef structures were installed by Merkel & Associates, Inc. (M&A) on March 20 and 21, 2008 (M&A 2008). These observations constitute the fourth and final quarterly biological monitoring of the artificial reef sites.

#### **Embarcadero Marina South**

The biological survey at Embarcadero Marina South was performed on June 8, 2009 by M&A biologist, Heather Krish. Invertebrate species observed utilizing the most recently installed structures were California spiny lobsters (*Panulirus interruptus*), multiple species of sponges (Porifera), gorgonians (Gorgonacea) and several unidentified encrusting bryozoans (Bryozoa). The abundance of the invasive colonial bryozoan *Zoobotryon verticillatum* was consistent with the last survey in that it was present, yet not as overwhelmingly abundant as it had been in surveys prior to the third quarterly survey.

The fish species observed within or near the reef structures were consistent with earlier surveys. Listed from most to least abundant, they include kelp bass (*Paralabrax clathratus*), spotted bass (*Paralabrax maculatofasciatus*), barred bass (*Paralabrax nebulifer*), and round rays (*Urobatis halleri*). Opaleye (*Girella nigricans*), yellow fin croaker (*Umbrina roncador*) and several unidentified surfperch (*Embiotocidae*) were also noted, all approximately equal in abundance.

A major shift in algal growth was apparent on this survey. In the third quarter, *Undaria pinnatifida* nearly covered the entirety of the reefs. A decrease in this population has occurred leaving no single species clearly dominant. Along with the *Undaria pinnatifida* that persisted, *Gracilaria*, *Ulva*, and *Sargassum muticum* were observed.

As expected, more fishing line, lures, and lead weights were seen on both old and new sections of reef than in previous surveys. A build-up of fishing lines and bio fouling of these lines is beginning to block the pipe openings of both old and new reef structures. Two deceased spiny lobsters were seen entangled in this derelict gear. Photos from this reef can be seen on Photo Page 1 at the end of this document.

#### **Le Meridien**

Ms. Krish also performed the biological survey at Le Meridien on June 8, 2009. The dominant fish and invertebrate species were the same as those observed at the Embarcadero Marina South site with the exceptions of the fish opaleye and yellow fin croaker, which were not observed, and tunicates (Urochordata),

which were. The density of *Zoobotryon verticillatum* was comparable to that of the last survey, in which it was observed but not dominant. *Undaria* and *Ulva* were present, however, *Sargassum muticum* was the most abundant algae, yet this too, was less abundant than it was in the third quarterly survey. Photos from this reef can be seen on Photo Page 2 at the end of this document.

It has been a pleasure working on this project with the Port of San Diego. If you have any questions regarding this letter or the included materials, please contact me at (858) 560-5465.

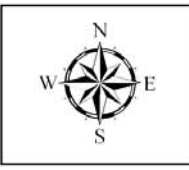
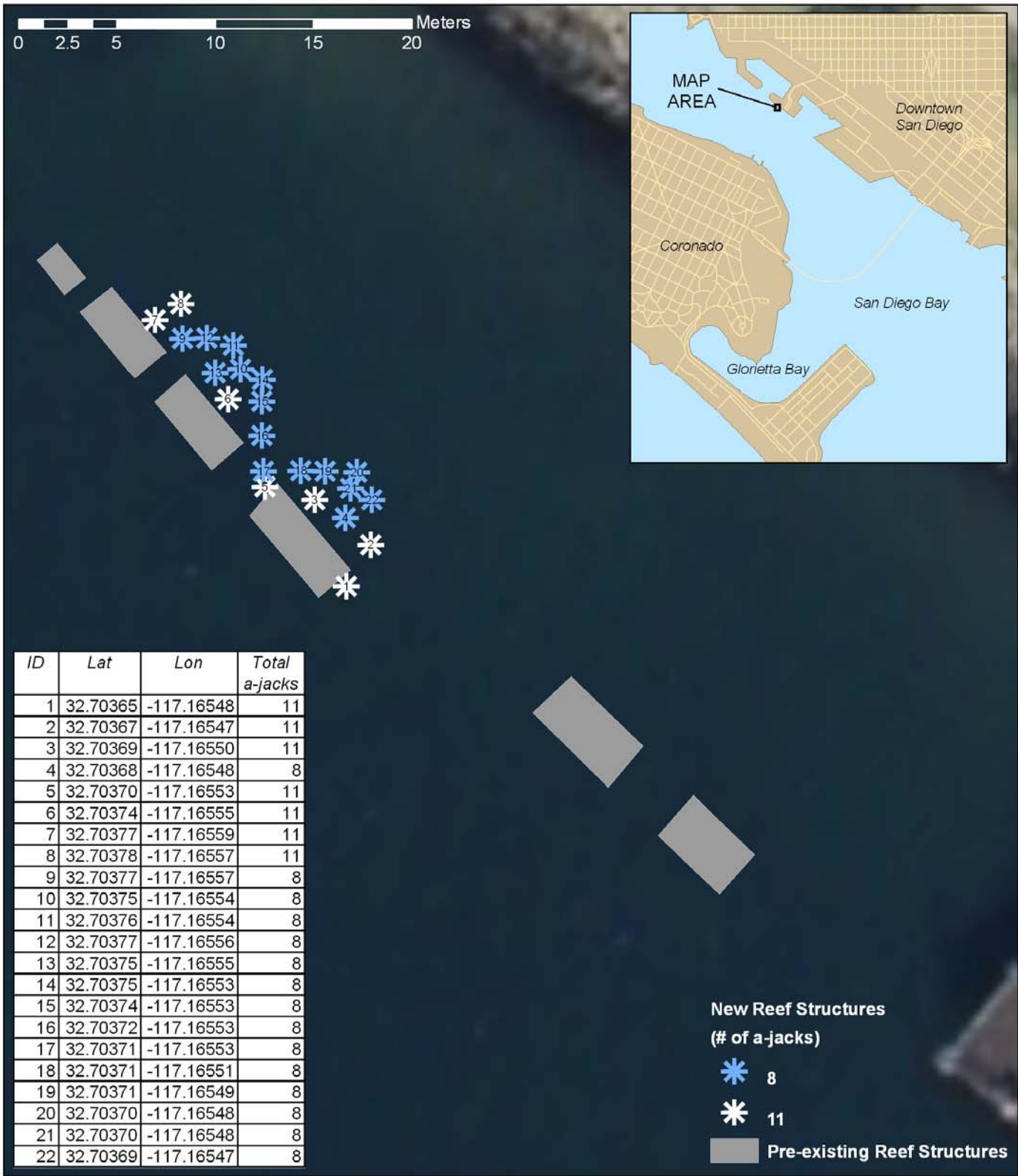
Sincerely,

A handwritten signature in black ink, appearing to read "Robert Mooney". The signature is fluid and cursive, with a horizontal line underneath the name.

Robert Mooney, Ph.D.  
Senior Biologist

**References:**

[M&A] Merkel & Associates, Inc. 2008. Embarcadero Fishing Pier and Le Meridien Fish Enhancement Structures. Letter report regarding installation process. Prepared for the San Diego Unified Port District. March 15, 2008.



**Embarcadero Artificial Reef Structures**  
San Diego Bay Fish Enhancement Structures Project

**Figure 1**

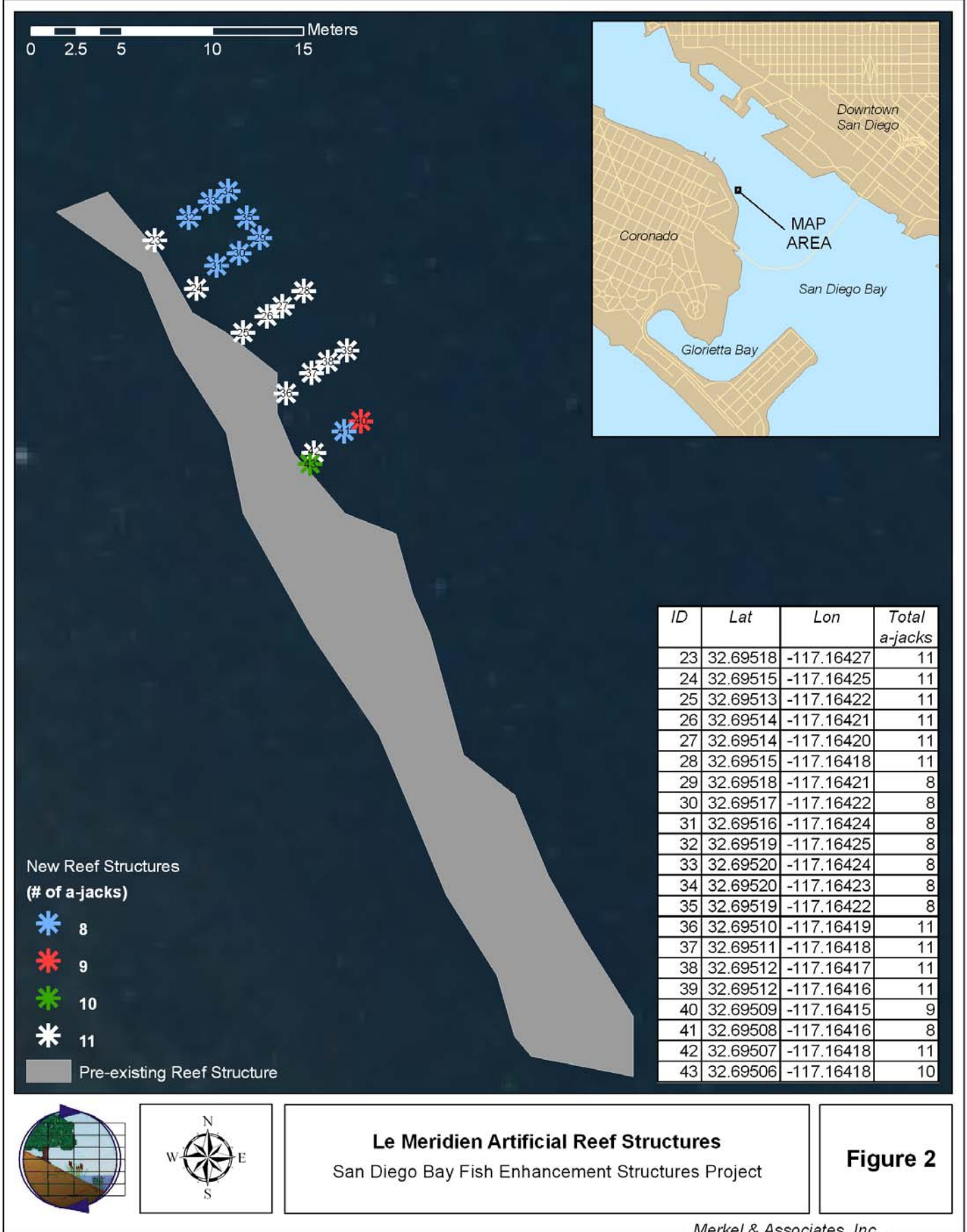




Photo Page 1. Top Left: *Gracilaria*. Top Right: *Sargassum muticum*. Middle Left: Gorgonian. Middle Right: *Undaria pinnatifida*. Bottom Left: Fishing line blocking a pipe opening in the reef. Bottom Right: A dead lobster tangled in fishing line.



Photo Page 2. Top Left: *Sargassum muticum* with sponge growth. Top Right: Tunicates and sponge. Middle Left: Kelp Bass. Middle Right: *Ulva* on an A-jack. Bottom Left: *Undaria pinnatifida*. Bottom Right: Lobster with Fish and Game ID tag.