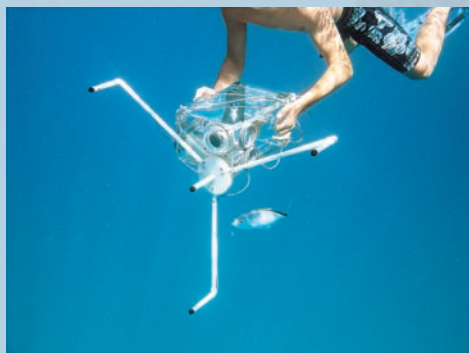# "Kickass": A New Underwater Audio/Video Recording System

by Michiel Schotten

Its official name is 4-channel Underwater Dolphin Data Acquisition System, or 4-channel UDDAS, but that just wouldn't do for the *R/V Stenella* crew. Just like its predecessor, the single-channel UDDAS built in 2002 by Marc Lammers was coined "Badass", the crew put all their creative abilities to full steam and quickly came up with a more appropriate name for this one as well: the "Kickass" was born! Its development and construction have been part of my Ph.D. study at the Hawaii Institute of Marine Biology and at Groningen University, The Netherlands. One thing about Kickass is that it is big, heavy and bulky on the ship, and needed the assistance of two crew members to be put into the water (with thanks to the Mayer family!). However, once in the water, it transforms into a more or less streamlined, weightless, mean lean recording machine, which tends to evoke the curiosity of fish and

Even fish think this new gadget is cool. Here a little fish is taking cover and checking it out.

dolphin alike. Its purpose: record the full frequency bandwidth of dolphin sounds up to 240 kiloHertz (over 10 times higher than what humans can hear), pinpoint the sounds to a location in 3-D and then attribute those sounds to individual dolphins on the simultaneously recorded video. A range of interesting questions could be answered this way, for example: If one dolphin makes one type of sound during communication, with what sounds do other dolphins respond? Are these sounds accompanied by specific behaviors of individual dolphins? If an echolocating dolphin homes in on a target, how does it adjust its sonar clicks?

The key to all these questions, however, is to find out which dolphin is vocalizing and when, something which is hard to do normally unless there is the occasional bubble trail from the blowhole. This is the reason Kickass was developed. It makes use of the fact that hydrophones (i.e. underwater microphones) spaced several feet apart, each receive the sound at a slightly different time. From these differences in arrival times, the location of the sound source can be calculated. Later it can be seen on the simultaneous video which dolphin was at the calculated position at that particular time. Specific features of the sound can thus be attributed to specific dolphin behaviors. Kickass uses an array of 4

hydrophones mounted in the front, and incoming dolphin sounds are amplified and then digitized at a very high rate. Then with a mini-computer, powered by two big batteries, the sounds are stored on a hard drive. That's Kickass in a nutshell.

The last WDP fieldtrip of the season was, after initial field tests in Hawaii, its first real use "in action". WDP's knowledge of the individual spotted and bottlenose dolphins in its catalog acquired over 20 years of fieldwork is unique in the world, and presents an ideal setting to employ a system as Kickass which focuses on getting recordings from individual dolphins. After all, if the life history and family relationships of a certain dolphin are well known, it puts the high frequency sounds recorded from that dolphin into a much more meaningful perspective. The trip turned out to be very successful, with great conditions and many good dolphin encounters. Kickass held up very well, and I was able to make many good recordings of a variety of behaviors of both spotted and bottlenose dolphins. Analyzing these will take many months, but preliminary views of the data already yielded a new finding: some of the click recordings went all the way up to the upper recording limit of 240 kHz. This is unexpected, and since this frequency is the high end of Kickass (although it can be extended later on), the question arises: how high can these sounds go? Hopefully the 2006 field season will shed new light on this.

Here a speckled female, Burgundy is checking out Michiel and kickass – she and her friends were very curious!