

1st AWI-ZMT SCIENTIFIC DIVING COURSE

with kind support of the HCRM Crete

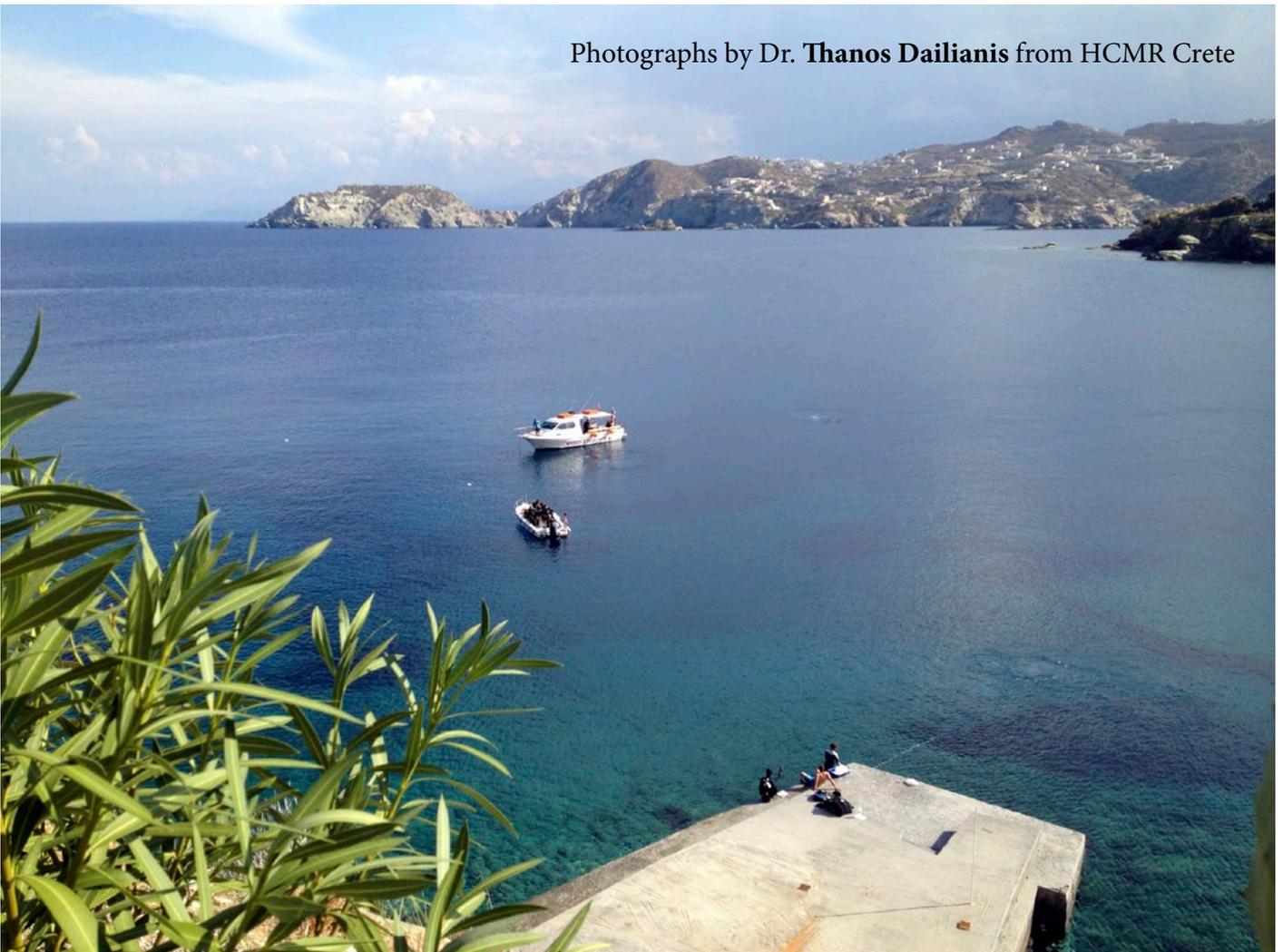
Photographs by Dr. Thanos Dailianis

An illustrated
course report

Part b (warmwater)
30th Oct - 15th Nov 2013

Dr. Georgios Tsounis

All rights reserved, 2013



“*DIVER IN THE WATER!*” Malik is on mission leader duty and shouts that command loud and clear. Water splashes onto my face as Claire plunges into the sea, and I suddenly remember we are on a boat off Crete with three research diver trainees... The warm sun is sparkling on the Aegean Sea, yet I can’t quite maintain a vacation spirit: It is November, the tourists have gone back to work in the rain, and we arrived with a dozen students and four instructors to prepare them during two weeks for the exam. That official exam means serious business, as we invited three independent examiners for the end of the course, appointed by the German statutory accident insurance association.

“*Diver in the water*”, is echoing back from the other boat. The other groups repeat the command to acknowledge it in military fashion. For some operations it is crucial to let the boat captain know that a diver has entered the water, and it is one of the routines that have to become second nature to the course participants. On the second boat, the other group is still preparing their diver. That’s right, Sebastian is just sitting there, being dressed and checked by Stephie who is responsible for that group today. This comfortable method of starting the dive is typical in commercial diving and harkens back to the old days of hard hat helmet diving. Back then divers were wearing lead shoes and a copper helmet. They could not move alone, could not check their equipment while locked into their helmet. Helmet divers

This is a report of the 2nd part of the 2013 AWI-ZMT Research Diving Course

even used to wear red woolen hats, so the rest of the boat crew knew who needed special attention. Variations of that basic concept have proven themselves over more than a century in all types of diving where the responsibility over diving safety must be legally delegated for insurance purposes. This means that a diving supervisor, or mission leader, takes all decisions. Should any of his team members be harmed or injured, he/she must defend his/her decision in front of a legal investigation. This is the reality of occupational diving, and learning to operate with that attitude was the key to this course.

Though unusual for anyone with a sport diving background, it quickly became a daily routine for the students: “Are your fins closed, where do you wear your knife”, Stephie goes through Sebastian’s equipment. “Can you reach your weight belt, how much air is in your tank, do your regulators work?”. She checks the function of everything, before helping him into the water. But Mission leaders even have to control “their” diver under water. Malik pulls five times

on the line that he carefully holds in his hand, and receives five pulls back from Claire, who is at ten meters depth in front of our boat. Malik constantly observes her bubbles reaching the surface to confirm she is breathing fine, and looks at the watch on his slate. “15mins dive time”, he announces, and checks that Jeremy is ok. On this dive, Jeremy acts as the safety diver. Should Claire require any

assistance or stop responding to signals, then Jeremy would enter the water immediately. This determines the minimum size of a dive team: Three persons. Claire dives alone on a tether line, but since she is wearing a full face mask, it means she can't aspirate water even in the case of unconsciousness, so she is protected during the time the safety diver needs to reach her. The mission leader has a plastic slate with notes of dive time calculations according to the carried air supply, so nothing is ever left to chance. Becoming familiar with this system is part of the course curriculum, and at ZMT we first try to thoroughly understand these procedures, to then be able to optimize them for any environment.

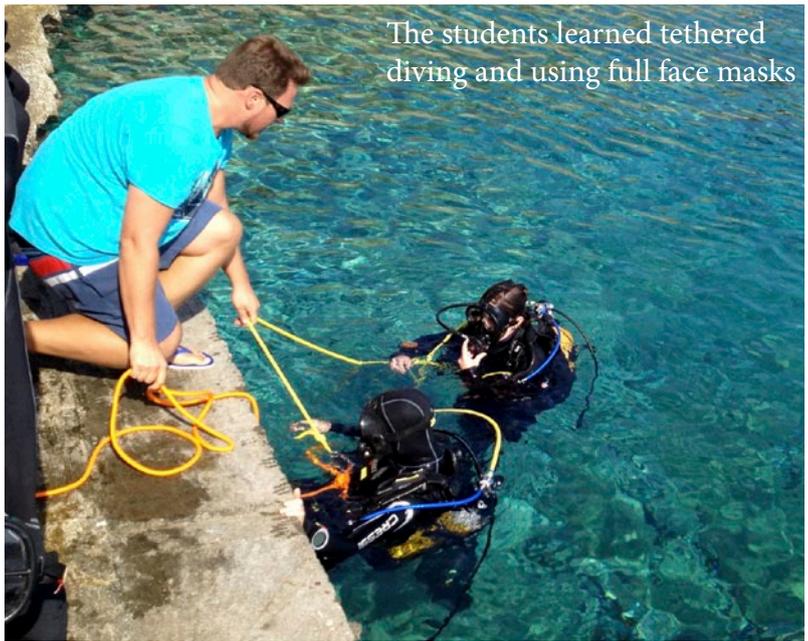
Returning to the beach after the dive, everyone unloads equipment from the boat into the water, over the beach and into the dive club: a torturous ritual common to any form of diving. Over the days of the course this procedure gets noticeably more efficient, as on the first day, everyone carried his own gear, while on the last day the loading and unloading took half the time and effort thanks to forming human transport chains.

And so another typical day in the course goes by, and everyone ends up exhausted after a 12 hour day. During these November evenings, we had the village for ourselves. Agia Pelagia is deserted in winter, which brings a certain melancholy with it. Many participants brought work with them to finish off in the evenings, or books to read. But they soon find out that coming to the apartment after diving, one is almost too tired to cook, let alone work on some manuscript for his supervisor or editor. Some students gather together in the apartments and cook together while also studying for the theory exams. Others meet at Mouragio restaurant (the only one still open) for traditional Greek food.

Malik is grinning from ear to ear when he breaks the news to Stephanie that she will be the "Mission Leader of the Day" for tomorrow. Stephanie, who was just laughing about a joke at the dinner table, becomes dead-serious and her mind begins to go through all preparations. Each group has a mission leader, but one of them has the responsibility to coordinate the four groups so that all tasks are accomplished on schedule: Meeting at 08:15 at the dive club to assemble the equipment and hold a briefing for the day, where the important points are discussed. Loading the boat at 09:00, making sure no important things are missing, short lunch break at 13:00 and a second dive at 14:00, until everyone walks up the hill to the apartments. Consequently, being mission leader of the day is rather tough on the nerves. Apart from the preparation and concentration, the students also realize it requires certain leadership



Malik is on mission leader duty and checks his divers before their dive



The students learned tethered diving and using full face masks



photo: Georgios Tsouris

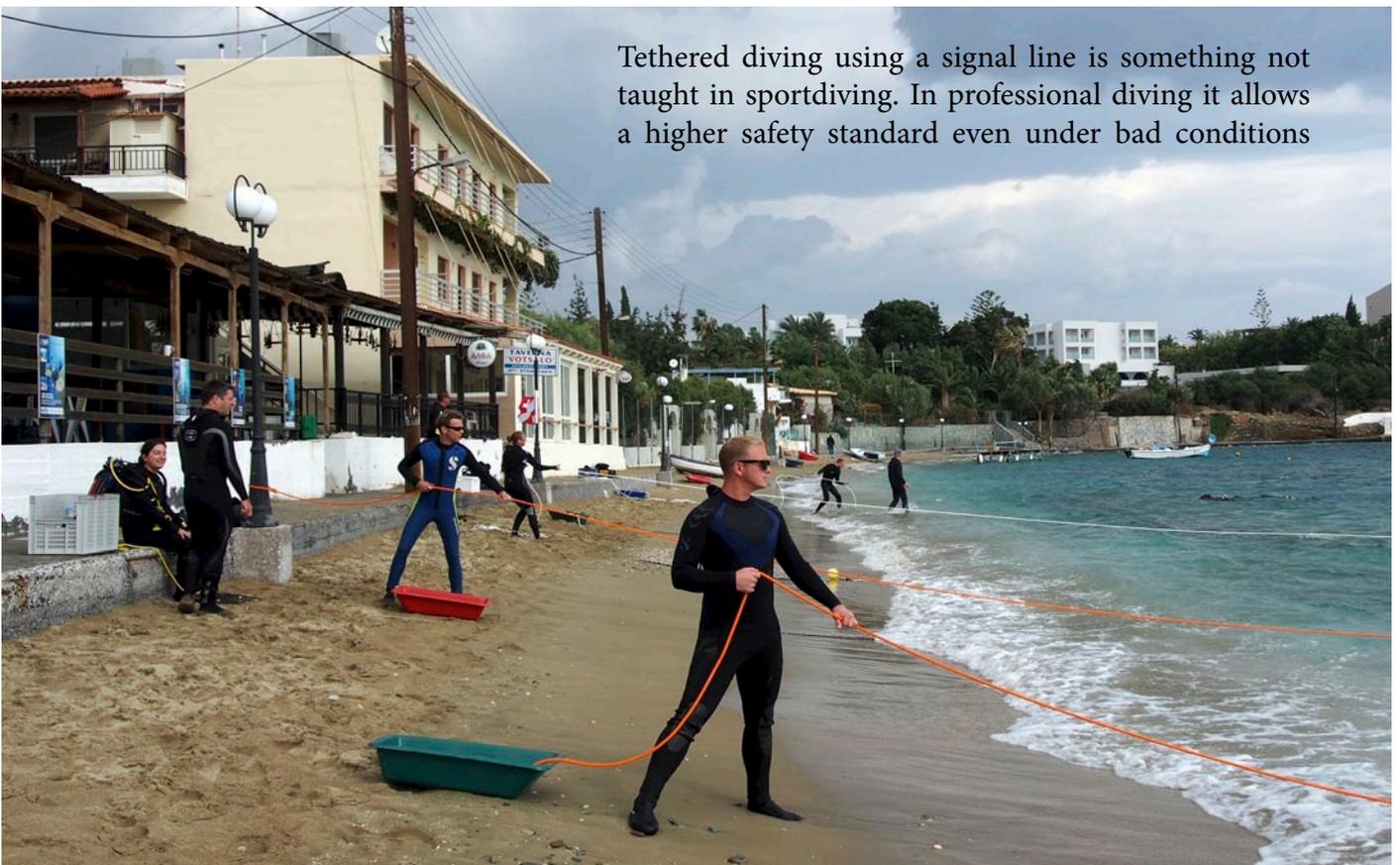
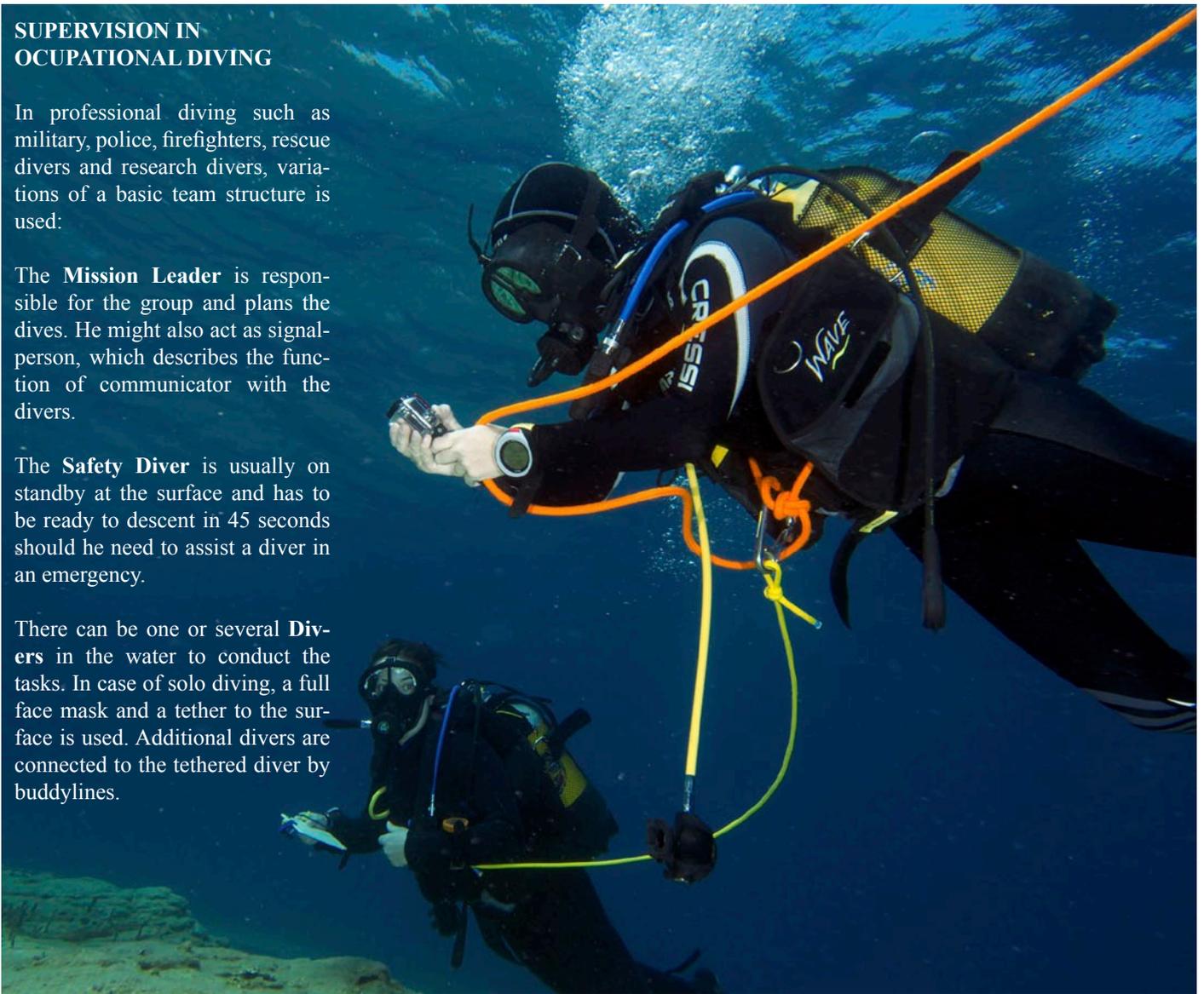
SUPERVISION IN OCUPATIONAL DIVING

In professional diving such as military, police, firefighters, rescue divers and research divers, variations of a basic team structure is used:

The **Mission Leader** is responsible for the group and plans the dives. He might also act as signal-person, which describes the function of communicator with the divers.

The **Safety Diver** is usually on standby at the surface and has to be ready to descent in 45 seconds should he need to assist a diver in an emergency.

There can be one or several **Divers** in the water to conduct the tasks. In case of solo diving, a full face mask and a tether to the surface is used. Additional divers are connected to the tethered diver by buddylines.



Tethered diving using a signal line is something not taught in sportdiving. In professional diving it allows a higher safety standard even under bad conditions

Agia Pelagia proved to be a perfect venue for our course in November



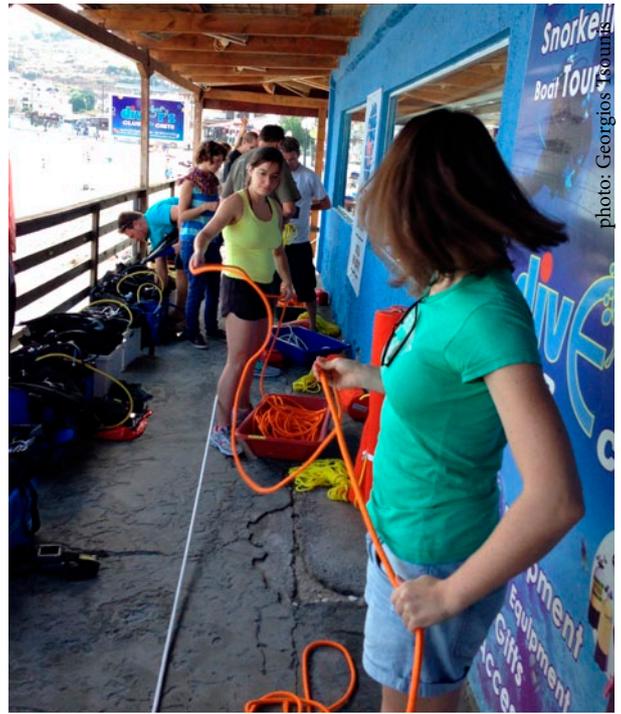
and communication skills. While in the first week the students focussed more on the site and their equipment, the instructors gradually left more of the responsibility to the students, until on exam day, the students ran the operation like clockwork.

On the next days, the course split into four groups, over a large 10m Boat, a 6m boat from the Crete Divers Club that we chose as logistic partner, and a concrete pier in the bay of Agia Pelagia. A third boat was made available by the Hellenic Center for Marine Research that supported our course in a knowledge transfer collaboration: The HCMR is in the process of developing its own scientific diving course under the umbrella of the European Scientific Diving Panel. So in many regards this was a special course: First of all it was a research diver course for a group that was already actively working as research divers for many years. Then of course, due to ZMT's international composition, the course was held in English.

Another difference to previous German research diving courses was that this course placed the second part in warm water, as a first effort to apply and further develop our rules that originate from commercial diving in northern waters to working in tropical areas. ZMT staff were as skeptical as our Greek colleagues. "Why the full face mask? How will you use your reserve regulator if that big masks occupies your whole face", asked some. What is the benefit of the signal-line, while diving in a 5m deep lagoon where you can see the diver from above the boat? Our chief instructor Professor Philipp Fischer was open to discuss these rules from various perspectives, backing them up with decades of diving and teaching experience. But this course would have been a failure if it merely tried to convince the participants to blindly follow rules. Rather, the goal was to open the participants' eyes to a different perception of responsibility, and to provide them with the tools to enforce the highest level of diving safety.

Of course, this safety system and configuration originated from work diving in Nordic climates under zero visibility, where a dive buddy is of less use than a safety diver topside. The preceding first part of our course in the North Sea (see the Helgoland report on the ZMT website) was a valuable experience to fully understand this system. Understanding the underlying principles shall allow ZMT as well as individual mission leaders, to optimize their safety procedures for each environment.

The way to achieve that, consists of a documentation and supervision routine, combined with a thorough theoretical knowledge on diving risks and practical rescue skills. The underlying idea is to analyze risks beforehand: "Anyone can jump in the water, but how do you get an unconscious diver into



80 meters
of line



Of course, managing the lines
had to be learned...



Leadership Skills: Jeremy discusses the planned tasks



Fabian prepares a flow-scheme for more complex work

safety?" This means assuming the worst case at the worst time, and coming up with a written plan of how to find and get an injured diver out of the water and into the hospital.

Indeed, on the first morning, before getting their feet wet, the students interviewed Dimitris Drakos, owner of Divers Club Crete: Local conditions, emergency numbers, access points for ambulance cars, and other questions were discussed and printed out. The hospital and decompression chambers were contacted to check operation hours and let them know about our work schedule.

And all of this was then put thoroughly into practice during the so called "safety days", when emergencies were simulated. The participants knew that emergency drills would happen, but they did not know *what* would happen. Take for example Sebastian, on the first safety day in Crete (our third over the whole course). "How long has Fabian been already underwater?" He asked Sara who was the group's stand by diver, and held the slate to write down notes. "18mins", she replied. Every moment now they expected Fabian to come foaming to the surface and start screaming for help, but nothing happened. A bit annoyed that Fabian's expected emergency simulation was overdue, Sebastian pulled the signal line five times to ask OK, but no reply came. And suddenly the adrenaline get's going, hands get sweaty and the whole world moves in slow motion as the mind is racing: "Sara, get ready, we have a simulated emergency!" "SIMULATED EMERGENCY!",



Teamwork: unloading the boats

photo: Georgios Tsoumis

photo: Georgios Tsoumis

The group was challenged early on to organise themselves. Participants took turns to practice being the “responsible mission leader of the day”



he screams over to warn the other groups. “Roger that!”, they reply. As he puts on Sara’s fins and mask, he holds the signal line and glances over to the water, still no reply from Fabian. The five steps to the water seem like a huge distance when in a hurry, and hundreds of thoughts race through their heads: “Is he simulating an unconsciousness scenario? For how long might he have been doing that? Did we write down the time of emergency? Where is the telephone right now? Did I forget anything? Sebastian

hooks Sara’s buddy line into the main signal line and she swims along it towards Fabian. She descends and finds him with his face towards the bottom, not moving. As practiced before, she arches his head back to allow compressed air to escape from his lungs while bringing him to the surface. There she fully inflates his buoyancy jacket, makes sure his head stays out of the water, and then gives Sebastian the signal to pull them back with the line. On the shore they remove his equipment and carry him out of the water. Then



During daily briefings and debriefings, the tasks and safety precautions were discussed



Sara is surveying the seafloor in order to produce a bionomic map



photo: Georgios Tsoumis

Teamwork...



photo: Georgios Tsoumis



... and more teamwork...

photo: Georgios Tsoumis



photo: Georgios Tsoumis



The supervision system quickly became a familiar routine while concentrating on the survey project

the diagnosis starts. What symptoms does he have? Is he breathing? Who calls the ambulance, who starts the CPR resuscitation? As Sebastian is the mission leader for this exercise, he has to take all those decisions. He instructs Sara to make the phone call. One of the instructors simulates the operator on the other end: "Yes, we will send an ambulance, where exactly are you in Crete?" In the end it turns out that Fabian simulated symptoms from bumping his head against a rock. Other groups had panicking divers screaming at the surface, or coming up with various maladies such as carbon monoxide poisoning or decompression sickness. Even when everyone thought

the exercises were over and the day came to an end, one student faked stepping on a venomous fish, while another fell over board and needed to be rescued.

Of course, taking the right decisions requires thorough theoretical knowledge. So in the afternoons and often in the evenings right until dinner the instructors gave theory lessons and question-and-answer sessions on diving medicine, dive equipment engineering, physics and laws concerning safety at work. Even Sunday was not really a complete day off: Everyone used the opportunity to study the regulations or diving medicine. And some even went into the pool for some breath-holding practice.

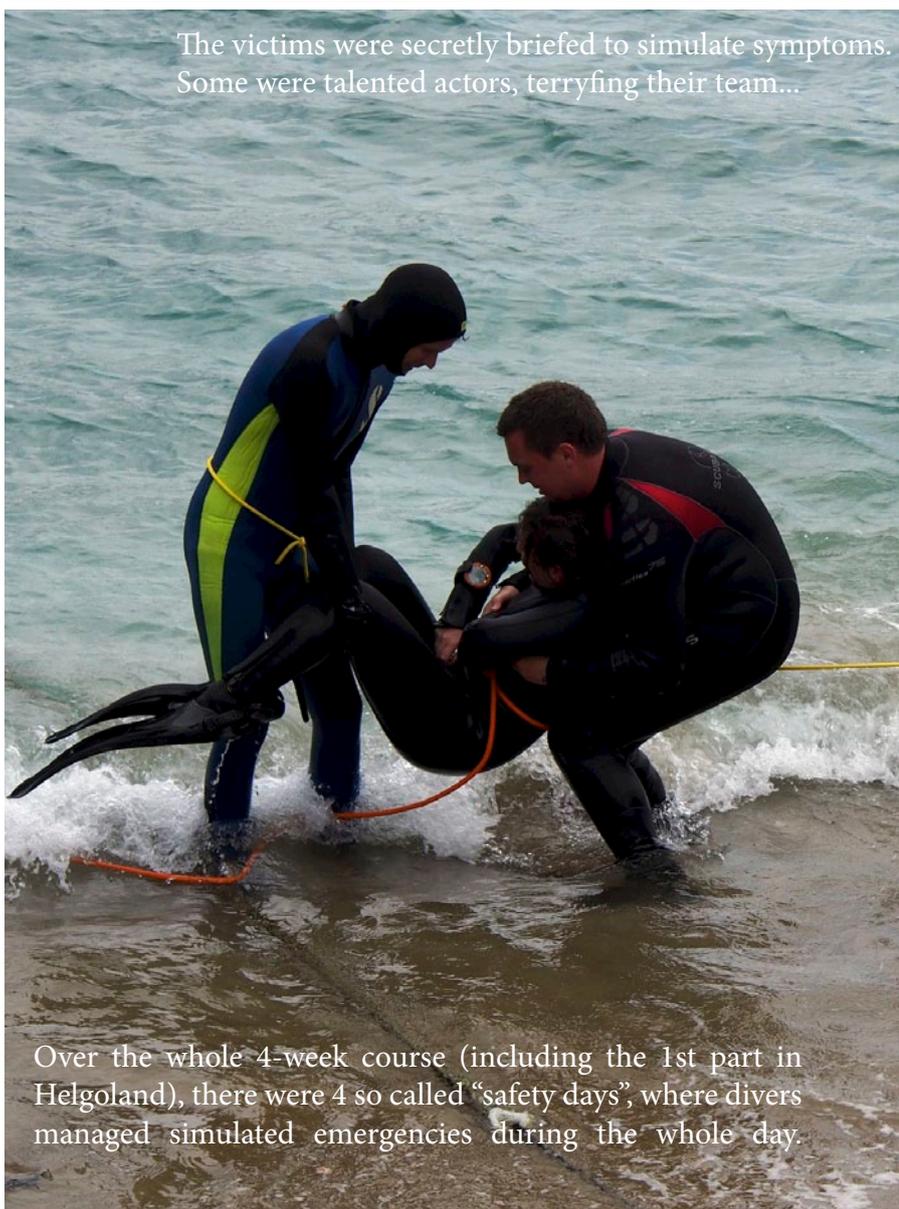


Management skills had to be perfected

Emergency exercise during the “safety days”



The victims were secretly briefed to simulate symptoms. Some were talented actors, terrifying their team...

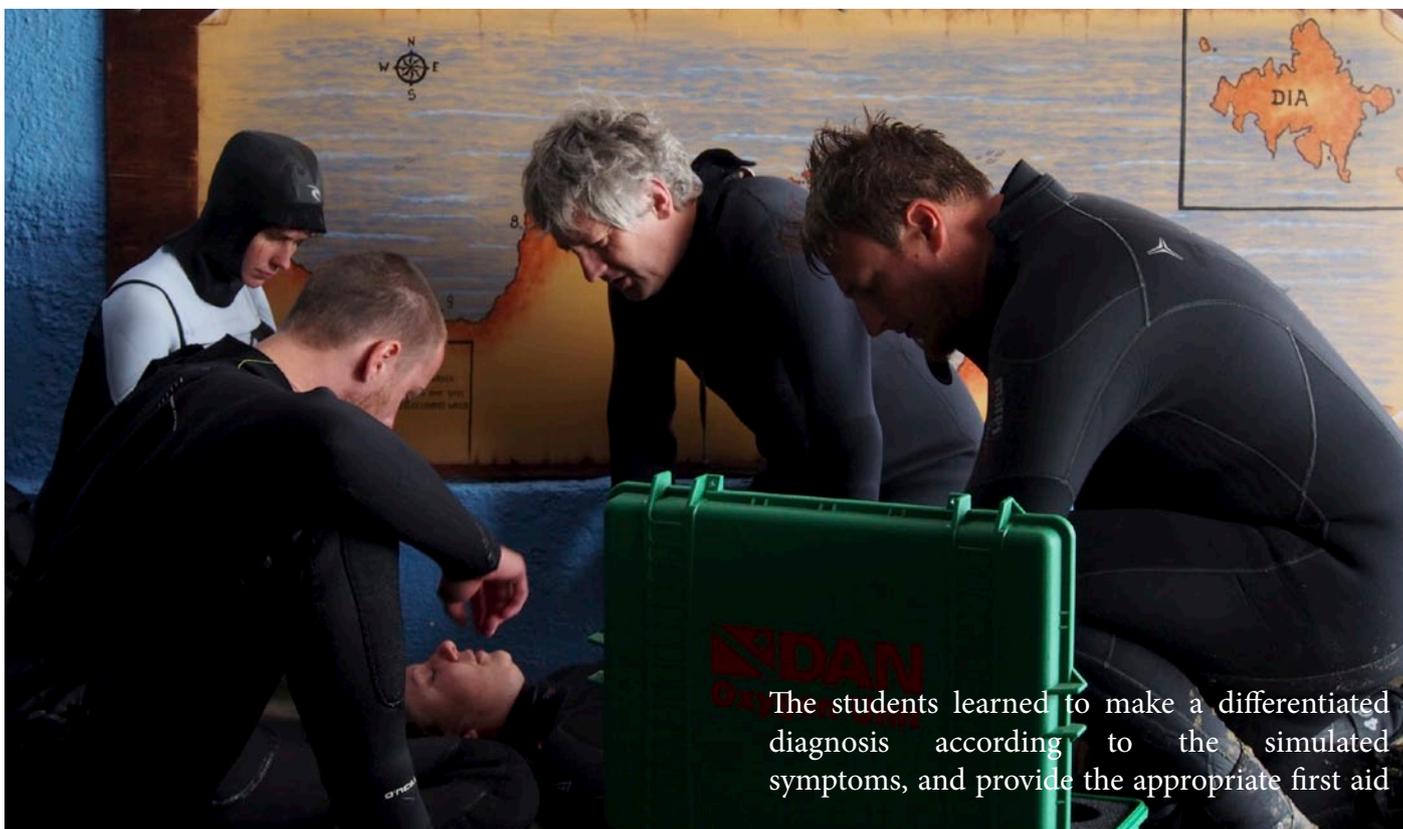


Over the whole 4-week course (including the 1st part in Helgoland), there were 4 so called “safety days”, where divers managed simulated emergencies during the whole day.

Another important module of the course was fitness in the water. A 1000 meter swim had to be managed in less than 18 minutes. More difficult was a breath-hold swim of 40m. The hardest exercise however proved to be a one minute breath-hold during which three specific nautical knots have to be tied around the mask and snorkel: The bowline, the clove hitch, and the figure eight. Initially, some divers struggled to keep weights on them which held them down, others could not remember their knots, though the main challenge was to resist the urge to breathe. While the swim just needs effort and fitness, the breath holding required mind control and relaxation, whereas the knots just need practice, practice, and practice. The more you think about holding your breath, the more nervous you become and the more urgent you need to breathe. However, after learning to relax the mind, everyone made it during the preparation and in the exam. Another exercise that shows particularly well if a diver can move efficiently in the water and handle his gear is the removal of tank and mask underwater. This one was easy for everyone while concentrating on his/herself, but staying together and observing each other proved more challenging.

Apart from training exercises, the course also included the very real task of bionomical mapping of a chosen dive site. This work had to be organized each day by a different course participant, and it meant that apart from being responsible for dive safety and the schedule, the students had to plan and execute work under water. Such a project carried out over several days with four groups is quite complex, and valuable lessons were learned: For example, in diving projects, doing things slow and step by step, does speed things up. In fact, an inspection dive was worth the effort and set the way forward. Diving and sampling skills were not taught *per se*, and students often chose tasks that they were personally interested in (e.g. photographic sampling, moving objects with a lifting bag).

Rather, organization and management skills were honed during the course. It meant to take research diving seriously as a method, as a craft. Thinking about

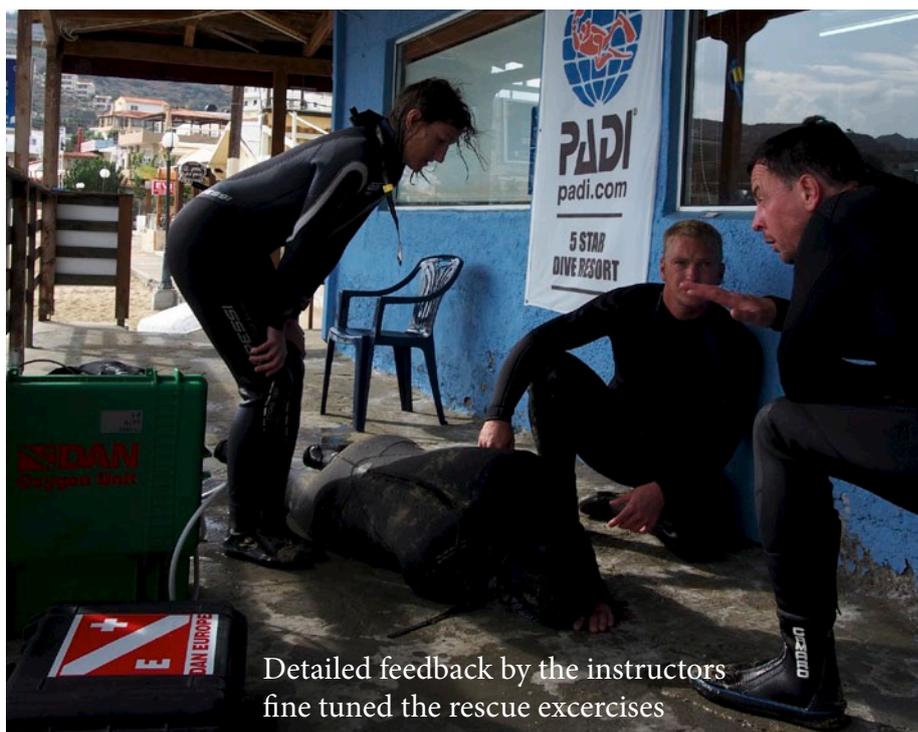


The students learned to make a differentiated diagnosis according to the simulated symptoms, and provide the appropriate first aid

the right tools for the job, preparing, planning and structuring complex projects to break tasks down and execute them safely and efficiently makes diving a powerful tool for scientific data acquisition. Assimilating this approach from the course to apply it later on in their work was one of the goals of the course.

However, the key topic during the course was safety at work according to government laws and rules, and this is certainly what distinguishes this course from sport diving courses: The theory covered different legislative levels, such as on EU community level, and at national level, in order to explain how governmental rules and laws translate into regulations for scientific diving. The license is even recognized as a profession in Germany. In combination with the practical exercises and four full weeks spent in the field, a scientific diving course following the curriculum of the German accident insurance association is certainly one of the most intensive scientific diving courses available, and definitely a highlight in one's diving career.

After two weeks of training in Helgoland, and another two in Crete, the participants were ready for the exam, which lasted two-and-a-half



Detailed feedback by the instructors fine tuned the rescue exercises





One minute breath hold while tying three knots



Removing and donning the tank underwater

days. For such an official governmental training, the statutory accident insurance association sends a chief examiner who appoints two further examiners. So we invited Dipl. Ing. Martin Voigt as chair of the examiner board, Dr. Gerd Niedzwiedz from University of Rostock, and Dr. Volker Warninghoff from the German Navy. Apart from a lightning storm interrupting us, the practical exams went well: The students were observed from above and below water executing dives and demonstrating communication to the diver using line signals. Emergency exercises including simulated treatment had to be demonstrated to a hyperbaric physician. The oral theory exams alone occupied the whole last day. Overall, our examiners were pleased with the students' skills, and everyone passed.

For the ZMT this was the first research diving course ever, and as such this was an important first step closer to becoming an official Training Center for Scientific Diving. This year's course was lead by scientific diving instructor and KFT President Prof. Dr. Philipp Fischer at the Alfred Wegener Institute of Polar and Marine Research, as well as his team, co-instructor Max Schwanitz and assistant instructor Christoph Walcher. The collaboration established a knowledge transfer to ZMT, but also the Hellenic Center for Marine Research, who are in the process of setting up a similar course on their own, within the framework of the European Scientific Diving Panel. So the course was a success on many levels, as it taught on an individual level, but also institutional and national level. At ZMT we are working hard to meet the prerequisites of becoming a training center at the end of 2014, and are committed to teach scientific diving to the highest safety standards. This will make the institute's 20 years experience in tropical science available to external participants through a constantly evolving course curriculum, and involvement in the Commission for Research Diving (KFT), who just accepted ZMT as a new member. In the future, the course will likely be offered in a single three week module in the tropics or southern Europe that ends with the European Scientific Diver Examination, while previously qualified graduates with more experience join the course for the two last weeks and are tested for their mission leader qualification (Advanced European Scientific Diver). While the courses in 2013 and 2014 served mainly to train ZMT staff, they will soon be available to anyone, and in addition graduate courses such as the ZMT's ISATEC Master course in tropical marine ecology it will be one more contribution to training the next generation of marine scientists.

Dr. **Georgios Tsounis**, Diving Safety Officer
 Leibniz Center for Tropical Marine Ecology (GmbH)
www.zmt-bremen.de



Surface marker buoys can be a viable alternative to signal lines



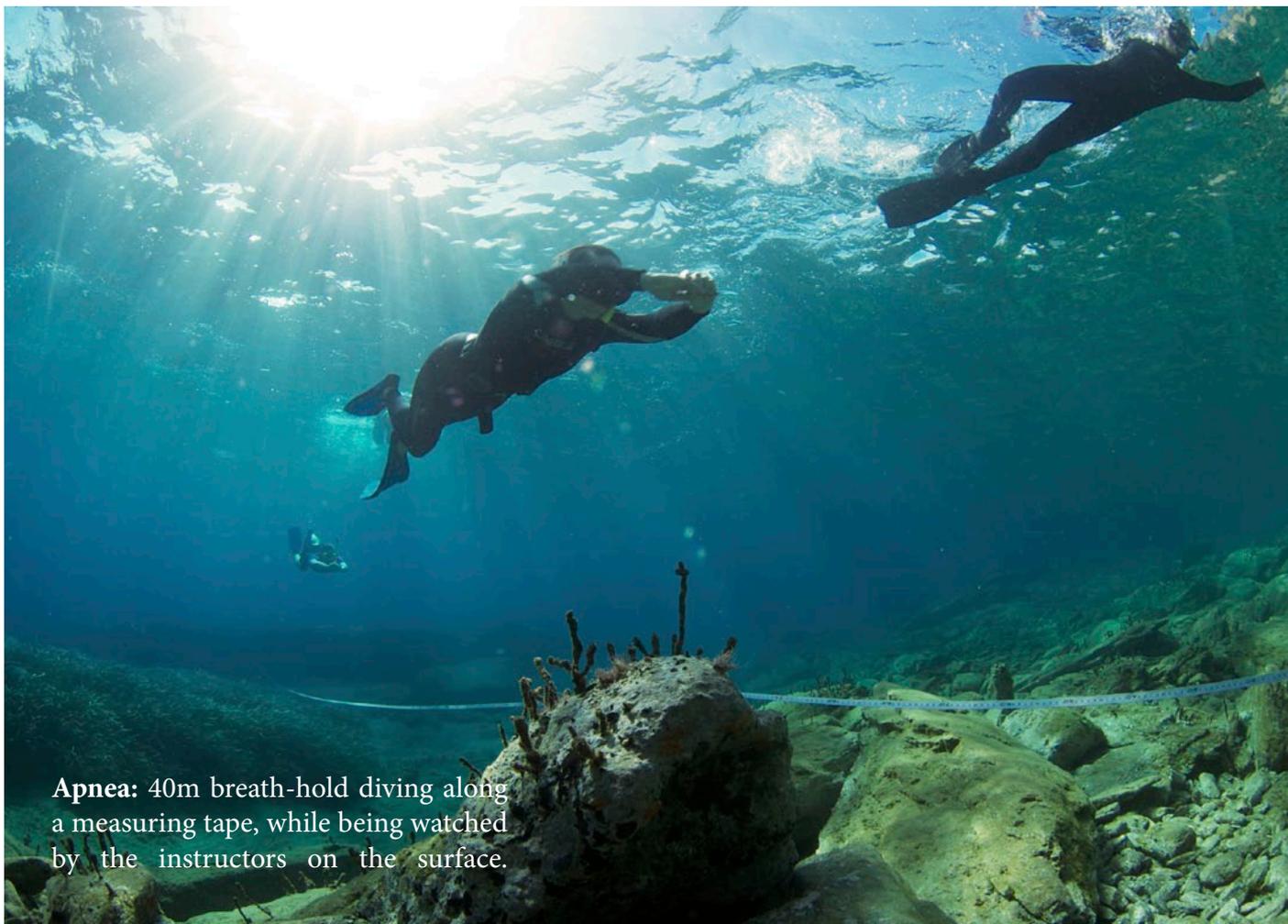
40m breath hold distance



Tying a bowline, clove hitch and figure eight on the mask



Coordinating as a team was not always easy



Apnea: 40m breath-hold diving along a measuring tape, while being watched by the instructors on the surface.



WHY WE NEED RULES

Safety rules are not popular in diving, but human psychology requires rules (let alone legal insurance). The problem is that new divers are initially at risk because of their inexperience and ignorance about the dangers underwater. Then, with some basic knowledge and training, they quickly gain respect and fear, becoming safer divers. But with growing experience, the divers become overconfident, because experience deceptively taught them that nothing ever happens. In that state of complacency divers omit safety precautions and get away with it (often for years) until incidents occur. Minor incidents are learning experiences that call for caution, but sometimes the event is a severe accident. Fatal dive accidents are rarely due to a single cause, but rather due to a chain of events. So how can one avoid the accumulation of too many micro-events against ones favor? Rules de-couple safety decisions somewhat from our individual perception, and help mitigate consequences of misjudgment of risk. They maintain a margin of error that allows to deal with unexpected events. The trick about rules is that they help to achieve a *consistence* in safety that would not be possible relying on our variable individual risk perception. Or put another way:

Dive safety could be defined as safety measures one habitually takes one hundred times, although 99 times it is not necessary. But that 100th time when one followed the rules and the unexpected occurs is when it counts, and that is the way rules keep you alive.

photo: Georgios Tsoumis



Modern amphitheater:
Theory lessons at the hotel in the afternoon

photo: Georgios Tsoumis



Homework:
Apnea training in the hotel pool on Sunday afternoon

Acknowledgements



Photo: Wanda Plaiti

Happy and proud faces on the afternoon after the last exam

The success of this course was possible only thanks to a collaboration among a great number of people, several of them behind the scenes, of which I cannot even name all. First of all the ZMT would like to thank Prof. Philipp Fischer for leading the course and supporting the ZMT on its way to become a training center recognized by the Commission for Research Diving in Germany and the Statutory Accident Insurance. His team at the AWI, co-instructors Max Schwanitz and Matthias Wehkamp and assistant instructors Christoph Walcher and Stephanie Wehkamp, as well as Marco Warmuth, Jürgen Laudien, and Dr. Axel Stöckert are highly appreciated for their tremendous experience, professionalism and passion. We also thank our examiners for taking the time to come all the way to Crete for three exam days: Dipl. Ing. Martin Voigt from the Statutory Accident Insurance, Dr. Volker Warninghoff from the German Navy, and Dr. Gerd Niedzwiedz from the University of Rostock.

At ZMT I would like to thank Frank Pitschke for his considerable efforts to help setting up the dive unit and help teaching during the preparation for the course. His experience and enthusiasm were crucial. Dr. Sebastian Ferse, Dr. Malik Naumann and Prof. Christian Wild initiated a new concept of diving safety at ZMT and took the first steps. Dr. Andreas Kunzmann, Ulrich Pint and Steffanie Bröhl are an important part of the ZMT dive unit team and help assuring that everything runs smoothly. Elke Kasper, Merce Sanchez and Petra Käpnick helped with travel arrangements, and Andreas Peterman with last

minute orders, but thanks also goes to other ZMT staff who cannot be all named here. Finally, thanks to Dr. Ursel Selent and our Director Prof. Hildegard Westphal for the decision to engage as an institution in teaching research diving.

At HCRM in Greece I cannot thank my colleagues enough for their help in organizing the course, and providing crucial parts of logistics or equipment. Dr. Thanos Dailianis from HCRM Crete invested tremendous effort to help choose the right venues, and served as an observer to document the course. Dr. Maria Salomidi and Yiannis Issaris came from HCRM in Athens, and Maria Sini from the University of the Aegean in Lesbos to observe and ensure a knowledge transfer within the framework of the European Scientific Diving Panel. Thanks as well to Dr. Wanda Plaiti, Dr. George Petihakis and Panagiotis Vavilis at HCRM Crete for their support and hospitality.

Agia Pelagia turned out to be the perfect venue for a research diving course in November. Not only due to the favorable weather and 22 degrees Celsius in the water, but more importantly to the professionally run Divers Club Crete. Dimitris Drakos and his team Renata, Nikos, and Makis supported our course in every way possible during the planning phase and the course. Last not least, Stella and her family kept their restaurant “Mouragio” open for us during the course, as the only one in Agia Pelagia. Their warmth and hospitality more than compensated for the otherwise empty streets.