

## Introducing Scuba Diving for Fishermen of Pantai Kondang Merak, Malang

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### **Abstract**

*Pantai Kondang Merak has a biodiversity of marine resources, so that the community always depend on exploration and exploitation activities through fishing, and catch lobster, sea cucumber, abalone and some of algae with diving activities. The diving activities usually in 5-30 m depth in reef area, using air compressor that will danger their live. This compressor has long regulator hose (about 50 m), during diving process the hose will be tied in their waist with 5-7 kg lead, it similar with weight belt in SCUBA diving. The hose also has other function as keep the diver from water current drifting. This method will disrupt the air supply from compressor to mouth face and endanger the life of diver. The safety diving standard is using a SCUBA set, that has a portable air supply and clean air, unlike the air that resulted by the conventional compressor. The aim of this activity is to give safe diving method and give ecotourism skill to the fisherman in Kondang Merak, thus avoiding fisherman from decompression sickness and seek alternative livelihood during west monsoon.*

**Keywords:** *fisherman, compressor, SCUBA, decompression sickness, marine resources*

### **Abstrak**

Pantai Kondang Merak memiliki kekayaan sumberdaya hayati laut yang beraneka ragam. Kehidupan masyarakat Kondang Merak bergantung pada kegiatan eksplorasi dan eksploitasi melalui penangkapan ikan, lobster, teripang, abalone dan berbagai jenis alga dengan cara melakukan penyelaman. Kegiatan penyelaman dilakukan pada kedalaman sekitar 5-30 m di area terumbu karang. Nelayan kompresor menghadapi beberapa masalah dimana selang udara yang dililitkan ke tubuh nelayan dengan tujuan agar nelayan tersebut tidak terbawa arus, tetapi teknik tersebut malah menyebabkan suplai udara ke nelayan menjadi terhambat. Karena keterbatasan pengetahuan teknis penyelaman menyebabkan nelayan tersebut menderita penyakit dekompresi dan nitrogen narkosis sehingga membahayakan nyawa nelayan tersebut. Oleh karena itu, nelayan kompresor diberikan pengetahuan akademis, teknis dan medis penyelaman untuk meningkatkan kemampuan nelayan Kondang Merak. Namun demikian, pelatihan tersebut masih belum dapat meningkatkan penghasilan masyarakat dan hanya pada peningkatan standar kesehatan dan keamanan saja. Pembelian kompresor untuk diversifikasi produk jasa yang dapat disediakan oleh nelayan Kondang Merak masih belum terealisasi karena terkait masalah pendanaan. Pada saat ini, pendapatan masyarakat masih bergantung pada ketersediaan sumberdaya alam dengan menggunakan alat kompresor yang biasa digunakan.

**Kata Kunci:** *nelayan, kompresor, SCUBA, penyakit dekompresi, sumberdaya laut*

### A. INTRODUCTION

Pantai Kondang Merak is located on the southern coast of Malang Regency located in Sumberbening Village, Bantur District, Malang Regency, East Java. It takes approximately 70 km or can be reached 2.5 hours from Malang. Access to Pantai Merak Kondang relative difficult due to more 3 km of it, is a muddy rock road.

There are two groups of fishermen in Kondang Merak. The first group of fishermen was established since 1994 and consists of 30 fishermen. The community members of this group are the people who live in Kondang Merak and their main job was the fisherman. In the west monsoon period, they only fishing around the beach. The second group is a compressor fisherman with 6 fishermen members. Compressor fishermen usually look for lobster, abalone, and fish in Merak area at noon time.

The effect of west monsoon is heavy rain, strong winds, high waves, turbid and cold of sea water. Scientifically, the west monsoon (musim barat) is a southwest monsoon where the air period from the continent of Asia will bring a lot of rainwater and strong winds. This condition is very impossible for fishermen to go fishing because it will be dangerous for personal safety and their equipment such as boat and fishing gear. For more 2 months if the west monsoon comes the fishermen will be fishing in the reef flat area for fishing reef fish and some of them, return to the origin village for cultivation.

The dive compressor used by fishermen is an air compressor for filling car or motorcycle tires. Mostly, this compressor will be modified by adding a regulator hose along the 30 - 50 m and second stage to breathe in the water. The disadvantages of this method are: first, the air that produced by this type of compressor is very dirty because the tire compressor does not have an air filter, so the air will be mixed with exhaust gas (CO<sub>2</sub>), dust and oil vapor. Second, the absence of pressure and depth gauge where both of these kind of tools are very important

for diving activity to know the air pressure and the depth of the water. All this time to know the depth of their location the fishermen using the marker in a host of the second stage each 10 m. Depth is a limiting factor for a diver, a normal diver (recreational diving) not be allowed more 40 m depth during diving. Third, the compressor died suddenly. To face the problem the fisherman will quick ascend and this is will increase of decompression sickness, and another risk is the potential of twisted by the long host during diving.

The diving technique that is practiced of the fisherman was not standardized and far from the correct technique. Quick descend or ascend during diving will cause of barometric syndrome and resulted in deafness, nosebleeds, dizziness and even stroke (Jusmawati et al., 2016). During ascending or descending a diver should move slowly, if the divers dive more than 18 m depth, they need safety stop to for minimum 5 minutes in 5 m depth. The nitrogen gas that enters the body tissue when a diver descends at a certain depth and then enters the blood vessel as it rises to the surface. If diver ascends very quickly, the nitrogen gas will enlarge and cover the blood vessels that will interfere with the supply of oxygen to the brain and other important organs and will cause stroke or paralysis (Dwiyanti et al., 2012).

The challenges of for diving will come from the environment because naturally human is living in the terrestrial area. Three main stressors of underwater environment can be classified into three categories: physical, physiological and psychological (Strauss and Aksenov, 2004). Physical stress will come from the different density of seawater and air. Seawater 775 denser than air, so human eyes cannot see clearly in the sea water (Loew and McFarland, 1990). Pressure is defined as a force per unit area, it means if a diver inside of water, he will receive the effect of the hydrostatic pressure of sea water or weight of water column. In the surface of the water the

pressure will equal with 1 ATA (atmospheres) and the pressure increasing 1 ATA each 10 m depth. When a diver dives in-depth 30 m he will receive 4 ATA of seawater pressure.

Thermal, water has specific heat about 1000 larger than air and conduct away of heat from diver faster 25 than air. In this condition the potential body heat loss in seawater larger than in the air, so if a diver contact with water too long, he will have potential getting hypothermia. Current and wave are two common challenge where water motion will influence of buoyancy of diver.

Physiological stresses are associated with normal breathing of human in the air, breathing in of oxygen and exhalation of carbon dioxide. Oxygen in seawater will dissolve in water bond in their molecules, where the human cannot absorb it directly. Using a SCUBA this problem was erased because a diver can inhale the gas directly from the tank. The condition if the oxygen to low to breathe a diver will respect hypoxia condition where inadequate of oxygen for the body's organ.

The new and different environment that effect in visioning and hearing of human. The vision is distorted inside of water because of the different light index of seawater than air. The hearing of human will also be altered during diving because water conduction is about 25 times great than air. These all will be a new sensation to the human and will affect on psychological stress (Anegg et al, 2002).

The output of this activity was to transfer 1) diving theory, the gas and pressure law and effect if break of the rule for their safety, 2) knowledge of diving correctly, 3) increase the skill of correct SCUBA, 4) the alternative livelihood and 5) create the ability to explain coral reef ecosystem and the potential of underwater in Kondang Merak and get additional income from guide and equipment rental services.

## **B. PRACTICE AND METHOD**

The method used in this activity using the participatory rural appraisal (PRA) approach (Mikkelsen, 2011) involves the community directly in all process activities. The implementation of these activities was:

### **1. Socialization of activities**

This stage is the initial process to introduce to partners (fisherman group) of the planning of programs and mapping the potential threat or weakness during the program implementation.

### **2. Training**

- a. Diving Academic Training,
- b. Diving Technical Training,
- c. SCUBA training and
- d. Ecotourism short training

### **3. Support SCUBA set (BCD, regulator, and tanks)**

### **4. Community Assistance**

Assistance will be done 3 times in this program. A casual meeting with a familiar community will also discuss the progress of the program and the possibility of resolving any problems that may arise.

### **5. Evaluation**

To monitor the SCUBA set usage we ask the fisherman make a log book, that will record the hour of SCUBA and income from rent of SCUBA set.

## **C. RESULT AND DISCUSSION**

### **Training of SCUBA equipment**

Skin diving or snorkeling is activity in the surface of water using snorkel, masker, and fin. If the diver dive below the surface for close up look the object in the water it will categorize as skin diving (Carillet and Wheeler, 2001). In this training, the participants (fishermen) was explained the equipment for skin and SCUBA diving. First, masker, or sometimes called as a diving mask is an item diving equipment that covers some of face or eyes and nose to create small air space avoiding light refracted in the water so the diver can see clearly during diving. Other functions of the mask are to prevent water enter into nose or eyes. The diving mask has 2 categories: the half mask, that

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cover nose and eyes, and a full-face mask, that cover nose, eyes and mouth that connect directly to the breathing apparatus. Generally, a diving mask made from silicone or rubber with tempered glass for the lens (Richardson et al., 2008).

Second, snorkel, is a breathing tube, use for snorkeling activity. A snorkel tube typically has 30 cm long and 1-2 cm in diameter. Two types of snorkel they were L and J shape, each of these kind was fitted with purge valve and mouthpiece in the lower end. The third, fins, are couple fin used in the foot to help diver move in water efficiently because human feet are not appropriate and may to small to provide mobile movement during diving. The kick of fine help diver ten times faster than just bare feet. In generally fins have two types, they are full-foot and open heel fin. Full-foot fin is like the shoe, cover the heel with rubber, while open heel fin is open at the heel with a small strap. To use the kind of fin the diver should worn dive boot.

Fourth, SCUBA tank or diving cylinder. The function of a SCUBA tank is to store and also the transport of high-pressure air for diving activity. The diving cylinder made from aluminum or steel. Aluminum is lighter than steel, and commonly aluminum tank have a flat bottom, while steel cylinder has dished (concave) bottoms. In the shoulder of diving cylinder usually carries the stamp from an authorized country where the diving cylinder was made. For example, DOT-3AL 3000 P1576 LUXFER 01A93 S80 (Figure 1). DOT is Department of Transportation (US code), 3AL is US specification code for 3-gauge aluminum, 3000 is the allowed maximum pressure for 3000 psi, P1576 is a unique production code, LUXFER is manufacturer, 01A93 is 01 codes for month of manufacture, A is for inspection code symbol and 93 is year of manufacture, S80 = capacity of diving cylinder 80 cubic foot tank.

The fifth, regulator, is the device that has the function to deliver air from SCUBA tank to the diver. The regulator has two

stages to deliver air. The first stage is attached in the SCUBA tank to reduce high-pressure air from SCUBA tank to the second stage. The second stage mounts with a comfortable mouthpiece to allow diver such the air easily.



Figure 1. Stamps marking in SCUBA tank or diving cylinder.

Sixth, Buoyancy Compensating Device (BCD), is a kind of vest that be equipped by air blade controller that allows a diver to establish negative, neutral or positive buoyancy during diving activity. There are many types of BCD such as Adjustable buoyancy life jacket, Wraparound buoyancy BCs, Back inflation, and Sidemount BCDs (Hendrick et al., 2000).

### Open water Training

In standard open water course there are many steps before take a diver certificate, first is diving academic knowledge, pool skill, and open water. In this activity is a special course because the participants were fishermen who every day working in the sea. The main point for this training was diving academic knowledge and open water practices. The subject matters for diving academic knowledge were introducing the kind of diving gears, such as masker, snorkel, fin, SCUBA tanks, regulator and BCD. Next were diving medic aspect and physic of diving. This chapter explained the gas and pressure law with a simple way and the effect of the body to adapt to abnormal environment. The fishermen also got the theory of the danger of sea creatures. This was basic knowledge to avoiding or not interact with hundreds of dangerous sea creatures in the sea.

The course material continues for SCUBA practices, the participants were given skills for assembling SCUBA set, three ways to enter in the sea such as giant step, front and back roll, buddy breathing, hand signaling, buoyancy and mask clearing.



Figure 2. A Fisherman Tries to Using SCUBA in Shallow Water

### Marine ecotourism

Marine ecotourism was defined as marine nature-based tourism that involves education and interpretation of the natural environment and is managed to be ecologically sustainable (Garrod and Wilson, 2003). Special of ecotourism some experts stated many definitions of ecotourism, and at least all of the conical to 3 things: the main attractions are natural, such as flora, fauna, and landscape (geology) and culture becomes a supporting attraction; the existence of learning about the environment and the conservation of physical and cultural attraction (Cater and Cater, 2007). While marine Ecotourism is one component of ecotourism whose sector is very wide, where marine ecotourism will prioritize unique destinations such as endangered species, marine habitat, sea, and coastal scenery.

SCUBA is a tool to help humans explore nature under water, and its use in Indonesia is very popular since the 1990s. In Bali, one of the diving tourism centers in Indonesia has started SCUBA activities for recreational purposes or referred to as recreational diving, where coral reef is the main object of this activity. Environmentalists try to avoid SCUBA's activities so as not to damage coral reef ecosystems and the reverse can contribute to conservation activities and increase local incomes.



Figure 3. Marine Ecotourism Training Hold in the Fishermen Meeting Hall at Pantai Kondang Merak

Concerns about coral reef damage in diving activities can be seen from the number of coral fractures due to direct contact with divers, such as: kicked while diving, stricken by fin of diver, broken as handle during rushing current by diver, standing on massive coral and take coral also reef fish for souvenirs and aquarium purposes. All these activities were increasing stress in the coral reef ecosystem.

This perception must be changed because the idea of tourism-based conservation has been developed and proven in many places successfully. Diving for a tool of marine ecotourism is a good idea because of the coverage of coral reef in Indonesia was 14% from all over the world. This natural potential is also located in Pantai Kondang Merak which has life coral cover about 23% that was composed by the domination of massive, branching and foliose coral with various attractive colors. The Pantai Kondang Merak's fishermen have been carrying out conservation activities since 2010 such as coral transplantation, made some fish apartments and algae clearance in transplant areas. This is a natural capital that has been owned by the fishermen, so it can still be developed in the future.

Marine ecotourism now became a new approach to balance the conservation, education and economic and since 2000 the number of ecotourism increasing sharply (Orams, 2003). An increasing number of activities and number of visits to marine ecotourism significantly increasing the value of from tourism sector, for example, ecotourism whit tip shark in the Coral Sea,

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Australia, was generated 14 M AUD\$ (Fitzpatrick et al, 2011). Another success story also came from Serangan Bali, wherein the beginning most of the villager exploitate the coral and reef fishes used destructive methods such as bom and cyanide. Then everything has been changing, when local community grouped as Karya Segara initiate build an eco-tourism concept to built conservation in Serangan. This local NGO makes the association with travel agents to build Coral Day program and until now became a magnet for ecotourism activity (Chairiyah, 2013).



Figure 4. Field Trip to Explore the Potential of Marine Ecotourism in Pantai Kondang Merak

### D. CLOSING

#### Conclusion

In general, the training of SCUBA diving for the Kondang Merak fishermen is still around the preparation of the correct diving that was held in August to September. The skill can be the main asset for fishermen in the future as alternative livelihood during the west monsoon.

#### Suggestion

The price of SCUBA set and diving equipment usually in US dollar currency, with a different changing rate per day. This condition was influenced by actual and planning cost, so some in this program the number of diving gears different from writing in the proposal. The community service program like this, need supporting not only from university but also support from local government to seriously solve the problem that been a long time faced fishermen in Pantai Kondang Merak.

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