

## Three profitable non-extreme freediving strategies used by the Bajau - marine hunter-gatherers

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### Introduction

In the study of mammalian and human apneic diving, most research interest has been devoted to extreme performance, e.g. Elephant seal's diving to >1000m for >1h, and the human ability to dive to >100m and for >10min on a single breath. However, typical mammalian divers are moderate divers; Sea Otters and human apneic divers often make serial shallow short dives. In Southeast Asia, several populations have adopted a lifestyle dependent on freediving. One such group is the Bajau in Indonesia, Philippines and Malaysia. Our aim was to study their different diving strategies.

### Methods

Two previously visited communities of stilt houses on the sea in Sulawesi were revisited during 2014. Inhabitants depend entirely on marine hunting and gathering mainly by freediving with little equipment (Table 1). We observed and logged diving depths using time-depth loggers (Sensus Ultra, ReefNet Inc, Ontario, Canada) of a dive shift each of 3 different diving methods.

### Results

Methods used were: 1) Individual spearfishing; diver with goggles and sling speargun hunts big fish, 2) collective net spearfishing; divers chase fish into rough nets put in from boats. Surrounded fish are speared and some caught in the net, 3) tripang gathering; echinoderms are collected. The deepest dives were found during individual spearfishing, while both other methods involved shallower dives (Table 1). All methods produced a substantial catch, but most effective was collective spearfishing with nets, in which each diver obtained about 10kg of catch in 4h. Typically a diving shift lasts 2-3h, and is repeated again if more catch is needed that day.

Diving method	Equipment used	n	Divers age	Mean depth	Maximal depth
Individual spearfishing	Mask, fins, speargun	4 men	30.8(8.8)	4.4(1.6)	10.9(4.1)
Collective spearfishing	Goggles, net	4 men	31.3(6.8)	1.8(0.3)	3.5(2.0)
Tripang collecting	Goggles, basket	5 women	44.8(10.2)	1.4(0.1)	1.7(0.1)

Table 1. Tools, number, gender, mean(SD) age, average depth and maximal depth for fishing methods.

### Conclusions

Different diving strategies can yield a large catch without exploiting the maximal human diving capacity. While most of the daily diving is shallow, it can when necessary go on without interruption across the whole day. In areas where much marine life is found in the shallow reefs, the need to go deep is limited. Only for hunting big fish, the divers make straining dives to 15m.