Fishing gear

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ABSTRACT

This paper is an introduction to traditional and modern methods and gear used by Indonesian fishers, whether by angling, spearing, netting, trapping, stupefying or other means. My aim is to help lexicographers to move beyond simple descriptions such as ‘a kind of net’ or ‘a kind of fish trap’ and toward definitions which are clear, accurate and informative.

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VERSION HISTORY

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Tangguk rapat, keruntung bubus.
The scoop basket is tight,
but fish are flying out of the creel.[1]

1 Introduction

This article is written for lexicographers working in the Indonesian context. My aim is to describe traditional methods and gear used in fishing in Indonesian waters, whether by angling, spearing, netting, trapping, stupefying or other means, and also touch on more modern methods which followed the mechanization of fishing boats beginning in the 1950s. I hope this guide will help you to move beyond simple descriptions such as 'a kind of net' or 'a kind of fish trap' and toward definitions which are clear, accurate and informative.

In all cases, my authority for English terms has been the fourth edition of *Von Brandt's Fish Catching Methods of the World* (Gabriel et al. 2005). Much of the information in this book has been summarized in Indonesian by Ardidja (2007a, 2007b); his two compilations have therefore been my starting place when looking for equivalent Indonesian terms. Although somewhat dated, Appendix 1 "Methods of Fishing" in Wilkinson, Berkeley and Robinson (1904:15 ff.) proved very helpful, particularly as it describes in and of themselves nets and traps used by Malay fishers.[2] Even today this work may serve as an exemplar of how to describe the fishing gear of a particular region. Various tables in Bailey, Dwiponggo and Marahudin (1987:23 ff.) which listed Indonesian and English equivalents were also informative. Unfortunately, definitions in the usual places such as *Kamus Besar Bahasa Indonesia* (Tim Penyusun Kamus 2001) or Stevens and Schmidgall-Tellings's (2004) *A Comprehensive Indonesian-English Dictionary* were often too cursory to identify gear with certainty. However, they proved useful as confirmation checks, as did Google searches of Indonesian terms.

While this guide doesn't cover every kind of fishing method, net or trap that you may encounter during the course of your research, I hope you find the framework that this paper provides to be a useful starting point.

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[1] Indonesian proverb referring to a man who is good at bringing in money but whose wife quickly spends it.

[2] A major difference between these sources is that Ardidja is more likely to employ terms calqued from English, whereas Wilkinson always gives the native term, for example Ardidja *pukat tarik berkapal* versus Wilkinson *pukat payang* (for boat sienes), Ardidja *perangkap berbentuk pipa* versus Wilkinson *tengkalak* (for tubular traps).

2 Line fishing, angling

In the present day the two terms ‘line fishing’ and ‘angling’ are often used synonymously. However, we make the following distinction: angling refers specifically to fishing using a line to which a hook (viz. ‘angle’) has been attached. Line fishing, on the other hand, encompasses angling, but also includes certain other methods of fishing (albeit rarely seen today) in which a line with something other than a hook is employed, such as a bob or a snare. We begin with angling.

Angling (*memancing*, *mancing*) refers to fishing with a **hook** (*mata kail*, *mata pancing*) attached to a **fishing line** (*tali kail*, *tali pancing*, also commonly *tali nilon* or simply *nilon* in the case of nylon fishing line). Usually the hook is supplied with **bait** (*umpan*, *umpan alami*) of some kind, including live fish (*umpan hidup*), or it may be a **lure** (*umpan buatan*, *umpan palsu*). In the modern day **fishing swivels** (*kekili*) are sometimes used to attach a hook, lure, or leader. There are at least six ways to go line fishing, each requiring slightly different equipment.

- A traditional kind of **fishing pole** (also called pole and line, angling rod, or fishing rod, Indonesian *joran*, *baur*, *tangkai pancing*, *batang pancing*, *galah pancing*) is made out of a length of bamboo, kangaroo grass stem, etc., without any reel. A **lead weight** or **sinker** (*pemberat*, *timah*) is used for getting the hook and line to the bottom. A **float** or **bobber** (*guntang*, *pelampung pancing*) can be used to suspend a weighted hook at a certain depth below the surface, while a **spreader** (*ranggung*) is used to suspend the hook at a certain distance above the bottom.

- Another kind of setup for pole fishing, known in Java and doubtless other parts of Indonesia, is called a **spring rod** or **whippy bough**. In this kind of ‘automatic fishing,’ a bamboo rod is held in a bent (tensed) form. When a fish takes the bait, it releases a holding mechanism whereby the pole returns to its straight position, thus snagging the fish (and usually also hauling it out of water).

- A **hand line** (*pancing ulur*) refers to a fishing line which is played out by hand. Hand lines in turn are of two types: the short hand line which is simply lowered over the side of a boat (pier, etc.) (*pancing ulur* proper), and the long thrown line (*pancing hambur*, alternatively *ambor-ambor*). The end of the line that is held (*punca tali pancing*) may be kept in one’s hand, tied around one’s waist or to some part of body or boat, or attached to a **spool** or **reel** (*kili pancing*, *kili-kili*, *alat penggulung tali pancing*). In my experience the usual kind of spool is made of wood carved in the shape of a ring a few inches in diameter.

- A **trolling line** (*pancing tonda*) is a fishing line which is moved through the water, usually behind a boat—think of sport fishing as one example. A weight is usually required to keep the baited hook or lure below the surface of the water as the line is trolled.

- A **long line** (*pancing rawai*) consists of a main line (sometimes up to a mile in length, and supported with floats), with several or numerous branch lines with baited hooks on the ends. Long lines can be set in place (*pancing rawai tetap*)—for example from bank to bank across a river—or allowed to drift (*pancing rawai hanyut*).

- **Kite fishing** (*memancing layang-layang*) using traditional materials has been described from Sumatra as well as northern and southeastern Sulawesi, and may formerly have been even more widespread. In this method, the 'tail' of the kite is a line which is allowed to drag in the water. Traditionally instead of a hook, at the end of the line is a baited noose or a lure consisting of a ball of cotton or spider web (see below regarding 'snares' and 'bobs'). Traditional kite fishing was particularly used to catch garfish and bonitos.

In South Sulawesi I have also seen an even simpler angling apparatus being used, consisting of a float to which a short length of fishing line (about 2 feet) and a hook had been attached. A boy was operating several of these in shallow ocean water. When a float started bobbing, he would retrieve the caught fish and rebait the hook with a piece of banana. I don't know of any technical term for this kind of angling line.

Once a fish has been caught, a **landing net** may be used to scoop (*menyérok*, stem *sérok*) a fish out of the water and into a boat or onto land. Indonesian terms which can be used for 'landing net' include *sauk*, *tangguk*, *sésér* and *jaring mendarat*. Only the last specifically refers to landing nets (more is said below regarding the others), but this expression has obviously been calqued from English. Alternatively, for larger fish a **gaff** may be used.[3] A gaff is a long pole with a barbless hook on one end. The aim is to hook the fish in the back underneath the spine. While some sources translate 'gaff' simply as Indonesian *tombak*, some web sources report *ganco*; a more precise definition would be *tombak dengan kait untuk menggancu dan menaikkan ikan besar* (see below regarding fishing spears, *tombak ikan*).

A **fishing creel**, or simply creel, is a basket in which to store one's catch. The basket may be made from rattan, bamboo, reed or other material. The generic Indonesian term for creel is *keranjang ikan*, although a particular type of creel with a narrow neck is called a *kumbu* or *kembu*. In some places a fishing creel worn on the side is called a *keruntung*,[4] but in other places this is understood instead to refer to a kind of basket with shoulder straps worn on the back. A kind of basket made from loosely woven bamboo (viz. with large interstices) is called a *jaras*, but can be used for other purposes, e.g. carrying goods on the head.

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[3] It would be a gaffe to spell gaff with an 'e.'

[4] Cf. the example sentence included in *Kamus Besar*: *dia pergi ke sungai menjinjing jala dan keruntung tergantung di pinggangnya*.

When marketing one's catch, the fish may be **strung by the gills** (*diikat, dicocokkan pd insang*) on loops of rattan. A **string of fish** (as a unit of measure or quantity) is an *ikat ikan* or *susun ikan*.

Hooks with multiple points (e.g. double hooks, triple hooks, quadruple hooks) in Indonesian are called *kail garong*, defined in *Kamus Besar* as *sejenis kail pancing dengan beberapa mata kail yang disatukan*. A double hook can specifically be called a *kail mata ganda*. Slightly different are **tandem hooks**, that is, hooks of the same size combined one after another in a line. Hooks with multiple points and tandem hooks should not be confused with **compound hooks**, a term referring to hooks in which the shank and barb are separate pieces attached at an angle—a 'primitive' type of hook of native manufacture rarely seen today. Similar to hooks are gorges. A **gorge** is a device which is easily swallowed but when the line is pulled the gorge turns, springs or opens in such a way that it catches and cannot be expelled by the fish. The simplest kind of gorge is a small, straight, needle-like piece of wood, bone, etc. which is tied in the middle. Swallowed lengthwise by the fish, the piece turns sideways when pulled and lodges in the fish's gullet. Fishing with gorges is thought to have predated fishing with hooks, although gorges are still in use in many places today.

It is also possible to fish using a line without any hook or gorge at all. A **hookless line**, consisting of line and bait only, is usually used only for crustaceans and for gastropods such as whelks, octopi or squid, since fish usually release bait when they feel resistance. A **bob**, on the other hand, is made out of wool, hemp, hair, spider web, etc., perhaps with some kind of bait enclosed within. The intent with a bob is to entangle an eel or fish by its (curved) teeth. Obviously, only certain species of fish can be caught by this method.

A **fish snare** is a loop of cord which tightens around a fish's body (like a lasso). It can be as simple as a noose held open using a forked stick, which is worked over the fish's head (e.g. used in shark fishing in some places of Indonesia). Other snares may be operated by line. Some snares are baited (to entice a fish to put its head through the noose).

3 Spearing and ripping

A traditional **fishing spear** consists of a bamboo or wooden **shaft** (*batang bambu atau kayu*) with one or more barbed **prongs** or **points** (*mata tombak*), usually of metal. A fishing spear may be thrown, or it may be pushed or thrust forward without releasing it from the hand. To aid in retrieving a thrown spear (especially when it hits prey), a **retrieving line** (*tali penariknya*) may also be used. The most general Indonesian term for a fishing spear is *tombak ikan*. A two-pointed fishing spear (*tombak ikan yang bermata dua*) is called a *piarit*, while a three-pointed fishing spear (*tombak ikan yang bermata tiga*, in English **trident**) is called a *serampang* or *trisula*.[5] A fishing spear without any metal tip,

[5] I am not aware of specific lexical items in English or Indonesian for fish spears that have more than three prongs, although they are encountered in local languages, e.g. Kulisusu *sosapa* 'five-pronged fishing

but which simply uses the sharpened end of wood or bamboo, thus really more of a single-pointed lance, could be referred to instead as a *seligi untuk menikam ikan*.

A **harpoon** (*harpun*, *tempuling*) differs from a spear in that the head is designed to separate from the shaft when it enters the prey. A **harpoon line** (*tali harpun*) connects the head to the shaft. After the harpoon strikes prey, the shaft floats to the surface, where it is retrieved by the fisher who can then use the harpoon line to haul in their catch. In addition to the harpoon line, a regular retrieving line (connecting the fisher to the shaft) may also be used.

Traditional spear fishing is done in shallow water. In deeper water a diver may make use of a **spear gun** (*panah ikan*, *senapan ikan*).[6] The homemade spear guns I have seen in Sulawesi use **elastic bands** (*tali karét*) to propel the spear forward. A **trigger** (*pelatuk*) below the **handle** (*gagang*) holds the spear (or harpoon) in place until ready to be fired. The spear may be attached to the gun with a retrieving line, or it may be free-shafted (not attached to the gun or to a float).

Free diving refers to diving without any snorkel or air tank. A spear gun fisher may also use gear such as a **snorkel** (*snorkel*), flippers or **fins** (*fin*), **swim goggles** or **diving mask** (*kacamata selam*, *masker selam*, also rarely *cermin selam*) and a **dive light** (*sénter selam*).

A **pole-hook** (*joran berpancing*) consists of a shaft with a hook on one end. Unlike spears, which are thrust or thrown forward, pole-hooks are operated by pulling or jerking back so as to impale prey on the hook. Instead of tines, fish rakes or **fish harrows** (*pancing garit*) have a row of hooks with which to impale fish. A fish harrow may be drawn by a line across the sea floor to catch flat fish such as flounder. The act of impaling a fish's body on a hook (by any method, including line fishing) is called **ripping**. Ripping is done with sharp, unbaited hooks, although bait may be used to attract prey close to the ripper. Long lines (see above) may also be used with ripping hooks rather than baited hooks, if used in places where fish naturally congregate or migrate.

A **fish scythe** has a series of points on one side, and is operated not by pushing or pulling but rather by stroking the scythe through a school of fish with the intent of impaling prey. **Eel combs** and **eel forks** (with maybe only one or two prongs) are similar to fish scythes, but are designed to be worked through muddy sea beds. A **fish plummet** (*ladung*) is a heavy device with a point or points on the bottom which is dropped onto prey (often by a diver). The plummet with caught fish, turtle, etc. is hauled back to the surface using a retrieving line.

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spear.' It is also possible that the Indonesian term *serampang*, while specifically referring to three-pronged fishing spears, may also serve as a generic term.

[6] Of these two terms, probably *senapan ikan* is to be preferred, as this would allow *panah ikan* to be applied to regular bow-and-arrow fishing (which is usually done from above the water's surface). A third possible term, *senjata ikan*, is ambiguous because in this case *senjata* 'weapon' can also refer to the dangerous or poisonous spines of fish themselves.

4 Nets and similar gear

This section covers nets, as well as certain other devices (primarily baskets) which are used in conceptually similar ways. At present the two main Indonesian terms for fishnets, *jaring* and *pukat*, have a significant overlap in meaning. Only the former, however, is used to refer to gill nets, while only the latter refers to seines/dragnets. Whether the original difference between *jaring* and *pukat* is to be sought here in the type of net, in a distinction between mesh sizes, in whether the net was staked (fixed) versus hauled, or—as Wilkinson suggests—an intermingling of what were originally regional terms,[7] is now difficult to determine.

4.1 Castnets and cover pots

A **castnet** (Indonesian *jala*,[8] rarely also *rambat*) is usually round, with weights on the edges. A castnet is designed so that when it is thrown (*ditébar*, *dihambur*) it spreads out and sinks, trapping fish below it.

A **plunge basket** (Indonesian *serekap* (?); also referred to in English as a thrust basket or by the superordinate term 'cover pot') is a coop which is thrust down over a fish. The fish is removed through an opening in the top, e.g. by hand or by using a scoop net or a spear. Plunge baskets are most effective in turbid water or areas with lots of water plants; they are used in rice paddies, in fresh water and in estuaries, but less often in coastal waters.

Lantern nets are framed nets with a large opening at the bottom, designed to be thrust down over fish in the same way as a plunge basket. Lantern nets do not make use of lanterns, but are so named because in some models the frame somewhat resembles a lantern. Because their sides are of net rather than woody material, lantern nets are typically constructed on a larger scale than plunge baskets. Wilkinson, Berkeley and Robinson (1904:27) noted a kind of framed net with a large, four-sided opening on the bottom, which Malay fishers cast on the water. This kind of framed castnet was called a *langit-langit*.

Cover nets, also called falling nets (*jaring jatuh*), are cone-shaped nets held open and lowered over fish. After the prey is covered, the net is allowed to fall and entangle the prey. Some cover nets have a purse line (*tali kerut*) with which the bottom is closed before the net is raised. Unlike castnets, plunge baskets and lantern nets—which are primarily shallow water gear—cover nets can be used in deeper water.

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[7] "The common terms *pukat* and *jaring* occur (in kindred forms) beyond the [Malay] Peninsula; it would appear as though the *jaring* was of Bugis origin while the *pukat* came from the west coast of Sumatra. It is impossible to speak with precision on this point …" (Wilkinson, Berkeley and Robinson 1904:25).

[8] From Sanskirt *jāla* 'net, snare, web.'

4.2 Liftnets

A **liftnet** works the opposite way of a castnet. A liftnet is lowered into the water and left for a certain amount of time (either on the bottom or suspended horizontally), then when lifted catches prey which is swimming above it or has crawled onto it. Liftnets may be relatively flat or they may be deeper, with a kind of pocket in the middle. In general, lift nets must be watched in order to ascertain the right time for lifting. An Indonesian name for liftnets in general is *jaring angkat*, a term which has been 'lifted' directly from English.

Small liftnets usually have a frame,[9] which may be round or square. A very simple kind of hand liftnet used in Indonesia, called a *tangkul*, consists of a four-sided piece of netting held open by two tensed, U-shaped pieces which cross in the middle. A long handle is attached at this crossing point, by which the net is raised and lowered. Larger models may be more complex (e.g. two or more handles operated in tandem). Such **stick-held liftnets** may be operated from shore, from a bridge or pier, or from the side of a boat. In so-called **Chinese-type liftnets** the handle is operated as a lever—it is set on a pivot with a counterweight opposite the net, making it easier to raise and lower.

Certain **crab nets** (*bintur* or *jaring bintur*)[10] also qualify as lift nets. These nets are usually round-framed, and baited to attract prey. Some small models (*bintur campak*) are pulled up with lines or cords. In another model a pole for lifting runs vertically through the center of the net so that the entire apparatus looks like a large ski pole; the protruding tip of the pole is used to stake the net to the bottom. A kind of large crab net made of mesh or loosely plaited rattan, called a *bintur cacak*, is lifted out of the water using a lever in much the same way as Chinese-type liftnets.

Liftnets which are too large to be framed can also called **blanket nets** (*bagan*). Blanket nets may be operated:

- by hand in shallow water (usually requiring a gang of people);
- beneath or from the side of a single boat (the far side of the net being operated by poles) (*bagan perahu*);
- between several boats (also called a *bagan perahu*, but note also specifically *pukat tangkul* with a boat on each corner);
- beneath a fixed structure built on piles, usually also supplied with guiding barriers (*bagan tetap*, *jeremal*, *jermal*);

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[9] Any kind of net with a framed opening or border, whether a scoopnet, liftnet, bagnet, etc. can probably be referred to as a *jaring berbingkai*.

[10] Also sometimes spelled *bintor* or *bintoh*. These nets can also be named after the kind of crab which is sought, thus *jaring rajungan*, *jaring kepiting*, etc.

- from a floating platform (raft or catamaran) (*bagan apung*).[11]

The last are employed to best advantage during dark phases of the moon, with a bright lantern hanging above the net to attract fish.

4.3 Bagnets

A **bagnet** is bag-shaped net which is designed to be anchored in the water, or pushed or pulled through the water. General terms for bagnets in Indonesian include *jaring berkantong*, *jaring kantong*, and *pukat bakul*.

Simple, hand-operated bagnets are primarily of three types. Each type is defined principally by its mode of operation—scooping, skimming, or pushing along the bottom—but how a net is operated also has implications for its construction.

> A **scoop net** (Indonesian *sauk*, also *tangguk*, *sésér* but see further below) is a kind of net with an opening usually held open by a hoop—though some scoop nets may be triangular-framed. The handle may be long or short, or entirely absent in some models. A scoop net specifically used in conjunction with angling can also be called a landing net (see above).
>
> **Skimming nets** (Indonesian *pukat siring* ??) are roughly triangular in shape, framed on two sides and open on the third. The two frame pieces, which form a V when the net is open, can be clapped together with a scissors-like motion to close the net. Because of this, skimming nets are sometimes also called clap nets.
>
> A **push net** (Indonesian *sungkur*, *sungkor*, *langgai*, *langgé*, *sésér*, *pukat sodok*, *pukat sorong*) is designed to be pushed along the bottom in shallow water. A push net thus always has at least one straight side, namely the side which runs against the bottom. The leading edge of a push net may be supplied with **runners** (*rél*, *kayu seperti sepatu*) or even wheels to help it more easily traverse the bottom. Following Wilkinson, a *sungkur* and a *langgai* differ in that the former was made of gunny cloth with a bag at the apex (for holding the catch), while the latter was made of netting without any bag (Wilkinson, Berkeley and Robinson 1904:29). In the largest types of push nets (*pukat sorong*), the sides may exceed twelve meters in length. The apex of the net is supported on the prow of a boat while two fishermen, one on each side, walk/push the net forward, with the boat following along behind.

While the terms *sauk*, *tangguk* and *sésér* are used somewhat interchangeably, the following notes are in order. The term *sauk* can refer to any kind of framed net with a handle, especially a long handle, including for example nets used for catching butterflies. The Indonesian term *tangguk* apparently originally referred to **scoop baskets**, a meaning which it still has today. Scoop baskets are used similarly to scoop nets, but of course are

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[11] According to Stevens and Schmidgall-Tellings (2004:s.v.), a fixed-structure lift net is a *bagan tancap*, while a movable lift net set on a floating platform is a *bagan gerak*.

made out of woody material. To unambiguously indicate a scoop net, the phrase *pukat tangguk* may be used. Also, *tangguk* is preferable to *sauk* when referring to scoop nets with a frame only but no handle. Some sources suggest that the *sésér* originally had a face of plaited bamboo, while other sources suggest a triangular shape. It is probably for this reason—the triangular shape—that the term *sésér* (but not *sauk* or *tangguk*) can also refer to pushnets.

A **scraper** (*penggaruk*) is a particular kind of long-handled scoop net (or scoop basket) with a strong frame, used for scraping shellfish off of river bottoms or the sea floor. Scrapers may be supplied with rake-like teeth or a sharp edge to assist with scraping.

Larger, stationary bag nets are called **stow nets** or **gape nets**.[12] Stownets usually depend on a river current or sea current to hold the bag of the net open. Methods for holding the mouth itself open and in place include (a) a frame; (b) a reduced frame consisting of a floating upper beam and weighted lower beam; (c) using floats and bottom stakes or anchors; or (d) by attaching the corners of the opening to two vertical poles staked in the bottom. In order to keep fish from simply swimming around a net, several stow nets may be used side by side across a current. Alternatively, barriers, leaders or wings may be used to guide fish into the net. To keep fish from exiting, a stow net may also make use of a retarding device (such as a fish trap or fyke net).

In Indonesian, a stow net with its barriers operated in a river is called a *candik*, while a stow net with its barriers operated in a marine environment is called an *ambai*.[13] A kind of transportable floating stow net, usually anchored in estuaries, is called a *pompang* or *gombang cina* (Wilkinson, Berkeley and Robinson 1904:28).

Fyke nets (*jaring arus*)[14] are cone-shaped nets held open by a series of hoops, designed to be fully collapsible when stored. The distinguishing characteristic of a fyke net, however, is the presence of a funnel-shaped throat leading into the bag, which prevents fish from exiting (a kind of non-return device). Fyke nets are thus technically a kind of trap (see below), although made out of netting.[15] Fyke nets are used by small-scale fishers in rivers or shallow ocean waters,[16] where the traps are usually supplied with a lead and wings. **Barrel-shaped hoop nets** are similar to fyke nets, but may have entrances (throats) at both ends. Because of the hoops which frame and hold them open, both kinds of nets are sometimes referred to as *jaring berkerangka*.[17]

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[12] In older literature, sometimes also called purse nets, but not to be confused with modern purse seines.

[13] With guiding stakes, *ambai berjajar*.

[14] Some Indonesian sources mistakenly refer to fyke nets as 'flow nets,' an error apparently introduced by directly translating (calquing) the Indonesian term.

[15] the English name, incidentally, comes from Dutch *fuik* 'trap.'

[16] Fyke nets are also by researchers in order to sample which species are present in an area.

[17] But see also footnote 9 above. Does *berbingkai* mean framed in two dimensions, while *berkerangka* means framed in three dimensions?

4.4 Trawls

A trawl[18] (*pukat héla*, *pukat tunda*)[19] is a general term for any net which is drawn through the water behind one or more boats. Trawls are thought to have developed from a type of **manually pulled scoop net**. Prior to motorization, trawling was limited to slow moving **dredges** (*pukat garuk*) and **beamtrawls** (*pukat héla berpalang*),[20] which had squat, wide rectangular openings for collecting shellfish, shrimp, sponges, etc. from the bottom.

In trawls used with motorized boats—significant power is required to pull the nets through water—the opening is unframed and the question then becomes how to keep the mouth open. Possible solutions include attaching the tow lines to booms or outriggers which extend outward from the boat; trawling with two boats pulling a single net between them, called a twin-boat trawl;[21] or using otter boards. Set obliquely to the flow of water, otter boards (*papan pembuka*) act as shearing devices, forcing lines outward and the net open.

Motorized trawling was first introduced into Indonesia (in Riau Province) in 1966 (Bailey 1988:32). Trawl nets are sometimes referred to as *pukat jepang*. A *pukat harimau* is a type of very large-sized trawl net. In the modern day trawl nets are supplied with turtle excluder devices (TED), called *kisi-kisi* in Indonesian.

Apollo nets (*jaring apolo*) are a kind of twin-boat bottom trawl net (*pukat héla dasar*) made of polythene, with a 50-meter wide mouth. Apollo nets are weighted down with a long iron chain for bottom trawling, and are considered destructive of habitat. They also indiscriminately capture all sizes of fish, shrimp, etc., thereby depleting potential future stock. The so-called *jaring arad* and *jaring garok* are relatively inexpensive 'mini-trawls' which are similarly destructive and indiscriminate. All three types of trawls are banned in Indonesia (*pukat langgar*).

4.5 Seines and surround nets

A seine (also called a dragnet) is a net which hangs in the water like a fence and is used to encircle a school of fish from the sides. A typical seine net consists of three parts: two long **wings** (*sayap*), one on each side (pulled by a **towing line**, *tali selambar*), and a middle area called the **bunt** or **bag** (*kandul*) where the net hangs loosely or forms a true

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[18] Do not confuse trawling (fishing with a net dragged behind a boat) with trolling (fishing with a hook and line behind a boat, a kind of angling).

[19] Some sources give *pukat tarik*, but following Wilkinson, Berkely and Robinson (1904:27), the term *pukat tarik* is more properly applied to beach seines.

[20] In a dredge the opening is completely framed, while a beamtrawl has only a partial frame—a beam across the top with side bars, but only netting across the bottom. Dredges and beamtrawls were pulled behind boats with sails. In addition, there are also today 'hand trawl nets,' but these are primarily used for sampling (i.e. in scientific research) rather than in fishing per se.

[21] Conversely, a double-trawl, *pukat héla ganda*, refers to one boat pulling a pair of trawl nets.

bag, and which holds the catch as the net is drawn in. Although some seine nets are small, most seine nets are large scale.

Beach seines (*pukat pantai*, *pukat tepi*, *pukat tarik*, *pukat pantai tarik*) are operated along the shore, where the seine forms a wide arc. As the seine is pulled toward shore, the area enclosed by the seine grows smaller and smaller. Beach seines are usually only used on beaches where the ground is relatively flat and unobstructed, because in order to operate effectively the ground rope has to be in constant contact with the bottom. Ordinary beach seines are on the order of 100 or 150 meters long and use floats and weights. Particularly large beach seines (*pukat acéh*) may reach a length three or four times that long. Smaller seines may be held open by spreading rods only. A kind of small beach seine, less than 40 meters long with ends held open by sticks and operated by two or four men, is called a *sika* (or *pukat sika*) in Indonesian, or **pole seine** in English. Similar nets but of still even smaller size, perhaps only a meter or two or three long—thus not really seines in the true sense of the word—are better termed **double-stick nets**.

A seine net operated from a boat can be called a **boat seine**. Traditional seines in Indonesia, operated from unmotorized boats, were called *pukat payang* (Abdullah 1983:214). However, the term *payang* now includes modern types of nets such as the Danish seine and the purse seine (both introduced to Indonesia in the 20th century).

Danish seines (*pukat dogol*, *pukat cantrang*) are operated in open water, and depend on fish being frightened by the wings and thus herded into the bag area. Most commercial seines which are operated in open water today, however, are the more efficient **purse seines** and **ring nets** (*pukat jerut*, *pukat cincin*).[22] Purse seines are essentially a wall of net with a **purse line** (*tali kolor*, *tali kerut*) at the bottom with which the net is closed before it is drawn in. Today more commercial catch is taken with purse seines and trawls (see above) than any other kind of fishing gear. Purse seining was in use in Malaysia by the 1950s (Kementerian Pertanian 1957:1) and was introduced to Indonesia in the early 1970s (Bailey 1988:32).

Purse seines can be considered a type of **surround net** (*jaring lingkar*) because they are designed to surround fish on all sides—horizontally and vertically. Another type of surround net is shaped more like a dustpan, and is used to catch fish swimming near the surface. Fish enter the 'dustpan' through the open leading edge, but are completely trapped when this edge is lifted. So-called **lampara nets** (*pukat lampara*) are similar, but in addition have leading wings to guide fish into the bag.

A kenka net (*pukat kenka*) is another type of seine net. How it differs from the above types of seines is unclear to me. According to some sources it is primarily used for catching shrimp.

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[22] Technically, a ring net is a hybrid between a purse seine and a lampara net, with a purse line. Whether the Indonesian terms make the same distinction is unknown to me. The *cincin* 'ring' in *pukat cincin* appears to refer to the rings through which the purse line is threaded.

4.6 Gillnets

In a gillnet (*jaring insang*), fish try to squeeze through the mesh but cannot, then get caught by their gill covers (opercula) when trying to back out. Different mesh sizes are used to target different sizes of fish. **Fixed-location gillnets** (*jaring insang tetap*) include bottom-set gillnets, anchored floating gillnets and staked gillnets, set across the expected direction of fish migration. A **drift gillnet** (*jaring insang hanyut*) is allowed to drift, either independently, or attached to a boat which drifts with it. An **encircling gillnet** (*jaring insang lingkar*) is used to encircle a shoal of fish, which are then driven into the net by frightening them. Like seines and dragnets, gillnets may have floats at the top and weights at the bottom, but of course no purse line. Increases in gillnet efficiency have been achieved by replacing natural fibers with less visible or transparent synthetic fibers. The Indonesian terms *jaring klitik* and *jaring rampus* refer to monofilament gillnets; how these terms differ from each other is unclear to me.

4.7 Entangling nets

Like gillnets, entangling nets (*jaring puntal*) are hung like fences, held vertically in the water by floats on the top and weights on the bottom. In order to be effective, an entangling net must hang somewhat loosely in the water. One way (among many) to do this is to connect the top and bottom lines (float line and lead line) of the net with connecting lines which are somewhat shorter than the depth of the net. Another model uses both vertical and horizontal lines to create 'frames' or 'windows' of slack netting.

A **trammel net** (*jaring tramel, pukat tiga lapis*) is yet another type of entangling net. In this case the net consists of a slack middle panel of small mesh size sandwiched between two outer layers of netting which are taut and have a larger mesh size. The inner panel, called the lint or linnet, is typically two to three times as deep as the outer layers, and thus has plenty of slack for entangling. A fish swimming through one of the outer panels hits the inner panel, is carried through the other outer panel, and becomes entangled in the resulting pocket of netting. The word trammel comes from French *trois mailles* 'three meshes.'

4.8 Drive-in nets

Drive-in fishing refers to scaring or herding fish into a net or other area where they can be captured. In order to increase catch, drive-in fishing can 'supplement' fishing with various kinds of nets. It can also be operated on a very small scale—for example a scoop net (*tangguk*) set up in an irrigation ditch into which fish are driven—and even ordinary mats and sarongs are sometimes used in a simple kind of drive-in fishing.

In addition to drive-in fishing as a method, there are also genuine drive-in nets (*pukat tahan, pukat rentang, pukat penggiring*). The usual drive-in net is set in a fixed location and is shaped like a dustpan (thus similar to certain older types of surround nets, see above under seines), the lip of which is raised once fish have entered. Other drive-in nets may be

shaped more like seines or stownets. Drive-in fishing is particularly useful in areas where the bottom is too rocky or jagged for other kinds of nets to be used.

Of course one or another method must be used to herd and concentrate the fish. Frequently used tactics include:

- a line of people splashing or otherwise making a commotion;
- throwing rocks into the water, sometimes with retrieval lines attached so that they can be thrown again;
- hitting the water with the flat of paddles, or with specially constructed **pulse sticks** which are plunged into the water;
- tin cans, clappers, or other noise-making implements;
- scare lines made of ropes incorporating leaves, palm fronds, old netting, etc., which are pulled through the water.

In shallow water, scare lines may be used horizontally, drawn in toward the net like a seine. In deeper water scare lines may be used vertically, e.g. a row of swimmers or divers each dragging a scare line.

Muroami (Indonesian also *muroami*) refers to a particular kind of scare tactic in which weights or other pounding devices operated from cranes are smashed into coral beds in order to frighten fish into surrounding nets. This method has long-lasting, almost totally destructive effects.

4.9 Pound nets

A pound net, also called a trap net or setnet, consists of a set or series of net fences leading into a holding pen (the pound or 'pot' of the net). The arrangement of guiding nets, possibly including retarding or non-return devices, allows fish to enter the pen, but escape is nearly impossible. Some pound nets are set in place on stakes. Other pound nets use anchors and floats, which allow them to be set in deeper water.

Pound nets are conceptually very similar to the weir traps described below (which are the traditional gear used in Indonesia), differing primarily in material of construction. Modern-day pound nets have been introduced to Indonesia from Japan and are known by their Japanese names such as *hisago-ami*, *otoshi-ami* and *masu-ami*.

5 Barriers and stationary traps

Barriers for herding fish are variously used: they may concentrate fish in certain areas, making them easier to be harvested by some other means (spear, scoop net, etc.); they may serve as wings and leaders which guide fish into catching chambers, or into traps

from which there is no escape; or when constructed in certain ways the barriers become the traps themselves. Barriers are also variously fabricated: they may be made of stone, earth or mud, sticks, woven slats, or even of netting. A barrier made of non-textile material can be called a **weir**, although vertical sticks placed individually in a row can simply be called **guiding stakes**. A very common type of fish barrier used throughout Indonesia, called *belat*, is a screen made of slats of bamboo or bertram palm (*Eugeissona* spp., Indonesian *bertam*) which are woven together. These screens are stiff in one direction but can be rolled up in the other direction, and much resemble the so-called matchstick rollup blinds used in houses. A section of such fencing is a *bidang belat*.

A **tidal weir** is a barrier which prevents fish from returning to the sea as the tide falls. Wilkinson describes such a barrier, called a *belat parit*, as consisting of:

> … a row of stakes stretching across the mouth of a small tidal bight or estuary. When the tide is high, a screen or net is fastened to these stakes, thus closing the exit; and the fish that have entered the enclosure between the stakes with the high tide are left high and dry at low tide, or in such shallow water that they are easily caught with a casting-net (*jala*). (Wilkinson, Berkeley and Robinson 1904:22)

From Japan to Australia and New Zealand there are also found tidal weirs which are permanent structures made of stone. In some there are gaps which must be closed by a moveable barrier at high tide; others are entire, and operate on the principle that egressing tidal water can flow through the rock barrier, but larger fish cannot. It is thought that some of these stone tidal weirs have been in use for centuries, if not millennia.

A **fish fence**, set parallel or obliquely to the coastline, operates on a principle similar to that of a tidal weir, but is different in that fish could potentially swim around the fence. In order to hinder (but not entirely prevent) a fish from finding its escape, the end of a fish fence is usually curved back on itself.[23]

Barriers may also be used to funnel fish into a catching chamber. For example, the fixed-structure lift nets mentioned above, called *bagan tetap* or *jermal* in Indonesian, have barriers which lead to a single catching chamber. Here the net is permanently raised on three sides, and the fish enter though the lowered fourth side, which is periodically raised to harvest fish that have entered. Because the net must be watched, crew quarters are built above the net.

Constructed another way, barriers become traps themselves. In this case there are multiple catching chambers (*sekatan*, *kurung*),[24] with narrow vertical passageways leading from one chamber to the next smaller one. Because the slit-like openings act as retarding or

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[23] It is of course possible to use gill nets and entangling nets (described above) in the same manner as a fish fence. Such 'barrier nets' are erected at high tide, and retrieved with their catch at low tide. Whereas a fence merely hinders a fish's movement, the nets entrap them.

[24] Note also Wilkinson (1908:s.v.) *kurong keléngkéng*, the innermost chamber of a fish trap.

non-return devices, the traps do not have to be watched, rather fish are harvested at low tide (often using spears and scoop nets). These **weir traps** are named *séro* (also *sérok*, *sirok*), *kélong* or simply *belat* in Indonesian. Several different types of weir traps are known, distinguished by the number, arrangement and shape of the catching chambers as well as by the material and sturdiness of construction (Wilkinson, Berkeley and Robinson 1904:16 ff.).

A special type of barrier, used in fast-flowing rivers, is a **fish grating** (*saringan ikan*), constructed as a screen of parallel sticks or boards which gently rise in the direction of the current. As water passes through the grating, fish travelling downstream with it become stranded on the grating where they can be harvested, or in some cases fall into a specially constructed holding trough or bag.

6 Portable traps

The pound nets and weir traps mentioned above have been described as two-dimensional traps, that is, open on the top and, at least theoretically, expandable to very large sizes. Because they are operated in fixed locations, they are sometimes termed 'stationary traps.' The traps described in this section are of the smaller three-dimensional type, and from that perspective can be considered 'portable traps.' Of course the catching power of any trap may be expanded by supplying barriers such as leads and wings which guide prey toward it.

The distinguishing characteristic of a bona fide trap (*perangkap*) is a non-return device. The non-return device can be a slit; a funnel-shaped opening often called a 'throat'; or a step. In terms of traps, a 'step' consists of a gentle rise leading up to a step which goes down into the trap. Once a fish goes over the step, following the bottom or the wall it can no longer find the exit (which, ironically, may be only a few inches above it). Another method of preventing a fish from escaping is to employ a tube which grows increasingly narrow along its length, so that once a fish has entered the mouth and proceeded a certain distance it has no room to turn around. In this case the 'non-return device' is the trap itself, which is called a **tubular trap** (*tengkalak, sejenis perangkap berbentuk pipa*). In addition, the opening of any trap can be further supplied with thorns or spines which encourage passage in only one direction.

Slits, funnels and steps are types of passive non-return devices. Other traps use a door or some other kind of active device that the fish triggers and thereby prevents its own return to open waters. Traps using a triggered device may be divided among:

- gravity-operated traps – when triggered, a door falls closed under the force of gravity;
- spring traps – a door is closed using the elastic power of a bent rod;
- torsion traps – a door is closed by using the power lying in twisted string or twine;

- deadfall traps – the fish releases a weight which kills it or holds it fast; or a trap comes down over the fish and is held there by a weight.

There are doubtless variations in the types of traps used from one locale to another. However, the following are the principle parameters we may use as lexicographers for describing and distinguishing one type of trap from another:

- general size and shape;
- materials and method of construction;
- type of non-return device;
- presence or absence of thorns or spines;
- presence or absence of fences or guiding barriers;
- baited or unbaited;
- place where used, e.g. rice paddy, lake, stream, river, estuary, seashore, etc.;
- intended prey, e.g. fish, shrimp, lobster, etc.

The general Indonesian term for fish trap is *bubu* or *lukah*, a kind of basket- or barrel-shaped trap traditionally woven or plaited from bamboo, rattan, vine, or tree bark, though sometimes now plaited from plastic strips. The interstices may be large or small, depending on the intended prey. The following are other kinds traps, as described in Wilkinson, Berkeley and Robinson (1904:23-24):

> The *tuar* a very large *lukah* made of thorns or of bamboo;
>
> The *setapan*, *setapu* or *tengkalak onak*, a small trap of roughly conical shape made of thorns (*onap*), the barbed points of which turn inwards and serve as *unyap*;
>
> The *singil* (Clifford and Swettenham) or *singgit* (Clifford), which appears to be a small trap either of bamboo (with *unyap*) or of thorns;
>
> The *tembilar*, a trap of the *bubu* type with an entrance supplied with spikes (*unyap*) to prevent exit;
>
> The *gerogoh* (Skeat), a Kelantan or Patani trap, shaped like a barrel or cask with one end closed and the other furnished with spikes (*unyap*);

The *bemban* (Clifford), "a conical trap smaller and more pointed than the bubu";[25]

The *balut-balut* (Swettenham), a Perak type of the Pahang *bemban*;

The *lil* (Skeat), a large spheroidal basket-like trap used in Kelantan; it is entered at the side and the entrance is supplied with in-turning spikes to prevent the exit of the fish;

The *yut*, a basket-trap in which the force of the current and the confined nature of the trap take the place of spikes in preventing the fish from turning around;

The *tubin* or *terubin*, a square Pahang and Patani trap with a falling door; this trap is supplied with bait, and the tugging of the fish at the bait dislodges a catch and lets the door fall so as to prevent the egress of the fish.

The term *bubu lipat* refers to modern-day traps, usually of metal, which fold up or collapse for storage.

In the same way that 'ghost net' is any net which has been left or lost in the ocean by fishers, so also the term 'ghost trap' can refer to any trap that has been lost or is otherwise no longer being tended. When a caught fish or crustacean dies, it can attract other fish or animals, and the trap can become self-baiting perhaps for several years. Consequently in the West it is increasingly common for traps to be supplied with biodegradable 'escape hatches.'

7 Artificial hiding places

Artificial hiding places (*perangkap yang merupakan tempat berlindung atau bersembunyi*) are used to attract fish, crustaceans (shrimp, crabs, crayfish, etc.), octopi, etc. to areas where they can be harvested. Artificial hiding places are of two principle types. In the first type the artificial hiding place consists of floating or submerged vegetation (leaves, palm fronds, branches, brushwood) and are known as **bush traps**, **brush traps**, or **brushwood traps**. In the Indonesian context, the term *rumpon* refers to leafy brush used to attract fish, while the term *unjam* (sometimes spelled *unjang*) refers specifically to palm fronds anchored at sea to attract fish.

Brush traps can be operated in the following ways.

- The area around the brush, being enriched in prey, is fished by whatever means.
- An entire bundle of leaves, brush, etc. is quickly lifted and thrown into a boat, perhaps using a scoop net underneath as it is removed.

[25] The definitions in Echols and Shadily (1989:s.v.) "k.o. staked fish trap" and *Kamus Besar* (Tim Penyusun Kamus 2001:s.v.) "alat penangkap ikan menyerupai bubu, diberi bertali yg diikatkan pd tongkai" both emphasize the fact that this kind of trap is staked.

- The leaves or brush are placed in a container, and later the container is lifted to harvest prey. A kind of conical basket baited with twigs is called a *bubu ranggas* in Indonesian, the term *ranggas* referring to the mass of twigs themselves.

- The brushwood is surrounded with a net (e.g. gillnet) and either (a) prey is frightened into the net by shaking or slightly lifting the brush mass; or (b) the brush is entirely removed and the catch harvested. In this method, the area to be used is usually set beforehand with surrounding stakes to which the net is later attached. This kind of trap is called a *temberam* in Indonesian, although a *temberam* can also be set using bait instead of brush (Wilkinson, Berkeley and Robinson 1904:23).

In the second type of artificial hiding place, the fish, crab, octopus, or other animal is offered a tube, pot, box, can, or some other kind of shelter in which to take refuge. Since the animal is free to come and go, success usually depends on lifting the gear quickly before the animal has a chance to escape. A well-known device of this type are the so-called octopus pots of Japan and other areas. South Sulawesi is known for its floating tubes supplied with garlands of palm leaflets, called *bubu hanyut*, used to attract flying fish. In this case the tubes are offered as a nesting area, and it is the roe which is harvested.

I have also seen a very simple variation of the 'shelter' method used in Southeast Sulawesi. When people are combing the shallows at low tide, a basket is set on its side on the bottom, with a few rocks placed around and over its entrance. The hope is that as nearby rocks are lifted or moved in search of shellfish, disturbed fish will choose the dark opening of the basket as their next refuge. The basket is then lifted before fish have a chance to escape elsewhere.

8 Gathering at low tide

Although collecting by hand or with simple tools can be done anywhere, the most important places for gathering are areas of seashore exposed at low tide. Apart from the unlucky stranded fish, animals collected by **hand-picking** are mostly limited to shellfish, sea urchins, sea cucumbers, worms and small octopi and crustaceans. Besides one's bare hands, various tools may be employed for digging, prying into crevices, or otherwise dislodging prey, and include shovels, scratchers, hoes, crowbars, chisels, hammers, spoons, knives, forks, tongs, tweezers and pokers. As can be seen from this list, such tools don't bear special names in English but are usually named after whatever household or gardening implement they most resemble.

9 Stupefying

There exist several methods for stunning or stupefying fish, making them easier to catch. Perhaps the simplest method is to muddy the waters of a small pool or pond, thus depriving fish of oxygen. This method is called **deoxygenation** or suffocation.

Various **fish poisons** are also well known in Indonesia, traditionally derived from various plants but today also including industrial chemicals such as cyanide (*sianida*). A natural fish poison known and used throughout Indonesia is derris root (*tuba*), from a woody creeper of the legume family.[26] However, plants which are known to have a toxic effect on fish are so numerous that their descriptions lie beyond the scope of this paper. I hope to have more to say about plants used for their poisoning effects in a separate article.

In **electrical fishing** (or electric stunning, Indonesian *menyetrum ikan*), an anode and cathode of an electrical system are placed in water, stunning nearby fish as the electric current flows through their bodies. Electrical fishing is most effective in fresh water, such as rivers and ponds. Because of the higher conductivity of salt water, in marine environments electric currents tend to flow around rather than through fish.

Blast fishing (e.g. with dynamite) (*penangkapan ikan dengan dinamit atau bahan peledak lainnya*), is known all over the world. It is prohibited in Indonesia (and most other places) because of its indiscriminate destructive effects on coral and young fish (fish fry, *benih ikan*).

10 Killing caught fish

Once a fish has been caught, there are several methods for killing it, including:

- asphyxiation (*kesesakan nafas*) – allowing a fish to suffocate in air;
- spiking or pithing (*menusuk otak ikan*) – inserting a spike into the brain of the fish;
- bleeding (*mengeluarkan darah*) – by making a cut through the gills or in the throat area;
- evisceration (*mengeluarkan isi perut*) – disemboweling or gutting a fish;
- percussive stunning (*mementung kepala ikan*) – hitting the fish on the head with a cudgel or 'priest.'

Percussive stunning is considered the most humane method.

In another method, called shark finning, a shark's fins and tails are removed, and the carcass is thrown back into the sea (*pengambilan sirip ikan hiu dengan tubuhnya dibuang biar ikan hiu masih hidup*). Often the shark is still alive but, unable to swim, it sinks toward the bottom where it slowly suffocates (because it cannot pass water through its gills) or is eaten alive by other fish. Simple economics lie behind this practice: shark meat is low in value and often not considered worth transporting, versus the dried fins that can

[26] *Tuba* may refer to any of several species of genus DERRIS used for fish poison or, growing only in western Indonesia, the similar creeper MILLETTIA SERICEA (also a legume). In a more general way *tuba* may refer to any plant-derived material for stupefying fish (Wilkinson 1959:s.v.).

sell for $300 or more a pound. Nonetheless the practice of shark finning is considered inhumane.

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