

# Timed Search Methods

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## Study Area

Timed searches for tortoises and semi-aquatic turtles should be conducted in suitable terrestrial habitats, preferably as far as possible from roads, footpaths, and villages. This will reduce human impact and therefore give you a better chance of finding turtles. It is much easier to walk along a path than walking through thick forest, but it is unlikely that you will find anything! However, there are exceptions - disused logging roads in thick forest can be good places to search. So head off the path and get into the forest (but take a map, compass, and GPS, or you may never be seen again).

If you are **surveying a specific species**, focus on areas of suitable habitat for that species (e.g., montane evergreen forest for the Impressed Tortoise *Manouria impressa*, or flooded grasslands for the Black Marsh Turtle *Siebenrockiella crassicollis*). However, do not only look in the habitats that field guides or local villagers name as the most suitable habitat. This is the best place to start, but you should also survey other habitats. It can be surprising where tortoises and turtles are found. Also, our knowledge of species is still incomplete, so if you find a species in a different habitat your survey will add important information to our understanding of the ecology of the species. And if you are very lucky, you may find additional species to those on which you are targeting your survey.

If you are **surveying an area** to find out which species are found there, it is essential that you conduct timed searches in all representative habitat types. For example, in southwest Cambodia we conduct timed searches in lowland evergreen forest, dry deciduous forest, dry grasslands, flooded grasslands, permanent marshes, lake edges, bamboo forest, hill forest, pine forest, and along the banks of rivers and streams. In this way, we maximize the chances of finding all species that are present.

Areas to be surveyed should be chosen based on information gathered from interviews with local communities. People living in the survey area often have a great deal of knowledge of the species which are present and where they are found, and you should talk to them before starting your surveys. However, take care. People may accidentally or purposefully not tell you the truth. They may send you to places where turtles were found in the past (but are now over-harvested and extinct at that site), or they may keep quiet about the best places to find turtles. So use interview data carefully, and make some decisions on survey sites based on what you think could be good places for turtles, not just based on what people tell you!

Timed searches are good methods to find turtles and tortoises in the early morning and evening, especially during the rainy season. Many species are inactive for most of the day, and many are dormant during the dry season. Remember: you need to do timed searches when the animals are not hiding and when they are most active. A walking turtle is much easier to find than a turtle hiding under vegetation. Also, many species are

nocturnal and are mostly active during the night. So study the ecology of the species you are targeting, and be prepared to go out at night with a head-torch and explore the area. Keep as quiet as possible. As a tortoise moving through leaf litter can be very noisy, and you may be able to detect it by sound as well as by sight.

### **Timed searches**

Instead of clearing formal transects (cutting paths) through evergreen forest, it is recommended that tortoise and semi-aquatic turtle surveys should consist of **timed searches** instead. During these searches, the team should walk in a fixed direction along roughly parallel routes and should look for tortoises, turtles, tracks, or faeces. Every search should be timed using a stopwatch, and searches conducted during the morning and in the afternoon (and early in the night if possible). To begin the timed search, the team should line up in the forest, with each team-member standing approximately 5-10m apart from the next (depending on the density of the vegetation). The important thing is that transects are close enough together to ensure that people can see each other and not get lost. Also, by walking in a line close to each other, the area will be thoroughly searched and few turtles or tortoises will be missed.

The number of participants in a timed search can vary but should be at least 4 people, including trained team members and at least one local guide. Previous experience suggests that once you get more than 7-8 people, it gets difficult to control and people can easily become lost from the group. Always remember that safety is the highest priority. It is no use finding a rare turtle species but losing a team member! To minimize observer variation, try to keep some of the team members the same for all surveys.

If possible, at least one well controlled **local hunting dog** should be used. They will find turtles that everyone has missed – an example is a hunting dog locating a Black Marsh Turtle buried in leaf litter less than 10m from a field-camp! The dogs should be allowed to run freely between and around the team, and they will find concealed animals. This considerably increases the effectiveness of the searches, as was proven to be the case by Platt *et al.*, 2003, wherein dogs were shown to be almost five times more efficient at finding tortoises than people. However, if you take more than two dogs, they just play, fight, or run around in a group. It is recommended to take two dogs if possible.

The dogs must be kept under close control at all times, and must not be allowed to harm the tortoises or turtles in any way, nor any other wildlife they find. If a hunting dog begins to scratch and bite the turtle, you should stop the survey and replace the dog. In our experience, it is not difficult to find dogs that simply stop and bark when they find an animal (not only turtles – our dogs also found snakes and lizards).

Also, extreme care should be taken when selecting guides for the trip. The owner of the dog will want to join you on the trip, but be aware that he is very likely to be a hunter (which is why he has a trained hunting dog!). You do not want the guide or dog owner to return to the site after you leave and harvest all the turtles you found. We have got around this problem by choosing guides who were reliable forest rangers, by borrowing

dogs that had been confiscated from hunters in the forest, or even by getting a puppy from the local village and keeping it for training as a fellow team-member!

### **Search Effort**

The search effort (and hence relative abundance) for each tortoise and turtle species is calculated as **the number of person-hours required to locate one tortoise**. So for example, there may be six of you in a team, and you search in the morning and at night for a week, with a total search time of 17 hours. Because there are six of you looking at the same time, that is  $17 \times 6 = 102$  person-hours.

Now, imagine you find two Asian box turtles (*Cuora amboinensis*), one elongated tortoise (*Indotestudo elongata*) and five Asian leaf turtles (*Cyclemys dentata*). The amount of time taken to find each species is as follows:

**Asian box turtle:** 2 turtles in 102 person-hours, so  $102 / 2 = 51$  **person-hours** to find one box turtle;

**Elongated tortoise:** 1 turtle in 102 person-hours = **102 person-hours** to find one elongated tortoise;

**Asian leaf turtle:** 5 turtles in 102 person-hours =  $102 / 5 = 20.4$  **person-hours** to find one leaf turtle.

So we can see that the Asian leaf turtle is relatively more abundant than the other species, as it only took 20.4 person-hours to find one. The Asian box turtle is the second most abundant species relative to the others, as it only took 51 person-hours to find one. But the elongated tortoise is relatively uncommon because it took 102 person-hours just to find one!

To summarise, timed searches give us a way to quantitatively (i.e. with numbers) state the relative abundance of all of the species you found.

### **Measurements**

When a tortoise or turtle is found, the date, time, time taken to find it (i.e. time on stopwatch), locality (determined with Garmin-12 GPS), habitat, microhabitat, altitude, weather, and air temperature should be recorded. The tortoise or turtle should be identified to species using field guides (Cox *et al.*, 1998, and Stuart *et al.*, 2001) and its behaviour recorded (i.e. was it resting head in, resting head out, walking, feeding, combat (male-male), mating (male-female), or nesting).

In addition, its age can be roughly estimated by counting the number of growth rings on the scutes. Be careful though, as growth rates can vary a lot between species, so one growth ring may not mean one year. However, counting and recording the number of growth rings still gives us an idea of the relative age of each turtle or tortoise you catch.

The sex of the tortoise or turtle can be determined based on differences in shell size and morphology (shape), and by tail size (males have longer, thicker tails). The straight-line

carapace length should be recorded using calipers or measuring tape, and a unique mark be given to each individual by notching the marginal scutes of the carapace, thereby ensuring that recaptures are recognized and recorded (see Marking Turtles, below).

Every tortoise and turtle must be photographed above, below, and from the side with head out. This will provide confirmatory evidence of species identifications. Empty shells that you may find should also be photographed and measured, and should ideally be collected and retained whenever possible (but never buy them or you will support the trade in turtle shells!). At least one DNA sample (shell fragment or blood sample) should be taken for each tortoise and turtle species, in case there are doubts as to the validity of species identifications.

### **Marking Turtles**

Each turtle should be marked individually so that you do not count the same animal more than once. There is a marking scheme in use that allows the turtles to be marked with minimal damage and as few a number of marks as possible.

### **Datasheets**

A data sheet has been produced to ensure that information is recorded systematically in the field. All information will be entered onto the computer at the end of each field trip.

### **References**

Cox, M.J., van Dijk, P.P., Nabhitabhata, J. and Thirakhupt, K., 1998. A photographic Guide to Snakes and other Reptiles of Thailand and southeast Asia.

IUCN Red List of Threatened Species, 2002.

Platt, S.G., Ko, W.K., Khaing, L.L., Myo, K.M., Swe, T., Lwin, T., and Bridgewater, T.R., 2003. Population status and conservation of the Critically Endangered Burmese Star Tortoise *Geochelone platynota* in central Myanmar. *Oryx* Vol **37** No. 3, 464-471.

Stuart, B., van Dijk, P.P., and Hendrie, D., 2001. Photographic Guide to the Turtles of Thailand, Laos, Vietnam and Cambodia.