Cardiff University Otter Project - Post Mortem Information

Otters found dead across England and Wales are sent to the Cardiff University Otter Project (CUOP) for post mortem examination. The location of each animal is recorded and information passed to the relevant authorities for use in targeting mitigation schemes. Locations with multiple fatalities or where breeding (lactating/pregnant) females are found are prioritised.

Data and tissues collected during post mortem

External examination
- **Morphometric data** (nose to anus and anus to tail-tip length, weight). This gives us a broad idea of the age class of the animal, and its condition. It also acts as a benchmark to which we can compare organ weights, and ensure that they follow a normal pattern relative to the size of the animal.
- **Injuries**: The animal is carefully examined for any injuries and these are described – including fighting injuries (see below) and any other injuries.
- **Fighting injuries**: Bite marks (usually represented by a pair of punctures roughly 15mm [lower canines] or 21 mm [upper canines] apart) or cuts, particularly around the anogenital area, feet and head, are recorded. Competition, particularly between males, can be severe, and may increase with increasing populations. Injuries can also lead to serious infections and in some cases to death of the animal.
- **Ectoparasites**: Removed and identified. Ticks are often found in aggregations around the ears but can be found, attached or loose, anywhere on the animal.
- **Teeth**: checked for signs of wear, breakages, missing teeth or infection.
- **Markings**: A photograph is taken of the throat, chin and moustache and any markings are noted. Animals with pale spots throughout the pelt occur occasionally and are known as ‘Royal’ otters.
- **Vibrissae (whiskers)**: – taken for potential future analysis e.g. of heavy metal levels or stable isotope analysis of diet. Whiskers are particularly useful as the position along the whisker can indicate when the animal was exposed to pollutants / experienced a change of diet.
- **Ears**: Retained for work on haemoparasites.
- **Tongue**: Retained for work on toxoplasma.

Reproductive condition:
- **Females**: Nipples are checked to establish the past reproductive history of the animal. Otters have 2 or (rarely) 3 pairs of nipples, all of which are checked individually. Protruding nipples indicate the female has previously fed kits. Nipples are checked for lactation and this can indicate the female has recently had kits or is at a late stage of pregnancy.
- **Males**: Testes are classed as having descended or not.

Internal examination
The following is an overview of the main observations recorded and organs retained at post mortem. In addition, any unusual findings – such as cysts, growths or bacterial infection – are noted and, if necessary, photographed and samples of the abnormality are retained.
- **Fat layer**: We categorise the fat layer as poor / moderate /good / excellent, according to the extent to which fat covers the abdomen / thorax. In animals with good fat layers there are often also intramuscular fat deposits, which are noted. Fat levels can help assess the state of health of the animal.
- **Muscle layer**: We categorise the muscle layer as poor / moderate /good / excellent, judging by the thickness of the sheets of muscle covering the thorax and abdomen. This may indicate
the state of health in adults but varies with age, juveniles having much less developed muscle layers than mature animals.

**Abdominal cavity**

The abdominal cavity is examined and the presence of free blood and / or blood clotting is recorded. Damage / displacement of the organs is recorded. Damage to the diaphragm is recorded.

- **Liver**: Retained for chemical analysis including screening for pollutants such as organochlorines and PCBs (analysis carried out by the Environment Agency). The liver is also checked for endoparasites such as liver fluke. Total liver weight is recorded. Currently a sub-sample of liver is also being used for heavy metal analysis as part of a predatory bird monitoring scheme (http://pbms.ceh.ac.uk/).

- **Gall bladder**: Retained and microscopically checked for gall stones and flukes (*Pseudamphistomum truncatum* and *Metorchis albidas* have both been found in otter gall bladders, and a PhD study is currently underway studying their distribution and ecology).

- **Kidney**: Retained and weighed to check normality, screened for renal calculi (kidney stones) which can be found in older animals or those in poor health. If found, kidney stones are retained and weighed.

- **Adrenal glands**: Retained and weighed to check normality. Adrenal glands enlarge rapidly when the animal is physiologically stressed, so can act as a health indicator. Adrenal glands are checked for a nodular appearance, or any variation in size between the two adrenals.

- **Spleen**: Retained and weighed to check normality.

- **Testes (males)**: Weighed to check normality, and retained for possible future work on sperm development.

- **Uterus (females)**: Checked for any thickening or convolutions, which can indicate a recent or current pregnancy. Incision made along each horn to check inside for any foetal development, or placental scarring (which indicates previous pregnancy). Weighed, left and right horn lengths measured (otters have a 2-horned uterus), and retained. Any unusual uteri are photographed; for example, convoluted uteri may indicate early stage pregnancy.

- **Stomach/intestine contents**: Retained, for research into diet

**Thoracic cavity**

The thoracic cavity is opened by cutting along the central line of cartilage. The presence of free blood and / or blood clotting is recorded.

- **Lungs**: Examined for signs of respiratory infection. L and R lobes are weighed.

- **Heart**: Examined to check if normal and the valves are clear – abnormalities have (rarely) been noted. The heart is weighed and retained for work on Toxoplasma

- **Thymus gland** is a potential age indicator. Weighed and retained.

- **Thyroids glands** are retained and weighed. Abnormalities in thyroid weight can indicate impacts of pollution.

- **Brain**: Retained for work on Toxoplasma

**Bony materials**
Skull, baculum (penis bone), right hind limb (tibia, fibula and femur), and rib – all retained, variably for morphometric data, heavy metal and stable isotope analysis. The bone samples are cleaned and archived by the National Museums of Scotland.

- **Skull**: retained and cleaned for morphometric analysis. Cranial sutures are recorded as open / closed.
- **Tooth**: The lower right canine is retained for age-determination – previous analyses have been done by Matson’s, USA ([http://www.matsonslab.com/](http://www.matsonslab.com/)).
- **Rib**: Retained. Rib samples have previously been used for heavy metal analysis. We routinely retain the 7th rib from the bottom on the right hand side.
- **Leg**: Retained and cleaned for morphometric analysis and examination of the femoral sutures. Samples taken for stable isotope analysis (used in current research to indicate the relative proportion of marine/freshwater prey in diet). We routinely retain the hind right tib, fib and femur.
- **Baculum** (penis bone, males): Measured to indicate sexual maturity – a male with a baculum > 60mm in length is considered sexually mature and therefore an adult. Injuries are occasionally noted (e.g. broken baculum / callous formation where previous breaks have healed).

**Other**

- **Scents glands**: Retained for work on chemical communication.
- **Faeces** (sample of gut contents taken near the rectum) retained for research associated with scent analysis, and for screening for parasites.
- **Muscle**: Retained for analysis. Current research projects using muscle tissue include genetic analysis (landscape genetics, contribution made by introduced individuals, patterns of spread), and stable isotope analysis (to monitor nutrient cycling and contribution of marine nutrients to recent diet).
- **Blood**: Retained for screening for *Toxoplasma gondii* and potentially other infections. Where possible blood is taken from the thoracic cavity.
- (Occasionally) pellets – on a few occasions the animal may have been shot, any pellets found are retained and the point of injury is photographed. The occurrence of shot animals is very carefully monitored.
- **Pelt**: Retained for potential future work on hair analysis.