Lecture 2: Sampling gear
Total samples

- Total samples
- **Draining**
  - Gives a total sample but this is often not practical.
  - Kariega estuary study on salt marshes.
- **Explosives**
  - Extremely effective sampling tools there is inherent danger.
  - Legal issues their use is discouraged.
Partial samples

• **Passive sampling gear**
  • Gill nets, traps, fyke nets and longlines.
  • Advantage of passive fishing gear is that it is not time consuming and after it is set other activities can be carried out by the researcher.
  • Good gear for monitoring fish stocks
  • Catch-per-unit effort of a passive gear must always be standardized to a measurement of the gear and a to a unit time. eg kg per 100m net per hour.
  • Overestimates the number of fish that move
Gill nets

- Rectangular wall of netting.
- Very size selective.
- Always use a gill net fleet.
- Number of panels and mesh size - determined by the target species.
- The placement of the individual panels within the fleet must be randomised.
Hanging ratio

50%

40%

60%
• Monofilament is more efficient than multifilament nets, but are much harder to repair.

• Important that the net is set along a depth contour.

• Also floating or bottom set gill nets.

• CPUE always has a net length and time component: \( x \text{ kg/100-m net/hr-1} \).
Disadvantages

Selective

Bycatch

Ghost gears
Traps

- Baited valve traps
- Habitat traps (octopus longlines)
- Fyke nets

- It does not really matter how these gears are set (along or across contours) as long as it is consistent.

- CPUE?
- Fish not killed in gear
Advantages

- Fish can be released after capture
- Less size and species selective

Disadvantages

- Ghost gears
- Bycatch
Longlines

• Hook sizes depend on the species and size of fish that are to be targeted.
• Hooks are size selective.
• Longline CPUE:
  - $x \text{ kg/100-hook/hr}$.
Advantages of passive gear

- Labour of operation is economical.
- With appropriate precautions, fish can be caught unharmed (not gill nets).
- Information concerning density (both spatial and temporal) and migrations can be collected as the fishing effort remains constant from day to day.
- Can be used to measure relative abundance.

Bias with passive gear

- Relies on the fish to encounter the gear and select for:
  - More active species.
  - More active individuals within a population (spawning migration/nest, feeding etc).
  - Longlines and baited traps will obviously target foraging fish.
- Gears may saturate.
- All are size selective depending on the dimensions of the gear.
- They are not suitable for all habitat types.
- They lack a spatial dimension and are therefore not useful for estimating total abundance.

How will this affect results???? And how can this be remedied?
Active gear

- **Major advantage is that they do not rely on active fish and sample over a known area.**
- **Most have spatial dimension.**
- **Hook and line**
  - Operator bias and selects for actively feeding fish. Also hook size is selective.
- **Scoop Nets**
  - Can be useful for sampling among vegetation and in small streams.
  - Biased against large fish

- **Cast Net**
- Operator bias
Seine nets

- Seines are the biggest, most expensive and labour-consuming fishing gears.
• **Advantage of seines**  
  – Large sample can be obtained in a relatively short time if the fishing conditions are favourable.  
  – Seine nets are relatively non-selective for certain sizes of fish.

• **Disadvantages**  
  – High cost and the number of personnel needed for its use.  
  – Not all areas of the water body are accessible.  
  – The morphology of the bottom is one of the most important of these conditions.  
  – Seining beaches should have hard, clear, gently sloping bottoms.  
  – Efficiency reduced if it is hauled into a boat (Danish seine better).  
  – If snags etc. have to be removed the preparation of special sampling beaches may well influence the fish behaviour.  
  – Avoidance reactions select against larger and more active fish.  
  – Difficult in running waters.  
  – Depth limited.
Electro-fishing

- Use of an electric current flowing through the water.

Advantages

- Do not require preliminary preparation of the site
- Requirements in terms of manpower and physical exertion are small.
- Immediate collection of fish.
- Competently carried out, the method does not result in mortality or damage to the fish to any greater extent than does netting.
Disadvantages

• Variability of effect when compared with the use of nets or traps.

• Risk of physical danger to both fish and operators.

• The sampling error arises mainly from the fugitive fish.

• A batch of fish caught electrically, marked and subsequently fished over, will include some which will subsequently avoid an electric field at the first sensation.

• This sensitivity may decrease with time, but in the case of salmonids it persists for more than a day.

• Effect of this shyness - increase the numbers of unmarked fish associated with the marked ones re-caught, and so to inflate the estimate of population.
Chemicals

• Two toxicants, rotenone and antimycin
• Rotenone, the active constituent of derris root,
• Inhibits electron transport over the gill membrane.
• Also lethal to many other species.
• Stability or persistence of rotenone is dependent
  – pH, temperature, oxygen and suspended matter.
• Varies appreciably between species, and between
  fry, juveniles and adults of one species.
• Predators may gorge themselves on smaller fish.
• Some fish surface within minutes but quickly sink.
• Poisoning is, therefore, limited to shallow areas in lakes, to relatively small bodies of standing water and to shallow, slow-moving rivers.
• The areas sampled can be limited by *barrier nets and by a chemical such as potassium permanganate* to destroy the toxicant outside the net.
Advantages
• Fairly non-selective in terms of size.

• If the sampled areas are representative of the entire water body or of a series of water bodies then information on species composition, size distribution and on standing stock, in terms of numbers and weight per unit area can be obtained.

• Accuracy of estimations depends on:
  – sufficient concentration of toxicant
  – the ability to collect all fish.

• The cost of the technique can be relatively low.

Disadvantages
• Destructive on target species.
• Cannot be applied to waters destined for human consumption.
Best gears and practices?