

Inanga/Whitebait

Counting eggs – assess spawning activity



Counting how many inanga eggs are laid in 'the love zone' over a spawning season is a great way to assess spawning activity, and compare activity over time.

We use a simple scientific method called 'random stratified sampling' to 'quantify' the number of eggs per site. You don't have to try and count every single inanga egg on the bank or in the temporary straw bale habitat you've previously installed! This makes the process faster and more consistent between sites.

Quantifying eggs in NATURAL HABITAT:

You've already found 'the Love Zone' * (so you know the section of river where you're most likely to find eggs), it's low tide, and you're ready for an inanga egg hunt.

First you need to define the AREA of the 'patch' of eggs. An egg patch can be made up of lots of smaller 'clumps' of eggs. As long as clumps are less than 1 m apart they are considered to be part of the same patch.

Once you've measured the length of your patch, and you know the average width of all egg clumps in the patch, then you can calculate the AREA of egg coverage with this equation:

$$\text{AREA (m}^2 \text{ of the patch with eggs)} = \text{patch length} \times \text{average clump width}^{**}$$

Next, estimate the NUMBER OF EGGS in the whole patch by doing representative sample counts of individual eggs within a small space. We scale up these small sample numbers later.

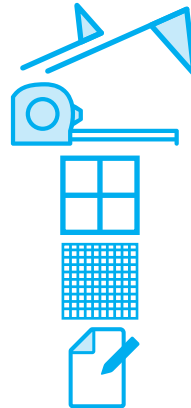
Within your egg patch **RANDOMLY** (don't purposefully look for eggs) place a 10×10 cm wire quadrat. If there are less than 200-odd eggs within the whole quadrat

count them all – but, if there are more, use the 10×10 cm wire quadrat with 1 cm grid squares, and count all the eggs within only 5 random squares (so 5 out of 100 squares in the grid) then multiply by 20. If there's no eggs in a square just record zero.

$$\text{DENSITY (eggs per m}^2 \text{ per patch)} = \text{average number of eggs in all quadrat counts}^{***} \times 100$$

$$\text{PRODUCTIVITY (number of egg patch)} = \text{AREA} \times \text{DENSITY}$$

Monitoring equipment needed:



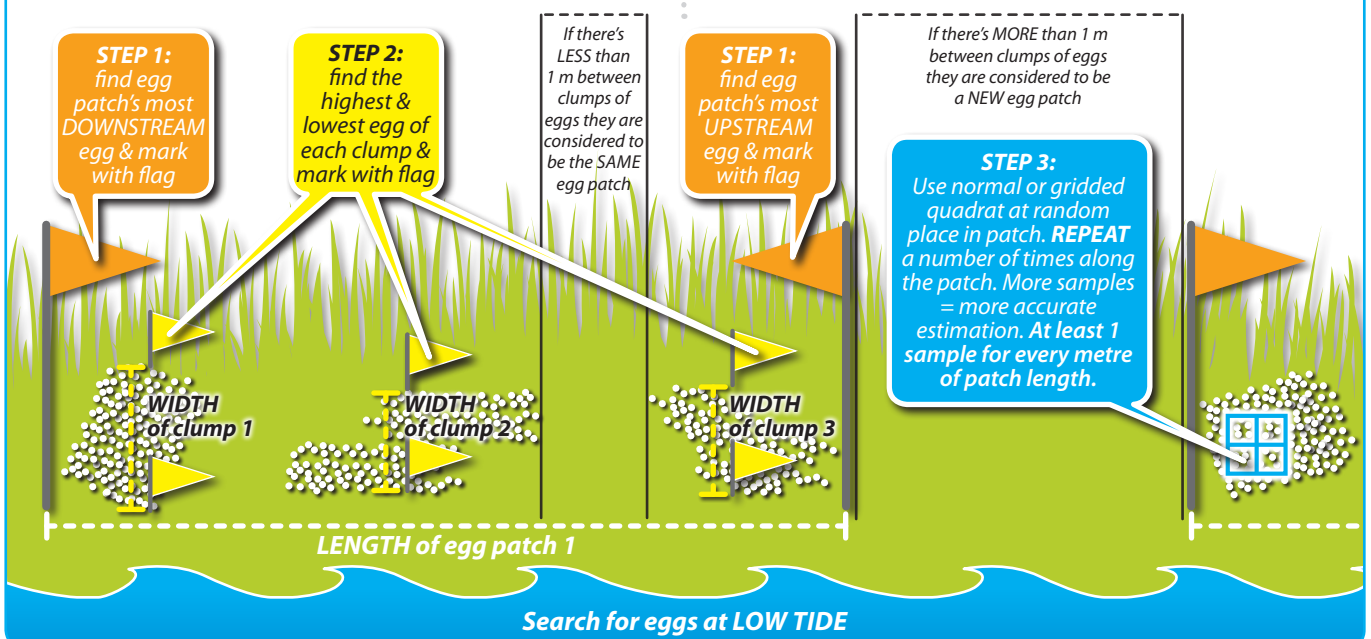
flags/flagging tape

tape measure

10×10 cm wire quadrat

10×10 cm wire quadrat with 1 cm grid squares

equipment to record data



* see 'Further Reading & Resources' if you don't know what/where 'the Love Zone' is

** average clump width = all clump widths added together then divided by number of clumps

*** average number of eggs = all quadrat totals for that patch added together then divided by the number of quadrats counted

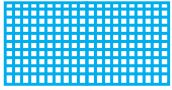
Quantifying eggs in TEMPORARY STRAW BALE HABITAT:

If you have previously installed temporary straw bale habitats on your waterway, use the same method for quantifying the AREA of egg coverage, and the DENSITY of egg coverage as you would in the natural environment – just with the systematic method explained here...

Monitoring equipment needed:



sun umbrella



1x0.5 m AREA grid with 5x5 cm grid squares



10x10 cm DENSITY quadrat



10x10 cm DENSITY quadrat with 1x1 cm grid squares



equipment to record data

You will also need all the equipment to remove and replace the bales as needed. See 'Further Reading & Resources'.

SURVEY METHOD (the order to work in):

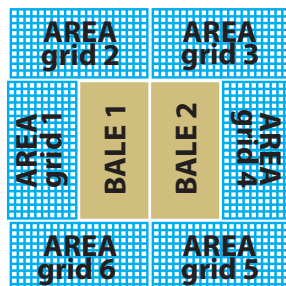


Before you start – ALWAYS ensure bales are shaded from the sun. Eggs dry out and die very quickly in the sun.

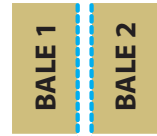
Using a sun umbrella to protect any eggs found while checking 0.5 m ground perimeter around bales.

Surface 1: First, check the 0.5 m perimeter of ground around the bales for eggs.

- IF YOU DON'T FIND EGGS just record a zero on your data sheet and continue to surface 2.
- IF YOU DO FIND EGGS – follow the 1) AREA, then 2) DENSITY count methods explained on the next page. This will involve you placing the large 1x0.5 m grid with 5x5 cm grid squares 6 times to cover the whole perimeter. Once you've done the area & density counts move to surface 2.



Surface 2: Next, check the bale interior surfaces for eggs. The interior surfaces are the sides where the bales touch each other in the middle.



2x bale interior surfaces

- IF YOU DON'T FIND EGGS just record a zero on your data sheet and continue to surface 3.
- IF YOU DO FIND EGGS – follow the 1) AREA, then 2) DENSITY count methods explained on the next page. This will entail you placing the large 1x0.5 m grid with 5x5 cm grid squares twice – once on each bale.



Checking the interior surface of a bale for eggs.

Be careful when rolling the bales to ensure they don't fall apart/damage eggs.

Surface 3: Lastly, check the ground underneath the bales for eggs.

- IF YOU DON'T FIND EGGS just record a zero on your data sheet and you are finished for this site.
- IF YOU DO FIND EGGS – follow the 1) AREA, then 2) DENSITY count methods explained on the next page. This will entail you placing the large 1x0.5 m grid with 5x5 cm grid squares twice – once on the ground underneath each bale. If it looks like the eggs have stuck/or been laid on the bottom of the bale instead of the ground, then use the bottom of the bale INSTEAD of the ground underneath the bale. Only count one of these – don't count both.



Checking the ground under the bale for eggs.

AREA & DENSITY COUNTING METHODS FOR WHEN YOU DO FIND EGGS:

When eggs ARE found use your quadrats to do 1) AREA and 2) DENSITY counts. These counts allow you to estimate:

- AREA of egg coverage = m² of the bale set with eggs
- DENSITY of eggs = eggs per m² per bale set
- egg PRODUCTIVITY = number of eggs per bale set

Doing a DENSITY count with the 10x10 cm quadrat with 1x1 cm squares on the interior surface of a bale.



1) DEFINE AREA (counting grid squares): 1x0.5 m large area grid with 5x5 cm squares



Using the large AREA grid on the ground around the bales.



Using the large AREA grid on an interior bale surface.

If you find eggs – apply the large AREA grid to the area you found them.... 1) grass around the bales, 2) the interior surfaces of the bales, and 3) the ground underneath the bales (as described in the Survey Method on previous page). Count the number of 5x5 cm grid squares that have eggs in them. You will repeat this 6 times on the grass (to cover the whole perimeter), once on each of the two bales interior surfaces, and once underneath each of the two bales. You can then calculate the...

$$\text{AREA} = \text{number of grid squares with eggs} \times 0.0025$$

2) DEFINE DENSITY (counting eggs): Use ONE of the following methods to do a representative egg count. Repeat up to 3 times per surface in different random spots. Record totals of all your quadrat counts. If there's no eggs in a quadrat/square just record a zero on your data sheet.

if LESS than 200-odd eggs use the 10x10 cm quadrat



Count **all** the eggs within the **whole** quadrat (i.e., all 4 squares). This gives you the total for this quadrat count.

OR

if MORE than 200-odd eggs use the 10x10 cm quadrat with 1x1 cm squares



Count **all** the eggs in only **5** random grid squares, then **multiply that number by 20**. This gives you the total for this quadrat count.

Once you've completed all the appropriate small quadrat counts and found your averages* you can then calculate the...

$$\text{DENSITY} = \text{average}^* \text{ number of eggs in all quadrat counts} \times 100$$

$$\text{PRODUCTIVITY} = \text{AREA} \times \text{DENSITY}$$

* Average = all quadrat totals for that bale set added together then divided by the number of quadrats counted

FURTHER READING & RESOURCES:

- To find instructions on how to find 'the love zone' see Whitebait Connection (WBC) National Inanga Spawning Education Programme (NISP) resource 2a: Finding natural spawning sites.
- For list of equipment required when shifting bales see WBC NISP resource 3a: Install temporary spawning habitat.
- Find local tide tables at www.linz.govt.nz/hydro

The National Inanga Spawning Education Programme is supported by...



AQUATIC SCIENCE & VISUAL COMMUNICATION

