



Report on Gaden Hatchery Fish Kill

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Overview:

During the months of January and February 2019, Gaden Trout Hatchery in Jindabyne experienced a fish kill which saw large scale mortalities of Rainbow Trout (*Onchorhynchus mykiss*), Brown Trout (*Salmo trutta*), Atlantic Salmon (*Salmo salar*) and Brook Trout (*Salvelinus fontinalis*). Moribund fingerlings ranged in size from 50mm to 100mm, and broodstock up to 8 kilograms.

15 – 20 000 Rainbow Trout fingerlings were lost, along with 40 adult Broodstock and ex-broodstock Rainbow Trout. 30 ex-broodstock Brown Trout plus 10 000 Brown trout fingerlings were also lost. These mortalities mainly occurred on the night of 25 January.

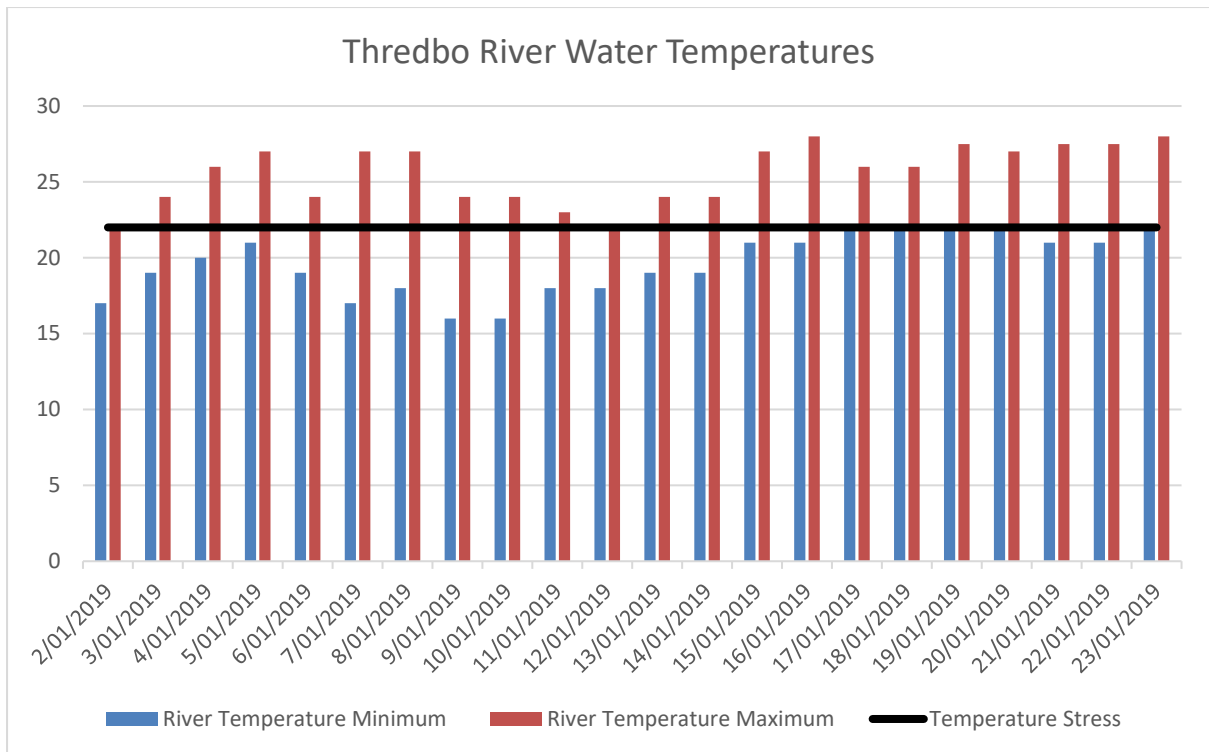
Brook Trout mortalities on the night of 23 January included 350 0+ future broodstock, 350 1+ broodstock and 30 2+ and 3+ broodstock fish.

Mortalities also occurred in Atlantic Salmon, losing 30 fish of varying age and size.

Broodstock mortalities occurred with fish being held in earthen ponds, while all fingerling mortalities occurred in raceways, circular tanks and earthen ponds.

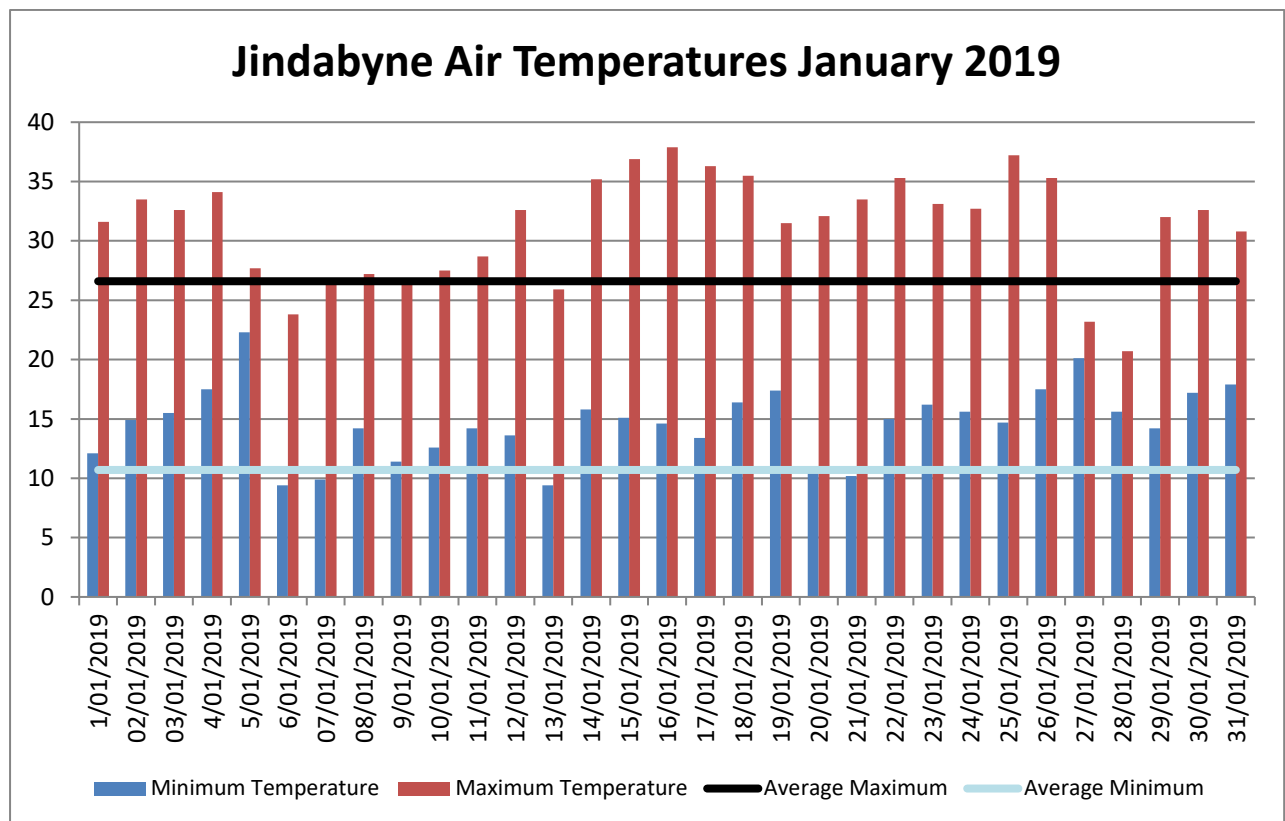
Specific conditions relevant to the mortality event included:

- The Thredbo River, which is the source water for the hatchery experienced very low flows throughout the time of the fish kill. River heights in January were between .247m and .363m, compared to January the previous year of .294m to .684m, which is considered an average year. There were no relieving flows during the time of the mortality event. This reduced head pressure in the water available to the hatchery and severely impacted the ability of staff to deliver fresh water to the ponds, raceways and tanks.
- River temperatures in the Thredbo River were exceptionally high in the months of January and February, as heat wave conditions hit the Eastern States of Australia. During the time frame of the mortalities, river temperatures ranged from a minimum of 16 degrees Celsius, to a maximum of 28 degrees Celsius, with maximum river temperatures reaching 22 degrees Celsius or greater for a period of 22 days straight. For 12 of those days the minimum water temperature did not fall below 19 degrees Celsius. Water temperatures 4-19 degrees Celsius are considered suitable for maintaining brown trout; 10-22 degrees Celsius for rainbow trout, with temperature stress beginning when the water temperature exceeds 22 degrees Celsius. See graph below



- The month of January saw the maximum air temperature in Jindabyne rise to 4.7 degrees Celsius above average. Twenty days in January recorded temperatures over the January average of 31.3 degrees, and nine days in the month exceeded 34 degrees Celsius.
- Average minimum temperatures were 4 degrees Celsius above the average of 10.7 degrees Celsius for the Month of January. Fifteen nights during January saw the temperature remain above 15 degrees Celsius. This is significant in the fact that the water temperatures across the hatchery did not have any time to cool overnight, as the air temperature remained high.

See Graph Below:



Actions taken to prevent/minimise mortality:

- All fish on site were put on a minimal feed program from the 15th of January due to rising water temperature and visible signs of stress in fish. Feeding was done in the morning when the water was at its coolest, and feeding ceased altogether once water temps reached 22 degrees Celsius.
- Staff added extra aeration to all ponds, raceways and circular tanks where available.
- Water flows were increased to all tanks, but this had minimal impact due to low head pressure and the already high water temperatures in the river.
- All cleaning of tanks and raceways was minimised or stopped completely to ensure that no further stress was placed on the fish.
- Efforts were made to shade affected ponds to try and decrease water temperature.
- Samples of fish were taken from affected tanks, ponds and raceways and necropsied to determine cause of death. No parasites or disease were present. Prolonged heat stress was determined as the cause of death. Frozen samples were kept.
- Water quality readings were taken on a regular basis in tanks, ponds and raceways. Dissolved Oxygen and P.H were found to remain within normal thresholds, and other than extremely high temperatures, no issues of concern were found in the water quality.
- Emergency stockings of 70 000 Rainbow Trout were carried out to Lake Eucumbene and Lake Jindabyne in order to prevent further mortalities in the hatchery. Although

water temperatures around the edges of both lakes were 22-23 degrees Celsius temperature in the lakes dropped rapidly with depth.

- Further emergency stocking took place on the 28th and 29th January to the Swampy Plains River and the Tumut River. No extra signs of stress were seen in these fish during the stocking event at these two locations.

Summary :

The month of January in Jindabyne saw the average maximum and minimum temperatures rise to 4 degrees above Average (Bureau of Meteorology). Extremely low flows in the Thredbo River, which is the only source of water for the hatchery, saw water temperatures rise to unprecedented levels, with no major rain events or flows to help lower water temperatures available to the hatchery.

The prolonged high water temperatures caused ongoing, severe stress to broodstock and fingerlings, resulting in a high number of mortalities across the hatchery site. All possible precautions and actions were put into place by staff to minimise and prevent mortalities.

Recommendations:

1. A recirculation system should be fitted to circular tanks with a chiller unit on it to keep temperatures down during extended periods of heat and/or low river flow.
2. Earthen ponds should all have aerators installed.
3. Shallow earthen ponds need to be shaded in an attempt to keep water temperatures down.

Note: *A large recirculation system is in the process of being installed in the hatchery that includes a chiller unit that can chill water from 28 degrees Celsius down to 16 degrees Celsius. All ponds have been fitted with new venturi aerators (which had been ordered in early December 2018 but were not in stock) to assist with aeration of the water.*

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