

Angler use of the upper Oreti trout fishery during the 2018/19 and 2020/21 fishing season.



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Introduction

The upper Oreti River is located in the Southland region, upstream of Rocky Point near the township of Mossburn. The upper Oreti is a nationally significant trout fishing river (Southland Fish & Game Council, 2018) and has a Water Conservation Order. The fishery consists of eleven fishing beats, ranging in length from ~4km-7km (Figure 1). The beat system is voluntary and in general, rules of the beat system are adhered to by anglers. The beat system requires anglers to park their vehicles next to a beat sign to indicate to other anglers they intend to fish on that beat. This beat system was established in 2017 to help manage angling pressure as the fishery increased in popularity.

The upper Oreti is highly valued by anglers because it provides an opportunity to sight fish to large (trophy size) brown trout (Unwin 2013) amidst pleasant scenery. Southland Fish and Game drift dive surveys have shown that on average there are ~37 large (450-750 mm) brown trout per kilometre of river (Southland Fish and Game, unpublished data). The upper river is also highly valued because of accessibility (Unwin 2013). There are several river access points along the length of the upper river (Figure 1).

Due to the quality of the fishing on the upper Oreti, this section of river has become well known internationally. This notoriety has resulted in high levels of angler use by non-resident anglers (Sutherland, 2001; Unwin, 2016) and reports of overcrowding and displacement from local anglers (Hayes and Lovelock 2019). Increasing numbers of resident angler complaints led the Southland Fish & Game Council to conduct a large scale investigation into angler use of the upper Oreti trout fishery, angler origins, perceptions and displacement between 2018 and 2021.

This report documents the results from two separate but related studies that were conducted during the 2018/19 fishing season and 2020/21 season. In 2018/19, trail cameras were used to monitor angler use of the fishing beats. To complement this, a series of on-the-ground licence checks were conducted to assess angler origins. This provided baseline angler use and angler origin data when both residents and non-residents were using the fishery. During the 2020/21 season, the absence of non-resident anglers (due to the global Covid-19 pandemic) provided a unique opportunity to assess resident angler demand for the upper Oreti fishery. Angler use of the fishery

was again monitored using trail cameras. The specific aims addressed during these two fishing seasons were:

- (1) Assess angler use of the upper Oreti River during the 2018/19 and 2020/21 seasons.
- (2) Assess the origin (non-resident/resident) of anglers who fish on the upper Oreti in 2019 and generate a non-resident to resident use ratio.
- (3) Determine whether resident angler use of the upper Oreti trout fishery increases in the absence of non-resident anglers.
- (4) Draw conclusions around the likelihood of resident angler displacement on the upper Oreti River.

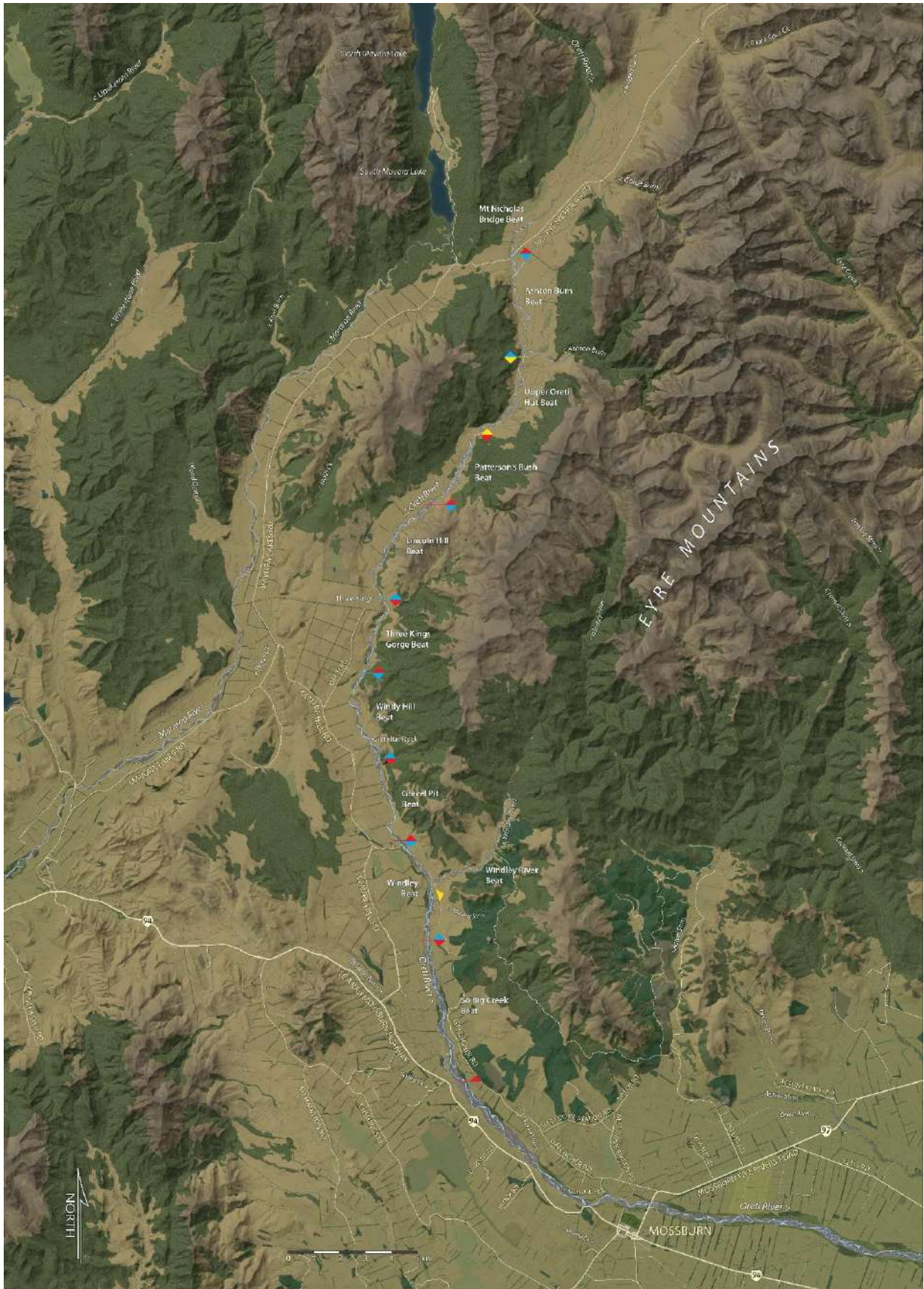


Figure 1: Upper Oreti River fishing beats.

Methods

Assessing Angler Use

As previously mentioned, the upper Oreti fishery is split into eleven voluntary fishing beats and anglers park their vehicle next to the beat sign to indicate to other anglers they are fishing that beat (Figure 2). This system makes it easy to determine whether an angler is fishing on a particular beat because a vehicle will be parked next to the sign if an angler is fishing.

To accurately and conveniently assess whether a beat was being fished, a trail camera was set up overlooking the beat carparks (Figure 3). The trail camera was set on timelapse and took a photo every minute during the 2018/19 season and every 10 minutes during the 2020/21 season¹. The cameras were set up throughout the season and camera batteries and SD cards were changed as required.

When processing the trail camera photos, a beat was deemed occupied on a given day if an angler parked next to the beat sign (regardless of how long they fished for). The time in which they arrived and left the beat was also recorded. This provided the metric Beat Occupancy as a measure of angler use. Beat occupancy rates by month and fishing season were then collated for comparison.



Figure 2: An example of a fishing beat sign.

¹ Taking a photo every minute in 2018/19 was deemed excessive so photo period frequency was decreased to 10 minutes in the 2020/21 season.



Figure 3: An example trail camera photo of the Windley, Windley River and Gravel Pit Beat showing anglers parked at beat carparks.

Assessing Angler Origins

To assess the origin of anglers fishing on the upper Oreti between January 2019 and April 2019, instructional signage was erected at the beat signs (Figure 4). This signage instructed anglers to leave their fishing licence on their dashboard. During this period, Fish & Game officers would drive to each beat sign and note down the licence details of the anglers fishing at each beat. For each beat, at least one licence check was made on a weekday and one licence check on a weekend day between 10am and 3pm. At the end of the season the data was collated and a ratio of non-resident-to-resident use of the upper Oreti was determined.



Figure 4: Instructional signage used to help monitor the origin of anglers on the upper Oreti.

Estimating non-resident use of the upper Oreti

To estimate the degree to which beats were occupied by non-resident anglers, the non-resident to resident ratio (determined during the angler origin assessment) was extrapolated across the occupancy rate for the January 2019 – April 2019 period. For example, if beats were occupied on 300 occasions and the non-resident to resident ratio from on-the-ground angler checks was 2:1, then it would be assumed that of the 300 occupied beats, 200 were occupied by non-resident anglers and 100 were occupied by resident anglers.

Results and discussion

Beat Occupancy rates

Beat occupancy rates varied by beat, month and season (Table 1-7). In general, beat occupancy rates were highest during summer months and the most popular beats were the upper most beats, particularly those with easy access (Mt Nicolas, Oreti Hut, Ashton and Lincoln Hill).

During the summer of the 2018/19 season (when non-resident anglers were present), some beats had very high occupancy rates, some >60%, (Table 2-5), whilst other beats received less pressure. Throughout the study, the trail cameras frequently photographed vehicles driving to an occupied beat carpark and then driving away, presumably because the angler saw the beat they wanted to fish was occupied.

During the 2020/21 season (when only resident anglers were present), beat occupancy rates were typically lower than in the 2018/19 season, but were still high (>50% occupancy rate) for certain beats at certain times (Table 3, 5, 6). For some beats during certain months, there was comparable (and even greater) demand during the 2020/21 season compared to the 2018/19 season (Table 1-7). This was particularly evident during the month of April (Table 7).

These results suggest that resident demand for the upper Oreti fishery is high. When only residents were present, the demand for the fishery remained high. This suggests that during the 2020/21 season, resident anglers took advantage of the opportunity to fish the upper Oreti more than previous seasons because they knew there would not be competition for angling space from non-resident anglers.

Angler Origins

Overall, Fish & Game staff made 367 individual visits to beat signs during the 2018/19 season. On 162 (44%) occasions the beat was not occupied and on 205 (56%) occasions the beat was in use (Figure 5). Of the 205 uses, on 140 (33%) occasions the beat was being fished by a non-resident, on 37 (10%) occasions the beat was being fished by a resident, and on 28 (8%) occasions the angler did not leave their licence on their dashboard, so it was not possible to determine angler origins (Figure 5).

In total, 177 physical licence checks were made and of those, 140 (79%) were non-resident and 27 (21%) were resident (including resident fishing guides). This equates to a non-resident to resident ratio of approximately 4:1. This ratio is higher than was previously determined on the upper Oreti. In 2001, an angler survey was conducted and revealed that between January and April 2001, 69% of angler use was from non-residents (Sutherland, 2001). It is therefore likely that either non-resident use has increased over time and/or, residents have been displaced because of their perceptions around crowding.

Estimating non-resident and resident use of the upper Oreti

The beat occupancy rates and angler origin ratio can be used to estimate the number of days the upper Oreti River was occupied by non-residents and residents between January and April 2019. This can then be compared to resident beat occupancy rates between January and April 2021 when the international border was closed. Table 8 compares the predicted (2019) and observed (2021) non-resident and resident use of the upper Oreti fishery.

Given the approximately 4:1 non-resident to resident ratio on the upper Oreti in January-April 2019, it is estimated that the overall beat occupancy rate of non-residents was 27.1% and 7.2% for residents (Table 8). In 2021, all use of the upper Oreti was assumed to be resident use (because of the absence of international travel) and the overall beat occupancy rate was 28.0% (Table 8).

Comparison of the overall beat occupancy rates suggests that resident use of the upper Oreti increased by 389% in 2021 (relative to 2019) (Table 8). This result is further evidence of resident angler displacement (Hayes and Lovelock 2019) on the upper Oreti when non-resident anglers are present. When given the opportunity to fish the upper Oreti in the absence of non-resident anglers, resident anglers have taken the opportunity and fished the river significantly more than they did in 2019.

Table 1: A comparison of Oreti beat occupancy rates by season for the month of October.

| Beat | Number of days monitored October 2018 | Occupancy rate October 2018 | Number of days monitored October 2020 | Occupancy rate October 2020 |
|-------------------------|---------------------------------------|-----------------------------|---------------------------------------|-----------------------------|
| Mt Nicholas | * | | 21* | 29% |
| Ashton Burn | * | | 23 | 39% |
| Oreti Hut | * | | 23 | 43% |
| Patterson's Bush | 16* | 25% | * | |
| Linclon Hill | 16* | 50% | * | |
| Three Kings | 16* | 31% | 23 | 22% |
| Windy Hill | † | | 23 | 9% |
| Gravel Pit | 18* | 33% | 23 | 17% |
| Windley Beat | 18* | 11% | 23 | 30% |
| Windley River | 18*● | 22% | 23 | 22% |
| So Big | * | | 23 | 17% |

*Camera malfunction resulting in lost data

†No access to this beat because of lambing

●Occupancy rate for Windley River beat is likely to be understated because anglers can access the river via a forestry road (anglers may not park at the beat sign)

Table 2: A comparison of Oreti beat occupancy rates by season for the month of November.

| Beat | Number of days monitored November 2018 | Occupancy rate November 2018 | Number of days monitored November 2020 | Occupancy rate November 2020 |
|------------------|--|------------------------------|--|------------------------------|
| Mt Nicholas | 18* | 67% | 12* | 42% |
| Ashton Burn | 22* | 72% | 30 | 33% |
| Oreti Hut | 22* | 27% | 30 | 40% |
| Patterson's Bush | 21* | 38% | 11* | 0% |
| Lincoln Hill | 21* | 43% | 11* | 36% |
| Three Kings | 21* | 14% | 20* | 30% |
| Windy Hill | † | | 20* | 10% |
| Gravel Pit | 23* | 17% | 30 | 27% |
| Windley Beat | 23* | 4% | 30 | 13% |
| Windley River● | 23* | 4% | 30 | 3% |
| So Big | 13* | 23% | o | |

*Camera malfunction resulting in lost data

†No access to this beat because of lambing

●Occupancy rate for Windley River beat is likely to be understated because anglers can access the river via a forestry road (anglers may not park at the beat sign)

o Gravel extraction influenced access at So Big. We discontinued monitoring of So Big occupancy for remainder of the season.

Table 3: A comparison of Oreti beat occupancy rates by season for the month of December.

| Beat | Number of days monitored December 2018 | Occupancy rate December 2018 (%) | Number of days monitored December 2020 | Occupancy rate December 2020 (%) |
|------------------|--|----------------------------------|--|----------------------------------|
| Mt Nicholas | 31 | 77% | 31 | 29% |
| Ashton Burn | 31 | 81% | 31 | 42% |
| Oreti Hut | 31 | 81% | 31 | 32% |
| Patterson's Bush | 19* | 47% | 31 | 10% |
| Lincoln Hill | 19* | 79% | 31 | 45% |
| Three Kings | Not available† | | 31 | 52% |
| Windy Hill | Not available† | | 31 | 29% |
| Gravel Pit | 31 | 45% | 31 | 26% |
| Windley Beat | 31 | 42% | 31 | 29% |
| Windley River● | 31 | 6% | 31 | 3% |
| So Big | 29 | 28% | | |

*Camera malfunction resulted in loss of data

† Access to these beats affected by crop in paddock and angler uncertainty about driving through paddocks. Anglers were not driving through the paddocks and instead were parking at roadside and walking.

●Occupancy rate for Windley River beat is likely to be understated because anglers can access the river via a forestry road (anglers may not park at the beat sign)

Table 4: A comparison of Oreti beat occupancy rates by season for the month of January.

| Beat | Number of days monitored January 2019 | Occupancy rate January 2019 (%) | Number of days monitored January 2021 | Occupancy rate January 2021 (%) |
|------------------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
| Mt Nicholas | 15* | 53% | 23* | 22% |
| Ashton Burn | 31 | 45% | 29* | 24% |
| Oreti Hut | 31 | 39% | 29* | 28% |
| Patterson's Bush | 21* | 33% | 31 | 26% |
| Lincoln Hill | 21* | 48% | 31 | 48% |
| Three Kings | Not available† | | 31 | 32% |
| Windy Hill | Not available† | | 31 | 29% |
| Gravel Pit | 26* | 31% | 27* | 41% |
| Windley Beat | 26* | 12% | 27* | 26% |
| Windley River● | 26* | 19% | 27* | 30% |
| So Big | 31 | 35% | | |

*Camera malfunction or drained batteries resulted in loss of data.

† Access to these beats affected by crop in paddock and angler uncertainty about driving through paddocks. Anglers were not driving through the paddocks and instead were parking at roadside and walking.

●Occupancy rate for Windley River beat is likely to be understated because anglers can access the river via a forestry road (anglers may not park at the beat sign)

Table 5: A comparison of Oreti beat occupancy rates by season for the month of February.

| Beat | Number of days monitored February 2019 | Occupancy rate February 2019 (%) | Number of days monitored February 2021 | Occupancy rate February 2021 (%) |
|------------------|---|---|---|---|
| Mt Nicholas | 28 | 57% | 28 | 36% |
| Ashton Burn | 28 | 79% | 28 | 57% |
| Oreti Hut | 28 | 61% | 28 | 46% |
| Patterson's Bush | 15* | 47% | 28 | 36% |
| Lincoln Hill | 15* | 73% | 28 | 69% |
| Three Kings | 28 | 64% | 28 | 26% |
| Windy Hill | 28 | 29% | 28 | 25% |
| Gravel Pit | 16* | 50% | 28 | 25% |
| Windley Beat | 16* | 44% | 28 | 18% |
| Windley River● | 16* | 25% | 28 | 4% |
| So Big | 28 | 39% | | |

*Camera malfunction or drained batteries resulted in loss of data.

●Occupancy rate for Windley River beat is likely to be understated because anglers can access the river via a forestry road (anglers may not park at the beat sign)

Table 6: A comparison of Oreti beat occupancy rates by season for the month of March.

| Beat | Number of days monitored March 2019 | Occupancy rate March 2019 (%) | Number of days monitored March 2021 | Occupancy rate March 2021 (%) |
|------------------|--|--------------------------------------|--|--------------------------------------|
| Mt Nicholas | 31 | 23% | 31 | 19% |
| Ashton Burn | 31 | 48% | 31 | 48% |
| Oreti Hut | 31 | 29% | 31 | 39% |
| Patterson's Bush | 31 | 42% | 31 | 16% |
| Lincoln Hill | 31 | 55% | 31 | 52% |
| Three Kings | 31 | 35% | 31 | 29% |
| Windy Hill | 31 | 13% | 31 | 23% |
| Gravel Pit | 31 | 35% | 31 | 19% |
| Windley Beat | 31 | 26% | 31 | 26% |
| Windley River● | 31 | 6% | 31 | 0% |
| So Big | 31 | 26% | 31 | |

●Occupancy rate for Windley River beat is likely to be understated because anglers can access the river via a forestry road (anglers may not park at the beat sign)

Table 7: A comparison of Oreti beat occupancy rates by season for the month of April.

| Beat | Number of days monitored April 2019 | Occupancy rate April 2019 (%) | Number of days monitored April 2021 | Occupancy rate April 2021 (%) |
|------------------|--|--------------------------------------|--|--------------------------------------|
| Mt Nicholas | 25* | 20% | 30 | 10% |
| Ashton Burn | 27* | 30% | 30 | 40% |
| Oreti Hut | 27* | 7% | 30 | 27% |
| Patterson's Bush | 28* | 14% | 30 | 23% |
| Lincoln Hill | 28* | 29% | 30 | 57% |
| Three Kings | 29* | 28% | 30 | 33% |
| Windy Hill | 29* | 3% | 30 | 10% |
| Gravel Pit | 14* | 43% | 30 | 17% |
| Windley Beat | 14* | 7% | 30 | 17% |
| Windley River● | 14* | 21% | 30 | 3% |
| So Big | 27* | 22% | | |

*Drained batteries resulted in loss of data.

●Occupancy rate for Windley River beat is likely to be understated because anglers can access the river via a forestry road (anglers may not park at the beat sign)

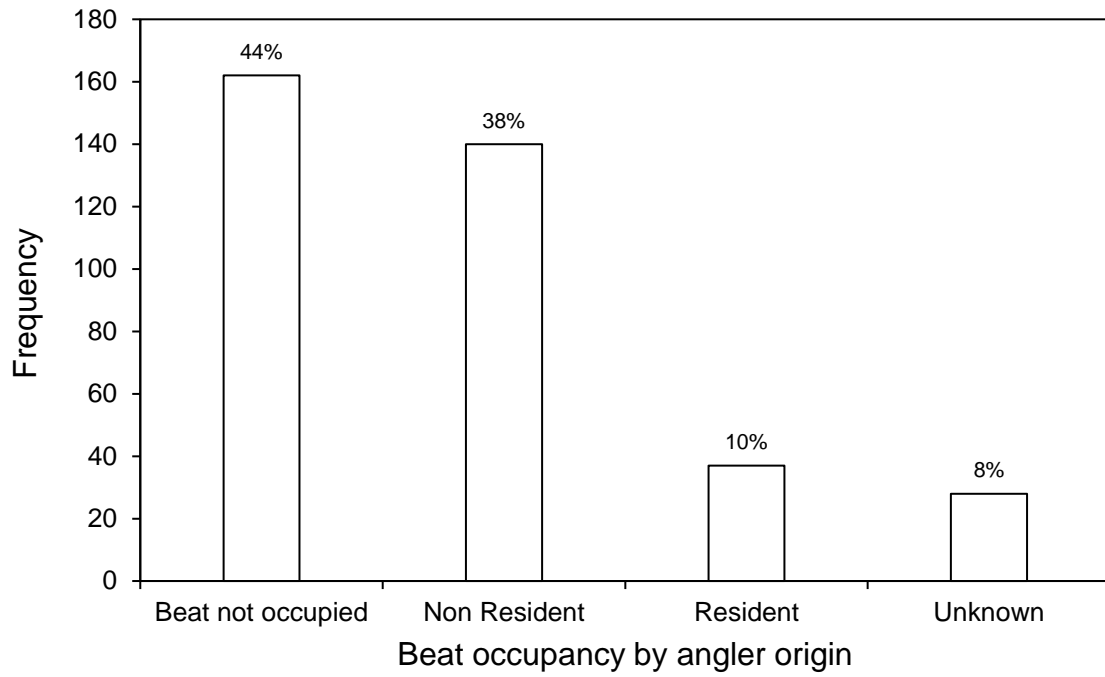


Figure 5: Upper Oreti River beat occupancy rates by resident and non-resident anglers between January and April 2019.

Table 8: A comparison of the predicted/observed resident and non-resident use of the upper Oreti fishery during the 2018/19 and 2020/21 fishing seasons.

| | Jan-Apr 2019 data | Jan-Apr 2019 data | Jan-Apr 2021 data | Jan-Apr 2021 data |
|--------------------------------------|---------------------|--------------------|---------------------|---------------------|
| | Beat days monitored | Beat days occupied | Beat days monitored | Beat days occupied |
| Data points collected | 1074 | 369 | 1068 | 299 |
| Predicted NR | | 291 | | |
| Predicted/observed resident use | | 77 | | 299 |
| | | | | |
| | | Jan-Apr 2019 data | | Jan-April 2021 data |
| Beat occupancy rate NR | | 27.1% | | 0 |
| Beat occupancy rate resident (%) | | 7.2% | | 28.0% |
| Percent increase in resident use (%) | | | | 389% |

Assumption: The number of 'fishable days' (due to weather and river level variables) is comparable between time periods.

Limitation: Some data was lost during both monitoring periods due to cameras malfunctioning, batteries running out and disruptions to access because of stock or gravel extraction works.

Yellow: Predicted number of non-resident angler visits between Jan-April 2019 based on the NR:Resident angler ratio (79:21).

Green: Predicted number of resident angler visits between Jan-April 2019 based on the NR:Resident angler ratio (79:21).

Red: Observed resident angler visits between January and April 2021.

Blue: Approximate % increase in resident angler use of the upper Oreti.

Conclusions and future work

This study has demonstrated there is significant non-resident and resident demand for the upper Oreti trout fishery, particularly the upper most beats during the summer period. When non-resident anglers are present, they outnumber resident anglers ~ 4:1. There is evidence of resident angler displacement on the upper Oreti. During the Covid-19 boarder restrictions, when non-resident anglers were absent, resident anglers fished the upper Oreti more frequently relative to when non-resident anglers were present (presumably because they knew there would be reduced competition for fishing space). Future research needs to carefully assess resident angler satisfaction and crowding perceptions in the absence of non-resident anglers.

References

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