BEFORE THE CANTERBURY REGIONAL COUNCIL

***IN THE MATTER OF*:** the Resource Management Act 1991

AND

***IN THE MATTER OF*:** a submission on the partially operative Canterbury Land and Water Regional Plan – Plan Change 5 (Nutrient Management and Waitaki Sub-region)

EVIDENCE OF DR NICHOLAS REX DUNN
FOR DIRECTOR-GENERAL OF CONSERVATION

Dated 22 July 2016

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STATEMENT OF EVIDENCE OF NICHOLAS REX DUNN

INTRODUCTION

1. My full name is Dr Nicholas Rex Dunn.

2. I am appearing on behalf of the Director-General of Conservation. I am employed by the Department of Conservation (DOC) as a Freshwater Science Advisor in the Freshwater Section of the Science & Policy Group. I have held this role since September 2012. I was employed by the Department as a Technical Support Officer Freshwater in the Canterbury Conservancy between December 2010 and September 2012.

3. I hold a Bachelor of Science (Earth Sciences) degree from the University of Waikato where I majored in hydrology and soil science, and a Master of Science (Environmental Science) (First Class Honours) degree from the University of Canterbury, majoring in freshwater ecology and hydrology. I also hold a Doctor of Philosophy research degree from the University of Otago, in which I investigated aspects of the influences of flow regimes on the ecology of non-migratory galaxias fishes.

4. I am familiar with Canterbury mudfish, lowland longjaw galaxias, upland longjaw galaxias, and bignose galaxias. Dr Leanne O'Brien (whose thesis focused on the conservation ecology of Canterbury mudfish (*Neochanna burrowsius*)) and I have co-authored a number of publications and reports detailing Canterbury mudfish, their habitats, and conservation management. Dr O'Brien and I have also conducted research on lowland longjaw galaxias in the Kauru River, and held this species in captivity.

5. I have undertaken field surveys or visited waterbodies within the Canterbury area containing the above species periodically since 2001.

6. I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

7. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

8. My evidence provides a threatened native fish perspective on the matters raised in the Director-General's submission on Plan Change 5 (Nutrient Management and Waitaki Sub-region) of the Canterbury Land and Regional Water Plan.

9. Specifically, my evidence addresses the Director-General's submission regarding the protection of habitats of freshwater fish (namely Canterbury mudfish, lowland longjaw galaxias, upland longjaw galaxias, and bignose galaxias) in the Waitaki sub-region.

THREATENED FRESHWATER FISH SPECIES

10. A number of threatened freshwater fish species are endemic to the Canterbury region, meaning they only occur in Canterbury, or have distributions largely confined to Canterbury.

11. Furthermore, the Waitaki River catchment is a centre of endemism and diversity of the "pencil *Galaxias*" species group containing lowland longjaw galaxias, upland longjaw galaxias, bignose galaxias, and alpine galaxias (McDowall 2010).

12. Subpopulations of upland- and lowland longjaw galaxias in the Waitaki River catchment are considered to be genetically distinct from subpopulations of these species in other catchments (Waters & Craw 2008); as such they are recognised as indeterminate taxa in the New Zealand Threat Classification System (Townsend et al. 2008) conservation status assessments of Allibone et al. (2010) and Goodman et al. (2014), and will retain this status until further work establishes whether they should be regarded as separate species.

CREATION OF SPECIES DISTRIBUTION DATA

13. I have prepared illustrations showing the known extents of freshwater fish habitats in the upper Waitaki sub-region.

14. For lowland longjaw galaxias "Waitaki", upland longjaw galaxias "Waitaki", and bignose galaxias, data regarding their habitat locations were obtained from:
    a. the New Zealand Freshwater Fish Database (NZFFD; administered by NIWA);
    b. adult fish distribution prediction models developed by Leathwick et al. (2008) and Crow et al. (2014); and
    c. DOC staff who have knowledge of these habitats.

15. The prediction models referred to in paragraph 14 (b) above are based on the river network originally developed as the River Environment Classification (Snelder et al. 2004). The prediction models correlate the occurrence of individual fish species to biologically-relevant environmental descriptors of the river and stream environments (but not lakes or wetlands), at sampled sites (Leathwick et al. 2008; Crow et al. 2014). These models were then used to develop predictions of the probability of occurrence for each species, for all river and stream segments in the River Environment Classification (Leathwick et al. 2008; Crow et al. 2014).

16. In my work, distributions of each species were generated using reaches with predicted occurrences of ≥0.2 for the Leathwick et al. (2008) predictions and the relevant Cohen's Kappa value for the Crow et al. (2014) predictions, in the vicinity of NZFFD records and which were considered likely habitat for each species.

17. For Canterbury mudfish, another approach was required. The predicted distribution of this species was not mapped by Leathwick et al. (2008) or Crow et al. (2014), principally because it occurs in wetland and stream habitat not included in River Environment Classification (REC) reaches.

18. To develop distributions of sub-populations of Canterbury mudfish, areas in the vicinity of NZFFD records which were considered by Dr Leanne O'Brien (Ichthyo-niche) to be likely habitat were delineated digitally on LINZ (Land Information New Zealand) and Canterbury Regional Council georeferenced orthographs.

Canterbury mudfish (*Neochanna burrowsius*)

19. Canterbury mudfish is an indigenous freshwater fish species found in sixteen river catchments from the south bank of the Ashley River to the south bank of the Waitaki River (NZFFD; O'Brien & Dunn 2007a). The locations in which it is found are illustrated in Figure 1 below as red lines.

20. Under the New Zealand Threat Classification System (Townsend et al. 2008), Canterbury mudfish has the conservation status of Threatened – Nationally Critical, which is based on the criteria that irrespective of size or number of subpopulations it has a very high (>70%) ongoing or predicted decline (Goodman et. al. 2014).

21. Furthermore, the three qualifiers of Conservation Dependant, Range Restricted, and Sparse apply for the threat classification for Canterbury mudfish. Conservation Dependant means 'the taxon is likely to move to a higher threat category if current management ceases' (Townsend et al. 2008, p 28). The next highest classification is Extinct. Range Restricted means 'taxa confined to specific substrates, habitats or geographic areas of less than 1000 $km^{2,}$ (Townsend et al. 2008, p 29). Sparse means 'taxa that occur within typically small and widely scattered populations' (Townsend et al. 2008, p 30).

22. I have estimated the total habitat area of Canterbury mudfish as 32 ha across 89 known sub-population habitat fragments (Dunn unpublished update of O'Brien & Dunn (2012)). Within the Waitaki sub-region there are ten sub-population habitat fragments totalling 2.1 ha within the Northern Fan and Valley and Tributaries Freshwater Management Units.

23. In addition to the sub-populations described above, twenty-nine sub-populations which have previously been recorded across Canterbury have gone extinct, two of which are within the Waitaki sub-region.

24. Canterbury mudfish are wetland specialists (O'Brien & Dunn (2007b)). Their habitats are still or very slow-flowing, meandering, swampy streams with deep pools; seepage streams; spring fed streams; scour holes; and stockwater races. The diverse range of habitats in which Canterbury mudfish are now found may be, in part, a consequence of the removal of the once extensive wetlands that covered the Canterbury Plains which has forced mudfish to occupy whatever habitat remains that they can tolerate (O'Brien & Dunn 2007b).

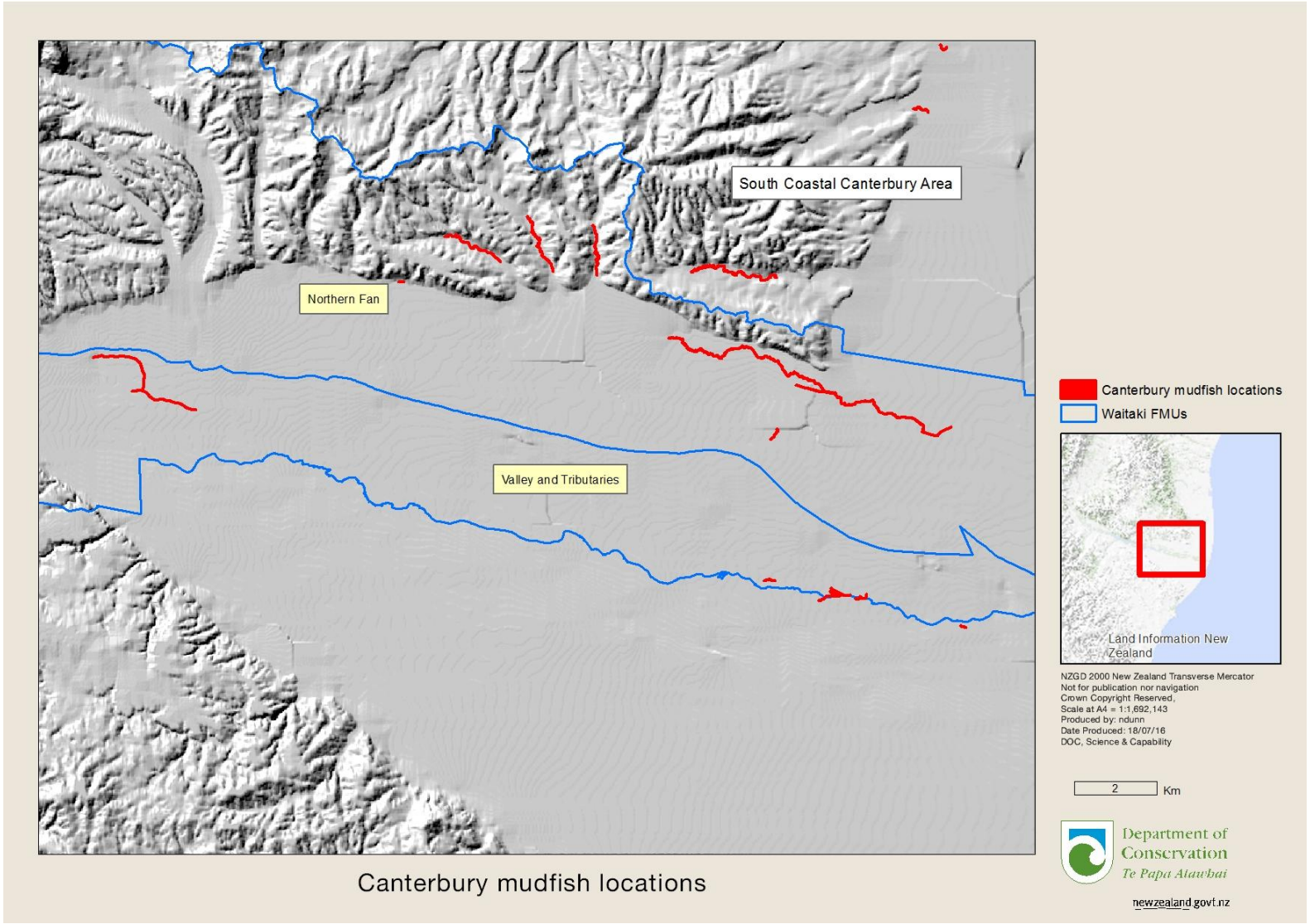

Figure 1. Distribution of Canterbury mudfish in the Waitaki sub-region.

Lowland longjaw galaxias (Waitaki River) (*Galaxias* affinis *cobitinis* "Waitaki")

25. Lowland longjaw galaxias "Waitaki" is an indigenous freshwater fish found only in the Waitaki River catchment (NZFFD). Its distribution is illustrated as red lines in Figure 2 below.

26. Under the New Zealand Threat Classification System (Townsend et al. 2008), lowland longjaw galaxias "Waitaki" has the conservation status of Threatened – Nationally Critical. This conservation status is based on the criterion that, irrespective of size or number of subpopulations, it has a very high (>70%) ongoing or predicted decline (Goodman et. al. 2014).

27. Furthermore, the qualifiers of Conservation Dependant and Range Restricted apply for the conservation status for lowland longjaw galaxias "Waitaki". Conservation Dependant means 'the taxon is likely to move to a higher threat category if current management ceases' (Townsend et al. 2008, p 28). The next highest category is Extinct. Range Restricted means 'taxa confined to specific substrates, habitats or geographic areas of less than 1000 km^2 (Townsend et al. 2008, p 29).

28. I have estimated the total habitat area of lowland longjaw galaxias "Waitaki" as 36 ha across 12 known sub-population habitat fragments (Dunn unpublished data).

29. The habitats of lowland longjaw galaxias "Waitaki" as stated by Ravenscroft et al. (2010) "are generally spring-type habitat, with greater densities in riffle habitats mostly towards the head of springs where the water exits from the ground. Lowland longjaw galaxias have specialised habitat requirements; the substrate often has an absence or limited algae biomass, limited sediment and the substrate particles are loosely compacted. These components create wider interstitial spaces and it is within this zone that the lowland longjaw galaxias seeks refuge, feeds, and spawns".

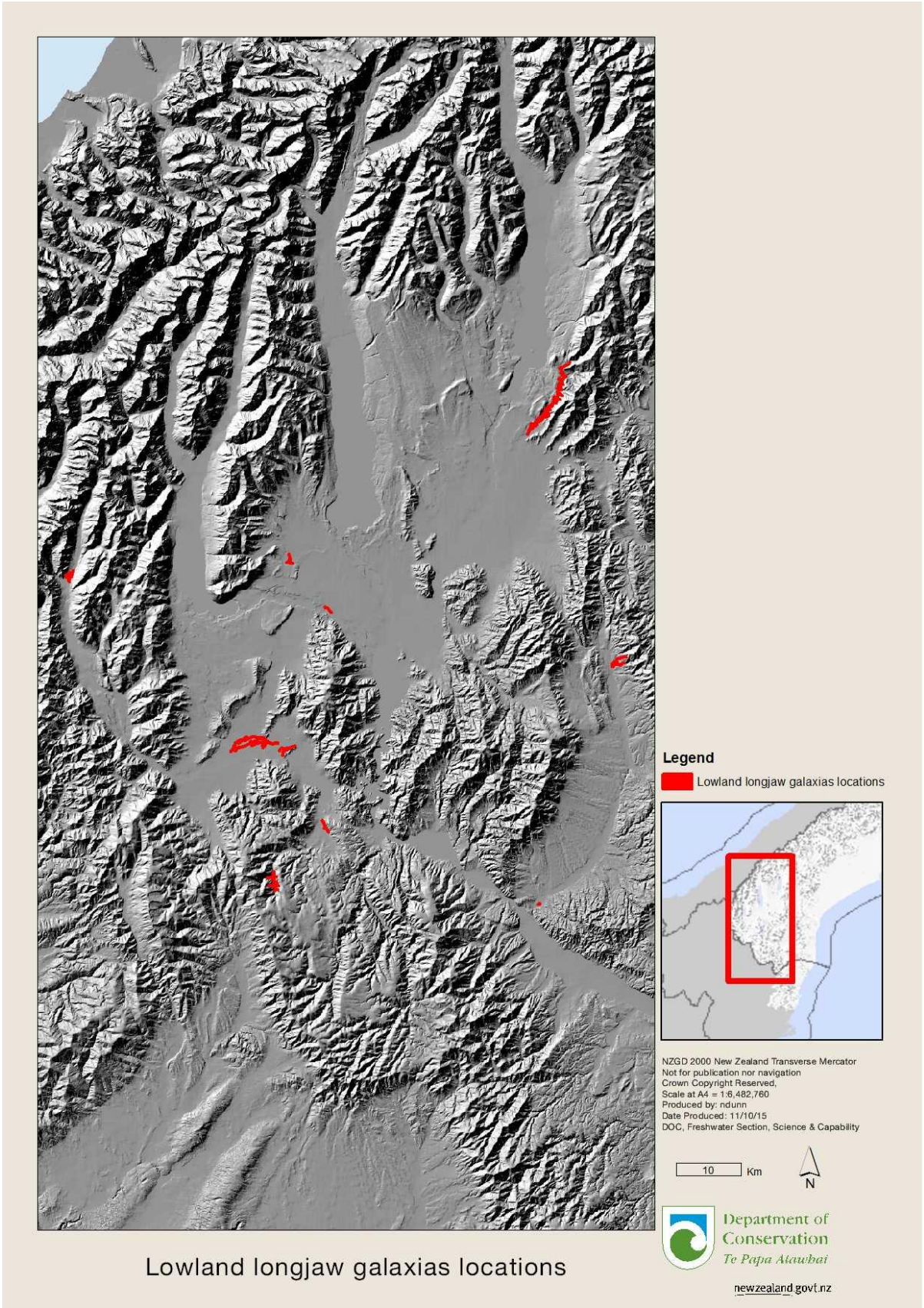

Figure 2. Distribution of lowland longjaw galaxias “Waitaki”.

Upland longjaw galaxias (Waitaki River) (*Galaxias* affinis *prognathus* "Waitaki")

30. Upland longjaw galaxias "Waitaki" is an indigenous freshwater fish found only in the Waitaki River catchment. The locations in which it is found are illustrated in Figure 3 (NZFFD).

31. Under the New Zealand Threat Classification System (Townsend et al. 2008), upland longjaw galaxias "Waitaki" has the conservation status of Threatened – Nationally Vulnerable, which is based on the criteria that it has a moderately sized population with a population trend that is declining (Goodman et. al. 2014).

32. Furthermore, the qualifiers of Data Poor, Range Restricted, and Sparse apply for the conservation status of upland longjaw galaxias "Waitaki". Data Poor means 'confidence in the listing is low due to there being only poor data available for assessment' (Townsend et al. 2008, p 28). Range Restricted means 'taxa confined to specific substrates, habitats or geographic areas of less than 1000 km^{2}' (Townsend et al. 2008, p 29). Sparse means 'taxa that occur within typically small and widely scattered populations' (Townsend et al. 2008, p 30).

33. I have estimated the total potential habitat area of upland longjaw galaxias "Waitaki" as 590 ha across 7 rivers within the Waitaki River catchment (Dunn unpublished data).

34. The habitats of upland longjaw galaxias "Waitaki" summarised by McDowall (1990, 2000) are margin areas of runs and riffles within swiftly flowing, boulder-gravel alpine stream and smaller gravel bed river braids with shallow depths and low velocities. While Stokell (1949, p 481) described "a favourite habitat is where a side-stream rejoins the main-stream at such a gradient that the water percolates through the boulders leaving their upper surfaces dry".

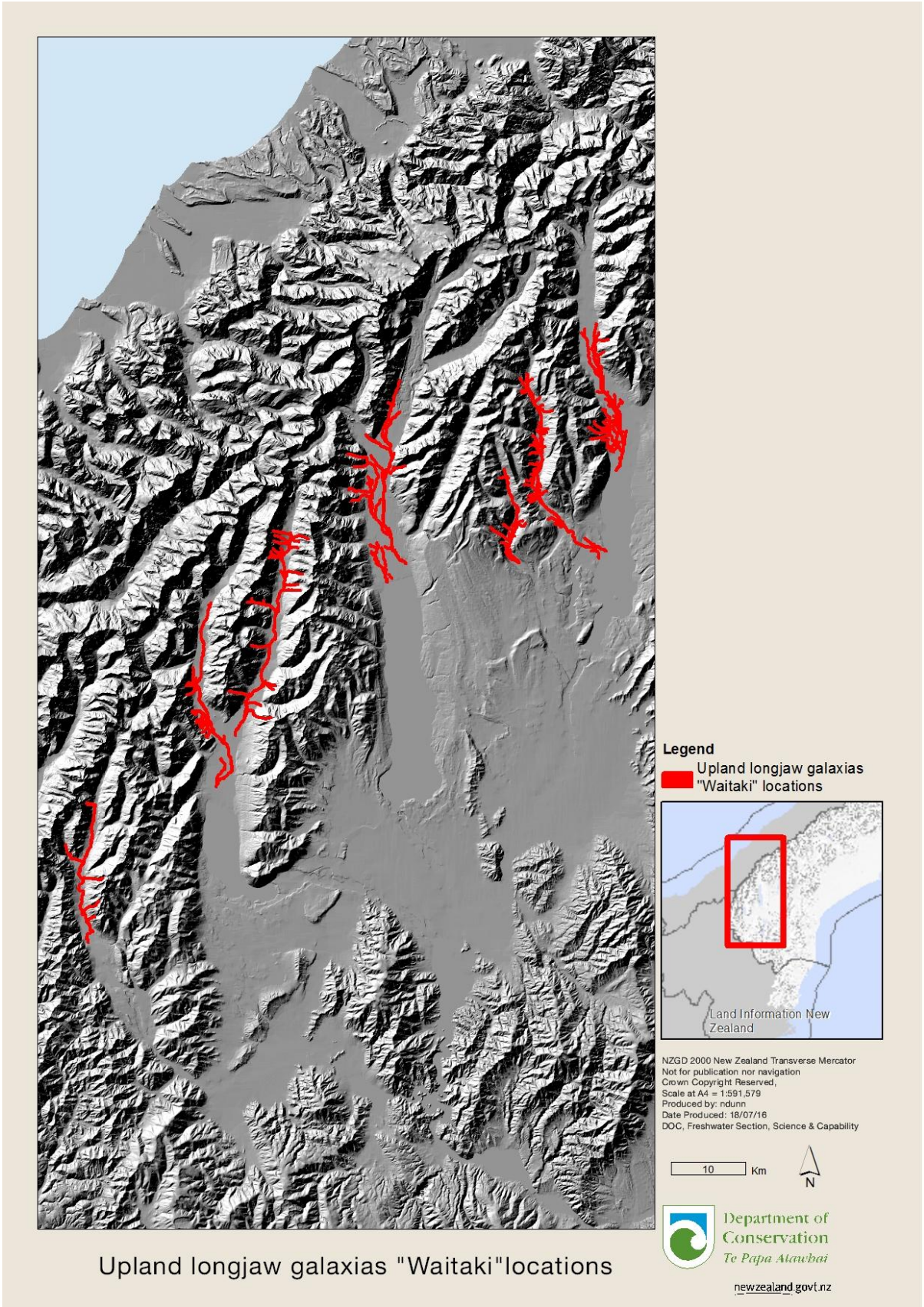

Figure 3. Distribution of upland longjaw galaxias “Waitaki”.

Bignose galaxias (*Galaxias macronasus*)

35. Bignose galaxias is an indigenous freshwater fish species found only in the Waitaki River catchment at the locations illustrated in red in Figure 4 (NZFFD).

36. Under the New Zealand Threat Classification System (Townsend et al. 2008), bignose galaxias has the conservation status of Threatened – Nationally Vulnerable, which is based on the criteria that it has a moderately sized population with a population trend that is declining (Goodman et. al. 2014).

37. Furthermore, the qualifier of Range Restricted applies for the conservation status for bignose galaxias. Range Restricted means 'taxa confined to specific substrates, habitats or geographic areas of less than 1000 km^2 (Townsend et al. 2008, p 29).

38. I have estimated the total habitat area of bignose galaxias as 88 ha across 26 known sub-population habitat fragments (Dunn unpublished data).

39. The habitat of bignose galaxias is typically associated with spring systems with mud substrate (Bowie 2004, Elkington & Charteris 2005). Further, McDowall & Waters (2003) described the habitat, as "small gravely riffles in the small streams" which have or had "associations with small wetlands, tended to have sandy-gravel substrates, but where small riffles formed owing to higher gradient, substrates were gravel/cobble".

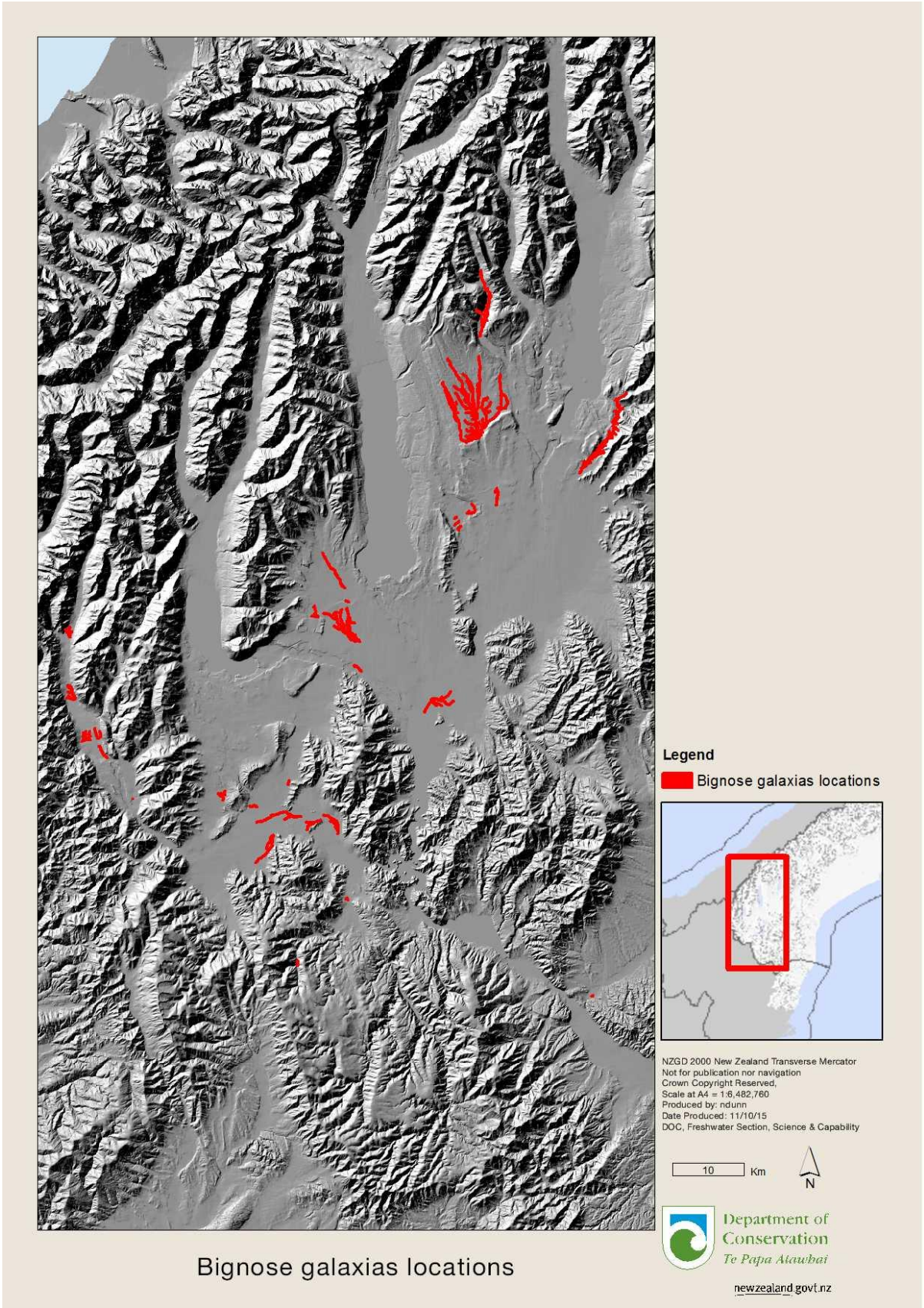

Figure 4. Distribution of bignose galaxias.

HABITAT PROTECTION

40. Knowledge of, and identification of the distribution of species and communities provides a basis for effective conservation (Leathwick et al. 2008). Effective conservation of species may be supported or enhanced by the identification of their habitats in public documents such as RMA plans. Habitat identification is a measure which enables greater awareness of areas of particular aquatic biodiversity value, and which may increase awareness of the way in which activities may adversely affect threatened freshwater fish and their habitat.

41. As discussed above, habitats of threatened non-migratory indigenous freshwater fish species in the Waitaki area include:

    a. still or very slow-flowing, meandering, swampy streams with deep pools; seepage streams; spring fed streams; scour holes; and stockwater races (Canterbury mudfish);

    b. spring-type habitat, with riffles towards the head of springs where the water exits from the ground, no or limited algae biomass, limited sediment, and loosely compacted substrate particles (lowland longjaw galaxias "Waitaki");

    c. margin areas of runs and riffles within swiftly flowing, boulder-gravel alpine stream and smaller gravel bed river braids with shallow depths and low velocities. Locations where a side-stream rejoins the main-stream at such a gradient that the water percolates through the boulders leaving their upper surfaces dry (upland longjaw galaxias "Waitaki"); and

    d. spring systems with mud substrate, small gravely riffles in the small streams associated with small wetlands, sandy-gravel substrates, or gravel/cobble substrates where small riffles form owing to higher gradient (bignose galaxias).

42. The types of habitats described above are typically small and vulnerable to disturbance such as being damaged by farmed stock. Springheads and wetlands, which these freshwater fish species favour as spawning and rearing habitats, are particularly vulnerable. Lowland habitats, intensively stocked areas in the McKenzie Basin and in sub-montane braided gravel bed rivers are also vulnerable to disturbance from stock.

43. Disturbance by stock can be avoided effectively by fencing off spring heads, wetlands, and streams.

44. In addition to physically excluding stock from water bodies, riparian margins, may, depending on their location and purpose, be useful in limiting sediment inputs into waterways, or in providing shading depending upon plant structure. However, shading which impedes the growth of macrophytes can be detrimental to those species such as Canterbury mudfish, and possibly some other species, which require aquatic macrophytes on which to lay their eggs.

45. Excessive macrophyte (weed) growth can be detrimental to fish species that utilise the substrate as refugia, or require areas of open water for pelagically swimming juveniles. However, some species require aquatic macrophytes on which to lay their eggs. Thus, drain or waterway clearance to remove macrophytes needs to be cognisant of species' presence and should be avoided, particularly during spawning and rearing of young.

46. Wetland drainage and channel straightening to increase drainage and flow directly destroys that habitat of the species discussed above.

47. Introduced salmonid species (trouts, salmons, and chars) are known to predate on and extirpate subpopulations of the native freshwater fish species discussed above. In some instances construction of barriers to impede upstream movement of salmonids with an upstream salmonid eradication programme could be beneficial to native freshwater fish species.

CONCLUSION

48. Canterbury mudfish, lowland longjaw galaxias "Waitaki", upland longjaw galaxias "Waitaki", and bignose galaxias are threatened freshwater fish which occur in small, discrete habitats in the Waitaki sub-region.

49. Identification and protection of the habitats of these species is required to ensure their persistence.

Nicholas Rex Dunn

22 July 2016

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