

Species Summaries



Trout Cod

23 Analysis and Summary of Historical Information on Native Fish

During the course of this project a large amount of historical information was collected on the native fish of the Murray-Darling Basin. Most of this has been reviewed on a catchment by catchment basis in the previous sections. The primary aim of the project was to collect historical information and identify the original distribution and habitat preferences of Trout cod and, secondarily, the other large native fish species within the southern half of the Basin. This section provides an analysis and summary of all the information collected.

The summary is presented on an individual species basis and for each the information is discussed under the following headings:

1. **European Discovery:** A description of the earliest European encounters with each species;
2. **Aboriginal Names:** A collation of names reported for each species in the writings of early Europeans attributed to aboriginal people. The list is certain to be very limited in scope as until comparatively recently few publications documented aboriginal language;
3. **European Names:** Briefly outlined is a history of the changes and synonyms of the scientific names used for each species, followed by the common names in general use from the past up to the present. In an earlier section a lengthy review was presented, covering the history of the taxonomic argument over Trout cod that continued for nearly 150 years. While previously discussed, a brief summary of the key changes in the scientific name of the Trout cod along with the basic reasons for these changes, has been provided;
4. **Distribution and Habitat:** All of the collected information on distribution and habitat associations is evaluated to highlight general trends and provide an overall description for each species. To aid in the analysis, the rarity scores assigned to each habitat zone, as defined previously in the summaries for each catchment, were averaged on a state and basin wide basis (in the area investigated in this project). Records originating from the Australian Capital Territory were included in determining the scores for NSW. Where the author assigned an upper or lower value to a rarity score the value was increased or decreased by 0.5 to improve the accuracy of the analysis; e.g., a L3 = 2.5 while a U3 = 3.5. As the focus of the project was to resolve the debate over the original distribution and habitat associations of Trout cod, there is a discussion on the differing views on the species former distribution and a consideration of the strength of the historical data which leads to a conclusion on this issue. For the other species there is a brief discussion, comparing the historical records reported in Lintermans (2007) to those recorded in this project to reach an overall conclusion on the range and habitat associations of each species;
5. **Translocations:** Historical accounts of translocations, that took place prior to the commencement of the stocking of hatchery produced fish in the 1970s, are summarised which may aid those undertaking research into the genetics of fish populations and help explain the presence of species in some waters;
6. **Size:** For each species information is provided on the maximum recorded size or weight which is known to be of interest to anglers;
7. In the case of Trout cod historical accounts relating to general aspects of its biology are presented. For the other species miscellaneous accounts or information identified in the historical material which to date have not been widely known are presented;
8. **Community Value:** A brief summary of the historical value of each species to the community including their popularity as angling and table fish and importance in commercial fisheries;
9. **Current Status:** The current conservation status of each species is stated, along with a brief summary of the major changes to distribution and abundance based on the historical evidence collected and recent angler reports;
10. A map using the information collected during this project presents the likely former historical distribution and abundance in the southern Murray-Darling Basin of each species.

Table 23.1 **Definitions of Rarity Scores used in the Project**

Abundance	Rarity Score	Criteria
Absent	0	No credible account reporting the species former presence
Rare	1	A few individual fish could be expected to be taken by a resident angler each year
Common	3	Regularly taken by a resident angler in small numbers: a typical expected catch would be less than 5 fish per day. The species may have been patchily distributed preferring specific reaches or habitats
Abundant	5	Frequently taken by a resident angler in good numbers: a typical catch would exceed 5 fish per day. Generally found along the length of the main channel though may have exhibited some local variations in abundance.

MURRAY TROUT IN THE YARRA.

TO THE EDITOR OF THE ARGUS.

Sir,—The fish referred to in your par. of yesterday as having been caught at Dight's Falls is what is known on the Murray as a Murray trout. It is closely allied to the Murray cod, but does not grow so large, and its habits are different. The cod is a sluggish fish, feeding on the bottom of rivers, while the "trout" frequents the most rapid portions of the stream, and feeds near the surface.

I have frequently observed them rising at flies and other insects in a similar manner to the English trout—hence the name it has acquired. The particular fish under notice is the largest I have seen caught on a rod, and its weight is probably due to the fish being full of spawn. These fish were introduced to the Yarra about 10 years ago, and many of them have been caught at all points between Melbourne and Healesville. I myself caught one of the same species five years ago near Heidelberg, weighing 3½ lb.

The markings of the cod are stripes on a greenish ground, while the trout is speckled on a blackish ground; besides this, the formation of the jaws of the two fish are distinctly different.

Argus, 8 September 1898

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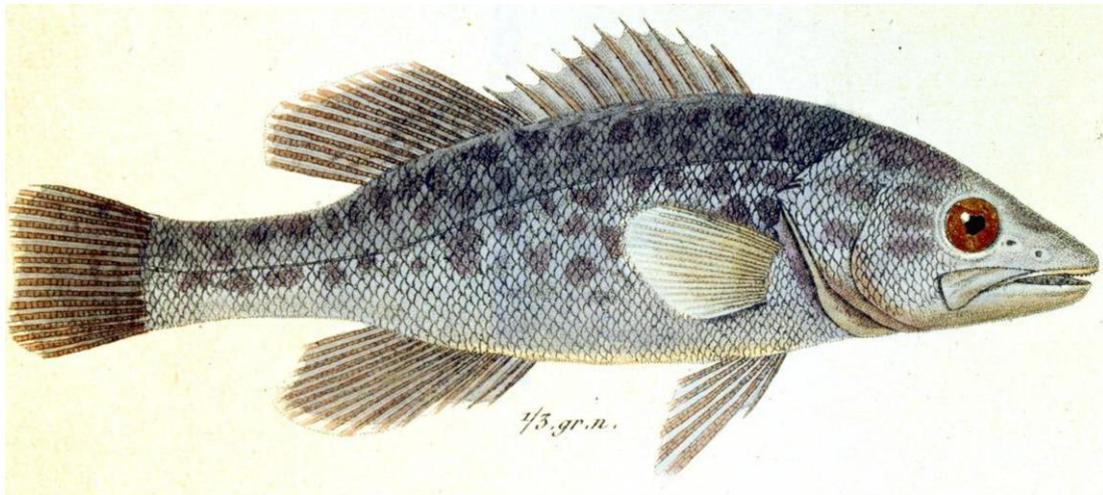
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23.1.1 European Discovery

The first European encounter with cod was by George Evans in November 1813 who recorded what he described as 'trout' from the Fish River, near the present site of Tarana (Mackness, 1965). The description provided by Evans, combined with other subsequent accounts, leaves no doubt that the fish were cod. The oral history of the Macquarie catchment suggests that Trout cod were the prevalent cod species in the upper Macquarie. It is therefore likely that Evans' catch included Trout cod and was probably the first European encounter with the species. The first unambiguous account of Trout cod was that of Lesson (Lesson, 1825) who captured them from the Macquarie River at Bathurst in February 1824, preserving a specimen that still exists. This specimen was later described and illustrated (Lesson, 1825, 1830; Cuvier & Valenciennes, 1829; Guérin-Méneville, 1829, 1838).

Photograph 23.1 The First Trout Cod



Artist Felix Guérin-Méneville created this illustration of the holotype for Trout cod collected by Rene Lesson from the Macquarie River at Bathurst in February 1824 and named by Georges Cuvier as *Gristes macquariensis*. It was published in *Iconographie de regne animal de G. Cuvier, Vol 1*, in 1836. Reprinted with permission from the Rare Books Collection, *State Library of Victoria*.

23.1.2 Aboriginal Names

European accounts record a number of aboriginal names for Trout cod. Blandowski (1858) reported the name 'Yaturr' as being used by the Yarree Yarree (Jari Jari) people of the lower Murray in Victoria. 'Ngumel' was the term used for Trout cod in the Wemba Wemba language of the Swan Hill region (Hercus, 1992; *Argus*, April 5, 1910) and Trout cod were known as 'Bangami' in the Yorta Yorta language of the Barmah region (Bowe & Morey, 1999). A newspaper account records that 'Inna' was a name for cod used by the Omeo aborigines (*Argus*, May 23, 1860) with earlier accounts suggesting that the term was pronounced as 'Inme' or 'Inni' (Clark, 2000). Historical evidence suggests that the majority of cod in the Omeo area were Trout cod. Very specific names were used for each type of fish reportedly ending in 'munjie' (*Argus*, May 23, 1860; Clark, 1998, 2000) with 'munjie' possibly added by aborigines in their communication with Europeans to emphasise the type of

animal they were discussing (Barry Blake, pers. com.), eg, Inna munjie = 'Trout cod, fish'. It is likely that 'Inme' or 'Inna' was the term for Trout cod in the Yaithmathang (Gundungerre) language of the Omeo region. Matthews (1909) recorded 'Yumboa' as the term for cod in the language of the Dhudhuroa along the upper Murray River, and the Kiewa and lower Mitta Mitta Rivers. In all three water ways Trout cod were prevalent and 'Yumboa' (pronounced 'Yambuwa') may have referred to the species. Bennet (1834) recorded two aboriginal words for cod in the Yass and Tumut areas (possibly the Ngunawal aboriginals), namely 'Mewuruk' and 'Bewuck' and while Bennet's description suggests that the former applied to Murray cod, there is insufficient evidence to conclude as to which species was referred to as 'Bewuck'.

23.1.3 European Names

A detailed history of the taxonomic name changes for Trout cod was provided earlier in a previous section. Summarising that history, the following key events took place. In 1825 Lesson published an account of his capture of a new species of fish from the Macquarie River at Bathurst naming it *Gryptes brisbanii* but not providing a description (Lesson, 1825). It was probably his intention to name the species *Grystes brisbanii* based on advice from Cuvier but a typographical error either on his part or that of the publisher resulted in the misspelling of the name of the genus. In 1829 Cuvier and Valenciennes published a detailed description of a specimen collected by Lesson naming the species *Grystes macquariensis* (Cuvier & Valenciennes, 1829). The following year Lesson published his description of the species and corrected the spelling naming the species *Grystes brisbanii* (Lesson, 1830). The illustration and holotype specimen demonstrates that *brisbanii/macquariensis* was a Trout cod.

In 1839 Mitchell published a description of a second species of cod which he captured from the Peel River in January 1832. He stated that they differed from the species described by the French due to the lack of white fin margins but also in a number of other unidentified features. He named it the new *Gristes peelii* (Mitchell, 1838). Mitchell's specimen has not survived but his illustration indicates that *peelii* was a Murray cod. In 1845 Richardson examined specimens of Murray cod exhibiting white fin margins which contradicted Mitchell's description and concluded that there was only a single species of cod, *Grystes macquariensis* (Richardson, 1845).

In 1859 Gunther separated the American and Australian species of *Grystes* and erected the genus *Oligorus* for the Australian species. Gunther possessed specimens of Trout cod (Gunther, 1880) but followed Richardson in recognising a single species *Oligorus macquariensis* (Gunther, 1859). In 1873 Castelnau published a detailed description of a new cod species which he distinguished from Murray cod by the possession of a longer upper jaw and other features, demonstrating it to be Trout cod. Unaware that the original description for *macquariensis* included a longer upper jaw, Castelnau named his new species *Oligorus mitchelli* (Castelnau, 1873). Ogilby, largely based on the examination of five cod museum specimens, concluded that only one species of cod existed namely *macquariensis* and rejected Castelnau's new species (Ogilby, 1893).

In 1929 Whitley recognised that the genus *Oligorus* was preoccupied by a beetle and erected the genus *Maccullochella* for Murray cod. A detailed examination of museum specimens led Whitley to the conclusion that only a single species of cod existed *Maccullochella macquariensis* (Whitley, 1937). The contention of a number of people including Stead, Tubb, Langtry, Roughley, Lake and Butcher that a second cod species existed, initiated a project in 1969 to resolve the issue. The result was that clear evidence was produced for the existence of two cod species with Trout cod being named *Maccullochella macquariensis* based on the specimen collected by Lesson in 1824 (Berra & Weatherly, 1972).

The earliest accounts of cod in the Bathurst area referred to the fish as 'trout' and 'rock cod' (Mackness, 1965; Cunningham, 1816). These names were probably applied to both cod species, with both of these terms ultimately being widely used as common names for Trout cod. The term 'trout' or 'Murray trout' was associated with Trout cod in the Barmah area from at least 1859 (*Argus*, 13 August 1859) and was in use from the Deniliquin area to as far south as the Coliban River near Kyneton (*Argus*, 17 March 1911; NSW Fisheries Report, 1914; *Argus*, 17 March 1911). A newspaper account links the term 'rock cod' to Trout cod in South Australia as early as 1892 (*Adelaide Register*, 20 May 1892), with Stead (1929b) later recording that it was widely used for the species, particularly along the lower Murray. This name was the term most frequently encountered over a wide area for the species by the author during the collection of oral history in this project. In north east Victoria, and as far west as Swan Hill, Trout cod were often referred to as 'bluenose' with the term probably in use by 1908 (Rhodes, 1999; Trueman & Luker, 1992). It does not appear to have been widely used north of the Murray River. The name 'Trout cod' was created by Stead in 1909 (*Sydney Morning Herald*, 23 November 1909) but appears only to have gained widespread use amongst anglers after the Second World War.

23.1.4 Distribution and Habitat

Two contrasting views have been expressed on the former distribution of Trout cod. The first was proposed by Lake who suggested that the species was 'restricted to the cooler upper reaches of the Murray River and its southern tributaries' (Lake, 1971). He probably reached that conclusion based on: the fact that he collected most of his specimens near Tintaldra and Brimin (Bryan Pratt & Vick Pay, pers. com.); his observations of adult Trout cod dying when handled at higher temperatures (Lake, 1967a); Langtry's observations (Cadwallader, 1977); and information provided to him by fishermen. A similar conclusion was reached by Cadwallader and Gooley (1984) who created a map on the former distribution of Trout cod in Victoria, largely from oral accounts of anglers, which recorded a concentration of reports of Trout cod in north eastern Victoria located in slopes and upland habitats. They were also probably influenced in reaching this conclusion by the habitat occupied by the single remaining translocated population in Victoria located in the rocky upland gorge of the Seven Creeks near Strathbogie (Cadwallader, 1979).

The alternate view, expressed in the most recent National Recovery Plan (Trout Cod Recovery Team, 2008), is that Trout cod, while acknowledged as having been present in upland areas, is primarily a lowland species with its former centre of distribution being the Central Murray and Murrumbidgee Rivers. This conclusion was reached based on: the presence today of Trout cod in the Central Murray River and detailed studies of their ecology in that area; Langtry's record of their former prevalence between Yarrawonga and Barmah, and near Bringagee (Cadwallader, 1977); museum records; the perceived unreliability of angler accounts; the suggested unreliability of the Seven Creeks as an indicator of Trout cod habitat due to the translocated origin of the population; and unpublished data reporting juvenile Trout cod to exhibit a preference for high water temperatures (Douglas *et al.*, 1994; Brown *et al.*, 1998; Trout Cod Recovery Team, 2008). The primary aim of this project was to resolve the debate on the former distribution and habitat associations of Trout cod and what follows is an evaluation of the collected evidence.

The surviving museum specimens of Trout cod in Australia were identified by Berra and Weatherly (1972) and Berra (1974). The databases of museums list other specimens which no longer exist under the name of *Maccullochella macquariensis* and these records have been included in recently published maps identifying the past distribution of Trout cod (Lintermans, 2007). Most of these additional records of lost specimens were identified when the species name for Murray cod was *macquariensis* and subsequent formal identification has not taken place, making them unreliable. A small number of additional specimens of Trout cod have been

located by the author and held by institutions or in private ownership. The majority of the surviving confirmed specimens of Trout cod were collected by Stead and his associates from the Murrumbidgee River between Gundagai and Hay in NSW, around the time of the First World War (*Australian Museum* database). Some potentially significant museum specimens from other areas have been lost, notably four recorded as *Maccullochella macquariensis* collected near Cooma around 1906, two specimens from the Fish River in 1882, as well as others from the Macquarie, Broken and Riverina catchments (*Australian Museum* database).

Collectively, the confirmed specimens of Trout cod originated from as far upstream as Bredbo (altitude about 700 m ASL, privately owned) and downstream to Purnong (altitude about 25 m ASL, held by the *South Australian Museum*), with a scattering from intermediate locations covering all habitats from the lower montane zone to the lowlands. Specimens from the central Murrumbidgee River, which was the focus of most of the research on native fish c1900-20 by NSW State Fisheries, are overrepresented in museum records. The preserved specimens of known origin from wild populations, which number under 30 fish from 12 locations (Bathurst, Bredbo, Tharwa, Gundagai, Wagga Wagga, Narrandera, Yanco, Hay, Thornton, Yarrowonga, Swan Hill, Purnong) indicate that Trout cod were present over a large area of the southern half of the Murray-Darling Basin, but there are simply too few to reliably infer its habitat preferences.

Brown *et al.* (1998) cited evidence from 'Davis (1995)' that juvenile Trout cod exhibited a preference for high water temperatures, suggesting that the species was not associated with the upper reaches of the rivers. No reference was provided for this source, nor was any detail of methodology or data. Lake (1967a) reported that adult Trout cod held in ponds died when handled at higher temperatures, while Murray cod were not affected. These observations were confirmed by an associate of Lake, who reported that some of the fish weighing approximately 5-12 kg, died when handled at 68 °F (20 °C) and all at higher temperatures (Vic Pay, pers. com.). Merrick and Schmida (1984) reported that while Trout cod held in aquaria withstood temperatures up to 28 °C for short periods, they suffered bacterial and fungal infections when held at temperatures exceeding 25 °C for any length of time. Captive adult Trout cod held by Native Fish Australia for several years in aquaria have survived over a temperature range of 4-30 °C (Author's pers. obs.) and higher temperatures have been experienced in the ponds of some government facilities holding adult Trout cod (Douglas *et al.*, 1994). These limited, anecdotal, conflicting observations on the temperature tolerances of Trout cod are of little value in identifying the species former habitat associations, compared with well documented historical records.

During this project 233 locations were identified as the source of probable or certain historical accounts of captures of Trout cod with an additional 228 locations identified as the source of captures of cod of undetermined identity. The collected evidence on the species abundance was used to develop rarity scores using the probable or certain historical accounts. The following table provides averages for the rarity scores created in each habitat zone in each catchment for Trout cod using historical evidence in this investigation:

Table 23.2 Trout cod Average Rarity Scores

Area	Zones			
	Lowland	Slopes	Upland	Montane
NSW & ACT	2.8	3.8	4.6	3.4
VIC	2.9	4.4	1.9	0.8
SA	1.7			
Basin	2.6	4.2	2.9	2.0

The average rarity scores suggest that in NSW Trout cod were common in the lowland zone (2.8), very common in the slopes zone (3.8), reasonably abundant in the upland zone (4.6) and common in the montane zone (3.4). The lowland score has been strongly influenced by the fact that Trout cod, while clearly abundant in the middle Murrumbidgee and Murray Rivers and possibly the upper Edward River, were less common, rare or absent in some such as the lower Lachlan River where they were unreported. If the scores for the lowlands in the Macquarie and Lachlan Catchments are ignored, the average rarity score for the lowlands in NSW rises to 3.6 implying that they were very common in this habitat south of the Lachlan. Some uncertainty exists for the rarity scores in non-lowland habitats in NSW. While there is good evidence that Trout cod were present and very common in the lower montane zone in the Murrumbidgee River, the evidence for this zone in other catchments, namely the Macquarie, Lachlan and Upper Murray catchments, is less substantial. In most cases these records originated from only the lower reaches of the montane zone, and the rarity scores should not be used to infer that they were generally common throughout this type of habitat; though in the Lachlan River there is evidence of cod being present near its source (Lhotsky, 1979). There is also uncertainty in the score given to Trout cod in the upland zone of the Murrumbidgee River. This score has been largely inferred based on their documented presence in the Tharwa area and their abundance in similar habitats elsewhere. Even allowing for a potential reduction in some of these non-upland scores, if new evidence is found, the average rarity scores suggest that in NSW the species was, in general, strongly associated with non-lowland habitat as well as being abundant in some areas in the lowlands.

In Victoria the average rarity scores suggest that while Trout cod were common in the lowland zone (2.9), they were strongly associated with the slopes zone where they were fairly abundant (4.4), had a modest presence in the upland zone (1.9) and a minor presence in the montane zone (0.8). The scores for the upland and montane zones to some degree may have been influenced by in-stream barriers, preventing access to these areas in some catchments such as the upper Campaspe River. In some upland rivers such as the Mitta Mitta, Trout cod were very common. As was the case in NSW, Trout cod were rare in some lowland areas, such as the lower Loddon River, and while in others were reported to be common, it was only in the lower Ovens that the species was clearly abundant in a lowland river. Some uncertainty exists on the original abundance of Trout cod in the lower Goulburn and Broken Catchments, and there is the potential for additional historical evidence to strengthen the scores in these areas and, as a consequence, the average score in Victoria for the lowlands. Oral history generally recalls Trout cod to have been more abundant than Murray cod in the smaller rivers and creeks in the slopes zone. Overall, the rarity scores suggest that Trout cod were strongly associated with the slopes zone in Victoria. The average rarity score of 1.7 for South Australia reflects the evidence that Trout cod, while being locally common upstream, declined in abundance downstream to be rare in the lower reaches of the Murray in that state. The collective results for the Basin suggest that Trout cod, on average, were most abundant in the slopes zone (4.2) and common in the uplands (2.9) and lowlands (2.6).

There are three rivers for which a substantial body of evidence exists demonstrating conclusively that Trout cod had originally been abundant. The first is the Murray River between Yarrawonga and Barmah, where their abundance was documented by Langtry (Cadwallader, 1977) and where they currently exist in substantial numbers in lowland habitat. The second is the Murrumbidgee River between Wagga Wagga and Narrandera, where most of the surviving museum specimens were collected and where the abundance of Trout cod was well documented by Stead and Jarman (NSW Fisheries Report, 1910; *Argus*, 1 October 1920). Wagga Wagga lies at the boundary between lowland and slopes habitats with Narrandera being in the lowland zone. The third is the Goulburn River between Eildon and Seymour, where oral history reporting Trout cod to have been abundant during the 1920s is validated by the existence of a number of superb photographs of catches of the species, and by a museum specimen (Berra, 1974). This section of the Goulburn River represents typical slopes habitat, with Seymour roughly at the boundary of slopes and lowland habitat.

While not as comprehensive, good evidence exists for Trout cod having been at least very common near the top of the upland and lower montane zones of the Murrumbidgee River, the Murrumbidgee River between Narrandera and Bringagee, the upper Edward River, the Murray River from Corowa to Brigenbrong, the Mitta Mitta River along its length upstream to the lower montane zone, the slopes zone of the Kiewa River, the lowland and slopes zone of the Ovens River, the slopes zone of the Campaspe River, the Central Murray River near Swan Hill and the Lower Murray River between Wentworth and Berri. Limited evidence confirms the presence of Trout cod in a number of waters where they were probably also very common including the upper Macquarie River, the upper Lachlan River and the upper Loddon River.

No evidence has been located of Trout cod being taken from the Darling River and both Jarman and Larsen reported that they were absent (*Argus*, 1 October 1920; 26 February 1932). Anglers have suggested that a second type of cod or 'rock cod' was formerly present in the upland habitat of the Gwydir River, although no evidence has been found to substantiate these reports. Trout cod were probably absent from the Murray-Darling streams in Queensland. In 1879 angler Don Donovan wrote a detailed account comparing the features of Murray cod and eastern freshwater cod. Discussing the cod of the western rivers he explicitly stated that 'none of the cod which I have caught in any of those streams ever varied in any one particular' (*Brisbane Courier*, 17 September 1879). As Donovan identified subtle differences between the eastern freshwater cod and Murray cod, if he had encountered Trout cod it is likely he would have recognised them as being different, suggesting their absence at that time.

Early accounts from explorers and newspapers indicate that cod penetrated well into the montane zone in some areas such as near Gunning (Lhotsky, 1979), near Cooma, where they were present in their thousands, (*Sydney Morning Herald*, 10 March 1915) and near Omeo (*Omeo Standard*, 2 December 1902). The oral history and photographs collected, while somewhat limited, indicate that of the two species of cod it was Trout cod that was most common in these high altitude areas. A Trout cod captured downstream of the Tantangara Dam near Yaouk in the early 1970s at around 1100 m ASL represents the current altitude record for the species. In the slopes, upland and montane zones Trout cod are consistently reported in the oral history to have exceeded Murray cod in relative abundance and in some areas were the only species of cod taken.

It can be concluded that the historical evidence reconciles the two contrasting views on Trout cod distribution and habitat association as both being in part correct but incomplete. The species was found from the Macquarie Catchment southwards and west into South Australia. The general trends from the rarity scores suggest that in the northern part of the species range, namely the Macquarie and Lachlan catchments, Trout cod were primarily an upland species with a significant presence in the slopes zone, but that progressively south the favoured habitat shifted downstream into the slopes and eastern parts of the lowlands, though with a significant presence generally in the upland zone. The historical evidence supports the modern view of the central Murrumbidgee and central Murray Rivers as excellent Trout cod habitat, but also indicates that large rivers in the slopes zone, such as the Goulburn and upper Murray Rivers, also supported large populations. The stronghold of Trout cod appears to have been the eastern lowlands, slopes and lower upland rivers. If the two disjunct populations in the upper Macquarie and upper Lachlan catchments are ignored, the Trout cod's former centre of distribution, rather than being the Central Murray and Murrumbidgee Rivers, is best identified with the Hume Highway between Seymour and Gundagai.

23.1.5 Translocations

Many of the early translocations of cod, such as those to Lake George, Lake Burrumbeet and the Yarra River were from upland areas, and probably included Trout cod. Most of those translocated populations

disappeared without leaving conclusive evidence as to which cod species were present. The translocations of cod to the Yarra River from 1857 to the 1870s (Wilson, 1858; Trueman, 2007) included Trout cod, forming a substantial population at least as far upstream as Healesville (*Argus*, 8 September 1898). In past years some elderly anglers informed the author that Trout cod were present in the Yarra River, but by the 1930s cod had become generally scarce and no Trout cod were captured after that time.

The cod translocated to Cataract Reservoir in the Nepean Catchment near Sydney from the Berembed Weir area in 1916 (NSW Fisheries Reports, 1914; 1923) included Trout cod which established a population. They were discovered to exist in significant numbers during the 1970s (Rod Harrison, pers. com.) though have extensively hybridized with Murray cod (Trout Cod Recovery Team, 2008). The cod translocated to the upper Seven Creeks from the Goulburn River and middle Seven Creeks during 1921-2, and from the Ovens River to Lake Sambell in 1928, contained Trout cod based on their presence in those waters decades later (Berra & Weatherly, 1972). Angler reports suggest that small numbers of Trout cod were present in the upper Shoalhaven River and probably originated from translocation activities during the 1870s (*Queanbeyan Age*, 17 May 1876). A newspaper account specifically identified 'trout' being shipped to the Avoca River (*Australasian*, 12 March 1870) and one suggested that 'Murray trout' may have been shipped to West Australia by William Saville-Kent (*Hobart Mercury*, 30 November 1911).

23.1.6 Size

Historical accounts generally reported Trout cod to be a smaller species than Murray cod. A maximum size of 10 lb. (4.6 kg) was reported for them in the Coliban River (*Argus*, 17 March 1911) while Jarman concluded that in the Murrumbidgee River near Narrandera 'a fish of 8lb. or 10lb. is a giant, the female always the largest' (*Argus*, 20 July 1917). Stead stated that 'a Trout Cod of fifteen to twenty pounds is quite a large one, and five pounds would be nearer to the normal size of large specimens' (Stead, 1929b). In contrast is the large size of the Trout cod in the Central Murray River documented by Langtry who captured fish up to 25 lb. (11.4 kg) as well as many over 10 lb. (4.6 kg) (Cadwallader, 1977). Some newspaper reports may have documented very large specimens. One account records the capture in the Ovens River near Wangaratta in 1908 of a 65 lb. (29.64 kg) cod which 'was of a peculiar bluish color, commonly known as a blue cod' (*North East Ensign*, 25 December 1908). The oral history and photographs indicate that in some waters Trout cod were commonly caught up to 5 kg in weight, and fish up to twice that figure were taken at regular intervals. Even in the comparatively small Seven Creeks 15 to 20 lb. (6.8 to 9 kg) specimens have been documented (Halsall, 1979). Trout cod are capable of relatively fast growth. One fish, of about a kilogram placed in a hatchery pond well stocked with yabbies, when removed six months later weighed 3.1 kg (Author's pers. obs.).

The maximum size to which Trout cod grow has been generally reported is 16 kg, this limit being traced back to John Lake. Lake's expression 'about 16 kg' in his descriptions (1967b: 1971) suggests that he did not weigh a Trout cod that size. He was aware of Langtry's manuscript which cited George Clarke, a local professional fisherman and fishing inspector at Barmah, as having taken a Trout cod weighing 32 lb. (14.6 kg) (Cadwallader, 1977) and may have rounded the 32 lb. to be 16 kg. Roy Holt of Beechworth captured c1950 a specimen a few ounces over 50 lb. (22.7 kg) from Lake Sambell which was weighed and sold, suggesting an accurate weight. Its capture is well corroborated by many witnesses in Beechworth, some of who were familiar with Trout cod. Oral and photographic evidence indicates that Holt captured a number of other Trout cod in the 30 to 40 lb. (13.6 to 18.2 kg) range from Lake Sambell. As Murray cod have not been reported from the lake there is little doubt as to the identity of the 50 lb. fish. It is a far better claim for a species record than the 16 kg widely quoted considering that specific details on a capture location or date for the particular 16 kg fish have never been provided. From Holt's capture it can be concluded that Trout cod can reach a weight of 22.7 kg. Other

accounts including those of Laddie Clifford, Henry Davies, Bert McKenzie, Roy Grant, Tom Jarvis, Reg Redrop and Bert Roberts generally reported a 20 lb. (9.0 kg) Trout cod to be a big fish but that rare captures of fish in the 50 to 80 lb. (22.7 to 36.4 kg) range occurred, though they were considered to be exceptional.

23.1.7 Historical Life History Observations

Stead reported that 'the average length of trout cod at maturity is 10 inches, with a weight of about 6 oz' (NSW Fisheries Report, 1914) and that two female fish from the Murrumbidgee weighing 8 and 9 oz contained 'advanced roe' (Stead, 1929b). Jarman suggested that Trout cod could be mature at three years of age and as small as 4 oz in weight (*Argus*, 20 July 1917). The age estimate suggests that NSW State Fisheries may have investigated the growth rate of the species around that time. Lake (1967a) stated that the eggs of Trout cod were larger than those of Murray cod and this was also reported by commercial fisherman R. J. Larsen (*Argus*, 12 February 1932). In contrast Stead believed that Trout cod produced smaller eggs (Stead, 1929b). Larsen noted that the ovaries of Trout cod were of a different shape and that some fins were larger compared to those of Murray cod (*Argus*, 12 February 1932).

Stead (1929b) stated 'The Trout Cod loves moving waters, and is most commonly found in the vicinity of river bends or "tarcoolas." Here, against a fairly deep bank, is the best spot to try for Trout Cod'. Anglers consistently report, both in the past and present, that Trout cod favour areas of flowing water, often near snags (e.g., *Argus*, 8 September 1898) though wooden debris has not always been a feature. In the Murray River Trout cod were known as 'rock cod' due to their association with areas of clean hard substrates such as clay banks, rocky reefs and sandy beaches. In slopes and upland habitats anglers reported the species to have been taken at the heads of holes in running water over rock or gravel substrates. They have also been observed to reside in stands of fringing vegetation when other cover has been absent (Author's pers. obs.). Stead (1929b) reported that Trout cod were rarely found in lagoons a view supported by Jarman (*Argus*, 15 July 1914).

Langtry and Tubb (Cadwallader, 1977) noted a tendency for Trout cod to spawn earlier than Murray cod as have some anglers such as Stan Walsh at Dartmouth. Anderson at Bringagee (Whitley, 1937) and Tubb at Barmah (Cadwallader, 1977) indicated that Trout cod spawned as early as September. Roughley (1955) reported that cod sometimes spawn as late as January. A recently spent female Trout cod was captured in the Seven Creeks by the author in late December 1980 (Author's pers. obs.). Historical sources suggested that cod in the past undertook mass movements considered to be migrations from the lowlands upstream towards headwater areas (NSW Government, 1880; *National Advocate*, 13 January 1925; *Sydney Morning Herald*, 1 December 1863, 22 September 1894). Dakin and Kesteven (1938) suggested that Trout cod were a migratory species, anecdotal evidence reported that Trout cod tagged in the early twentieth century by NSW investigators travelled several hundreds of kilometres (Laddie Clifford, pers. com.) and the Yorta Yorta people considered the species to be migratory (Don Briggs, pers. com.). Although few details have survived tagging experiments were undertaken with the species in the Murrumbidgee River (*Argus*, 20 July 1917).

Langtry reported the main item in the diet of Trout cod to be yabbies (Cadwallader, 1977). Trout cod sometimes feed at the surface on terrestrial items, in the Seven Creeks they have been observed consuming large black cicadas and grasshoppers and, in a number of instances, rising in numbers on insect hatches at the surface (Author's pers. obs.). This type of surface feeding behaviour was described in a newspaper account: 'the "trout" frequents the most rapid portions of the stream, and feeds near the surface. I have frequently observed them rising at flies and other insects in a manner similar to the English trout' (*Argus*, 8 September 1898). Stead also suggested that they exhibited surface feeding behaviour (*Sydney Morning Herald*, 15 July

1914). Murray crayfish, yabbies, scarab beetles, skinks, Blackfish, frogs, worms, small birds, a black snake, mice and even a platypus have been found in the stomachs of Trout cod taken from the Seven Creeks (Barney Kipping, pers. com.). A Trout cod taken from the Seven Creeks near Strathbogie and placed in a bucket ate a Blackfish while an angler sat next to it (*Argus*, 28 June 1934), while one captured from the same stream placed in a plastic drum ate four Blackfish during a 90 minute car journey (Author's pers. obs.). Trout cod from Bendora Reservoir in the ACT contained Blackfish, freshwater prawns and yabbies (Lintermans, pers. com.).

Cod have been frequently reported to eat other cod and a Murray cod of 25 lb. held in one of NSW State Fisheries ponds at Prospect near Sydney ate a Trout cod of 4 lb. (*Sydney Morning Herald*, 13 November 1914). R. J. Larsen reported the belief of professional fisherman that Murray cod were highly antagonistic towards 'trout' (Trout cod) and they would kill tethered Trout cod:

If cod and trout of the same size are tethered and a big wandering cod comes along he will invariably tackle the trout first. Mr. Larsen has put it to the test by tethering alternately two or three trout with the same number of cod and often found all the trout had been attacked, but not one cod (*Argus*, 12 February 1932).

23.1.8 Community Value

In the commercial fishery along the Murray and Murrumbidgee Rivers, Langtry's observations indicate that Trout cod were a component of the total cod catch, their proportion steadily increasing upstream. Near Yarrowonga they rivalled the take of Murray cod. He also reported that Trout cod would die more readily, struggle on tethers and its flesh would not keep as well as that of Murray cod (Cadwallader, 1977). Some of these observations have been repeated in the recollections of commercial fishermen interviewed. At Barmah, prior to refrigeration, fish destined for Melbourne were packed in wet gum leaves and the 'bluenose' were generally sold locally because they 'wouldn't keep as well as the cod' (Laddie Clifford, pers. com.). A newspaper account recorded that few baskets of 'trout' were forwarded to Melbourne from the Murray Fishery (*Sydney Morning Herald*, 17 June 1902). Most people interviewed described the flesh of Trout cod as drier than that of Murray cod, with less fat. Some people savoured the fat in Murray cod, but many did not and preferred Trout cod. The opinion of most correspondents to newspapers was that the 'Murray trout' was a superior table fish to Murray cod with some stating that it was without peer (eg. *Argus*, 17 March 1911).

Recreational fishermen universally recognised Trout cod as a superior angling fish to Murray cod, rated by many as the best species in the Basin. In waters where both cod species were common, Trout cod were often overshadowed by Murray cod due to the large size of some specimens of the latter. However accounts, such as that of Henry Davies, indicate that in the lowlands some anglers selectively targeted Trout cod in preference to Murray cod. In north east Victoria, where Trout cod were the prevalent cod species in many waters, the historical evidence indicates that they were the primary target of anglers, many recognising them as distinct to Murray cod (Rhodes, 1999). This was also probably the case in the upper reaches of the Macquarie, Lachlan and Murrumbidgee Rivers. In these areas Trout cod and Macquarie perch formed the key components of the recreational fishery. There is clear evidence from an early date that anglers widely distinguished 'Murray trout' from Murray cod as an esteemed angling species (*Argus*, 8 September 1898; 17 March 1911; 18 January 1913) including a poem published in the illustrated magazine *Melbourne Punch* in 1864 (*Hobart Mercury*, 30 April 1864):

**The Murray trout may swim about,
With unmolested cod,
And Yarra herrings from that day
Need never dread the rod. ***

23.1.9 Decline & Current Status

Rowland (1989) presented historical evidence indicating that commercial fishing had impacted on stocks of cod by the late nineteenth century and, as in some areas Trout cod were a significant proportion of the cod taken, it is likely that they had experienced a decline in these waters. By the end of the First World War cod had become rare in most of the higher altitude areas reported to contain them in the past, such as the Fish and Duckmaloi Rivers near Bathurst, the upper Lachlan River near Gunning, the upper Indi River, the upper Mitta Mitta River near Omeo and the upper King River above Cheshunt. Significant numbers remained in the Murrumbidgee River near Cooma, though reduced compared to past years. As the historical evidence suggests that Trout cod were prevalent in these waters, it appears that they first disappeared from the upstream areas of their range.

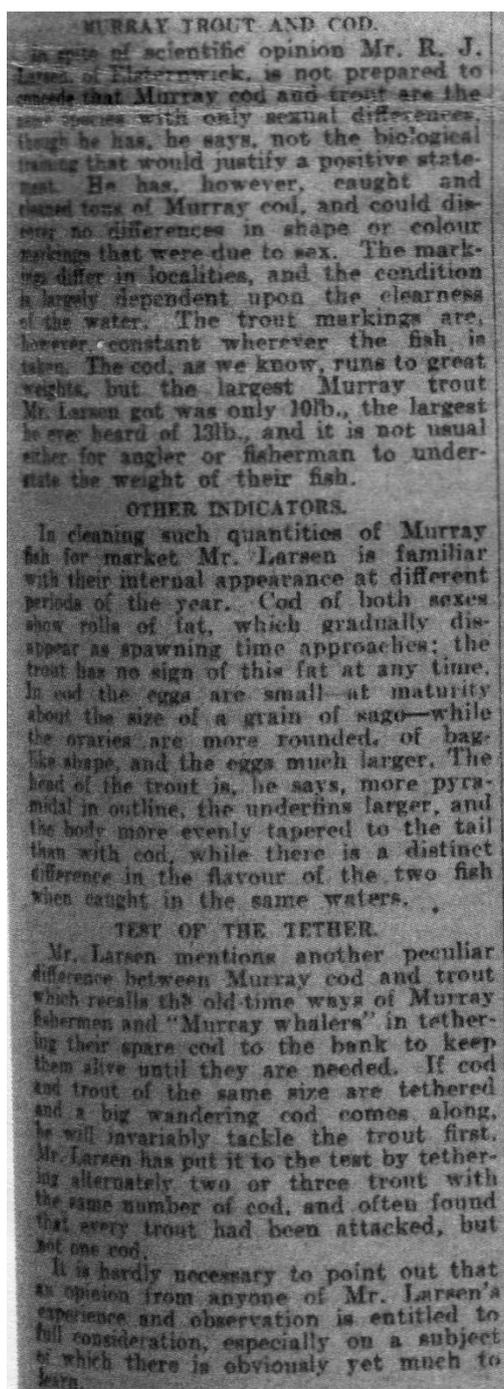
The historical evidence suggests that the greatest decline in Trout cod populations occurred from 1920-40 and in some cases large fish kills were associated with their disappearance. These include the Central Murrumbidgee River during the 1920s; the upper Lachlan River c1928; the middle reaches of the Goulburn River c1927-29; the Murray River between Albury and Yarrawonga c1928-34; the Upper Murray River in the 1930s and the Kiewa River in 1939 as well as many smaller streams over this period. By World War Two the species remained relatively abundant in the Ovens River and the Murray River between Yarrawonga and Barmah but, to a large degree, only remained as small populations elsewhere. The oral history indicates that all of these remaining populations continued to decline during the 1950s and 1960s. It has been suggested that the primary reason for the disappearance of Trout cod, at least in the lowlands, was the desnagging of rivers (Trout Cod Recovery Team, 2008). Langtry's records (Cadwallader, 1977) indicate that Trout cod remained common up to 1950 after the near complete removal of wooden debris from the Murray River between Yarrawonga and Barmah during the late nineteenth century (Public Works Department Victoria, 1867; Victorian Government, 1867; *Argus*, 18 February 1869; *Riverine Herald*, 19 June 1869). This suggests that while desnagging may have played an important role in their decline in some waters, it may not have been the primary reason for their disappearance. The collective historical evidence suggests that a suite of agents may have been responsible.

Berra and Weatherly (1972) in 1969-70 obtained Trout cod from only three waters, two of which contained translocated populations, with only a single fish being taken from within the species natural range in the Murrumbidgee River near Tharwa. The oral history indicates that the Trout cod population downstream of Yarrawonga had dwindled by 1970, with few fish being caught, but at the end of the decade had begun to recover. The translocated population in Lake Sambell was lost through successive fish kills in the early 1970s. Local extinctions continued until the middle 1980s, by which time only one wild population remained in the Murray River between Yarrawonga and Cobram, and two translocated populations existed in Seven Creeks and Cataract Reservoir.

Trout cod are listed as endangered under the Federal *Environment Protection and Biodiversity Conservation Act 1999*. In NSW Trout cod are listed as endangered under the *Fisheries Management Act 1994*; in the ACT are classified as endangered under the *Nature Conservation Act 1980*; and in Victoria are listed as threatened under the *Flora and Fauna Guarantee Act 1988*. In South Australia Trout cod are considered to be extinct and are protected by regulations under the *Fisheries Act 2007*. At the present time Trout cod are totally protected and cannot be taken by anglers in all states.

Since the late 1980s, liberations of hatchery produced Trout cod have established some significant populations, with evidence of reproduction in Bendora Dam, the Murrumbidgee River between Wagga Wagga and Narrandera, the upper Murray River between Walwa and Tintalra, the Macquarie River between

Wellington and Warren, the Goulburn River near Murchison and the Ovens River. The wild population in the Murray River below Yarrawonga has undergone a substantial recovery, with the species being now common downstream to Barmah, and captures reported near Swan Hill. The Trout cod National Recovery Plan (Trout Cod Recovery Team, 2008) stated that one of the goals is ultimately to recover populations of the species to allow recreational angling, and proposed that a recreational fishery be established in an impoundment. In 2008 DPI Victoria commenced stocking Trout cod into Lake Kerford near Beechworth to develop a pilot recreational fishery and the stocking was extended to include Lake Sambell in 2010. It has been proposed that Trout cod be stocked into the Goulburn River near Trawool to aid in the recovery of the species and to develop a pilot recreational fishery in a river.



Argus, 12 February 1932

MURRAY TROUT AND COD

In spite of scientific opinion Mr. R. J. Larsen Of Elsternwick, is not prepared to concede that Murray cod and trout are the same species with only sexual differences, though he has, he says, not the biological training that would justify a positive statement. He has, however, caught and cleaned tons of Murray cod, and could discern no differences in shape or colour markings that were due to sex. The markings differ in localities, and the condition is largely dependent on the clearness of the water. The trout markings are, however, constant wherever the fish is taken. The cod, as we know, runs to great weights, but the largest Murray trout Mr. Larsen got was only 10 lb., the largest he ever heard of 13lb., and it is not unusual either for anglers or fishermen to understate the weight of their fish.

OTHER INDICATORS

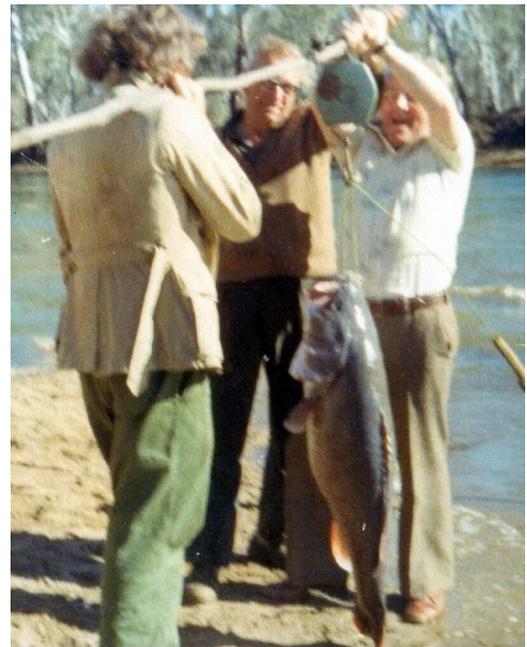
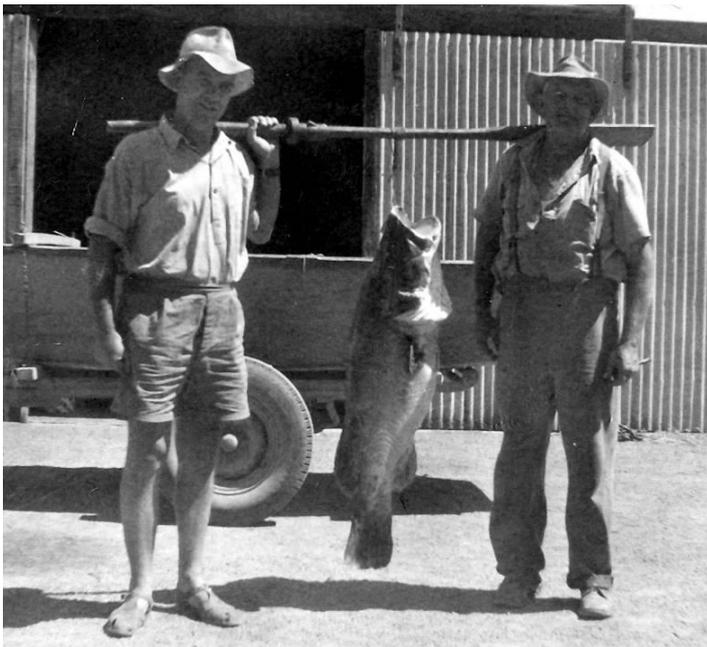
In cleaning such quantities of Murray for the market, Mr. Larsen is familiar with their internal appearance at different periods of the year. Cod of both sexes show rolls of fat, which gradually disappear as spawning time approaches; the trout has no sign of this fat at any time. In cod the eggs are small – at maturity about the size of a grain of sago – while the ovaries are more rounded, of bag-like shape, and the eggs much larger. The head of the trout is, he says, more pyramidal in outline, the underfins larger, and the body more evenly tapered to the tail than with cod, while there is a distinct difference in the flavour of the two fish when caught in the same waters.

TEST OF THE TETHER

Mr. Larsen mentions another peculiar difference between Murray cod and trout which recalls the old time ways of Murray fishermen and “Murray whalers” in tethering their spare cod to the bank to keep them alive until they are needed. If cod and trout of the same size are tethered and a big wandering cod comes along, he will invariably tackle the trout first. Mr. Larsen has put it to the test by tethering alternatively two or three trout with the same number of cod, and often found that every trout had been attacked, but not one cod.

It is hardly necessary to point out that an opinion from anyone of Mr. Larsen’s experience and observation is entitled to full consideration, especially on a subject to which there is obviously yet much to learn.

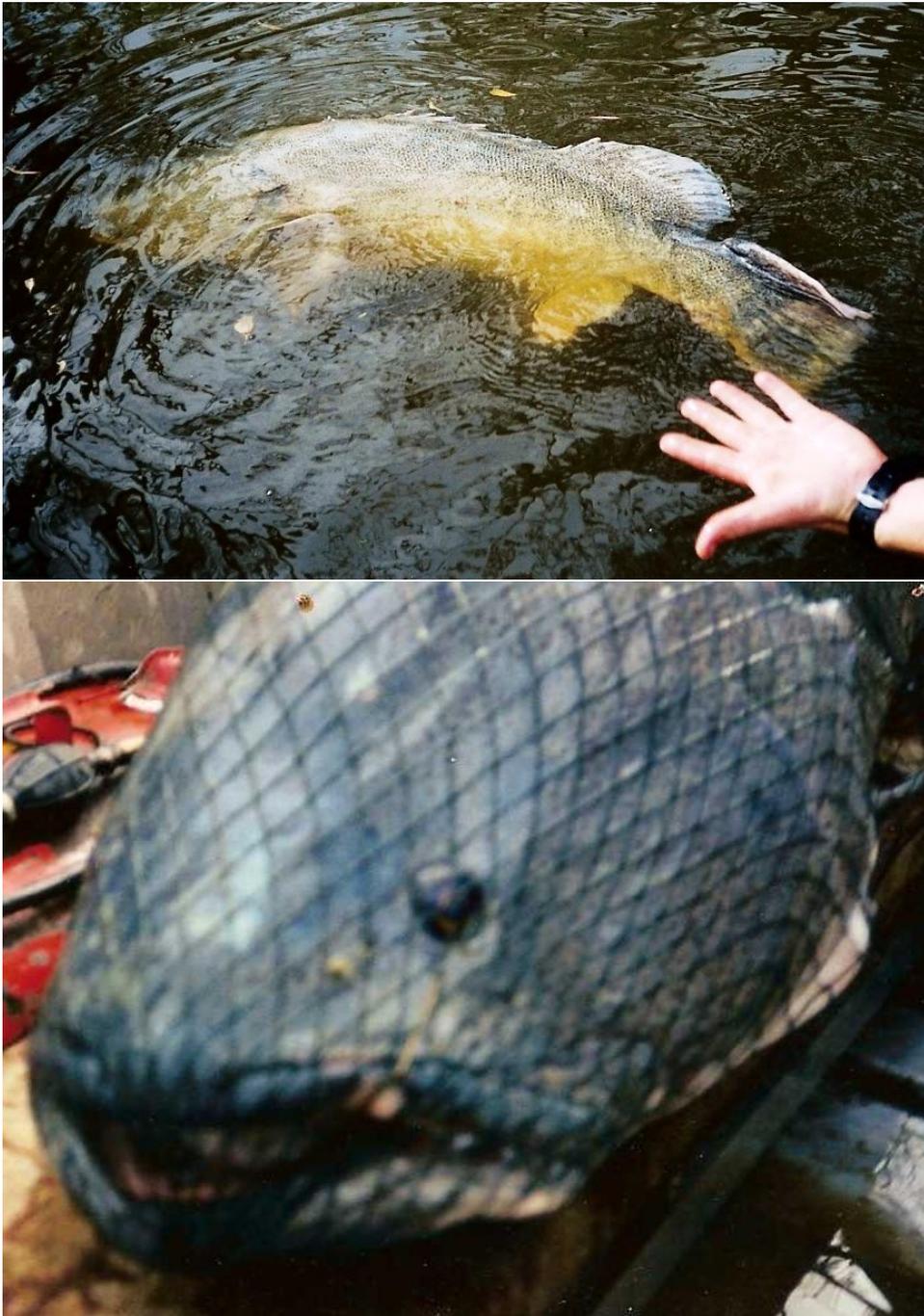
Photograph 23.2 Big Trout Cod in the Past



Left: Photo MR28. Albert Roberts (left) and John Cooper hold a 'rock cod' weighing 58 lb. (26.3 kg) caught in the Murray River at Bruces Bend near Yarrawonga in 1952. Although not conclusive the body shape and the relative length of the head and upper jaw suggests that it could be a Trout cod.

Right: Photo MR51. The late Reg Reddrop weighs what is believed to be a large Trout cod taken from the Murray River downstream of Tocumwal. The blue appearance of the head is quite striking. In the original photo small black dashes were also apparent and its general features suggest that the fish is a Trout cod. John Lake suggested a maximum weight for Trout cod of about 16 kg though fishermen claim that fish exceeding twice that weight were taken though were rare. Photos courtesy of Albert Roberts and Greg and Wendy McKenzie.

Photograph 23.3 A Giant Trout Cod Today?



Two of a set of photos of a cod captured, photographed and released by Heath McKenzie and John Breen from the Yulupna Creek in December 2000. The images are the only photographic evidence seen by the author that could be a contemporary capture of a giant Trout cod. In the top image of the general speckling is vivid while in the lower image the pointed snout and blue colour are evident. McKenzie reported that the top jaw overhung the lower jaw. Opinion is divided on whether the animal is a Trout cod. Professor Tim Berra, who captured specimens exceeding 10 kg in Lake Sambell, has indicated to the author that it is probably a Trout cod. Photos courtesy of Heath McKenzie.

Photograph 23.4 The Seven Creeks: A Last Upland Refuge



Many anglers are familiar with the Murray River between Yarrowonga and Barmah and are aware of its importance as a habitat for Trout cod. These two images illustrate the very different Trout cod habitat in the Seven Creeks. During the late 1960s in the stretch of water in the top photo Trout cod from three kilograms down to three inches were in residence with the author recalling on one occasion a dozen fish being angled from the run depicted. The bottom photo illustrates an example of pool habitat which exists in the creek and this particular spot was also a favoured location for Trout cod. In December 2007 individual fish could be seen patrolling near the rocks in the middle of the day. Both photos author.

Figure 23.1 A Reconstruction of the Historical Distribution & Abundance of Trout Cod in the Southern Murray-Darling Basin

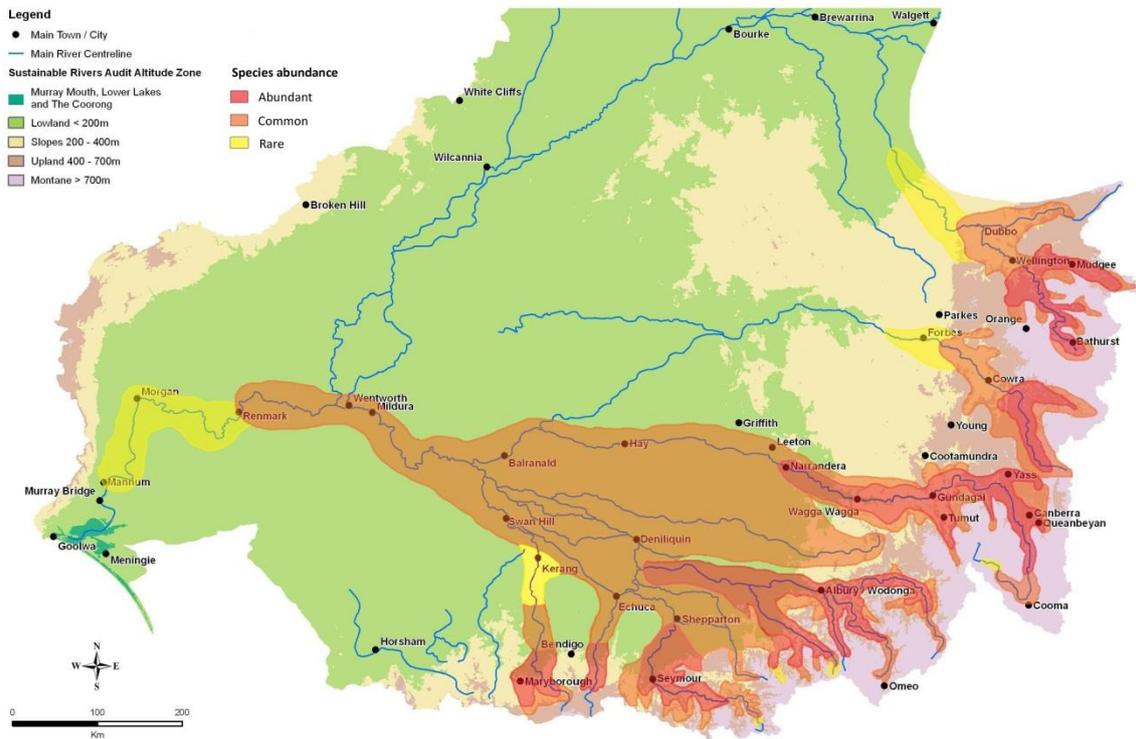


Table 23.9 ASFB Conservation Status of Murray-Darling Basin Fishes

The following table presents the most recent (2011) assessment of the conservation status of Murray-Darling Basin Fishes by the Threatened Fishes Committee of the Australian Society for Fish Biology courtesy of the Convenor, Mark Lintermans (Mark.Lintermans@canberra.edu.au). It utilises IUCN conservation categories and criteria.

Category	Scientific Name	Common Name
CRITICALLY ENDANGERED	<i>Craterocephalus fluviatilis</i>	Murray hardyhead
	<i>Galaxias fuscus</i>	Barred galaxias
	<i>Maccullochella macquariensis</i>	Trout cod
ENDANGERED	<i>Macquaria australasica</i>	Macquarie perch
VULNERABLE	<i>Craterocephalus amniculus</i>	Darling River hardyhead
	<i>Edelia obscura</i>	Yarra pygmy perch
	<i>Galaxias rostratus</i>	Flat-headed galaxias
	<i>Maccullochella peelii</i>	Murray cod
LOWER RISK – LEAST CONCERN	<i>Mogurnda adspersa</i>	Southern purple-spotted gudgeon