WILHELM BLANDOWSKI'S CONTRIBUTION TO ICHTHYOLOGY OF THE MURRAY–DARLING BASIN, AUSTRALIA

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Wilhelm Blandowski is best known for the scandal that surrounded his attempts to name a number of new species of freshwater fish after prominent members of the Victorian scientific establishment. Although this 19th Century anecdote is diverting, it belies, I believe, the significant contribution that the first paid Victorian government zoologist made to the ichthyology of the Murray-Darling Basin. Although his claim to new species was exaggerated, his collections, assisted by Gerard Krefft were the most diverse to that date. There is no doubt – because Blandowski tells us as much – that the expedition's success in collecting so many species, as well as information on distribution, habitat, size and diet, can be attributed to the knowledge of the local Aboriginal people, the Nyeri Nyeri. That Blandowski realised that this knowledge existed and acknowledged it, is unusual for the time. The information provided, although broadly consistent with what we know of the species' current habits, is scanty and there is some uncertainty as to the location where most of the species were collected. Interpretations based on illustrations, written descriptions and extant specimens suggest that many species that were collected in 1856/57 no longer occur in that region of the Murray-Darling Basin. Blandowski's collections also hint at the possibility that the distribution of the spotted galaxias, *Galaxias truttaceus* Valenciennes 1846, normally considered coastal, may have formerly extended much further up into freshwater.

Key words: riverine fish, indigenous knowledge, environmental history, history of science, freshwater.

> 'There were only three kinds of fish known to exist in the Murray, and of which, Sir Thomas Mitchell gives good drawings. I beg to lay before you nineteen different forms of fish living in the waters of the Murray and Billibongs.' (Blandowski 1857:134)

WHEN WILHELM BLANDOWSKI wrote these words in 1857 for the Transactions of the Philosophical Institute of Victoria, he exaggerated considerably, although he was not to know this. Whether through incompetence or naivety, he only collected and described eight new species (Blandowski 1857; Iredale & Whitley 1932; Allen 2001; Humphries 2003a) and none of these appeared in the scientific literature because of the sensibilities of the 19th century Victoria scientific elite and Blandowski's tactlessness, unwitting or otherwise (Paszkowski 1967; Allen 2001; Humphries 2003a). But eight species should not be interpreted as an insignificant number; indeed it is almost one quarter of the currently described species that occur in the freshwaters of the Murray-Darling Basin (Table 1) and it was to take another 50 years or so for the last of the species presented by Blandowski to the Philosophical Institute in 1857 to be properly described.

Blandowski is most infamous for the scandal with fish names, but the expedition collected much more than fish: Blandowski, ably assisted by Gerard Krefft – who was to be embroiled much later in his own scandal (Nancarrow, this volume) – and the local Nyeri Nyeri people, also collected mammals, birds, reptiles, molluscs, insects and plants. Through descriptions, illustrations and photographs, he and Krefft also conducted anthropological investigations (Blandowski 1857; Krefft 1866b). Some of this material was incorporated in museum collections in Australia and some was published, but much of it was taken to Europe, when Blandowski, disillusioned with the way he had been treated in Australia, returned there in 1859. But it is of the fish and the state of freshwater ichthyology prior to, and following, Blandowski's contribution, which I focus on here.

In this paper I will set the scene - historic, environmental and scientific - for the work carried out by Blandowski, Krefft and their Aboriginal collectors; I then describe the species collected and detail which ones were indeed new to science; I explore the reasons for Blandowski's success relative to his contemporaries and how Aboriginal knowledge contributed to that success; I examine what ecological and distributional information of the fish Blandowski was able

to glean from existing indigenous knowledge; and finally I outline the current state of the fish fauna of the junction of the Murray and Darling Rivers.

THE MURRAY-DARLING BASIN: HISTORY, ENVIRONMENT AND SCIENCE

The Murray-Darling Basin occupies approximately one seventh of Australia's landmass, draining more than a million square kilometres, and includes some of the largest and most iconic rivers in the country, including the Murray, Darling, Murrumbidgee and Paroo Rivers (Fig. 1). Total annual discharge averages 1.3 km^3 per year which, in comparison with rivers such as the Amazon (6,900 km^3), Danube (20 km^3), Mississippi (44 km^3) and Mekong (47 km^3), is very small indeed. Despite the diversity of climatic zones, altitudes, river types and habitats, the relatively small volume of water is probably the main reason that there are only about 36 species of wholly freshwater fish occurring in the Murray-Darling Basin (Lintermans 2007). Although there are some endemic species – e.g. Murray cod, *Maccullochella peelii peelii* (Mitchell, 1838)– many species also occur outside the Basin. It took some time for early European scientists to describe the first species of fish from this region. In fact the first species to be described, whose distribution included the Murray-Darling Basin, were from coastal populations and from Tasmania and, in the case of the common galaxias, *Galaxias maculatus* (Jenyns, 1842), from another continent, and were first encountered by

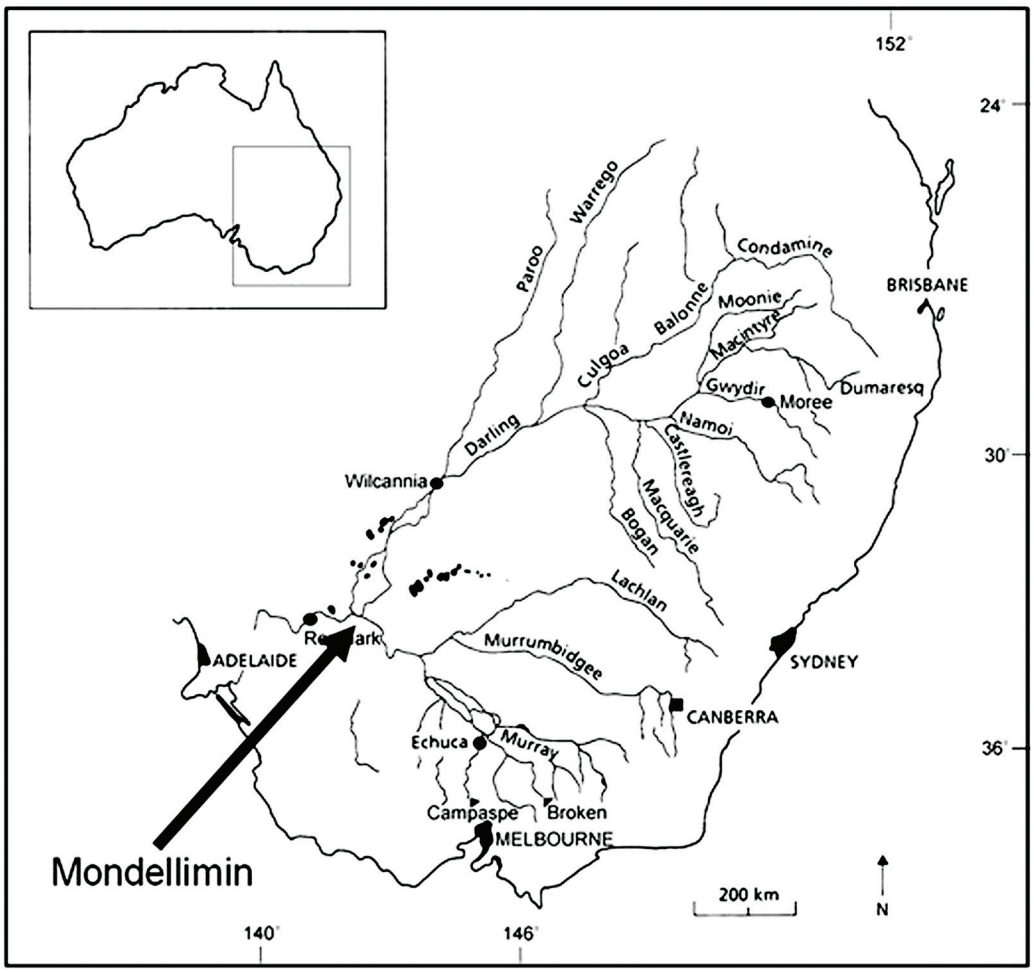

Fig. 1. Map of Murray-Darling Basin, showing the location of Mondellimin.

Table 1. Scientific name, common name, distribution, type locality, authority and year described for Murray-Darling Basin fishes.

Scientific name	Common name	Distribution	Type locality	Authority	Year
Pseudaphritis urvillii	tupong	lower M.	Tasmania, according to Waite, 1905	Valenciennes	1832
Maccullochella peelii peelii	Murray cod	widespread	Peel R.	Mitchell	1838
Bidyanus bidyanus	silver perch	fragmented	River between Gwydir and McIntyre	Mitchell	1838
Tandanus tandanus	freshwater catfish	declining, widespread	Namoi River	Mitchell	1838
Anguilla australis	short-finned eel	lower MDB	Port Arthur, Tas	Richardson	1841
Galaxias maculatus	common jollytail	lower Murray	Tierra del Fuego	Jenyns	1842
Macquaria ambigua	golden perch	widespread	?	Richardson	1845
Mordacia mordax	short-headed lamprey	lower MDB	Tasmania	Richardson	1846
Galaxias truttaceus	spotted galaxias	Campaspe and Colliban Rivers	Nicholls Rivulet, Tas	Valenciennes	1846
Gadopsis marmoratus	river blackfish	lower MDB	Murray R.	Richardson	1848
Geotria australis	pouched lamprey	lower MDB	Hobson's Bay or Onkaparinga	Gray	1851
Leiopotherapon unicolor	spangled perch	common mid-upper MDB	Mosquito Cr, Gwydir system	Günther	1859
Nannoperca australis	southern pygmy perch	southern MDB	Murray River	Günther	1861
Macquaria colonorum	estuary perch	lower Murray	Victoria	Günther	1863
Philypnodon grandiceps	flathead gudgeon	widespread	Upper Hawksbury	Krefft	1864
Galaxias olidus	mountain galaxias	upland and slopes	Qld????	Günther	1866
Ambassis agassizii	olive perchlet	threatened, extinct SA	Fitzroy R.	Steindachner	1867
Anguilla reinhardtii	long-finned eel	Condamine R.	Fitzroy R.	Steindachner	1867
Neosilurus hyrtlii	Hyrtl's tandan	Northern MDB	Fitzroy R.	Steindachner	1867
Craterocephalus stercusmuscarum fulvus	unspecked hardyhead	widespread	Cape York, Wild	Ivantsoff, Crowley and Allen	1987
Nematalosa erebi	bony herring	widespread, mid MDB	Mary R., QLD	Günther	1868
Galaxias rostratus	flat-headed galaxias	lowland MDB	Murray R. SA	Klunzinger	1872
Nannoperca obscura	Yarra pygmy perch	restricted, lower MDB	Yarra lagoon	Klunzinger	1872
Morgurnda adspersa	southern purple-spotted gudgeon	threatened, restricted	Fitzroy R., Rockhampton	Castelnau	1878
Melanotaenia fluviatilis	crimson-spotted rainbowfish	widespread	Murrumbidgee R.	Castelnau	1878
Retropinna semoni	Australian smelt	widespread	Burnett R., QLD	Weber	1895
Hypseleotris klunzingeri	western carp gudgeon	widespread	SA	Ogilby	1898
Craterocephalus fluviatilis	Murray hardyhead	threatened, restricted	Yanko Cr, Narrandera	McCulloch	1912
Porochilus rendahli	Rendahl's tandan	Condamine R.	Hermit Hill, NW Aust	Whitley	1928

Table 1 (continued). Scientific name, common name, distribution, type locality, authority and year described for Murray-Darling Basin fishes.

Scientific name	Common name	Distribution	Type locality	Authority	Year
Galaxias fuscus	barred galaxias	upland southern MDB	Rubicon R.	Mack	1936
Gadopsis bispinosus	two-spined blackfish	upland, southern MDB	King R.	Sanger	1984
Craterocephalus amniculus	Darling R. hardyhead	threatened, restricted	Cockburn R., NSW	Crowley and Ivantsoff	1990
Hypseleotris spp.					
Philypnodon macrostomus	dwarf flathead gudgeon	lower MDB		Hoese and Reader	2006

maritime explorers at the dawn of the 19th Century (Humphries 2003b).

Freshwater fishes have always been the poor cousins of marine fishes in terms of the interest they engendered for early European naturalists in Australia. For example, of the hundreds of new species of fishes brought back to France by François Péron (1775-1810) on the Baudin expedition in 1798-1801 and described by Georges Cuvier (1769-1832), Achille Valenciennes (1794-1865) and the Compte de Lacépède (1756-1825), only two or three were from freshwater. Most naturalists did not venture far inland for many different reasons: fear of Aborigines, climate and lack of water and because of the antipathy of many of the captains of the voyages to science in general. It was much more convenient to throw a net over the side of a sailing ship or collect along the seashore than it was to venture inland into inhospitable territory. So, until Thomas Mitchell, the surveyor, naturalist and explorer, conducted his several trips into the interior of Australia, most species that were described were collected by European maritime explorers – occasionally making forays inland - and all were shipped back to France or Britain for description by experts. Thus, Péron collected the spotted galaxias (*Galaxias truttaceus* Valenciennes, 1846), Jean René Constant Quoy (1790-1869) and Joseph Paul Gaimard (1793-1858), on Louis de Freycinet's expedition of 1817-1820 the congolli or tupong (*Pseudaphritis urvillii* Valenciennes, 1832), René-Primavère Lesson (1794-1849) on Louis Isadore Duperry's expedition of 1822-25 collected Macquarie perch (*Macquaria australasica* Cuvier, 1830) and trout cod (*Maccullochella macquariensis* Cuvier, 1829), John Richardson (1787-1865) described the river blackfish (*Gadopsis marmoratus* Richardson, 1848), the pouched lamprey (*Mordacia mordax* Richardson, 1846) and golden perch (*Macquaria ambigua* Richardson, 1845) from specimens collected on James Clark Ross' expedition of 1839-1843 and Charles Darwin (1809-1882) on Robert Fitzroy's expedition of 1831-36 collected the common jollytail (*Galaxias maculatus* Jenyns, 1842) from Tierra del Fuego (Table 1).

With the advent of organised land exploration, beginning with the crossing of the Blue Mountains west of Sydney in 1813 and then George Evans' expedition of the same year during which he named the Macquarie and Fish Rivers and stated that he was: '…quite astonished at the number [of fish] the Men catch every Evening….' (Mackaness 1965:24), the opportunity was there for much more comprehensive natural history collecting to take place. However, natural history collecting in the colony of Australia occurred in a

mostly sporadic and disorganised manner for several decades (Finney 1984, 1993) and the ichthyological component was particularly haphazard. Although the Australian Museum in Sydney had been set up in the 1820s, it was not able to operate independently of overseas experts and their knowledge until several decades later and so collections were uncoordinated. The National Museum of Victoria was established much later, in 1854 - the same year as Melbourne University, the Philosophical Society of Victoria and the Victorian Institute for the Advancement of Science – and only then because the surge in population associated with gold mining provided the interest and expertise to enable this to happen (Pescott 1954; Finney 1993). This meant that, particularly in Victoria, natural history collecting was very much an amateur occupation until the appointment of the National Museum's first zoologist, expatriate Prussian Wilhelm Blandowski (Paszkowski 1967).

BLANDOWSKI'S ICHTHYOLOGICAL COLLECTIONS

The material upon which this paper is based is largely from Blandowski's own published (Blandowski 1857) and unpublished material (the pages that were expunged from the 1857 published paper), the incomplete fish collections at the National Museum of Victoria (NMV), the catalogue of the expedition (located in the museum), Krefft's account of the expedition (Krefft n.d.), images of watercolours of the fish located at the Humboldt Natural History Museum in Berlin and published analyses and discussions of the results of the expedition (e.g. Iredale & Whitley 1932). Identification of the species collected are based on specimens from the NMV, from the illustrations from the intact 1857 Blandowski paper and from published analyses of the results of the expedition. However, in the end, my identifications of non-extant specimens are from illustrations and thus are open to other interpretations. I use Lintermans (2007) as the most recent text on the Murray-Darling Basin fish fauna. In addition, there is some uncertainty as to the exact location of collection of most specimens. Blandowski collected zoological specimens from Victoria prior to the Murray River expedition (1855a,b). In 1856/7 Blandowski's party travelled north from Melbourne and then west, following the Murray River, collecting along the way. Once at Mondellimin, Blandowski reported riding several hundred kilometres up the Darling River and also made his way downstream to Adelaide and from there back to Melbourne. It is possible that specimens supposedly coming from the junction of the Murray and Darling Rivers, actually originated from other locations visited as part of the expedition. In the interpretation of his results, I assume that if Blandowski provided a Nyeri Nyeri (the local Aboriginal tribe) name for a species, then it was collected in the local area; i.e. from waters associated with the junction of the Murray and Darling Rivers. Also, if he provided information on habitat, size or diet of a species of fish, I assume that these are based on his, Krefft's or his Nyeri Nyeri informants' observations of fish from the same local area. Certainly, there is every indication from the acknowledgement of his sources (see later), that Blandowski gleaned most of the information on the species collected from the Nyeri Nyeri people.

The parlous state of natural history as a whole, and ichthyology, in particular in the colony in the first three quarters of the 19th Century, was noted by Francois de Laporte, Count de Castelnau, in a paper describing species mostly gleaned from fish markets.

> Very little interest has been, till this time, felt in the Australian Colonies, on subjects of natural science….. It is singular to remark that not one of the Australian Colonies has a particular work on one single branch of its zoology, whereas in every State of North America has a complete series of valuable works on each branch of that science. In this the Australian Democracy seems to be far behind its American sister (Castelnau 1872:31-32.).

He drew attention to the fact that only four significant works had been completed on freshwater fishes in Victoria, although the state of the science of freshwater ichthyology was similarly deficient throughout Australia. Castelnau noted a short piece by Frederick McCoy in the Intercolonial Exhibition of 1866/67, a paper by Albert Günther (from the British Museum) and descriptions of new species by John Richardson, based on the collections from the voyage of the *Erebus* and *Terror*. But he gives pride of place to the paper on fishes by Blandowski from his expedition to the junction of the Murray and Darling Rivers. Castelnau omitted to mention, however, Mitchell's contributions, despite Blandowski's own acknowledgment of these.

Castelnau's high opinion of Blandowski was probably warranted, since Blandowski in fact collected about 15 distinct species of fish from the junction of the Murray and Darling Rivers (Fig. 2, Table 2). This is fewer than the 'nineteen different

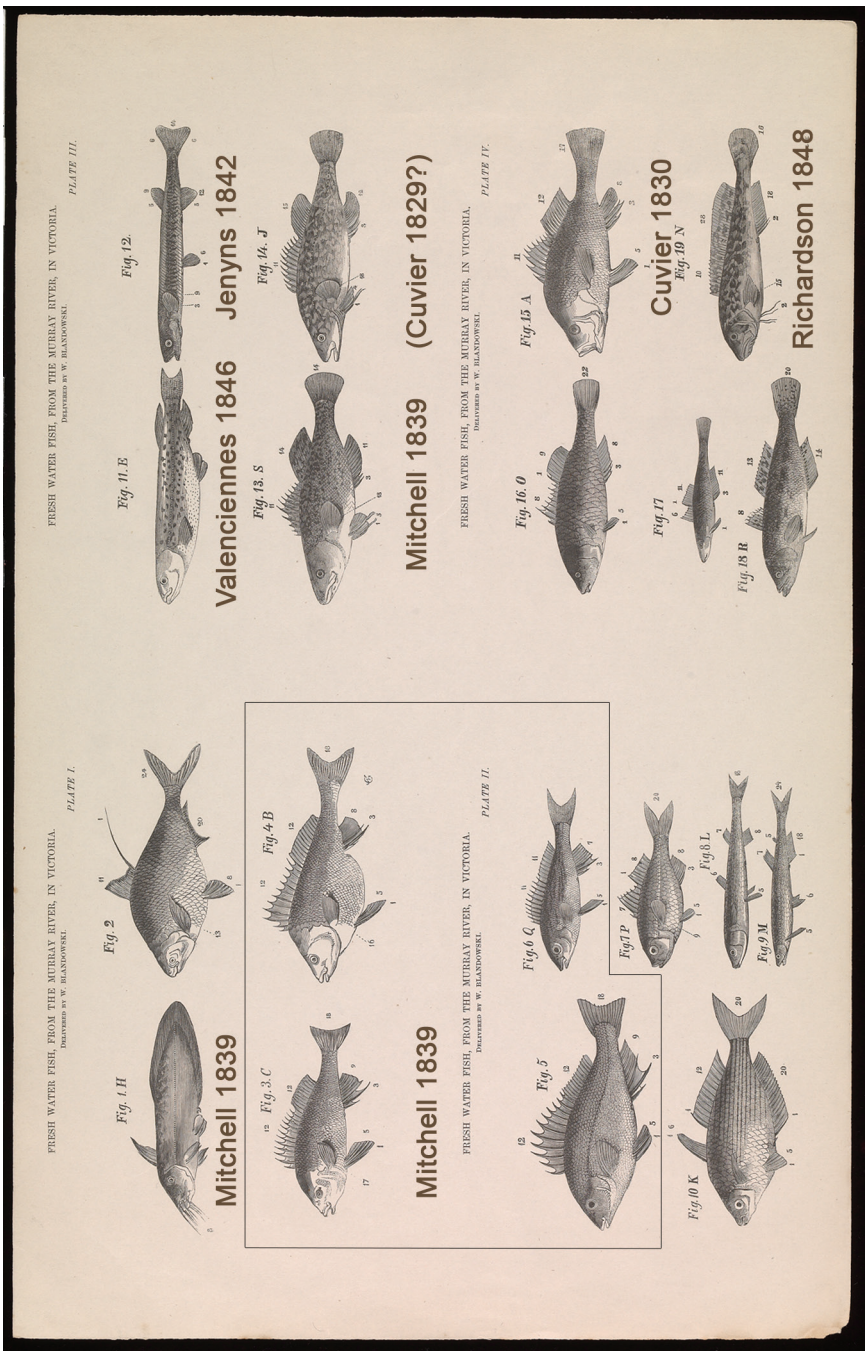

Fig. 2. Illustration of fishes collected from the junction of the Murray and Darling Rivers in 1856/57 with the dates and names of first scientific description. After Freshwater Fish from the Murray River in Victoria. Plates I, II, III, IV. William Blandowski (artist). F Grosse (Engraver). Museum Victoria.

Table 2. Species names, Blandowski's names, the number of the figure referred to in his paper, Aboriginal names, information on habitat, diet, distribution and size, whether the fish is still found at the junction of the Murray and Darling Rivers, and the type of habitat in which the fish is considered to occupy today.

Recognised species name	**Common name**	**Blandowski's species name**	**Blandowski's figure number**	**Aboriginal name**	**Habitat/diet**	**Distribution**	**Size**	**Remarks**	**Current distribution includes Murray at junction with Darling**	**Habitat from Lintermans (2007)**
Macquaria australasica Cuvier, 1830	Macquarie perch	*Tilka wilsonia*	Fig. 15 A	Pollugunder (Gunbower) or Birnnett (Loddon)	River & billabongs	Murray River	35-46 cm		No	Channel
Maccullochella peelii (Mitchell, 1838)	Murray cod	*Gristes peelii*	Fig. 13 S	Barnta		Murray & tributaries		Principal fish food for Aborigines	Yes	Channel
Maccullochella macquariensis? (Cuvier, 1829)	trout cod?	*Gristes macquariensis*	Fig. 14 J	Yaturr	River, associated with snag or rocks	Murray & tributaries	to 90-101 cm	Principal fish food for Aborigines	No	Channel
Bidyanus bidyanus Mitchell 1838	silver perch (small adult)	*Cernua bidyana*	Fig. 3 C	Baggack			to 46 cm		Yes	
Bidyanus bidyanus Mitchell, 1838	silver perch (large adult)	*Cernua eadesii*	Fig. 4 B	Buruitjall						Channel
Bidyanus bidyanus Mitchell, 1838	silver perch (large juvenile)	*Cernua nicholsonia*	Fig. 5	Karpa	River & billabongs, crayfish	Murray River	to 36 cm			Channel
Bidyanus bidyanus Mitchell, 1838	silver perch (small juvenile)	*Cernua ifflaensis*	Fig. 6 Q	Bipe purritjall	Only billabongs		5-7 cm			Channel
Tandanus tandanus Mitchell, 1838	freshwater catfish	*Plotosus tandanus*	Fig. 1 H	Kenaru	River & billabongs, 'Muddy spots', 'very small shells'	Murray River	to 60 cm, 3.2-3.6 kg	Good to eat; taboo to young men;	Yes	Slow-flowing streams and lakes

Table 2 (continued). Species names, Blandowski's names, the number of the figure referred to in his paper, Aboriginal names, information on habitat, diet, distribution and size, whether the fish is still found at the junction of the Murray and Darling Rivers, and the type of habitat in which the fish is considered to occupy today.

Recognised species name	Common name	Blandowski's species name	Blandowski's figure number	Aboriginal name	Habitat/diet	Distribution	Size	Remarks	Current distribution includes Murray at junction with Darling	Habitat from Lintermans (2007)
Galaxias rostratus Klunzinger, 1872	flat-headed galaxias	*Uteranka irvingii*	Fig. 12	Uterank		Murray River (& Yarra River)	to 18 cm	Rare in Murray River; main food of Macquarie perch.	No	Lower Murray lakes
Galaxias truttaceus Valenciennes, 1846	spotted galaxias	'Spotted trout'	Fig. 11 E	Poke	River & billabongs	Murray River (& Yarra River)	to 15-18 cm	"Becomes a fat, plump little fish"	No (possibly 1 juvenile collected near Wentworth)	Channel and lakes
Gadopsis marmoratus Richardson, 1848	river blackfish	*Brosmius bleasdalii*	Fig. 19 N	Paltk	Lives in mud, mostly in billabongs	Murray River (& Yarra River)	to 18 cm		No	Channel
Philypnodon grandiceps(?) Krefft,1864	flathead gudgeon		Fig. 17	Loetj	Billabongs		to 5 cm		Yes	Channel
Ambassis agassizii Steindachner, 1867	olive perchlet	*Cernua (?) wilkiensis*	Fig. 7 P	Mallupit	Billabongs		Very small		No	Channel and billabongs
Nematalosa erebi Günther, 1868	bony herring	*Megalope caillentassart*	Fig. 2	Manur		'Boston', Murray & Darling Rivers	25-35 cm	Good eating; especially June/ July; taboo to young women (aphrodisiac); placed on top of graves to indicate direction of killer.	Yes	Channel

Table 2 (continued). Species names, Blandowski's names, the number of the figure referred to in his paper, Aboriginal names, information on habitat, diet, distribution and size, whether the fish is still found at the junction of the Murray and Darling Rivers, and the type of habitat in which the fish is considered to occupy today.

Recognised species name	Common name	Blandowski's species name	Blandowski's figure number	Aboriginal name	Habitat/diet	Distribution	Size	Remarks	Current distribution includes Murray at junction with Darling	Habitat from Lintermans (2007)
Morgurnda adspersa Castelnau, 1878	purple-spotted gudgeon	*Kurrina macadamia*	Fig. 18 R	Koerin or Kurrin	Billabongs; small crayfish		Small		No	Channel and billabongs
Melanotaenia fluviatilis Castelnau, 1878	crimson-spotted rainbowfish	*Jerrina dobreensis*	Fig. 10 K	Jerrin	Billabongs mainly		to 13 cm	Roasted and eaten whole.	Yes	Channel and billabongs
Retropinna semoni Weber, 1895	Australian smelt	*Turruitja achenson*	Fig. 9 M	Turruitje	River & billabongs	Murray River			Yes	Channel and billabongs
Hypseleotris sp.(?)	carp gudgeon	*Collundera mülleriana*	Fig. 16 O	Collundera	Mainly billabongs		to 7.5 cm		Yes	
Craterocephalus stercusmuscarum fulvus Ivantsoff, Crowley and Allen, 1987	unspecked hardyhead	*Kohna mackennae*	Fig. 8 L	Kohn			to 7 cm		Yes, but lakes	Channel and billabongs

Fig. 3. Illustration of a juvenile silver perch, *Bidyanus bidyanus* Mitchell, 1838. Reproduced with permission of Museum für Naturkunde der Humboldt-Universität zu Berlin, Historische Bild- u. Schriftgutsammlungen. Bestand: Zool. Mus. Signatur: B VIII/. Blandowski Fish.

forms' of which Blandowski boasted, but is still almost half of all the wholly freshwater species that occur in the Murray-Darling Basin (Lintermans 2007). The discrepancy is because Blandowski did not recognise that there were four different life stages of silver perch (*Bidyanus bidyanus* Mitchell, 1838), although he could be forgiven for this mistake since the Nyeri Nyeri people clearly had names for each life stage (Fig. 3). Eight species were new to science (Humphries 2003a).

Blandowski, Krefft and their Nyeri Nyeri helpers collected a range of sizes and types of species, from the diminutive carp gudgeons (Blandowski's 1857 'fig. 16 O' in Figure 2), which rarely reach more than 40 mm, to the Murray cod (Blandowski's 1857 'fig. 13. S'), which would have typically grown to more than 1 m; from herbivores to piscivores; and from species which are main channel specialists to those that are mostly found in billabongs (Fig. 2, Table 2). The list includes most of the common species that would be expected to occur in this region, but by no means all. Golden perch is not illustrated, nor described, but specimens do occur in the Blandowski collection of Museum Victoria (Fig. 4). Southern pygmy perch (*Nannoperca australis* Günther, 1861) was absent also, but the olive perchlet (*Ambassis agassizi* Steindachner, 1867) (Blandowski's 1857 'fig. 7 P'), which was collected and illustrated, is quite similar in morphology to this species, and so may not have been included because Blandowski or the Nyeri Nyeri may have considered them the same species. Another possibility is that this species was not common in this region of the Murray-Darling Basin, as indeed it is not now, and was not encountered during the period of time at Mondellimin. This seems a little unusual, however, since another species – the spotted galaxias - that was thought until recently to be absent from the Murray-Darling Basin, was apparently collected during the expedition.

Despite the absence of an intact specimen and with only an illustration to go by, it is likely that Blandowski's 'fig. 11 R' is the spotted galaxias, *Galaxias truttaceus* Valenciennes, 1846 (Fig. 2). It is undoubtedly a galaxiid, because of its salmoniform shape, the single, posterior dorsal fin and the absence of an adipose fin. The large spots on the dorsum and

Fig. 4. Photograph of a golden perch, *Macquaria ambigua* Richardson, 1845, from the Blandowski Collection, Museum Victoria.

flanks, but not on the belly, are characteristic of this species, as are the dark margins of all fins except the caudal. Whilst there is a possibility that the individual collected was gravid and so more robust than normal, the specimen illustrated is clearly a deeper-bodied fish than the common galaxias/flat-headed galaxias line, and is shown as having spots, rather than bars, like the broad-finned galaxias, *Galaxias brevipinnis* Günther, 1866. There are two other issues which contribute to a degree of uncertainty about this species' identification and its occurrence in the collections: the absence of a bar through the eye and dark blotch behind the operculum and a question mark as to whether it was actually collected at the junction of the Murray and Darling Rivers. The slight morphological discrepancies can probably be put down to either natural regional variation or poor illustration, although it is possible that the species collected was Raadik's 'obscure galaxias' (*Galaxias* sp. 1), which has characteristics of the mountain galaxias (*Galaxias olidus* Günther, 1866) and the common galaxias/flat-headed galaxias group. The uncertainty of where it was collected can probably be dismissed because Blandowski gives its Nyeri Nyeri – the local people - name as *poke* and describes it as living in the river and billabongs, whilst also recognising that he has seen it living in the Yarra River near Melbourne. Iredale and Whitley (1932) identify the specimen from the illustration as the spotted galaxias and, with all things considered, I also lean toward that conclusion. However, without an extant specimen, there cannot be a definitive answer.

If, as I hypothesise, the species illustrated is indeed the spotted galaxias, its occurrence in this region is unusual, since it is normally considered to occur predominantly in coastal streams, although there are some landlocked populations in the central highland lakes of Tasmania (Humphries 1989). It is mainly coastal, because its life history normally includes a marine phase (diadromy): adults spawn in freshwater, the larvae are washed into estuaries and the sea after hatching and remain there until they migrate back into freshwater as juveniles. Whilst there have been records of other diadromous species considerably further upstream in the Murray River than at the junction with the Darling (Waite 1905; Lintermans 2007), this is the only record of this species, except for a questionable juvenile found at Wentworth in recent years (Dean Gilligan, personal communication) and some isolated populations in the headwaters of the Campaspe and Coliban Rivers (Humphries et al. 2002). The populations of the latter two rivers have been considered a result of translocations by anglers over the nearby Great Dividing Range, but if the occurrence of spotted galaxias in Blandowski's collections is true, this suggests that this species might have once been more widespread; that either coastal populations moved considerable distances upstream or that inland populations were essentially landlocked. Because coordinated fish surveys in the Murray River did not occur

until the late 1940s by J. O. Langtry (Cadwallader 1977), and since by this time there had been enormous environmental change wrought by pastoralism, commercial fishing, desnagging, river trade, weir construction, river regulation and nutrient enrichment, dramatic changes to the fish fauna, and even extirpation of species, may have occurred without leaving any record.

A degree of uncertainly remains if only because it appears that Blandowski sometimes interrogated his Nyeri Nyeri informants using illustrations from his notebooks as a guide. Darragh (this volume) records items from Blandowski's estate donated to the Royal Library, Berlin, including workbooks on the Mondellimin language, a dictionary of Aboriginal languages and a 'Native vocabulary about Natural History and things belonging to them'. An example where Blandowski may have used an illustration rather than a specimen involves his watercolour of *Galaxias rostratus* Klunzinger, 1872 (MfN,ZMB, B VIII / 448). Landsberg (this volume) notes that this specimen was collected from the Yarra and from Collingwood in 1853. It has the Nyeri Nyeri term 'uterank' pencilled beneath it, presumably identified by a Nyeri Nyeri informant. She also observes that a second illustration of *Galaxias rostratus,* (MfN, ZMB, B VIII / 447) '…painted in a more artificial style' was the source for figure 12 in Blandowski's (1857) publication. While Frederick Grosse did the engravings for the Plates, Krefft identifies Grosse's business partner, Nicolas Chevalier, as having reworked some of Blandowski's originals for these plates (in Darragh, this volume).

ECOLOGICAL AND DISTRIBUTIONAL KNOWLEDGE

In his 1857 paper to the Philosophical Institute, Blandowski provided only scant information on the distribution, habitat and biology of the fishes that were collected during the expedition and, as I have stated above, there is considerable uncertainty as to the exact location of collections (Table 2). However, as far as I can tell this was the first published ecological information for any species of freshwater fish from the Murray-Darling Basin and there was little to match it for some decades after. Most species were given Nyeri Nyeri names and Blandowski proposed scientific names for those that he considered were undescribed at that time. Whilst the numbers of fin rays and spines were given for most species, adequate morphological descriptions that might have given authority to Blandowski were provided for only four of them and the descriptions were never available to the scientific community at large (Humphries 2003a).

The maximum sizes of species detailed by Blandowski in his 1857 paper are remarkably similar, for the most part, to those given in current textbooks on Murray-Darling Basin freshwater fishes (Fig. 5). There are some species for which Blandowski provides no lengths, but for those he did, this gives us greater confidence in confirming – or otherwise – the identification of species. For flathead gudgeon, river blackfish, bony herring and catfish, Blandowski's sizes are underestimates of maximum sizes. However, this could be put down to regional variation and the relatively limited period that the expedition was collecting at Mondellimin. Blandowski's estimate of maximum size for the species thought to be trout cod is greater than is currently given. It may be that trout cod 150 years ago did reach greater sizes than nowadays, but it is also possible that, since Murray cod typically reaches greater sizes than its conspecific, that in fact this fish is a Murray cod.

The striking feature of the information about habitat for the fish collected by the expedition, was the number of species which apparently occurred in billabongs and/or the main channel of the river versus those that only lived in the main channel. Only the species that may have been trout cod or Murray cod (Blandowski's 'fig. 14. J') was considered to occur in the '…river, associated with snag or rocks' (Blandowski 1857). Of the remaining 12 forms described (I include here the various life stages of silver perch), seven were only or mainly found in billabongs and five were found in the river *and* billabongs. This is in contrast to current descriptions of the most common habitat for some species (Table 2). For example, Macquarie perch, small juvenile silver perch and river blackfish (Fig. 6) are not thought currently to be associated with floodplain habitats (Cadwallader & Backhouse 1983; Koehn & O'Connor 1990; McDowall 1996; Lintermans 2007), yet the first was, according to Blandowski, found in both habitats, and the second and third only or predominantly in billabongs. Have changes to the environment since 1857 (a large part of the river is now a series of long lakes, formed behind locks which began to be built in the 1920s, and the river is now, for the most part, isolated from its floodplain) altered the types of habitat that these species once occupied in the lower Murray to such an extent that they are no longer habitable? Or were

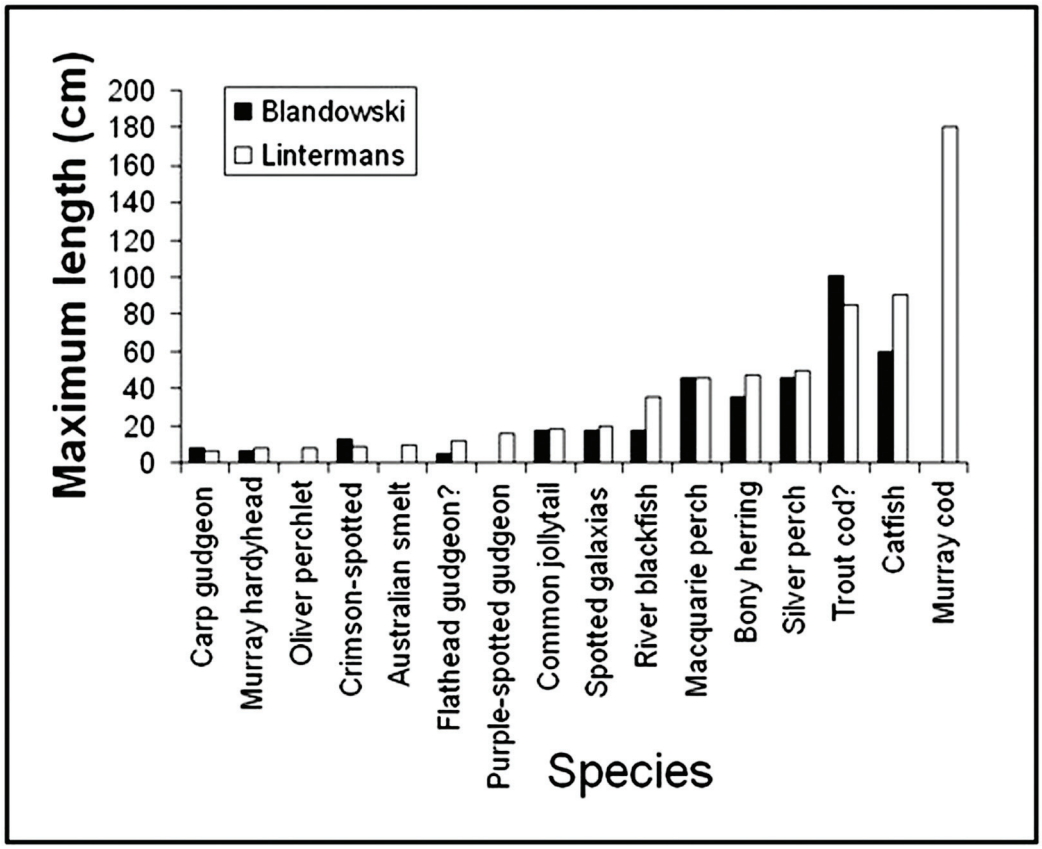

Fig. 5. Maximum length (cm) given by Blandowski and Lintermans (2007) to species of Murray-Darling Basin fishes.

Blandowski's informants mistaken? Nowadays the species mentioned are either not common or entirely absent from the lower Murray region and so much of our knowledge of their habitat associations are from other areas, which may not be indicative of the types of habitats that these species may have occupied under more 'natural' conditions.

As for food, the information is even more sparse, but again, groundbreaking for its time. Large juvenile silver perch are described as eating crayfish, which is not consistent with current descriptions of a more omnivorous diet, nor logical considering their small mouth (Table 2); catfish apparently ate 'very small shells', which are certainly included in their diet in more modern times, although they are not restricted to these; and purple-spotted gudgeons apparently ate small crayfish, which may be a subset of their present-day generalist carnivorous diet (Lintermans 2007).

Murray cod and possibly trout cod were the principal food fishes of the Nyeri Nyeri, which is consistent with other contemporaneous descriptions, although catfish and silver perch are also often mentioned (Mitchell 1838; Sturt 1982). Catfish were described as being good to eat and crimson-spotted rainbowfish (Fig. 7) were roasted and eaten whole. Bony herring were considered good eating (although it is interesting that there was no mention of the enormous numbers of fine bones that these fish possess), an aphrodisiac and so taboo to young women, and were placed on top of graves of people thought to have been murdered so that the elongated dorsal spine would indicate the direction of the killer (Blandowski 1857).

WHY WAS BLANDOWSKI SO SUCCESSFUL IN HIS COLLECTION OF FISH?

Blandowski is probably unrivalled in the success of his endeavours in freshwater ichthyology in Aus-

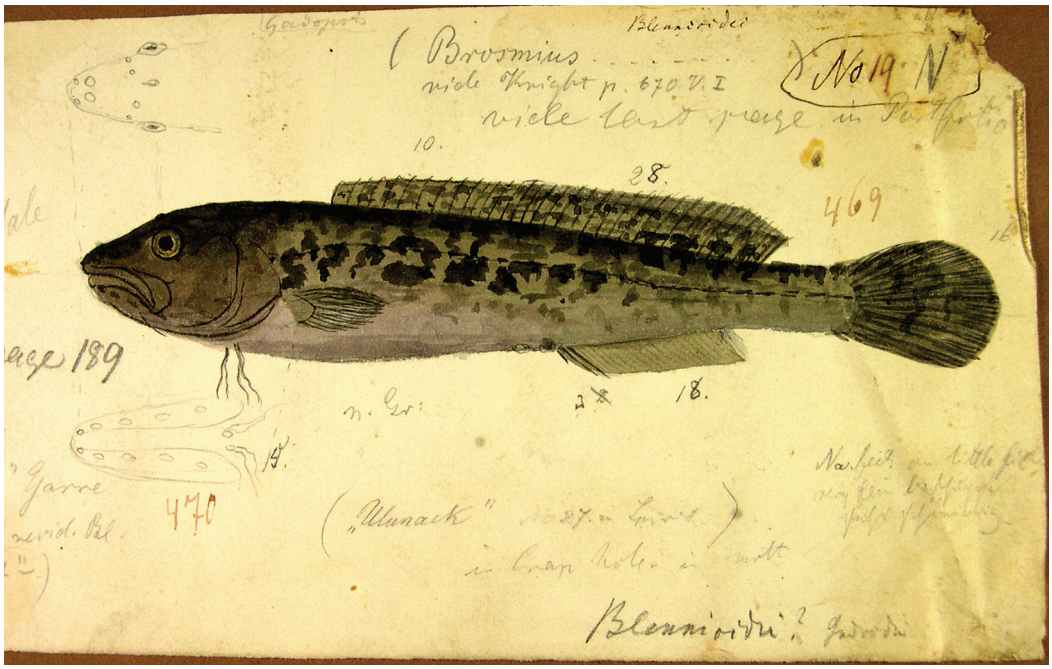

Fig. 6. Blandowski's illustration of an adult river blackfish, *Gadopsis marmoratus* Richardson, 1848. Reproduced with permission of Museum für Naturkunde der Humboldt-Universität zu Berlin, Historische Bild- u. Schriftgutsammlungen. Bestand: Zool. Mus. Signatur: B VIII/ Blandowski Fish.

tralia. The fish collections he, Krefft and the Nyeri Nyeri made in 1856/57 included more species and more ecological information than any similar collection up to that time. At least for the Murray-Darling Basin, the number of undescribed species collected has probably never been surpassed (Table 1). Krefft coordinated fish (and other animal) collecting while he was director of the Australian Museum in Sydney and either described them himself (Krefft 1864) or sent them overseas to Albert Günther at the British Museum (Günther 1859, 1861, 1863, 1866, 1868). But this effort over many years only amounted to six new freshwater species (including flathead gudgeon, which had been included in Blandowski's 1857 paper). Ferdinand von Mueller (1825-1896) collected fish during the A.C. Gregory expedition to northern Australia in 1855/6 and presumably prior to his time as director of the Melbourne Botanical Gardens, and some of these made their way to Franz Steindachner in Vienna (olive perchlet, long-finned eel and Hyrtl's tandan, Steindachner 1867) and to Carl Benjamin Klunzinger in Stüttgart (flat-headed galaxias and Yarra pygmy perch, Klunzinger 1872). This included another six new species, but again it took many years and at least four scientists to accomplish.

As far as Australian-based collectors and describers, only Castelnau comes close to Blandowski. Castelnau described a number of species of fish by frequenting the Melbourne fish markets, but received the two species of Murray-Darling Basin fishes that he described from other collectors (Castelnau 1878). He bemoaned the tendency for Australian natural history specimens to be exported to European experts who had little knowledge or understanding of the Australian environment, although it must be stated that he was responding to criticism of his taxonomy by Albert Günther:

> To put an end to these remarks, I will only add that I think that when zoologists have long resided in a locality, and have made its productions the object of a particular study, such as Ruppell, Bleeker, Day etc, their opinion is of greater value than that of a man, whatever may be his scientific acquirements, who remains in his study in Europe. A visit to a fish market, in bringing under your eyes thousands of specimens of a sort, will certainly lead you to a more correct idea of its variations than can be obtained by the residing zoologist, who only has at his disposition one, or in all cases, a very few specimens,

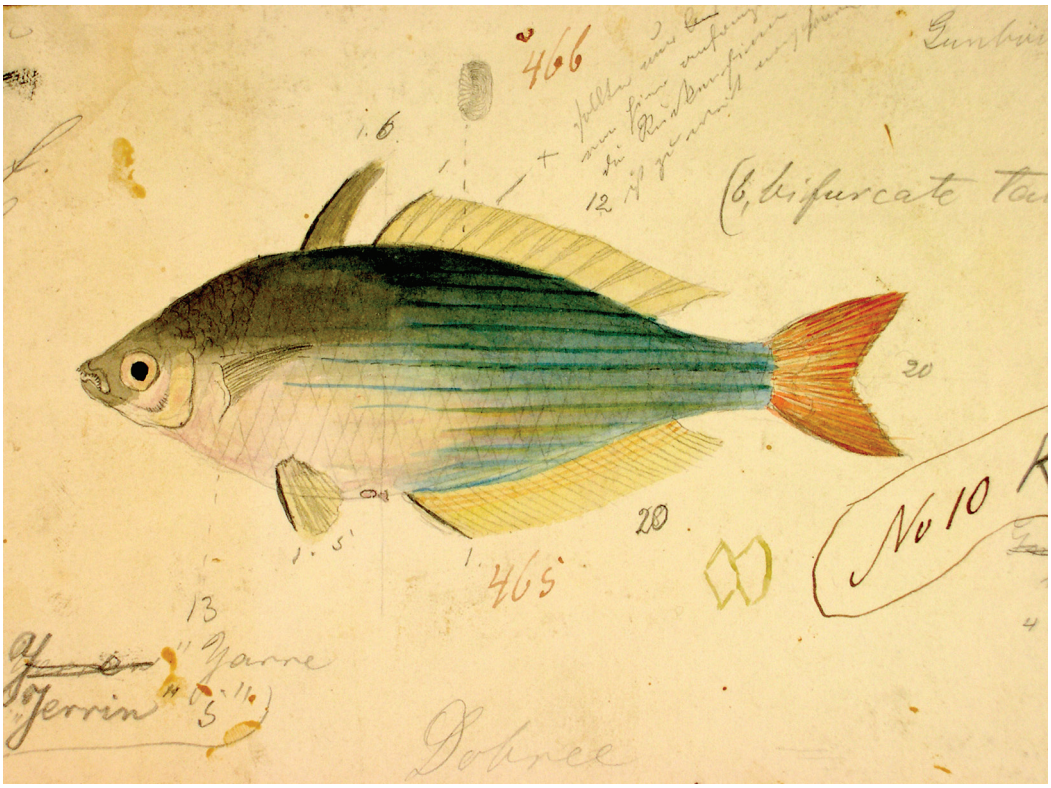

Fig. 7. Blandowski's illustration of an adult crimson-spotted rainbowfish, *Melanotaenia fluviatilis* Castelnau, 1878. Reproduced with permission of Museum für Naturkunde der Humboldt-Universität zu Berlin, Historische Bild- u. Schriftgutsammlungen. Bestand: Zool. Mus. Signatur: B VIII/ Blandowski Fish.

> having lost their colours, and more or less their form, by dessication (sic) or preservation in spirits (Castelnau 1872:37).

Blandowski's success can therefore be attributed partly to him being 'on the ground', heading his own expedition after several years of experience with the Australian environment and the natural history scene there, and partly due to his (and perhaps Krefft's) insightful and enlightened decision to enlist the help of the local indigenous population, the Nyeri Nyeri people. This was, I suggest, a masterstroke. Blandowski may not have been unique in his recognition and use of indigenous knowledge in natural history collecting – although in the mid-1800s this was unusual – but he was certainly unique in the candid manner in which he accredited the assistance and knowledge of the local people:

> ….I now beg to lay before you the result of my labours, observing in the meantime, that the mechanical part–viz, that of preserving the specimens–was done by white labourers alone, whilst the specimens were obtained by the assistance of the aborigines, to whom I am indebted for all the information and discoveries I have made, so that I can but claim a small share of the credit of having with my party, been successfully exploring the desert of Australia for eight months (Blandowski 1857:127).

This is a remarkable statement from one who received the ire of the scientific elite back in Melbourne for being arrogant and insulting (Paszkowski 1967). His sympathetic and enlightened attitude towards the Aborigines inadvertently shone through in Krefft's narrative of the first part of the expedition (Krefft n.d.), especially in relation to his attitude towards the young Aborigine Buckley, with whom he shared his blanket, trusted with his possessions and sent off to find a runaway horse. It showed a degree of trust and respect that was unusual for that era and that Krefft found galling.

As I have said, Blandowski was not the only naturalist to utilise indigenous knowledge at that time

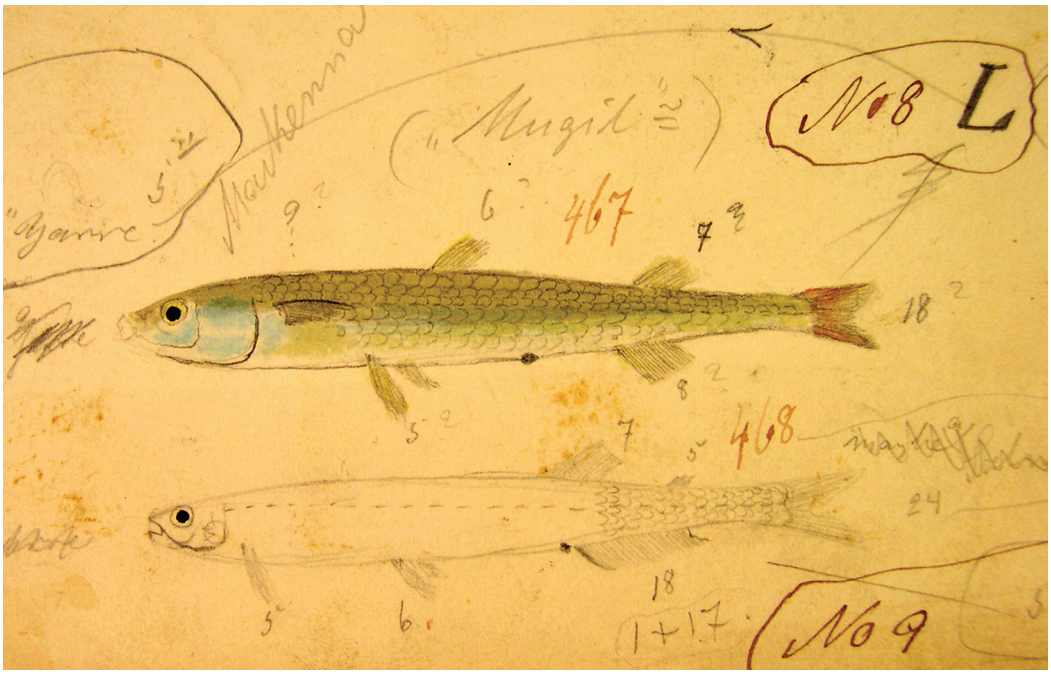

Fig. 8. Blandowski's illustration of an adult unspecked hardyhead, *Craterocephalus stercusmuscarum fulvus* Ivantsoff, Crowley and Allen, 1987 (top), and an adult Australian smelt, *Retropinna semoni* Weber, 1895 (bottom). Reproduced with permission of Museum für Naturkunde der Humboldt-Universität zu Berlin, Historische Bild- u. Schriftgutsammlungen. Bestand: Zool. Mus. Signatur: B VIII/ Blandowski Fish.

and after. For example, Mitchell documented the assistance rendered by Aboriginal people during his expeditions (Mitchell 1838), Georgiana Molloy, the wife of a local magistrate in south-west Western Australia, was befriended by, and gained much instruction on plants from, the local Aboriginal people in the early 1800s (Lines 1994) and Baldwin Spencer's 1894 Horn expedition to central Australia and collections thereafter benefited from local Aboriginal knowledge and collecting (Morton & Mulvaney 1996). But Blandowski clearly recognised the existence of the Nyeri Nyeri's knowledge and the limitations of his own, which was not consistent with his contemporaries (Griffiths 1996)[1]. Whatever Blandowski's motivation for using Aboriginal collectors, it was largely the reason for his great success in procuring so many species of fish.

THE SITUATION TODAY

Of the 15 species which are presumed to have been collected at the junction of the Murray and Darling rivers in 1856/57, seven are no longer found there (Table 2). Macquarie perch, trout cod, common galaxias, spotted galaxias, river blackfish, olive perchlet, southern purple-spotted gudgeon, and Murray hardyhead (Fig. 8) have not been recorded from the flowing waters in this region since 1980 (although there are populations of the last species from two lakes in the Mildura area) (Lintermans 2007). In addition, in Victoria, freshwater catfish is considered vulnerable, Macquarie perch, Murray cod and Murray hardyhead are considered endangered, silver perch and trout cod as critically endangered, and southern purple-spotted gudgeon and olive perchlet as extinct (Victorian Flora and Fauna Guarantee Act 1988; Lintermans 2007). These last two species are listed as endangered in New South Wales and South Australia. Alien species, such as common carp (*Cyprinus carpio* Linnaeus, 1758), goldfish (*Carrasius auratus* Linnaeus, 1758), eastern gambusia (*Gambusia holbrooki* Girard, 1859) and European perch (*Perca fluviatilis* Linnaeus, 1758), however, are now abundant.

The reasons for such a dramatic decline in distribution and abundance of most species of fish in the Murray-Darling Basin since the mid-1800s are many,

and no doubt relate to the huge environmental changes that have occurred since that time. Beginning with the displacement of Aboriginal people and settlement of the river districts in the late 1830s and early 1840s, then commercial fishing (from 1855), river trade and desnagging (from about 1860), introduction of alien species (from 1860s), weir building and river regulation (increasing dramatically from 1890) and lock construction (1920s onwards), the native fish have had a lot to contend with and have not fared well. The Murray-Darling Basin Commission has set a target of getting native fish communities back to 60% or better of their pre-European settlement state by about 2053. This will involve a six-pronged strategy, which will include dealing with flow regulation, allowing fish passage, controlling alien species and restoring habitat (Murray-Darling Basin Commission 2003; Lintermans 2007). Already, much research and on-ground work is being done to provide fish passage from the sea to Lake Hume, to restore instream habitat, deal with cold-water pollution and manage flows better in the River Murray. It is early days yet, and it will be a long, hard battle to achieve any resemblance to that which Blandowski, Krefft and the Nyeri Nyeri encountered at Modellimin 150 years ago.

CONCLUDING REMARKS

Wilhelm Blandowski's collecting and naming of fish has gone down in the annals of Australian science history as an amusing episode exposing the sensibilities of 19th Century Victorian scientists. Blandowski himself has been portrayed at best as one who misread the mood of the scientific elite of Melbourne and at worst as one who was arrogant and deliberately insulting. But the episode is far more important than that, and there are some significant lessons to be learned. Firstly, Blandowski was clearly in the right place at the right time. He arrived in Victoria at an opportune moment in its history, when learned societies were being formed, museums founded and money was relatively plentiful because of the gold boom. Nevertheless, Blandowski had set his mind on investigating natural history in Australia and was single-minded in his attitude once he obtained his position at the National Museum. His drive and enthusiasm, as well as being ably supported by the intensely critical, but talented Gerard Krefft, stood him in good stead to achieve great things. In all the collecting and describing of new species, the role of Krefft remains uncertain, and while Blandowski acknowledges Krefft's input (which was more than Krefft did in his own publications), we have little data on which to assess the two scientists' relative contributions. Krefft was clearly a gifted naturalist and artist, as evidenced by his illustrations during the expedition and his future work, and it is logical to assume that his role and contributions were significant. Secondly, Blandowski's confidence to consider himself qualified to describe species of fish, rather than send them off to European experts, as had been done and which continued for decades afterwards, catapulted him well beyond his contemporaries, at least in the ichthyological sphere, if not in natural history generally in Australia. Thirdly, observing terrestrial fauna and flora is relatively straightforward. Many species of birds, for example, can be observed by the naked eye and shot with guns. Presumably, this is why bird species tend to be described by scientists early in exploration of new lands (Finney 1984). But to collect and describe freshwater fish, I believe, takes a leap of imagination and insight. Fish are something that largely cannot be seen and for which one must get ones feet wet to collect. It symbolises, both literally and figuratively, I think, a deeper appreciation of natural history. Lastly, and probably most importantly, his recognition of existing indigenous knowledge and his use of it was amazingly astute for its time. Few of his contemporaries utilised this knowledge to the same extent, and even fewer acknowledged it. Even today, there is little recognition of how profound the pre-European role of Aboriginal people was in exploiting and modifying freshwater environments (Humphries 2007). The collections from the region at the junction of the Murray and Darling Rivers that benefited so much from the indigenous knowledge of the Nyeri Nyeri have given us some of the only information from which we can describe the pre-European fauna and from which we can judge how things have changed since that time.

Wilhelm Blandowski, despite his many faults, was ahead of his time and the recognition of his contribution to the natural history of Australia is well and truly overdue. Hopefully, this special issue and the associated symposium have gone some way towards redressing the oversight.

ACKNOWLEDGEMENTS

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NOTES

1. To be fair, however, it appears that Krefft later changed his attitude towards the Aboriginal helpers and writes in detail about the specimens of vertebrates brought to him and their communication of the habits of the animals that they collected (Krefft 1866a).

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