



The identity of *Chelodina oblonga* Gray 1841 (Testudines: Chelidae) reassessed

GLENN SHEA^{1,2}, SCOTT THOMSON³ & ARTHUR GEORGES⁴¹ Sydney School of Veterinary Science, B01, University of Sydney, NSW 2006 Australia✉ glenn.shea@sydney.edu.au; <https://orcid.org/0000-0002-0052-4205>² Australian Museum Research Institute, Australian Museum, 1 William St, Sydney, NSW 2010, Australia³ Chelonian Research Institute, 402 South Central Avenue, Oviedo, 32765, Florida, USA✉ scott.thomson321@gmail.com; <https://orcid.org/0000-0003-1279-2722>⁴ Institute for Applied Ecology, University of Canberra, ACT 2601 Australia✉ georges@aerg.canberra.edu.au; <https://orcid.org/0000-0003-2428-0361>

Abstract

The identity of *Chelodina oblonga* has been unclear because it has been variously defined to include populations of snake-necked chelid turtle from the southwest of Western Australia, across northern Australia, Cape York and southern New Guinea in its broadest conception, from just the northern part of this range (northern Australia and New Guinea), or restricted to the southwest corner of Western Australia in its narrowest conception. Uncertainty over the identity of the type specimens has added to the confusion. In this paper, we review the historical data on the extent of the type series of *Chelodina oblonga*, and its potential provenance, and find evidence that resolves some of the inconsistencies in previous literature on the identification of the type. Our analysis casts doubt on the northern Australian provenance of the type material. Hence, we return the name *C. oblonga* to the south-western species, in accordance with the genetic evidence for the provenance of the type in the Natural History Museum, London, and the external morphology of the type series. We designate a lectotype for the species, and redefine the subgeneric names that apply to the Australasian genus *Chelodina*, providing a new subgeneric name for one lineage.

Key words: Oblong turtle, *Chelodina rugosa*, *Macrochelodina*, chelid, freshwater turtle, taxonomy

Introduction

The identity of *Chelodina oblonga* has been subject to considerable debate in recent times leading to considerable confusion and taxonomic instability. The issue surrounds the identity of the purported type specimen, its provenance, and recent availability of mitochondrial sequences from this type specimen. In this paper, we review the available information and re-assign *Chelodina oblonga* J. Gray 1841 to the populations of snake-necked chelid turtle of south-western Western Australia.

The Australian chelid turtle *Chelodina oblonga* was described by John Edward Gray (1841) in a natural history appendix to the published journals of two expeditions to Western Australia by the explorer George Grey (G. Grey 1841). Despite the description being so published, there is nothing in the description to suggest that the type material was collected by Grey—Gray's paper on reptiles and amphibians was a listing of the species previously recorded from Australia, with the description of several new species that had been recently collected, mostly lodged in the British Museum in London (later the British Museum (Natural History), and now the Natural History Museum; BMNH) and the Museum of the Army Medical Service at Chatham. Of the species listed in the paper, George Grey is recorded therein as collector/donor for only two: the morphologically spectacular agamids *Chlamydosaurus kingii* and *Moloch horridus*.

The name *oblonga* was subsequently applied to the sole *Chelodina* species of south-western Australia by Goode (1967), who distinguished that species from a more widespread northern Australian taxon, for which Goode applied the name *Chelodina siebenrocki* Werner 1901 following Siebenrock (1915). The earlier name *Chelodina rugosa* Ogilby 1890 was shortly afterward resurrected for the northern Australian taxon (Cogger & Lindner 1974; Burbidge *et al.* 1974).

Doubts about the application of the name *oblonga* to the south-west Australian species were first raised by Cann (1998), who suggested that the illustration labelled as *Chelodina oblonga* by Gray (1856a) more closely resembled northern Australian populations. Thomson (2000) re-examined the type specimen in the BMNH, and on the basis of three osteological characters, considered the specimen to represent northern Australian populations rather than the south-west species, although this contradicted an earlier finding (Rhodin & Mittermeier 1977) that this specimen possessed exposed neural bones, a feature present in the south-western species and not in the northern species. Despite Thomson's recommendation that existing usage be maintained until the ICZN could be requested to rule on the issue to maintain stability of application of the name *oblonga*, advice followed by Georges and Thomson (2010), Fritz and Havaš (2007) transferred the name *oblonga* to northern Australian *Chelodina*. A proposal by Thomson (2006) to reject the name *oblonga* in favour of the more commonly used name *rugosa* for northern Australian *Chelodina* was rejected by the International Commission for Zoological Nomenclature (2013), leaving *oblonga* as a senior synonym of *rugosa*, and the name to be used for that species, with the former junior synonym *Chelodina colliei* Gray, 1856b resurrected for the south-western species. The clarity provided by the decision of the Commission had important consequences for subgeneric designations in the genus *Chelodina* (Georges & Thomson 2010) which we address later in this paper.

TABLE 1. Taxonomic and nomenclatural changes to the south-western Australian and widespread northern Australian snake-necked turtles.

	South-western taxon	Northern Australian taxon
Gray (1841)	<i>Chelodina oblonga</i> Gray 1841	
Gray (1844)	<i>Chelodina oblonga</i>	<i>Chelodina oblonga</i>
Gray (1856a,b)	<i>Chelodina colliei</i> Gray 1856, <i>Chelodina oblonga</i>	<i>Chelodina oblonga</i>
Boulenger (1889)	<i>Chelodina oblonga</i>	<i>Chelodina oblonga</i>
Goode (1967)	<i>Chelodina oblonga</i>	<i>Chelodina siebenrocki</i> Werner 1901
Cogger & Lindner (1974); Burbidge <i>et al.</i> (1974)	<i>Chelodina oblonga</i>	<i>Chelodina rugosa</i> Ogilby 1890
Wells & Wellington (1985)	<i>Macrochelodina oblonga</i>	<i>Macrochelodina rugosa</i>
Fritz & Havaš (2007)	<i>Chelodina colliei</i>	<i>Macrochelodina oblonga</i>
McCord & Joseph-Ouni (2007a)	<i>Macrodiremys oblonga</i>	<i>Macrochelodina rugosa</i>
Georges & Thomson (2010)	<i>Chelodina (Macrodiremys) colliei</i>	<i>Chelodina (Macrochelodina) oblonga</i>
Kehlmaier <i>et al.</i> (2019)	<i>Chelodina colliei</i>	<i>Chelodina rugosa</i>

Cann and Sadlier (2017) discussed the potential provenance of the BMNH type specimen, first considering the potential for it to have been collected by John Gould's collector John Gilbert when he visited the Port Essington region of the Northern Territory (as also proposed by Cann 1998 and Thomson 2000), concluding that it was possible for it to have reached London in time for J. Gray's (1841) description. However, they also noted this was not compatible with Gray's stated type locality of "West Australia", and that the specimen did not fully accord morphologically with subsequently collected material from the Port Essington area, and hence further explored the potential for the specimen to have been obtained by George Grey or John Lort Stokes in the northwest Kimberley region, during earlier explorations of the region by the *Beagle*. However, they were unable to match the BMNH type to the morphology of north-west Kimberley populations either. Despite this, they continued to apply the name *oblonga* to the widespread northern Australian species distributed from south-western drainages of the Gulf of Carpentaria, across the Top End of the Northern Territory, to near the Finnis River in the west. Some Kimberley populations formerly ascribed to *C. rugosa/oblonga* were described as a new taxon, *Macrochelodina walloyarrina*, by McCord and Joseph-Ouni (2007a), which was treated as a subspecies of *C. oblonga* by Cann and Sadlier (2017). While several checklists and catalogues (e.g., van Dijk *et al.* 2014; Rhodin *et al.* 2017; Uetz *et al.* 2019) recognise the taxon, the name *Macrochelodina walloyarrina* has been rejected as unavailable by some, owing to being published in a magazine outside the accepted channels for bringing observations or analysis into the body of science, with the naming not being coincident with an adequate and scientifically defensible description or diagnosis by modern standards (following Kaiser *et al.* 2013; Kaiser 2014). Others have synonymized the taxon with *Chelodina burrungandjii*

Thomson, Kennett & Georges 2000, a species described from Arnhem Land, because the analysis supporting the new taxon is inadequate (Georges & Thomson 2010) and disregards the observation that the Kimberley and Arnhem Land populations were not distinguishable when compared using allozymes but instead formed a single diagnosable taxon (Georges *et al.* 2002). Hence, to recognise the morphological and geographic distinction despite the absence of genetic differentiation, we treat *walloyarrina* as a subspecies of *C. burrungandjii* (contra the specific status proposed by Rhodin *et al.* 2017)

Most recently, a mitogenomic study examined the identity of a number of early chelid type specimens, and found that the sequences from the BMNH type of *Chelodina oblonga* did, in fact, match closely with the south-western Australian taxon, and not with the northern long-neck populations (Kehlmaier *et al.* 2019). Despite this, the apparent inconsistency between the mitogenomic evidence and the osteological evidence (Thomson 2000) and a desire to maintain nomenclatural stability led to Kehlmaier *et al.* (2019) recommending treatment of the name *oblonga* as a *nomen dubium*, retaining the name *C. colliei* for the south-western Australian taxon and restoring the name *C. rugosa* for the northern long-neck populations.

A summary of the nomenclatural and taxonomic changes relevant to the south-western and northern Australian snake-necked turtles is presented in Table 1.

In this paper, we review the historical data on the extent of the type series of *Chelodina oblonga*, and its potential provenance, and find evidence that resolves some of the inconsistencies in previous literature on the identification of the type. Our analysis casts doubt on the northern Australian provenance of the type material. Hence, we return the name *C. oblonga* to the south-western species, in accordance with the genetic evidence for the provenance of the BMNH type, and examination of the external morphology of the type series.

1. The extent of the type series of *Chelodina oblonga*.

The description of *Chelodina oblonga* by Gray (1841) is given over four paragraphs, accompanied by an illustration. The first paragraph is descriptive, and terminates in a stated locality of Western Australia. The next two paragraphs provide a comparison with the previously-described species *Chelodina longicollis*, and the final paragraph comments on size and features of the skin. This final paragraph states:

“This species grows to a large size. Mr. Gould brought a specimen which he gave to Mr. Bell, which is 11 inches long, and the neck is nearly equally long, very thick, and studded with large warts; the head is broad and depressed, covered with a thin skin, like a *Trionyx*, and marked with small thin scales.”

A specimen in the Natural History Museum in London (Fig. 1), which received the collections originally lodged in the British Museum, and which was initially registered there as 40.12.9.81 (now reregistered as 1947.3.5.89), closely matches the illustration provided by Gray (1841) in his plate 7 (reproduced here as Fig. 2), including details of asymmetries in the positions of limbs and digits, longitudinal division of the fifth vertebral shield, and an extremely foreshortened neck, with the head and neck mounted as for short-necked chelid species. The description of shell morphology provided in the first paragraph by Gray (1841) also matches this specimen, and there is little doubt that it is the specimen illustrated by Gray in his description of the species (as subsequently also stated by Gray 1844, 1856a). This specimen, which has been frequently identified as the holotype of the species (Rhodin & Mittermeier 1977; Cogger *et al.* 1983; King & Burke 1989; Cann 1998; Thomson 2000, 2006; Georges & Thomson 2010; van Dijk *et al.* 2014; Cann & Sadlier 2017; Uetz *et al.* 2019), has been illustrated by Cann (1998), Thomson (2000) and Cann and Sadlier (2017). Gray (1873) provided the first measurements of this specimen, noting a carapace length of only 6 $\frac{3}{4}$ inches (171 mm), much shorter than the 11 inches stated in the type description, and there is no record of any association of Bell (Thomas Bell, a noted researcher on chelonians of that era) with this specimen. It is instead associated with the locality Western Australia, and donor Gould.

The vast majority of Bell's collection of chelonians (Nowak-Kemp 2009; Nowak-Kemp & Fritz 2010) instead passed via the Rev. F.W. Hope to the Oxford University Museum of Natural History (OUMNH). There is one specimen identified as *Chelodina oblonga* among the Bell chelonian collection: OUMNH 2584 (Figs. 3–4), a stuffed and mounted specimen with a straight carapace length of 257 mm (10 $\frac{1}{8}$ inches) and a curved carapace length of 268 mm (10 $\frac{1}{2}$ inches), bearing only the locality data West and North-West Australia and the donor Bell. This specimen,



FIGURE 1. Ventral, left lateral and dorsal views of the lectotype of *Chelodina oblonga* Gray (BMNH 1947.3.5.89). The lateral image is slightly dorsally angled, affecting the profile of the carapace. (Image courtesy of P. Campbell, BMNH).

like the BMNH specimen, has a somewhat foreshortened neck due to the taxidermy process, but in this case, the outstretched neck approximates the carapace length, matching the description of relative neck length in the last paragraph of Gray's description, and in contrast to the much shorter neck in the BMNH specimen, the latter matching the illustration accompanying the description. The OUMNH specimen is likely to be the "11 inch" specimen referred to by Gray (1841), representing a second member of the type series of *Chelodina oblonga*. The existence of this specimen explains the discrepancy between the small size of the BMNH type and the only measurement provided in the description. Gray presumably based his description primarily on the specimen in the collection under his responsibility, which he was able to have illustrated, and mentions the size of the specimen in Bell's collection, which he may only have seen briefly, to demonstrate that the species grows to a larger size than represented by the BMNH specimen. Gray did not specifically identify the BMNH specimen as a holotype, or "type" in his original description, and hence both the BMNH and OUMNH specimens must be considered syntypes.

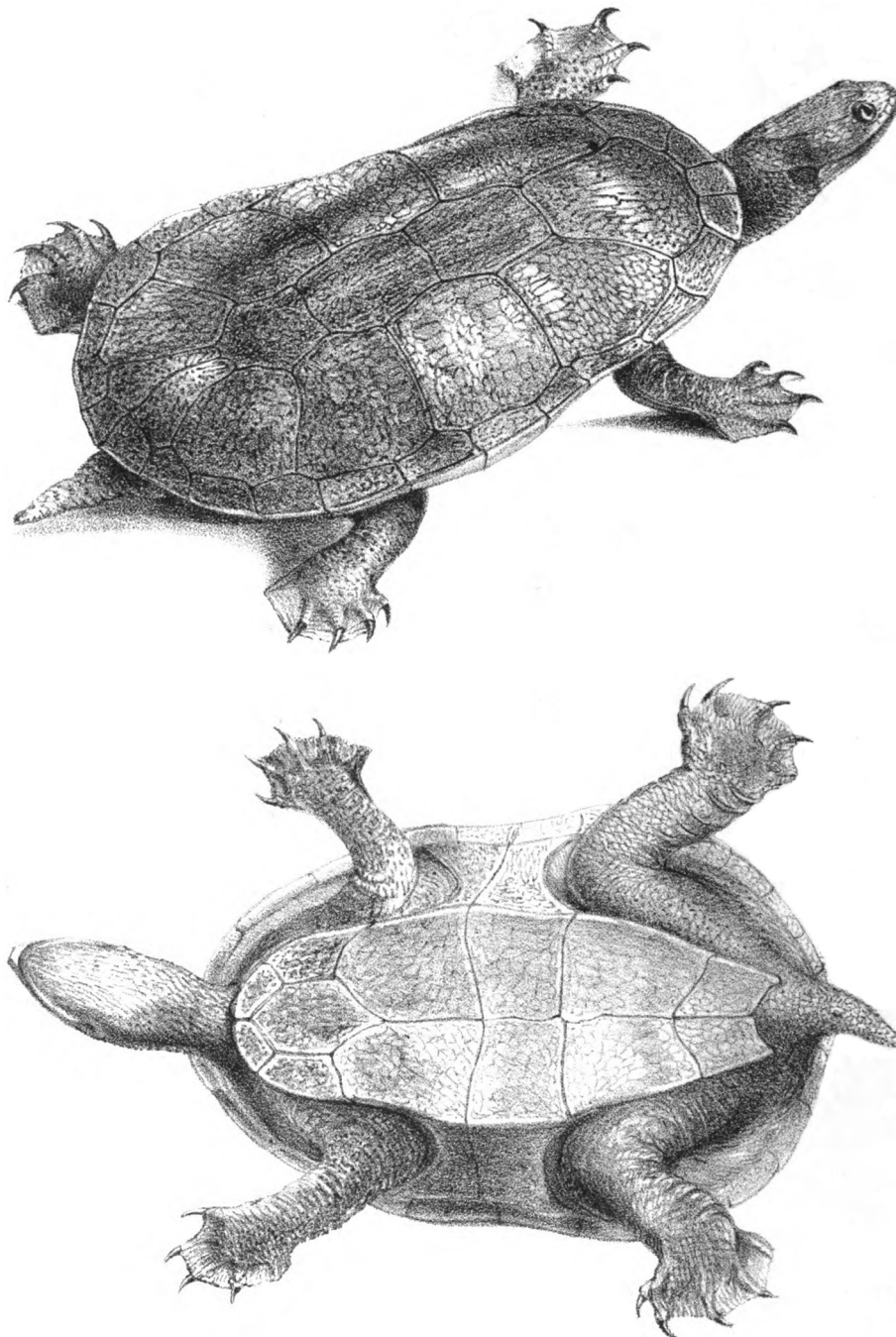


FIGURE 2. Illustration of *Chelodina oblonga* by Gray (1841), based on BMNH 1947.3.5.89. Compare with photographs of the same specimen in Figure 1.

Cann (1998) expressed doubt about the species identity of the specimen illustrated as *Chelodina oblonga* by Gray (1856a). However, the specimen illustrated by Gray (1856a) is clearly not the same one as illustrated in the type description of 1841. By 1856, the British Museum had received three more stuffed and mounted specimens identified as *C. oblonga*—two from Port Essington and a third from an unspecified locality in northern Australia—and it was presumably one of these that was illustrated by Gray (1856a). Of these three specimens, the first Port Essington specimen is 42.1.13.123, obtained from Captain William Wylly Chambers, captain of the *Pelorus*, which was in Port Essington from March 1840 to April 1841 (Spillett 1872). The second Port Essington specimen is listed by Gray as donor unknown, but it may be 46.7.27.5, later listed as from Port Essington, with donor unknown, by Gray (1873). This specimen is recorded in the archival Natural History Museum herpetology accession book as received from a Lieutenant Ince. This would have been John Matthew Robert Ince, First Lieutenant aboard H.M.S. *Fly*, which visited Port Essington between 27 Sept and 2 Oct 1844, at which point Ince was placed ashore in charge of convict masons until the *Fly* returned in January 1845 (Spillett 1972). This specimen was subsequently exchanged with the Museum of Comparative Zoology in 1929, where it is registered as R28758 (Loveridge 1934). The third specimen was obtained from a Mr Argent. This was presumably James Argent, a natural history dealer resident in Bishopsgate between at least 1838 and 1852 (Westgarth 2009). The latter specimen is probably 50.12.9.5, recorded in the BMNH accessions book as a *Chelodina* obtained from Argent, among five specimens from “Australia” from Argent on that day and including a *Chlamydosaurus*, another northern Australian species. The Argent specimen was not listed by Gray (1873), but it may have become one of the “northern Australia” specimens lacking donors listed for *C. oblonga* by Boulenger (1889), one a skeleton, the other a shell. We have not attempted to examine these specimens to determine which was illustrated by Gray (1856a).

2. Provenance of the types of *Chelodina oblonga*

2.1. John Gilbert as collector

The BMNH syntype, donated by Gould, has previously been considered to have been collected by John Gilbert, Gould’s collector in both Western Australia and at Port Essington (Cann 1998; Thomson 2000; Cann & Sadlier 2017). Cann and Sadlier (2017) considered there was ample time for Gilbert to have sent the specimen from Port Essington before the publication of Grey’s Journals, which are only given a year of publication of 1841. Two different reviews of the two volumes by Grey appeared synchronously in the *Athenaeum* and the *Examiner*, two literary journals published in London, in their issues for the week of November 27 1841 (Anonymous 1841a, b), followed by a second review in the *Athenaeum* of December 11 1841 (Anonymous 1841c), two issues later, suggesting that both volumes were issued only shortly before November 27 1841. While this would have left two months between Gilbert’s return to England in September 1841 and the publication of Grey’s Journals, it is not the date of publication of these volumes that is the limiting factor in determining the availability of the BMNH specimen to Gray for description and illustration; it is the date of registration that is critical.

The original registration number of the BMNH syntype, 40.12.9.81, indicates registration on 9 December 1840, and hence its arrival in London prior to that date. This date is not commensurate with the period that John Gilbert was collecting around in the Top End of the Northern Territory, but is in agreement with his first visit to south-west Australia. Gilbert had arrived in Australia with Gould aboard the *Parsee*, which reached Hobart on 18 September 1838, and Gould and Gilbert collected in Tasmania for the next few months. At the end of January 1839, Gould sent Gilbert to collect around the Swan River colony in south-western Australia, while Gould himself collected around Adelaide and in New South Wales (Hindwood 1938a; Datta 1997). Gilbert arrived in Western Australia aboard the *Comet* on 6 March 1839, and spent the next 11 months collecting in south-west Australia, before leaving the port of Fremantle aboard the *Caledonia* on 29 January 1840 (Whittell 1942a,b). After a fortnight collecting around Albany while the *Caledonia* was in port there, Gilbert reached Sydney on 30 April 1840 (Anonymous 1840a).

However, Gould had left Sydney aboard the *Kinnear* on 9 April 1840, reaching London about 18 August in the same year (Hindwood 1938a; Datta 1997), and Gilbert, finding Gould gone, followed a previous suggestion by Gould that he next visit northern Australia (Datta 1997), travelling to the nascent Port Essington settlement in the Northern Territory, leaving Sydney aboard the *Gilmore* on 15 June 1840 (Anonymous 1840b), and arriving there on 12 July (Spillett 1972; Fisher & Calaby 2009). Gilbert collected around Port Essington and its environs for 8

months, leaving the colony on 17 March 1841 aboard the *Pelorus*, which took him to Singapore, arriving on 23 April (Spillett 1972). From Singapore, Gilbert transferred to the *Thomas Harrison*, arriving at Gravesend on 23 September 1841 (Anonymous 1841d; Fisher & Calaby 2009). Given the lack of direct shipping between Port Essington and London, it is highly unlikely that there would have been sufficient time between Gilbert's arrival at Port Essington on 12 July 1840, and the registration of the BMNH type of *Chelodina oblonga* in London on 9 December in the same year, for Gilbert to have collected the specimen, prepared it as a dry mount, and shipped it to London (Gould had taken four months to travel directly by ship from Sydney to London in 1840, and four months to travel from London to Hobart in 1838, while Gilbert would take six months to travel from Port Essington to London via Singapore in the following year). Spillett (1972) reports no shipping passing through Port Essington in July and August 1840 (other than the *Gilmore* in July), only two ships (unnamed) in September, and only the *Lulworth* in October, en route to Kupang in Timor.

Gilbert is known to have sent a preliminary collection of birds from Port Essington to Gould, prior to Gilbert leaving Sydney for that colony, but these were specimens collected by Lieutenant Owen Stanley (Captain of the *Britomart*, one of the vessels that established the colony at Port Essington) between 2 December 1838 and 12 February 1840 (Spillett 1972; Fisher & Calaby 2009), with no indication of anything other than birds in that collection. The *Britomart* had returned to Sydney from Port Essington on 30 April 1840 (Anonymous 1840b), the same day as Gilbert arrived in Sydney from Swan River aboard the *Caledonia*.

Gilbert's collection of reptiles from Port Essington was registered at the British Museum on 13 October 1841, with registration numbers 41.10.13.4–45, and his Port Essington amphibians were registered on 24 February 1842. These dates of registration correspond to the first two papers by Gray specifically mentioning Gilbert's Port Essington reptiles, which were privately published by him in his Zoological Miscellany in March and April 1842 respectively. The first paper (Gray 1842a) describes Port Essington pythons as part of a revision of the family Boidae, while the second paper (Gray 1842b) specifically deals with Gilbert's Port Essington herpetological collections. In the introduction to that paper, Gray (1842b) states: "In the Appendix to Capt. Grey's Narrative of two excursions in Australia, I published a list of the species of reptiles then recorded as inhabiting that country. The following new species have since fallen under my notice; they are chiefly from a collection made by Mr. Gilbert, Mr. Gould's collector, at Port Essington, which has been purchased from the latter gentleman by the British Museum." [our emphasis]. Hence, Gray specifically states that the Gilbert Port Essington collection was received by him subsequent to his compilation of the list of the Australian herpetofauna that was published in the appendix to Grey's Journals in 1841.

In contrast to the difficulties that would have hampered any Gilbert-collected chelonians from Port Essington reaching London prior to the December 1840 registration date for the BMNH type, it is known that Gilbert did collect chelonians while in south-west Australia, and that these were sent by Gilbert to Gould in London. The second shipment of specimens from Swan River sent by Gilbert to Gould included both lizards and turtles, constituting a total of 9 "skins of reptiles" (Whittell 1942b). While the exact number of turtles is not known, it must be no less than two (as the plural "turtles" was used) and no more than seven (given that the plural was also used for "lizards", so that no less than two lizards were among the nine reptiles). These specimens were sent aboard the *Shepherd*, which left Fremantle on 1 January 1840, and arrived in London five months later, where the shipment was received by Gould's secretary Edwin Charles Prince, who acknowledged its arrival (though not at that time, his receipt of the specimens, still held by Customs) in a letter to Gould dated 4 May 1840 (Hindwood 1938b; Whittell 1942b). Prince ran Gould's business interests in London during Gould's absence in Australia. Both these specimens and Gould himself had arrived in London several months prior to the accession of the BMNH type, and it is readily possible for these Gilbert-collected *Chelodina* from south-west Australia to have been on sold by Gould to both Gray and Bell over the next four months.

From the above analysis, we conclude that Gray would have received specimens collected by Gilbert from southwestern Western Australia, including turtles, with ample time to prepare his description of *Chelodina oblonga* that appeared in the appendix to Grey's 1841 Journals. In contrast, there is evidence in the writings of Gray that the herpetological specimens collected by Gilbert from Port Essington were received subsequent to the publication of Grey's Journals.

2.2. George Grey as collector

Given that Gilbert was unlikely to have collected the BMNH type of *C. oblonga* at Port Essington, it is important to consider other possible sources of this specimen and/or the Bell collection specimen from northern or north-western Australia. Prior to 1840, there was no British or European settlement in north-western Australia other than around the Cobourg Peninsula and Melville Island (with the latter, Fort Dundas, a short-lived settlement only in existence between 1824 and 1829; Morris 2001). Only two British exploratory expeditions had undertaken work in the Kimberley region between 1830 and 1840, and both have been suggested as sources for the type series (Cann & Sadlier 2017). The explorer George Grey visited the north-west Kimberley between 3 December 1837 and 17 April 1838, initially landing at Hanover Bay, and then exploring inland (G. Grey 1841). However, his arrival coincided with the wet season, and the Timorese ponies he was using for pack horses found the rocky habitats covered with spinifex extremely difficult to traverse, and hence Grey had little time for collecting during his explorations. Grey's activities were often reduced to forced marches across country, with Grey himself suffering from infection of a spear wound acquired on 11 February. At the time of his return to the coast, one colleague gave the description:

“Poor Grey with his pale and emaciated appearance ... looked more like one on the brink of the grave than the leader of an expedition exploring the interior of a vast continent ... scanty food had reduced them to the skeleton-like appearances they assumed ... for several weeks a small portion of flour made into a cake called ‘damper’ with some tea was the only food they passed their lips” (Hordern 1989),

while Stokes (1846, Volume 1: 208) wrote:

“Poor fellow! gaunt misery had worn him to the bone; and I believe, that in any other part of the world, not myself alone, but Lieutenant Grey's most intimate friends, would have stared at him without the least approach to recognition. Badly wounded, and half-starved, he did, indeed, present a melancholy contrast to the vigorous and determined enthusiast we had parted from a few months before at the Cape, to whom danger seemed to have a charm, distinct from success.”

In his Journal, Grey does report his men obtaining a long-necked turtle, three fish, and several black cockatoos on 27 March (G. Grey 1841, Volume 1: 209), but only mentions the catch as a source of fresh meat. While men at his base camp near the coast could potentially have collected turtles during his absence, Grey's summary of the fauna observed during his Kimberley period states “a fresh-water tortoise was found inland” (G. Grey 1841, Volume 1: 246), suggesting that the long-necked turtle collected on 27 March was the only one found. From this locality, a long-necked turtle could only have been *C. burrungandjii walloyarrina*. Grey left the Kimberley coastline on the 17 April, aboard the *Lynher* for Mauritius, arriving there on 17 May 1838. He left Mauritius on 21 August, aboard the *Clorinda*, arriving in the Swan River colony on 18 September 1838 (Anonymous 1838). Grey spent the next five months in and around that colony. Between 17 February and 21 April 1839, Grey undertook his second expedition, from Shark Bay to Perth, again suffering many privations (G. Grey 1841). However, during his time around the Swan River, Grey recorded a visit to a lake called by the Aborigines Mooloore, about 15 miles from Perth, on 30 November 1839, where he was given 27 “fresh-water tortoises, the average weight of each of which was half a pound” (G. Grey 1841, volume 1: 292). From the size and locality, these could only have been the south-western *Chelodina* species. Mooloore is now known as Lake Joondalup. Hence, while Grey had access to a single *Chelodina* from the north-west Kimberley, he had, like Gilbert, more access to *Chelodina* from south-west Australia prior to the receipt of the BMNH type.

Grey was known to have supplied bird specimens to Gould, though these were mostly from his later period in Australia as Governor of South Australia from 1841 (Chisholm 1938). He is known to have sent birds to Gould from Mauritius in 1838—it is presumed that these were the “small” collections (Gould 1848: 4) made during Grey's first expedition to the Kimberley (Chisholm 1938; Whittell 1938, 1842a). Grey met Gilbert in the Swan River colony, and collected with him (Whittell 1942a, b), presumably after the former's return from his second expedition in April 1839, as Gilbert had arrived in March 1839 while Grey was still away. It is possible that they could have exchanged specimens, as Gilbert recorded Grey offering to purchase some of his skeletal collections (Whittell 1942b), but any turtles would likely have been the local south-western species.

2.3. The naturalists of the *Beagle*.

The third, and least-likely source of material from north-western Western Australia during the decade prior to receipt of the BMNH syntype was the 1837–1843 *Beagle* expedition under John Clements Wickham and later John Lort Stokes, a source also proposed by Cann and Sadlier (2017). Grey had been aboard the *Beagle* for the first part of its voyage to Australia, disembarking at Cape Town, and the *Beagle* was at the Swan River colony between 15 November 1837 and 3 January 1838, and in the north-west Kimberley from 17 January to mid-April 1838. For the last few days of that time, the *Beagle* was waiting for the return of Grey to his camp in Hanover Bay, and the *Beagle* and *Lynher* (Grey's transport) left Hanover Bay together on 17 April (G. Grey 1841; Hordern 1989) or 19 April 1838 (Stokes 1846). Hence, it would have been possible for Grey and the *Beagle* naturalists to have exchanged specimens during this time. Any *Chelodina* exchanged would have been *C. burrungandjii walloyarrina*. However, the *Beagle* did not overlap with Gilbert (Whittell 1942b), who first arrived in Swan River after the *Beagle* had left there again on 20 June 1838, while Gilbert's departure from Swan River was two days before the next arrival of the *Beagle* in Swan River on 31 January 1840. The *Beagle* did not return to England until 1843, and while the naturalists provided birds from their expedition to Gould for description (Whittell 1938), this was not until well after the date of description of *Chelodina oblonga*. Consequently, the only pathway for the *Beagle* naturalists to have collected the types of *C. oblonga* in the Kimberley or in south-west Australia before 1840, would be for them to have passed the specimens to Grey in April 1838, and for Grey to have sent them Gould in London among his Australian bird collection in May–August 1838. As Gould had already left for Australia, on 16 May 1838 (Datta 1997), any turtle specimens from this collection would have to have been held in London by Prince for two years until Gould's return in 1840, and then dispersed to Gray at the British Museum.

The *Beagle*'s next visit to tropical Australia, within the range of northern *Chelodina* populations, was not until July 1839, when they reached Torres Strait en route to Port Essington, spending the period 17–24 July at Port Essington (Spillett 1972), then exploring the coast and rivers between Port Essington and Victoria River until 12 December, before returning to the Swan River colony on 31 January 1840 (Stokes 1846; Hordern 1989), the first port from which a shipment of specimens from that part of the *Beagle*'s survey could have been sent to London. There is no evidence that such a shipment took place. Any such shipment containing the BMNH type of *Chelodina oblonga* would have to have been directly from the *Beagle* naturalists to Gould, as Gilbert had already left the colony at the time of the *Beagle*'s visit to Swan River in 1840, as had Grey, who had been appointed Government Resident at King George's Sound in August 1839 (Anonymous 1839), before returning to England via Adelaide, arriving in England in September 1840 (G. Grey 1841). As an official naval survey expedition, the naturalists aboard the *Beagle* would not have been in a situation to directly send specimens to a dealer in London without the approval of the Admiralty. The earliest reptile specimens received at the British Museum from any of the *Beagle* officers or naturalists appear to be specimens from the captains, Stokes, received October 1841, and Wickham, received November 1841, which would most probably have been sent during the four months that the ship spent in Sydney in early 1841, during which time the captaincy transferred from Wickham to Stokes (Hordern 1989).

2.4. Conclusion

From the above analysis, we conclude that it is reasonable to admit the possibility that the types of *Chelodina oblonga* were obtained from southwestern Western Australia, and that the previously published evidence based on an analysis of the movements of explorers and collectors during the relevant period (Cann 1998; Cann & Sadlier 2017) do not eliminate this possibility. Indeed, the movements and documented collecting by Gilbert on behalf of Gould suggest that southwestern Western Australia as the provenance of the types of *Chelodina oblonga* is quite likely. This, coupled with the mitochondrial evidence, provides a compelling case for the provenance of the *Chelodina oblonga* syntypes as being from southwestern Australia, which is the basis for our decision, explicitly made here, to reinstate *Chelodina oblonga* for these populations. We designate as lectotype, BMNH 1947.3.5.89 (European Nucleotide Archive LR215677). This is the specimen that was illustrated as part of the description of the species, was in Gray's home institution (and hence would have been available for him to examine carefully), has a documented date of accession that is commensurate with a south-west Australian locality, has consistently previously been assumed to be the holotype, has been examined repeatedly by subsequent authors, and has been genetically typed. We

bring *Chelodina colliei* into synonymy with *Chelodina oblonga*, confirming the application of the *Chelodina rugosa* to the long-necked turtle populations of northern Australia by Kehlmaier *et al.* (2019).

Redescriptions of the lectotype and paralectotype of *C. oblonga* are given below.

3. Nomenclatural Considerations

3.1. Higher nomenclature

The identification by Thomson (2000, 2006) of the type specimen for *Chelodina oblonga* J. Gray 1841 as coming from the northern Australian populations of snake-necked turtle, then referred to as *Chelodina rugosa*, resolved an unfortunate issue with the naming of lineages by Wells and Wellington (1985). Wells and Wellington chose *C. oblonga* J. Gray 1841 as the type species for their new genus *Macrochelodina*, with their original concept of that genus including both the *C. expansa* and *C. oblonga* species groups of Burbidge *et al.* (1974). The former species group included at the time the northern Australian species *C. rugosa* together with *C. siebenrocki* and *C. expansa* Gray 1857. Wells and Wellington's diagnosis for *Macrochelodina* applied to the *C. expansa* group and not to *C. oblonga*. Hence, when the name *C. oblonga* was transferred to the northern Australian lineage, the name *Macrochelodina* became applied to the larger and more widespread lineage, in line with the intent of Wells and Wellington (1985) as interpreted by Iverson *et al.* (2001) and Georges and Thomson (2010).

With our return of application of the name *oblonga* to the south-western species, to which it was assigned at the time of the naming of *Macrochelodina*, that generic name transfers to the single south-western species, leaving the *Chelodina expansa* group of Burbidge *et al.* (1974) unnamed, in line with the action, if not intent, of Wells and Wellington (1985), and *Macrodiremys* McCord & Joseph-Ouni, 2007 becomes a junior synonym of *Macrochelodina*. *Macrodiremys* was created for the south-western species after Thomson (2000, 2006) had identified the issue with application of the name *oblonga*. However, McCord and Joseph-Ouni invalidly (Kuchling 2010) designated a neotype for *C. oblonga* in an attempt to return that name to the south-western species rather than the northern species to which the name *oblonga* was at the time assigned, and designated *C. oblonga* (using that concept of the species) as the type of *Macrodiremys*. With our reassessment of the lectotype of *C. oblonga*, the designation of that species as the type of both *Macrochelodina* by Wells and Wellington (1985) and *Macrodiremys* by McCord and Joseph-Ouni (2007a) makes these two names objective synonyms, the identity of the nominal type species for the first fixed by the lectotype, the second involving a deliberate misidentification of the type species (Article 70.4.1 of the Code of Zoological Nomenclature: "an expressly stated misidentification of a previously established nominal species") as the species from south-western Australia, following Goode (1967) and subsequent authors, an action McCord & Joseph-Ouni attempted to formalise by invalidly designating a neotype for *C. oblonga*.

McCord and Joseph-Ouni's attempt to designate a neotype for *C. oblonga* to fix the name (and their type species for *Macrodiremys*) to the south-western species to which the name had been applied by authors from Goode (1967) for 40 years reflected the earlier, and similarly invalid, attempt by Iverson *et al.* (2001) to change the type species of *Macrochelodina* from *C. oblonga* to *C. rugosa* to unequivocally transfer that generic name from the south-western species to the northern lineage, given the uncertainty of application of the name *oblonga* to northern species. Iverson *et al.* based their transfer of type species on Article 70.3 of the Code of Zoological Nomenclature, which, when a type species name is subsequently found to belong to a different species to that previously identified, allows the first reviser to either continue to use the nominal species (Article 70.3.1) or transfer the type species to the taxonomic species involved in the misidentification (Article 70.3.2). However, while invoking Article 70.3, their choice of *C. rugosa* as a new type species does not fulfil either Article 70.3.1 or Article 70.3.2, as *C. rugosa* was neither the nominal species *C. oblonga*, nor the species involved in the misidentification, which was the south-western species to which they applied the name *C. colliei*, and they did not specifically invoke either Article. With the return of the name *C. oblonga* to the taxonomic species to which it applied at the time of description of *Macrochelodina*, that name reverts to the south-western species, the monotypic *C. oblonga* group of Burbidge *et al.* (1974).

With the recent treatment by Georges and Thomson (2010) of the species groups of Burbidge *et al.* (1974) as subgenera of *Chelodina*, this results in the *Chelodina longicollis* group residing in the nominate subgenus, *Chelodina oblonga* in the monotypic subgenus *Macrochelodina*, and Burbidge's *Chelodina expansa* group without a subgeneric name. We correct this, and provide updated diagnoses of these subgenera below.

3.2. Systematics

Order: Testudines Batsch 1788: 437

Family: Chelidae Gray 1825: 211 (as Chelidina, a subfamily under Emydidae)

Subfamily: Chelodininae Baur 1893: 211 (as Chelodinidae)

Genus: *Chelodina* Fitzinger 1826: 6

Type species: *Testudo longicollis* Shaw 1794; subsequent designation by Duméril & Bibron (1835: 442).

Revised Diagnosis: Medium to large freshwater turtles with exceptionally long necks; head and neck, when extended, typically of similar length to, or longer than, the carapace; gular scutes meet in front of intergular scute, or if not, barely separated by intergular (common variant in *C. burrungandjii*); skull anteriorly elongated; frontal bones fused into a single unit; parietal arch absent; atlas elements (intercentrum, centrum, lamina) fused into a single unit; four claws on front and back feet.

3.2.1. Subgenus: *Chelodina* (*Chelodina*) Fitzinger 1826:6, per Georges and Thomson (2010)

Revised Diagnosis: Medium sized semi-aquatic turtles; length of head and neck equal to, or slightly less than, length of carapace; dorsum of neck with many blunt conical tubercles. Carapace oblong to oval, often flattened dorsoventrally when compared to other subgenera, often with reticulated ornamentation of scutes. Plastron broad, flaring anteriorly at pectoral scutes and posteriorly at femoral scutes; covers or almost covers anterior orifice of shell in ventral view. Intergular scute posteriorly tapered; length approximately twice that of suture between pectoral scutes. Dentary bones enlarged with a larger triturating surface area than in other subgenera; no dorsoventral flattening of skull. Atlas (C1) not elongated substantially; moderate elongation of cervical vertebrae 2–4 (centra about twice as long as wide). Transverse processes of cervical vertebrae thin and bladelikey. Ilium in contact with 8th pleural only, from anterior to posterior internal surface. Hyolaryngeal complex modified; some elongation of corpus hyoideum, though cornubranhiale only slightly enlarged and cylindrical in cross section, epibranchials cartilaginous throughout life. Anterior bridge struts small; suture with pleurals does not significantly encroach upon pleural 1; posterior bridge strut small, barely contacts pleurals. Exposed neural bones typically absent (occasional single exposed neurals in large adults). Fluid with a pungent odour secreted from ducts in the inguinal and axillary pockets when distressed.

Assigned Species: *C. canni* McCord & Thomson 2002; *C. gunaleni* McCord & Joseph-Ouni 2007b; *C. longicollis* (Shaw 1794); *C. mccordi* Rhodin 1994a; *C. novaeguineae* Boulenger 1888; *C. pritchardi* Rhodin 1994b; *C. reimanni* Philippen & Grossmann 1990; *C. steindachneri* Siebenrock 1914; † *C. murrayi* Yates 2013.

Vernacular name: Australasian long-necked turtles

3.2.2. Subgenus: *Chelodina* (*Macrochelodina*) Wells & Wellington 1985: 9, this study.

Type species: *Chelodina oblonga* J. Gray, 1841, by original designation.

Synonymy: *Macrodiremys* McCord & Joseph-Ouni 2007a: 57.

Type species: *Chelodina oblonga* J. Gray, 1841, by original designation (but sensu their invalidly designated neotype – see Kuchling, 2010 for discussion).

Revised Diagnosis: Carapace broadly oblong, flattened dorsally and furrowed along midline; deep reticulated ornamentation of shell often present. Carapace elongated anteriorly and shortened posteriorly giving a narrow carapace with negligible posterior flaring; generalised reduction of carapace margins anteriorly and posteriorly; 5–8 (Smales 2019) exposed coffin-shaped neurals present. Anterior bridge strut small, sharply angled posteriorly with minimal suture surface with pleural 1; posterior bridge strut small, does not contact pleurals. Plastron long, narrow, more than twice as long as width measured immediately anterior to bridge, covering only about half of anterior orifice of shell in ventral view. Ilium in contact with posterior half of 8th pleural and pygal. Head and neck length, when fully extended, longer than carapace length; dorsum of neck finely reticulated, lacking obvious tubercles. Atlas (C1) moderately elongated; cervical vertebrae 2–4 greatly elongated (centrum about three times as long as

wide). Transverse processes of cervical vertebrae thin and bladelike. Hyolaryngeal assemblage highly modified; elongation of corpus hyoideum along sulcus tracheae; anterior cornubranhiale expanded but not flattened throughout length, elongated, but not extending beyond posterior cornubranhiale; epibranchials cartilaginous throughout life.

Assigned Species: *Chelodina oblonga* J. Gray 1841.

Vernacular name: Oblong turtle



FIGURE 3. Dorsal view of the paralectotype of *Chelodina oblonga* Gray (OUMNH 02584). (Image courtesy of K. Child, OUMNH).

3.2.3. Subgenus: *Chelodina* (*Chelydera*) subgen. nov. Thomson and Georges, this study.

Type Species: *Chelodina parkeri* Rhodin & Mittermeier 1976.

Diagnosis: Large riverine turtles; carapace broadly oval with noticeable flaring about marginal scutes 8–10; plastron narrow, covering only about half of the anterior orifice of the shell in ventral view; plastron of moderate length, approximately twice as long as its width measured anterior to the bridge; head and neck longer than carapace; intergular scute rhomboid in shape with width approximately equal to length. Neck dorsum finely reticulated, lacking obvious tubercles. Osteologically, atlas (C1) elongated; cervical vertebrae 2–4 greatly elongated (centrum about three times as long as wide); transverse processes of cervical vertebrae thickened, not bladelike as in subgenera *Chelodina* and *Macrochelodina*. Skull dorsoventrally flattened, in some species also laterally expanded, resulting in antero-posterior enlargement of palatines. Hyolaryngeal assemblage highly modified; extreme elongation of corpus hyoideum along sulcus tracheae; anterior cornubranhiale expanded, elongated, extending beyond posterior cornubranhiale; epibranchials fully ossified in adults, cartilaginous throughout life in species of the other subgenera. Anterior bridge struts enlarged; suture with pleural 1 extends half-way across pleural; proximal suture of strut enlarged and also contacts 2nd pleural in very large specimens; posterior bridge strut enlarged and thickened, but does not contact pleurals; ilium sutures with 8th pleural and pygal and is latero-posteriorly rotated. Exposed neural bones usually absent (except for *Chelodina burrungandjii*, typically with 3–6 exposed neurals; Smales 2019). Fluid from ducts in the inguinal and axillary pockets with noticeable odour, but not pungent.

Etymology: The name *Chelydera* is a combination of the Greek χέλυς/χέλυδρος (chelys/chelydros), meaning both a turtle (cf. the similarly snake-necked turtle genus *Chelus* Duméril 1806) and a water snake, and δειρή (deire), the neck (f.) (Liddell & Scott 1897; Brown 1956). This is in reference to the common name for this group, the snake-necked turtles. We use a feminine name for the subgenus to agree with *Chelodina*, to avoid a change in gender of any adjectival specific epithets if *Chelydera* is treated as generically distinct by some authors.



FIGURE 4. Ventral, right lateral and dorsal views of the shell of the paralectotype of *Chelodina oblonga* Gray (OUMNH 02584). (Images courtesy of K. Child, OUMNH).

Assigned Species: *C. parkeri* Rhodin & Mittermeier 1976; *C. burrungandjii* Thomson, Kennett & Georges 2000; *C. expansa* Gray 1857; *C. kuchlingi* Cann 1997; *C. rugosa* Ogilby 1890; † *C. insculpta* De Vis 1897; † *C. alanrxi* Lapparent de Broin & Molnar 2001 .

Vernacular name: Australasian snake-necked turtles

3.3. Key to subgenera of *Chelodina*

- 1 Plastron broad, covering or almost covering the anterior orifice of the shell in ventral view; intergular scute approximately twice as long as the suture between the pectoral scutes; length of head and neck equal or slightly less than length of the carapace; dorsum of neck with many blunt conical tubercles; fluid with a pungent odour secreted from ducts in the inguinal and axillary pockets when distressedsubgenus *Chelodina*
- Plastron narrow, covering only about half of the anterior orifice of the shell in ventral view; intergular scute approximately the same length as or shorter than the suture between the pectoral scutes; head and neck longer than carapace; dorsum of neck lacking obvious tubercles; fluid from ducts in the inguinal and axillary pockets if with noticeable odour, not pungent 2
- 2 Carapace approximately oval; plastron of moderate length, approximately twice as long as, or less than, its width measured anterior to the bridgesubgenus *Chelydera*
- Carapace very narrow, plastron long, narrow, more than twice as long as its width measured anterior to the bridge.subgenus *Macrochelodina*

3.4. Synonymy of *Chelodina oblonga*, and redescriptions of the type specimens.

3.4.1. Synonymy

- Chelodina oblonga* J. Gray 1841: 434, 446.
Chelodina colliei Gray 1856b: 267. Synonymy by Boulenger (1889).
Macrochelodina oblonga — Wells & Wellington 1985: 9.
Macrodiremys oblonga — McCord & Joseph-Ouni 2007a: 57.
Chelodina (Macrodiremys) colliei — Georges & Thomson 2010: 19.
Chelodina (Macrodiremys) colliei — van Dijk *et al.* (TTWG) 2014: 430.
Chelodina colliei — Cogger 2014: 243.
Chelodina (Macrodiremys) colliei — Rhodin *et al.* (TTWG) 2017: 193.
Chelodina colliei — Kehlmaier *et al.* 2019: 6.
Chelodina (Macrochelodina) oblonga — this study.

3.4.2. Description of type specimens:

Lectotype: BMNH 1947.3.5.89 (Fig 1). Carapace length (straight) = 17.2 cm.

Description. Plastron with three inked markings, on the left humeral scute is the BMNH number “1947.3.5.89”, on the right humeral is the number “74a” Also on the bridge area of the right abdominal is the original number “40.12.9.81”; the latter part of the number is less clear. Dry mounted specimen, entire with the limbs extended. Neck broken, posterior part of neck skin collapsed inside shell. Carapace oval, slightly elongated from above, slightly furrowed along midline, dark brown with a reticulated pattern. 5th vertebral scute divided along midline; 2nd marginal scute twice the length of first marginal, all other marginals normal. Plastron narrow and slightly trapezoidal, yellow-orange and highly reticulated. Legs all overstuffed; 4 claws on front and rear feet. Poor condition of neck makes determination of skin characters uncertain, however skin just behind the head finely reticulate with no tubercles observable. Head with artificial eyes inserted, and poorly preserved, though some osseous features visible externally.

Diagnostic comparison. The extreme narrowing and anterior elongation of the shell typical of the south-western Australian species is not obvious; however, carapace shape varies ontogenetically in this species, as apparent from a large series of specimens ranging from hatching to adult examined at the Chelonian Research Institute (CRI). The lectotype fits within the range of carapace shapes of a subadult of this taxon. Plastron length/width at level of axillary notch ratio (P L/W) 2.63, which is comparable with specimens of known Perth provenance (CRI 3129: P L/W

= 2.49; CRI 5070: P L/W = 2.56; CRI 4632: P L/W = 2.48), while species of *Chelodina* (*Chelydera*) range from 1.88 (*C. expansa* CRI 2397) to 2.10 (*C. burrungandjii wolloyarrina*; McCord & Joseph-Ouni, 2009). Frontal region of lectotype skull is narrower than in members of *Chelodina* (*Chelodina*); however, this character is even narrower in *Chelodina* (*Chelydera*) species from northern Australia, due to the anterior rotation and enlargement of the orbits. Postorbitals appear to be narrow and arched, similar to *Chelodina* (*Chelodina*), but differing from *Chelodina* (*Chelydera*) which has laterally flattened postorbitals. Posterior part of skull either poorly preserved or damaged, making outline of posterior parietal region difficult to ascertain. The skulls of both subspecies of *Chelodina burrungandjii* are dorsoventrally flattened, a shape not present in this specimen. Further, the skull of *Chelodina burrungandjii burrungandjii* is laterally broadened and the palate anteroposteriorly elongated (Thomson *et al.* 2000), a configuration also not present in the lectotype. The anterior bridge struts of the *Chelodina* (*Chelydera*) species are in general enlarged and encroach to over halfway across the first pleural—this is most extensive in *Chelodina expansa* and least in *Chelodina rugosa*; however this character is absent in the lectotype. *Chelodina burrungandjii* has an expanded posterior lobe of the plastron at the level of the femoral scutes (Thomson *et al.* 2000; McCord & Joseph-Ouni 2007a), a feature not present in the lectotype of *C. oblonga*, which has a more evenly tapered posterior lobe of the plastron characteristic of the south-western species (Goode 1967; Cogger 2017). The combination of characters above clearly assigns the lectotype to the Oblong Turtle. Thomson (2000) identified the presence of insertions for an expanded muscular system on the ventral surface of the carapace, only found in the members of the *Chelodina* B group. It is probable that this was an artefact of preservation as the muscles themselves were long gone, and this character should be considered to have been incorrectly codified at that time.

Paralectotype: OUMNH 02584 (Figs. 3–4). Carapace length (straight) = 27.5 cm.

Description. Plastron with three labels and markings: “Ref. 2584” inked onto left abdominal scute; “*Chelodina oblonga* Bell Coll Rev F.W. Hope” on a label stuck to the left abdominal and pectoral scutes, and “a” in a small label on the left abdominal scute. Dry mounted specimen, entire, with neck and limbs extended. Deep reticulated pattern on the shell typical of the Perth species. 4th vertebral scute and left 3rd costal scute divided; nuchal scute wide; 2nd marginal longer than 1st; supracaudal scute is offset and deformed; asymmetry of marginal length on the left and right side, though 11 are present on each side; lateral marginals reduced in lateral view. Bridge small, narrow. Plastron dark yellow with no deformities in the scutes. Neck and rear legs slightly overstuffed. 4 claws on front and rear feet. Dorsal surface of neck dark grey, skin finely reticulated, lacking tubercles.

Diagnostic comparison. Carapace elongate and narrow in dorsal view, dorsoventrally flattened in lateral view, medium brown; this combination of features is unique to the Oblong Turtle, the shell shape features are only prominent in adults. Bridge small, narrow. Plastron long, narrow (plastral length/width 2.51, markedly higher than any *Chelodina* (*Chelydera*) species). Some features of skull shape are visible due to shrinking of the skin over the skull. Frontal bone and postorbital region narrow, however the frontal is wider than in *Chelodina* (*Chelydera*); postorbital highly arched as against flat for *Chelodina* (*Chelydera*), see above. Posterior part of parietal elongated and narrow, beginning to expand anteriorly halfway towards orbits, giving a diamond shaped anterior parietal region. Parietal arches, dorsal to quadrates, do not reach supraoccipital, but form cristae that arch dorsomedially. While this specimen has not been genotyped, we believe that morphologically its identification as an Oblong Turtle is without question and genotyping would be for curatorial reasons only, as this specimen is not a name bearing type.

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