While Planet Earth is becoming an increasingly smaller and more familiar world as every corner is explored and colonised, there still remains many freshwater species undiscovered and undocumented. A number of significant species have been discovered in recent times, revealing a huge gap in the knowledge of the world around us. As the natural world struggles to adjust to ever-encroaching development, Mother Nature continues to surprise us with her miraculous secrets. It is surprising that on a planet that has been so comprehensively studied, used and abused, there are still new species that have managed to evade human detection.

There are several areas that have particular potential as reservoirs of undiscovered species; one such place is New Guinea. In the following chapters, the term New Guinea will be used to include the whole island of New Guinea and associated smaller islands.

Gerald Allen has added at least 75 new fish species to the scientific literature. This includes 35 species of rainbowfishes (including one new genus), 9 species of blue-eyes, 14 species of gudgeons, 9 species of gobies, plus 8 species in various other families.

A team of scientists led by Conservation International found dozens of new species in a survey of New Guinea's Foja Mountains. The December 2005 trip by a team from the United States, Indonesian and Australia discovered 20 new species of frogs, four new butterflies, five new palms and the largest recorded rhododendron flowers. They also found a red-faced, wattled honeyeater bird, the first new bird from the island of New Guinea since 1939, and rediscovered Berlepsch's six-wired bird of paradise, never before seen by Western scientists.

These discoveries were made under Conservation International Rapid Assessment Program (RAP) which deploys expert scientists to poorly understood regions in order to quickly assess the biological diversity of an area. The conservation organization makes RAP results immediately available to local and international decision makers to help support conservation action and biodiversity protection.

New Guinea's forests are some of the most diverse in the world, but they are increasingly under threat from commercial logging. However, the Foja Mountains of western New Guinea are so isolated – in the furthest reaches of the Indonesian province of West Papua - they remain relatively untouched. In other parts of West Papua poaching is taking a heavy toll on wildlife populations.

Whatever your subject of interest, you'll find the biodiversity of New Guinea extremely fascinating. The island contains very high levels of biodiversity and species endemism, boasting as many bird and plant species as nearby Australia in one tenth the land surface.

Home to a unique array of plant and animal species including the fabled birds of paradise, birdwing butterflies, tree-kangaroos, and more species of orchid than anywhere else on Earth, New Guinea ranks among the top biologically important regions of our planet. Its ethnic diversity is no less remarkable: almost one fifth of the world’s human languages are spoken here by ethnologically diverse peoples, still intrinsically interwoven with the natural fabric of their environment.

The sheer size of this land and its enormous altitudinal range help give rise to an extraordinary array of terrestrial ecosystems. From the world's most extensive and diverse mangroves, to swamps and savannah forests, a diverse mix of lowland and highland forest types, through to a variety of montane forests, finally giving way above the timberline to alpine heath, rolling meadows, lakes, bogs and even equatorial glaciers, remnants of an icy past.

New Guinea is one of the last great rainforest wilderness left in the tropics, harbouring what is the largest expanse of rainforest away from Amazonia and the Congo Basin. The Raja Ampat archipelago off New Guinea's western tip is now known to support the most diverse coral reefs on Earth. New Guinea is a natural wonderland, above and below the water.

What lies ahead is an immense challenge that stretches far into the future. Based on the past rate, one study estimates it will take another 1500 to 15000 years to complete the global inventory of life. With new technology such as DNA sequencing and a growing army of biologists, this process is accelerating, but even with these advances, the human race would likely benefit in slowing the destruction of remaining wild spaces on Earth, because who knows what may be hiding out there.
New Guinea and its associated archipelagos stretch across a distance of almost 3000 km between the equator and 12° south on the south-eastern rim of the Pacific Ocean. It is the second largest island in the world with a land area of approximately 836 171 km². The climate is basically equatorial and on the coastal seaboard and river basins it is hot, wet and humid. The highland regions are cooler and less humid but generally equally wet. The majority of the island, except for the south with its extensive and inaccessible swamps and mangrove forests, is mountainous. The mountains, rivers and valleys all act as biological barriers to the movement or migration of plants and animals around the island. Indeed, geologically, the island is extremely complex, comprised of many terrains that have accreted. The biogeography of the island often reflects the independent evolutionary history of these different terrains. The complexity of the province’s biogeography contributes to its rich biodiversity.

One Land - One People
People first settled New Guinea as long as 40,000 years ago. The first inhabitants would have made the journey when the mainland of New Guinea and Australia were all part of the same land mass. New Guinea Highlanders and Australian Aboriginals are the descendants of these first inhabitants. The next important wave of immigrants to the New Guinea area occurred approximately 3,500 years ago. These are peoples who linguistically and genetically seem to have originated in Taiwan and they would become the ancestors of the Melanesians.

Before the arrivals of Europeans sea captains from China and South East Asia traded with the coastal New Guineans. One record tells of Papuan slaves being used to build a temple in Java in the tenth century. The first European assumed to have sighted the island was Jorge de Meneses, the Portuguese governor of the Moluccas in 1526. He referred to the country as “Ilhas dos Pauas” which is from the Malay term “Orang Papuwah” meaning “fuzzy haired man”. In 1546, the Spanish explorer Inigo Ortiz de Retes named the main island ‘Nueva Guinea’ because the islanders resembled the people of Guinea in Africa. The first map showing the whole island (as an island) was published in 1600 and shows it as ‘Nova Guinea’. For the next few centuries, fearful of the reputation of the local people and ignorant of the rich resources available, New Guinea remained predominately untouched by Europeans.

During the 1880s the three dominant colonial powers in the area carved up the island of New Guinea. The Dutch got the west (Netherlands New Guinea) to create a barrier to the East Indies. The Germans took the north-east (German New Guinea) and the British got the south-east (Papua). In 1895 the borderline between Netherlands New Guinea and British New Guinea was set at 141°E and in 1910 the borderline between Netherlands New Guinea and German New Guinea was also set at 141°E.
The border does not actually run through 141°E all the way. From the northern coast near Wutung, the border follows 141°E until it reaches the Fly River, and then follows the river southward until it reaches 141°01'E, and then along 141°01'E until it reaches the southern coast near the mouth of Bensbach River. The post-colonial Papua New Guinea and Indonesia acknowledge the same borderline. To the north, a small section of the Sepik River also lies to the west of 141°E between 4°S and 5°S. Nevertheless, no such compromise has been made to the borderline at the two points where Sepik River crosses 141°E.

Papua was later placed under the authority of the Commonwealth of Australia in 1902 and at the Treaty of Versailles in 1919; Australia was given a mandate to administer the former German New Guinea. In 1957 Australia and the Netherlands began plans for independence of a united New Guinea by the 1970s. However, in 1961 an invasion force of Indonesian soldiers arrived in western New Guinea. Following diplomatic talks, the Dutch handed over the territory to a temporary UN administration. In 1963 Indonesia assumed full administrative control and in 1969 western New Guinea became a member province of Republik Indonesia. In 1975 eastern New Guinea became the independent state of Papua New Guinea.

Australia–New Guinea

Australia, New Guinea and adjacent islands (possibly including Halmahera Island), sit on the Sahul continental shelf and have been joined as a single landmass throughout much of their geological history. The water barrier, which is now the Arafura Sea, Gulf of Carpentaria, and Torres Strait, which separates Australia and New Guinea, represents a recent development, having resulted from rising sea levels. All of these seas are extremely shallow, with average depths ranging from about 15 to 60 metres.

The Sahul shelf is a structural platform of the ocean floor, extending from the north coast of Australia to the island of New Guinea. A continental shelf, it was once above sea level, and its surface still bears erosional features formed when streams crossed it to the oceans. The shelf was slowly warped downward by crustal forces. This subsidence is evidenced in coral atolls along its edge, composed of coral that grew as the land sank. The shelf's main divisions are the shallow Arafura Shelf, covered by the Arafura Sea and Gulf of Carpentaria; the Sahul Shelf under the Timor Sea; and the Rowley Shelf underlying a part of the northwest Indian Ocean extending to North West Cape, Western Australia. To the north lay the deeper Timor Trough and the volcanic Lesser Sunda Islands, separating the Sahul from the Sunda Shelf.

Global sea levels are currently higher than at anytime during the last 120,000 years, separating Australia and New Guinea by sea. However, Torres Strait has been acting almost consistently as a land-bridge since the last interglacial about 118,000 years ago up until 5-6,000 years ago, when marine transgression closed the bridge.

About 12,000 years ago, sea levels were low enough that the Arafura Shelf was exposed, and 20,000 years ago, sea levels were 120 m below present levels. Between 12,000 and 55,000 years ago, the Gulf of Carpentaria was a large inland lake. The mighty Fly River flowed into the lake before being diverted to the east. Pollen studies have shown that the vegetation surrounding the lake was very much as it is today in the open savannah country. The lake would have been fresh or brackish for much of its existence. Evidence from deep core drilling reveals a pattern of establishment and marine inundation of Lake Carpentaria that appears to have been repeated. It was a freshwater lake in the Jurassic then inundated by a marine transgression (in limestone deposits), and there was a further freshwater episode in the Miocene, followed by another marine transgression. The fish species of Cape York Peninsula have a strong affinity with New Guinea. The Olive and Jardine Rivers show some of the strongest relationship, with 81% and 63% of the fish species found in these rivers being common between the two countries.

The current distribution of a number of northern Australian and southern New Guinea rainbowfish species can be explained by the opportunities the lake and the exposed Arafura Shelf provided. The Arafura shelf that defined the western boundary of Lake Carpentaria would also have provided a land-bridge to New Guinea presumably with drainages flowing west to the Timor Sea. This would have allowed potential interchange of forms between West Papua, Arnhem Land and the Kimberley via coastal rivers and associated habitat quite different from that provided by Lake Carpentaria. It would also have isolated the rainbowfish fauna from these western and west-central rivers from those flowing into the eastern seaboard of Australia and south-eastern New Guinea. This may explain the different species from the Kimberley and western Arnhem Land – Melanotaenia australis, M. exquisita, M. pygmaea etc. Living evidence of long-standing connection with New Guinea is strongest in Cape York Peninsula, becoming attenuated in Arnhem Land and much more so in the Kimberley of north Western Australia.

Although the region today includes two very different nations and part of a third, and although the two main landmasses are currently separated by Torres Strait, from a biological and geological point of view, it is a single unit. Most of the fauna and flora of New Guinea are shared, at least in their origin, with the continent of Australia.

There were three main reasons for the enormous diversity that developed in both plant and animal life. While much of the rest of the world underwent significant cooling and thus loss of species diversity, Australia–New Guinea was drifting north at a pace such that the overall global cooling effect was roughly equalled by its gradual movement toward the equator. Temperatures in Australia–New Guinea, in other words, remained reasonably constant for a very long time, and a vast number of different plant and animal species were able to evolve to fit particular ecological niches.
New Guinea Freshwater Biodiversity

▲ Ramu River ▼ Ramu River Valley

[Image: A view of the Ramu River and the Ramu River Valley.]
New Guinea Freshwater Biodiversity
New Guinea Freshwater Biodiversity

Because the continent was more isolated than any other, very few outside species arrived to colonise, and unique native forms developed unimpeded. Finally, the continent was already very old and thus relatively infertile. Where other continents had volcanic activity and/or massive glaciation events to turn over fresh, un-leached rocks rich in minerals, the rocks and soils of Australia-New Guinea were left largely untouched except by gradual erosion and deep weathering. In general, fertile soils produce a profusion of life but only a relatively small number of species (because where nutrients are plentiful, competition is largely a matter of absorbing them as fast as possible). In contrast, infertile soils tend to produce a great variety of species, each one specialised for a particular niche: a single plant species, for example, can rapidly develop into several different but related species: one that specialises in slightly acid conditions, another that colonises dryer places, and so on.

For about 40 million years Australia-New Guinea was completely isolated. During this time, the continent experienced numerous changes in climate, but the overall trend was towards greater aridity. When South America eventually separated from Antarctica, the development of the cold Antarctic Circumpolar Current changed weather patterns across the world. For Australia-New Guinea, it brought a marked intensification of the drying trend. The great inland seas and lakes dried out. Much of the long-established broad-leaf deciduous forest began to give way to the distinctive hard-leaved sclerophyllous plants that characterise the modern Australian landscape. For many species, the primary refuge was the relatively cool and well-watered Great Dividing Range. Even today, pockets of remnant vegetation remain in the cool uplands, some species not much changed from the Gondwanan forms of 60 or 90 million years ago.

Eventually, the Australia-New Guinea tectonic plate collided with the Asian plate to the north. As a result of the collision, the northern part of the continent was buckled upwards, forming the high and rugged mountains of New Guinea and, by reverse (downwards) buckling, the strait that now separates the two main landmasses. Although New Guinea is the most northerly, and could be expected to be the most tropical in climate, the altitude of the New Guinea highlands is such that a great many animals and plants that were once common across Australia-New Guinea now survive only in the tropical highlands.

**Papua New Guinea**

Papua New Guinea with a land area of approximately 462,000 km² is located in the south-west Pacific about 160 kilometres north-east of Australia and includes the eastern half of the island of New Guinea; the Bismark Archipelago, of which New Britain, New Ireland, and Manus are the largest islands; Bougainville and Buka Islands in the Western Solomons; and the Trobriand, Woodlark, D'Entrecasteaux, and Louisiade Island groups to the east of the New Guinea mainland. Papua New Guinea has more than 1400 islands one third of which are in Milne Bay Province. It is bound by the Gulf of Carpentaria and Coral Sea to the south, Indonesia to the west, the Solomon Sea to the east and the Bismarck Sea to the northeast. Few Australians realise that one of Australia’s most northern boundaries, Saibai Island in Torres Strait, is a mere 3 km from the southern coast of Papua New Guinea.

The relief of Papua New Guinea is dominated by a broad central cordillera that runs through the middle of the country. On the border with West Papua, the main mountain range is about 100 km wide, but it increases in width in the central highlands region to 300 km. From there, the cordillera narrows towards Milne Bay. These highlands are a complex system of ranges and valleys. The highest peaks are Mt Wilhelm (4509 m), Mt Giluwe (4368 m), Mt Albert Edward (3990 m) and Mt Victoria (4035 m). The central cordillera is interspersed by broad upland valleys while the central depression that includes the valleys of the Sepik, Ramu and Markham Rivers, lies between the north and central ranges. Along the Daru coast, a great delta plain of swamps exists and large areas of the country are also covered by swamps. In general, the offshore islands are characterised by a similar pattern of mountain ranges with swampy coastal plains.

A discontinuous mountain chain separates the Sepik-Ramu wetland from the north coast. The Torricelli Mountains, rising to 1200 metres, form the western part of this chain, and at the eastern end the Adelbert, Finisterre and Saruwaged Ranges rise to almost 4000 metres. The Sepik and Ramu Rivers discharge to the Bismarck Sea in a wide gap between the Torricelli and Adelbert Ranges. The Markham River occupies the eastern part of this great northern depression, and is an unusual river for Papua New Guinea being a braided stream for most of its length. To the south, in the western part of Papua New Guinea, is a huge tract of low-lying land drained by the Fly and Strickland Rivers. The Purari River has a large catchment area (33670 km²) draining the central highlands, and is the third largest river in Papua New Guinea. The area east of the Purari River consists of the coastal plains of Gulf and Central Provinces. These coastal plains are swampy areas traversed by meandering rivers with associated oxbow lakes. The lower reaches of the rivers have extensive floodplains that may be seasonally inundated giving rise to vast swamps. Small wetlands are found in the highlands and on the islands.

The inland waters of Papua New Guinea are dominated by the major river systems that drain the central cordillera of the mainland. In the north are the Sepik River basin in the west and the Ramu River basin in the east. To the south the Fly and Strickland Rivers in the west drain into the southern watershed, which is the largest tract of low-lying land in Papua New Guinea, before discharging into the eastern Gulf of Papua, an extensive delta. Further east, the Purari River drains the central highlands and discharges into the Gulf of Papua, also through an extensive delta. These rivers are characterised by large flow volumes and high sediment loads, and in the upper and middle reaches are generally fast-flowing and turbulent.
The Sepik River is the largest river system in Papua New Guinea, with a catchment area of 77,700 km², and a discharge estimated to range between 4,500 and 11,000 cubic metres per second. It has a deep main river channel and is navigable for about 500 kilometres. The river discharges directly into the sea through a single outlet, in marked contrast to the rivers flowing south of the central cordillera, which characteristically have extensive deltas. There are approximately 1500 oxbow and other lakes within the Sepik floodplain, the largest of which is Chambri Lake. Many of the oxbow lakes in the lower floodplain are considerably deeper, but not as extensive.

The Fly River, although only 1200 kilometres in length, has a discharge range of 6,000 to 7,500 cubic metres per second, making it the second largest river in Papua New Guinea. The river descends rapidly from its headwaters in the central cordillera, but in its lower reaches the gradient is much more gentle. The river is navigable as far as the port of Kiunga, which is 800 kilometres from the sea, but only 40 metres above sea-level. The fauna and flora of the highland forests in the upper catchment are amongst the richest in Papua New Guinea, whilst the plains of the middle and lower Fly River support a mosaic of internationally significant wetland and savannah habitats.

Rainfall in the upper catchment of the Fly River regularly exceeds 10,000 mm per annum, and at times of flooding, the river level may rise by up to 10 metres, flooding the extensive areas of alluvial forest, swamp grassland and swamp savannah in the middle and lower floodplains. The river meanders across a wide and extensive floodplain in the lower reaches, where there are numerous lakes, backswamps and oxbows of variable depth depending on age. This river system has been described as the most significant river system, in terms of biological value, on the island of New Guinea, and therefore arguably one of the most biologically significant tropical river systems in the world, given Papua New Guinea’s global biodiversity status. There is now strong evidence that the mining operations at Ok Tedi have increased the rate of sedimentation downstream, and may be one of the causes of extensive areas of vegetation dieback and damage to aquatic habitats observed in recent years.

The Purari River discharges to the Gulf of Papua through an extensive delta of mangroves and associated forest assemblages and together with the Kikori River and its delta immediately to the west of the Purari River constitute one of the most important undisturbed natural mangrove assemblages in the South-East Asia and Pacific region.

Further to the east in Central Province, the Vailala, Lakekamu, Angabanga, Vanapa, Brown, Laloki and Kemp-Welch Rivers also have mangrove assemblages in the lower reaches, although not as extensive, Nor in as pristine a condition, as those of the Kikori and Purari Rivers. The upper catchment of the Laloki River system has undergone some modification with several upland tributary valleys flooded as a result of the construction of the Surinumu Dam as a water supply reservoir for Port Moresby, and the diversion of water to hydropower facilities at Rouna. This will have resulted in changes to the flow regime downstream, although an assessment of these changes is difficult as few records exist from before the construction of the dam and hydropower facilities.

There has also been considerable anthropogenic disturbance of the lower Laloki River as it meanders around and to the west of Port Moresby. In its lower reaches, the Waigani Swamp has been badly degraded as it receives about 80% of the sewage from Port Moresby and major changes to the natural floristic composition have been recorded over the last thirty years. More recently, the Angabanga River is showing possible signs of increased siltation and sedimentation in the lower reaches and river-mouth, which local people have attributed to mining in the upper catchment.

The Ramu and Markham Rivers flow west and east respectively from a watershed divide on an intermontane trough between the Finisterre and central cordillera ranges. The Ramu River, which has a relatively small catchment area, flows in a westerly direction, approximately 720 kilometres long, and discharges through a flat, swampy floodplain to the east of the Sepik River mouth. The Markham River, 170 kilometres long, flows through a wide, braided channel into the Huon Gulf by the city of Lae.

Given the high rainfall and generally rugged topography, rivers are usually fast-flowing with very high discharges. Consequently, except in the broader, lowland areas, most rivers in Papua New Guinea have poorly developed aquatic fauna and flora.

There are over 5,000 lakes in Papua New Guinea, but most are small with only 22 having a surface area greater than 1,000 hectares. Over 80% of the country’s lakes lie below 40 metres above sea-level and most are associated with large rivers and surrounded by extensive wetlands. Lake Murray, in the Fly-Strickland Basin is the largest lake, with an area of approximately 650 km² and a maximum depth of nine metres (mean depth of five metres). Lake Chambri, in the Sepik floodplain, is the next largest, and can extend up to 250 km² during floods. Like Lake Murray, it is a shallow lake with maximum depth of four to six metres.

Deep lakes are usually associated with calderas, such as Lake Wisdom on Long Island (360 m) and Lake Dakataua on West New Britain (120 m). Few studies have been carried out on these lakes and their biology remains largely unknown. Lake Kutubu, in the Southern Highlands petroleum fields, was formed when volcanic activity from Mt. Afuma blocked the watercourse. A number of biological surveys and studies have been conducted on Lake Kutubu that has indicated a high degree of endemism in the lake fauna, with several species new to science. It remains to be seen whether similar endemism occurs in other upland or montane lakes, for example, the lakes in the high mountains of the central cordillera which were formed by glacial activity, such as Lake Piunde and Lake Aunde on Mt Wilhelm.
New Guinea Freshwater Biodiversity
Most lowland freshwater wetlands are a mosaic of open water, herbaceous swamp, swamp savannah and woodland. These form a continuous sequence from open water to tall, mixed swamp forest, depending on the drainage, depth and flooding conditions, and the water quality (for example, the concentration of silts and nutrients which will affect the eutrophic status of the water). The aquatic vegetation consists of free-floating, floating-leaved and submerged plants that occupy the shallow margins between open water and the grass swamp. In many of the shallow lakes these vegetation types can cover the entire lake. Sedges, herbs and ferns are characteristic of permanent, relatively deeper, stagnant water swamps.

Throughout PNG the annual rainfall is on average about 3000 mm but varies from barely 1000 mm in Port Moresby, which lies in a rain shadow, to over 8000 mm in saturated Ningerum, in the headwaters of the Fly River of Western Province. Most areas have a drier and a wetter season, which are governed by the prevailing winds. From May to October the South East Trades bring rainfall to areas that have south-eastern facing coastlines and from December to April the North West Monsoons bring rain to areas that have north-western facing coastlines. The lowland areas have a temperature range from 32°C in the daytime to 23°C at night. In the highlands the average temperature range is from 25°C in the daytime to 15°C at night - though it can get much cooler at the highest altitudes. Along with the rest of the Pacific, PNG is influenced by the El Niño Southern Oscillation (ENSO) cycle, which brings a pronounced dry season every few years.

The luxuriant rainforest, which covers most of Papua New Guinea, gives a misleading impression that the soil is highly fertile; however, many of the inland soils are shallow, heavily leached, and relatively infertile. Notable exceptions are the broad lowland valleys of the Markham and Ramu Rivers and many highland valley systems, where alluvial loams or soils of volcanic origin can be very productive. The greatest soil fertility problem, leaching, results from heavy rainfall and already has degraded the soils of the Sepik and Daru Plains.

Mangrove swamps occupy large parts of the coastal areas in Papua New Guinea. They are normally found along protected bays and near the mouths of rivers. The largest areas of mangroves occur in the south, especially in the Gulf of Papua into which several large rivers flow (e.g. the Fly, Kikori and Purari). The north coast is not as rich in mangroves as the south coast. While large areas of mangroves in remote regions are untouched, those near urban areas and in proximity to development schemes are subject to various degrees of degradation. Some of the developments that have resulted in indiscriminate felling of mangroves include oil and gas exploration in the Gulf of Papua, various timber projects and port developments. The felling of mangroves for firewood in urban areas is also now causing concern.

No systematic or comprehensive surveys have been made of the fauna of any wetland in Papua New Guinea. Although major gaps still remain, knowledge of Papua New Guinea's biodiversity is much better than that of many other tropical countries. Papua New Guinea is much better known than West Papua for most (but not all) organisms - a factor which complicates analyses of endemism and distribution patterns. Overall, a very large body of data exists, but it is scattered through scientific literature that has accumulated over the last 200 years and collections located around the globe.

Papua New Guinea has an estimated 5% of the world's biodiversity though it represents only 1% of the world's surface area. For example the country has an estimated 300,000 species of insect - many of which are unknown to science - and well over 3000 species of orchids. There are over 300 species of reptiles including some of the world's most poisonous snakes and the saltwater crocodile, which grows to more than six metres in length. Papua New Guinea lies to the east of Wallace's line, the oceanic trench which delineates the major biogeographical boundary between Southeast Asia and Oceania. This means that its mammalian fauna are largely marsupial in common with Australia. The tree kangaroos are some of its most distinctive mammals and in 1994 a new species, Dingiso, was made known to science by the Australian biologist, Tim Flannery.

Arguably the jewel in the crown of Papua New Guinea's fauna is its birds. Papua New Guinea has 840 species of birds almost 100 more than Australia that has a far larger land mass. Its most famous birds are the illustrious birds of paradise. Thirty-eight of the known forty-two species of birds of paradise are found only in New Guinea and its immediate offshore islands. The Paradisaea bird of paradise, the 'kumul' is PNG's national emblem.

Although there is a lack of hard data, there is a general consensus that increasing development around the country is resulting in more solid and liquid wastes and soil sediments (from stormwaters and runoff from exposed ground surfaces) entering the rivers and coastal waters, causing deterioration in water quality.

This deterioration is most evident in the increasing amounts of domestic rubbish, particularly plastics, which are now commonly seen in many rivers and along shorelines. There is also some evidence, mainly anecdotal, that increasing siltation and eutrophication (nutrient and organic enrichment) of downstream catchments and coastal waters are affecting values such as potable water quality, biodiversity and ecological productivity. The extent to which toxic materials are a significant component in this deterioration will vary from catchment to catchment, but a more accurate assessment of national conditions is limited by a lack of data.

Although development is putting increasing pressure on these habitats, a lack of public awareness and understanding of the risks to, and importance of these habitats is exacerbating these risks. The generally low priority given to environmental concerns and the lack of skills and resources provided to conduct effective environmental management
and the monitoring of many developments in the rural sector, together with the inability of regulatory agencies to enforce compliance to acceptable practices, often results in unnecessary damage to these critical habitats.

In a country like Papua New Guinea, where approximately 80% of the population are dependent on maintaining the quality of their local environment to fulfill their basic needs, the importance of protecting critical habitats and the biodiversity they support goes beyond conserving the intrinsic biological value of these habitats. The establishment of adequate transport and communication facilities is both difficult and expensive because these geographical and climatic conditions inhibit the development of some of the interior and have a negative impact upon the entire process of social, political, and economic integration and development.

**Papua (Irian Jaya)**

The western half of New Guinea, with an area of 421,841 km², is the Indonesian part of the island and consists of two provinces, Papua and West Papua. It was previously known by various names, including Netherlands New Guinea (1895-1961), West Papua (1961-1962), West New Guinea (1963), West Irian (1963-1973), and Irian Jaya (1973-2000). The incorporation of western New Guinea into Indonesia remains controversial. Western New Guinea was annexed by Indonesia under the controversial “Act of Free Choice” in 1969. In 2003, the Indonesian central government declared that the province would be split into three provinces: Papua Province, Central Irian Jaya Province, and West Irian Jaya Province. Opposition to this resulted in the plan for Central Irian Jaya province being scrapped, and even the designation of West Irian Jaya Province is still legally unclear. Despite this, the West Irian Jaya (Irian Jaya Barat) province was formed on February 6th, 2006 and the name was officially changed to West Papua (Papua Barat) on February 7th, 2007.

The western half of New Guinea (47%) was claimed by the Netherlands as part of the Dutch East Indies from the 19th century onwards. When the Republic of Indonesia was created in 1949 the Netherlands granted independence to the colonised peoples of the former Dutch East Indies. Western New Guinea however, due to its distinct Melanesian population and cultural characteristics (West Papuans are ethnically and culturally distinct from the Indonesians), was retained as a colony by the Dutch and during the 1950s the Dutch government prepared the territory for independence. President Sukarno meanwhile consistently maintained Indonesia’s claim to all former territory of the Dutch, and when his demands were not met armed conflict ensued.

Under pressure from the United States to come to terms with Indonesia, the Dutch agreed to secret negotiations. In August 1961 an agreement was concluded in New York between the Netherlands and Indonesia, under which the Dutch were to leave Western New Guinea and transfer sovereignty to UNTEA (the United Nations Temporary Executive Authority), for a period of six years until a national vote was to be conducted to determine Papuan preference for independence, or integration with Indonesia. Almost immediately however, Indonesia took over the administration from UNTEA.

The terms of the handover from the Dutch to Indonesia in 1961 included the agreement that Indonesia was to allow a United Nations supervised ‘Act of Free Choice’ by 1969; this was instead undertaken by the Indonesian military. The “act of free choice” took the form of selecting 1026 representatives, teaching them the Indonesian language and explaining that the Netherlands was claiming their land and that Indonesia would help them remove any Dutch claim to colonial ownership of Western New Guinea; and finally having these representatives vote in front of armed Indonesian military. Neither of the two Western nations with an interest and some influence in the area, the Netherlands and Australia, saw fit to protest against these actions. Resistance to Indonesian occupation, both from the quasimilitary Organisasi Papua Merdeka (OPM, or Free Papua Movement) and through civil disobedience, has been a recurrent theme since the 1960s to now.

Western New Guinea (West Papua) and its peoples are divided into two distinct zones: the highlands and the lowlands. The central mountainous range is home to the highland tribes. These tribes include the Amungme and the Dani. The lowland people, such as the Asmat and Kamoro, live in the swampy coastal areas.

**Biodiversity**

The mountains of New Guinea’s Central Dividing Range run like a backbone from the Bird’s Head to the southeastern tail of the island. Within West Papua, these mountain ranges include the Sudirman Range (formerly Nassau Range) in the west and the Jayawijaya Range (Star Mountains) extending eastward toward the Papua New Guinea Border; those two ranges are separated by the great Balem Valley. The four remote, snow-capped peaks that crown this cordillera include the snow-capped Mt. Jaya (4884 m) with its nearby glacier at the Carstensz Pyramid, Mt. Idenburg (4717 m), Mt. Trikora (4730 m) and Mt. Mandala (4640 m).

The central mountain range divides the island into its two major lowland districts. Western New Guinea’s northern coastal plain has extensive foothills interspersed with lowland swamps, as well as several isolated coastal blocks of mountains such as the Cyclops Mountains (2160 m) near heavily populated Lake Sentani in the east, as well as the pristine forests of the Foya Mountains. The northern watershed of the central cordillera forms the Lakes Plain – a vast system of swamps and meander-belts between the central mountains and the north coast, which is drained from the east by the Taritatu (Idenburg) River and from the west by the Taritau (Rouffaer) River. These two rivers converge to form West Papua’s largest river, the Mamberamo, which slices through gorges in the coastal mountain blocks to empty northward into a swampy delta in the Pacific Ocean.
The lake plains and mountain blocks of West Papua's northern watershed contrast dramatically with the more expansive lowlands to the south of the Central Dividing Range. The coastal plains descend from the central mountains with a much gentler slope, sliding along the parallel lines of innumerable rivers which, arriving at low elevations, converge and split again forming wide, slow-moving, meandering, silt-depositing waterways, often through vast swamplands or seasonal lakes as well as spectacular lowland rainforest, then finally reach the sea and mix with it to become the brackish-water habitat of the mangrove swamp. These lowland rainforests, swamps, and mangrove areas all have a rich species diversity.

West Papua is perhaps the biologically richest and most diverse assemblage of ecosystems in the tropical Pacific region. Teeming with wildlife and vegetation, it is home to at least 100,000 species of plants and animals found nowhere else on earth; most of which have never been studied. It contains almost half Indonesia's total biodiversity and has a significant portion of the World's remaining tropical forests as well as some of the most pristine coral reefs in the world. Its jungles are among the wildest, most impenetrable in the world. It has the largest area of mangroves of any Indonesian island. Freshwater endemic species are found throughout West Papua because almost all lakes are unique ecosystem with endemic species. The Raja Ampat Islands, situated along the northwest coast of West Papua, is considered to be the single most biodiverse marine site in the world at this time.

Clearly because of its rich biodiversity, West Papua should be both an Indonesian and world priority for conservation activities to conserve its biota. Unfortunately there is a profound absence of biological information available.

The Mamberamo region is virtually undeveloped and retains most of its forest cover and has only a sparse human population. The region supports a vast area of pristine lowland rainforest on the northern side of West Papua's central cordillera. It is the largest catchment in West Papua, draining all northward flowing streams that descend from the central mountains between the Papua New Guinea border and approximately 137° west longitude.

The area is not well-studied but possesses a wealth of biodiversity. There have been some expeditions, in 1920 (van Heurn), 1939 (Archbold expedition) and 1947 (van Beinmel). Information about the Mamberamo biodiversity increased when Jared Diamond (1979) and Gerald Allen (1982) did some surveys in this area. Considering that these surveys only covered a small part of the area, this information is still not enough to know the biodiversity of Mamberamo. For example, a short survey there in the pristine lowland areas during a single dry season collected 129 butterfly, 480 moths, 23 fish, 21 frog, 36 reptile, 143 bird, 69 mammal and 234 plant species.

Exploitation of their natural resources is a major problem for the people of West Papua. The destruction of West Papua's culture and environment is taking place with the full knowledge of the governments of the Western Nations,
protecting the business interests of numerous large multinational corporations active in West Papua. The notorious Grasberg mine in the South Central highlands region, whose principal owners are the American company Freeport McMoRan and the British company Rio Tinto, is the largest copper and gold mine in the world. It has had a devastating impact on both the highland Amungme, whose land it occupies, and the lowland Kamoro, who suffer the effects of the mine's wastes.

Pristine forests, hills and mountains (eg. In and around cities of Jayapura and Sorong, have been denuded by indiscriminate logging and road and housing construction companies in their quests for hardwood logs and the so-called 'urban and rural' development. This includes logging of mangroves in the estuaries and coastal inlets. Road builders paid scant regard to the ravages of fire and soil erosions. The reefs, coastal seas, rivers and lakes have been overfished. Introduction of exotic plant diseases and predatory freshwater fish have the added potential of destroying the delicate balance of the ecosystem. Predatory freshwater fish could wipe out the local freshwater fish stocks and other freshwater life not just in West Papua but of the whole island.

**Freshwater Systems**

The best-known fauna in lakes and streams are the fish; this is a result of the extensive surveys by Gerald Allen and his colleagues over the past 15 years. Recent surveys by Allen et al. (2002) in the Yongsu-Cyclops Mountains and the southern Mamberamo Basin recorded a total of 23 species in 18 genera and 11 families. The small goby Gobius tigrellus was collected for the first time since the 1930s. It was previously known from only 10 specimens collected from the Mamberamo system by the 1938-1939 Archbold Expedition. Unfortunately, six introduced fish species were also documented in the Mamberamo system, which has the highest proportion of endemic species of any New Guinea river. The impacts of these introduced species on native fish populations should be assessed as a matter of urgency. Despite their proximity, the two main sites surveyed, the Furu and Tiri rivers, downstream from the Idenburg River, which flows into the Mamberamo River, had slightly different floras and faunas.

Water levels in the main river fluctuate dramatically through the year, creating a variety of aquatic habitats including swampy and flooded forest, swampy grasslands, oxbows, and small lakes. There is a transition from lowland to foothill forest at the southern edge of the basin where the central cordillera rises steeply from the swampy lowlands.

The Cyclops coast is probably the best example of a steep gradient coastal stream habitat in Papua. The only comparable areas are high offshore islands, such as Yapen, Biak and islands in the Raja Ampat Group. The Yongsu system remains in excellent condition, lending credence to the need for an integrated conservation management plan for the entire Cyclops coast. But it does not appear to contain endemic fish.
New Guinea Freshwater Biodiversity

Sudirman Mountains (Snow Mountains)

Paniai Lakes [West Papua]
On the other hand, the Mamberamo Basin contains the highest proportion of endemic fish of all the major New Guinea rivers. Although five species in Mamberamo are also endemic to the combined Sepik-Ramu systems, relatively few are unique to only one of these rivers. Of great concern is the observation that this endemicity is matched by the numbers of exotic fish (17%), introduced during the 1970s and 1980s that are also found in these rivers in the Mamberamo Basin.

Lake Sentani, near Jayapura at the NE extremity of West Papua, lies at an elevation of 73 m. It is an irregularly shaped lake with approximate dimensions of 28 km (E-W) by 19 km (N-S) and a surface area of 10,400 ha. Lake Sentani is by far the largest of the West Papuan lakes. It is fed by a catchment area of about 600 km² and has one outlet only, via the Jafuri and Tami rivers to the Pacific Ocean near the Papua New Guinea border and is bounded by the Cyclops Mountains to the north. A survey by Samuel J. Renyaan in 1993 recorded 33 species of fish, of which 12 are indigenous, 8 anadromous and 13 introduced. Surveys have shown an increase in introduced species but the impact on the total fish population has not been documented. Fish are extensively raised in ponds and cages around the perimeter of the lake and the introduction of species (particularly carp and tilapia) has been both accidental and intentional.

A number of freshwater lakes were identified as high priority for conservation by Conservation International in 1999. This was because they are important areas of fish and crayfish endemicity. These are Danau Bira (Lake Holmes), Lake Sentani, Lake Kamaka, Paniai Lakes, Ayamaru Lakes, Lake Kurumoi, Lake Yamur (which peculiarly contains Bull Shark (Carcharhinus), which is usually marine or estuarine species), Lake Lakamora, and Lake Aiwaso. The largest lake in West Papua is Paniai, followed in order of declining size by the lakes Ronbenbai and Sentani, both in the vicinity of Jayapura, and Anggigita near Manokwari.

Specific freshwater fish that are threatened in West Papua are: Freshwater Sawfish (**Pristis microdon**), Giant Freshwater Stingray (**Himantura chaophraya**), Bleher's Rainbowfish (**Chilatherina bleheri**), Sentani Rainbowfish (**Chilatherina sentaniensis**), Red Rainbowfish (**Glossolepis incisus**), Arfak Rainbowfish (**Melanotaenia arfakensis**), Boeseman's Rainbowfish (**Melanotaenia boesemani**) and Lake Kurumoi Rainbowfish (**Melanotaenia parva**) (Conservation International 2002).

In other areas of West Papua, exotic fish that compete with or prey upon native fauna, such as the Striped Snakehead (**Channa striata**) and Climbing Perch (**Anabas testudineus**), are particularly threatening to the native fish.
New Guinea Freshwater Biodiversity

Baliem River [West Papua]
Although the marine fishes of New Guinea are reasonably well documented, the same cannot be said of the freshwater fauna. Nevertheless, what little is known illustrates remarkable species diversity and uniqueness as well as close associations with Australia. Field surveys and published taxonomic works have been sporadic since the first species were discovered in the 1860s. Historically there have been considerable problems associated with fieldwork in the interior. Aside from the dangers of malaria and other diseases, potential collectors were discouraged by the hazards of overland travel across very difficult terrain. Consequently, most early collections were obtained near the coast or along navigable rivers. The most active period of ichthyological exploration occurred between 1903 and 1920 by Dutch naturalists. The majority of these early collections were summarized by Weber in 1913. By 1925, a total of approximately 100 species had been recorded from fresh waters. These indicated a high degree of specialization and endemism in the freshwater fish fauna.

Existing knowledge of the fishes of New Guinea has been well synthesised in field guides and checklists, but more research remains to be done. The freshwater fish fauna of New Guinea consists of approximately 375 species if a generous definition is given for freshwater. About one third of these have a marine larval stage, thus making them widespread. The ‘true’ freshwater ones, with no marine involvement, only number around 217. Of the 217 strictly freshwater species, 149 are endemic to New Guinea.

There has been a pronounced renewal of interest in the freshwater fauna during the past 25 years, in part due to the development of an efficient air transport network, as well as road construction in previously inaccessible districts. The number of fish species found in New Guinea seems to increase each time a qualified researcher enters a new area. Gerald Allen has added at least 75 new fish species to the scientific literature. This includes 35 species of rainbowfishes (including one new genus), 9 species of blue-eyes, 14 species of gudgeons, 9 species of gobies, plus 8 species in various other families.

Most recent research has involved Papua New Guinea, the island’s eastern half. Comprehensive surveys have been conducted for the Fly, Purari, Laloki, Sepik, Ramu, and Gogol rivers, as well as many other regions. As a result of these investigations there now exists a fairly comprehensive knowledge of the fishes inhabiting the eastern half of the island. Unfortunately, the western half, the Indonesian province of Papua, remains poorly studied. Our knowledge of the fishes of this vast area is still largely based on the now out-dated work of the early Dutch explorers. The Timika region and sections of the Mamberamo basin have been sampled, but most regions remain unsurveyed.

The freshwater ichthyofauna can be clearly divided into two zoogeographic regions. Freshwater bodies to the south of the central cordillera have an ichthyofauna closely allied with that of northern Australia. While several of those species with diadromous habits can be found in both southern and northern rivers, the fish permanently inhabiting freshwater in the north are invariably different species from those in southern water bodies. Apart from the land barrier formed by the central cordillera, northern rivers are much younger than southern rivers. Of those fish families common to both northern and southern rivers, species diversity is invariably lower in the north. Only two species, a rainbowfish (Chilatherina campsi) and a gudgeon (Oxyeleotris fimбриata) have managed to ‘cross’ the central mountains as they are found both on the northern as well as the southern drainages. Within the enormous southward-flowing Fly River alone there are well over 100 fish species, representing 33 families. The Sepik River, also large, is less diverse but serves as a corridor for many marine and marine-derived taxa.

In general, the fish fauna of New Guinea is closely related to that of northern Australia. Nearly all the families, most genera, and numerous species are shared between these two areas. While there are only around 33 species shared with northern Australia, the two most interesting families, the Melanotaenidae (Rainbowfishes) and the closely related Pseudomugilidae (Blue-eyes) are unique to Australia and New Guinea.
Fish Species List & Partial Distribution Record

Acanthopagrus berda - Pikey Bream [Fly River, Timika]
Achirus poropterus - Estuary Sole (Inhabits estuaries and the lower sections of freshwater streams)
Allomogurnda flavimarginata [Bulolo, Wau, Morobe Highlands]
Allomogurnda hoesei [Village of Lalibu, Southern Highlands]
Allomogurnda insularis [Matalamoia and Tuabeda Rivers (Goodenough Island)]
Allomogurnda landfordi [Lubu River (Kikori River system); Lakekamu River]
Allomogurnda montana [Awatowa River (Fergusson Island)]
Allomogurnda nesolepis - Yellowbelly Gudgeon [Wapoga, Tirawiwa, Mamberamo, Gogol, Tawarin, Markham, Ramu and Sepik River systems]
Allomogurnda papua [Kemp Welsh and Laloki Rivers]
Allomogurnda sampricei [Reifafeif River (Yapen Island)]
Ambassis argus - Sailfin Glassfish [Timika, Jamur Lake; Setakwa, Lorentz, Merauke, Bensbach, Fly-Strickland Rivers and Daru Island]
Ambassis buruensis - Buru Glassfish [Sepik River (Occurs in brackish mangrove estuaries and lower reaches of freshwater streams)]
Ambassis interrupta - Long-spined Glassfish [Wewak, Manus Island, Madang, Rabaul and from the Wapoga, Sepik, Ramu, Bensbach, Fly and Oroimo Rivers]
Ambassis macleayi - Macleay's Glassfish [Bensbach, Fly-Strickland (including Lake Murray)]
Ambassis macracanthus - Estuarine Glassfish [Wapoga, Tirawiwa Rivers, Klipong; Murnass River]
Ambassis miops - Flag-tailed Glassfish [Sermowai River, Yongsu region, Vailala Creek (near Port Moresby), Lorengau River on Manus Island]
Ambassis nalua - Scalloped Glassfish [Sepik, Bensbach, Purari River, Laloki Rivers (Usually found in brackish waters of bays and estuaries, entering freshwater and mangrove-lined tidal creeks)]
Ambassis reticulata [Omba River, Fakfak]
Ambassis urotaenia - Banded-tail Glassfish [Bensbach River (Occurs in brackish mangrove estuaries and lower reaches of freshwater streams)]
Ambassis vachelli - Vachelli's Glassfish (Occurs in brackish mangrove estuaries and lower reaches of freshwater streams)
Ammiataba affinis - Tiger Grunter [Fly, Morehead and Bensbach River systems]
Anguilla bicolor - Indian Short-finned Eel [Timika, Wapoga, Sepik, Ramu, Mamberamo, Lakekamu, Tirawiwa and Sapoi Rivers]
Anguilla interioris - Highlands Long-finned Eel [Gang Creek, Khornambe (PNG), Milne Bay (freshwater streams), Mamberamo, Lorentz River]
Anguilla marmorata - Giant Mottled Eel [Wapoga, Sepik, Tirawiwa and Ramu Rivers; Yongsu region, Gogol River, Buso River, Surumaran River, Sapi River]
Anguilla megastoma - Pacific Long-finned Eel [Streams of Popondetta and Kairiru Island, just northwest of Wewak]
Anguilla obscura - Pacific Short-finned Eel [Port Moresby, Embi Lakes near Popondetta, Madang, Sepik and Fly River]
Anguilla reinhardtii - Speckled Long-finned Eel [Fly River, Timika]
Antennarius biocellatus - Brackish Water Frogfish [Misool Island, Maiwara River (Milne Bay, PNG)]
Apogon amboinensis - Amboina Cardinalfish [Yongsu region, Biges River (PNG), (Occurs in brackish mangrove estuaries and lower reaches of freshwater streams)]
Apogon hyalosoma - Humpbacked Cardinalfish [Yongsu region (Occurs in brackish mangrove estuaries and lower reaches of freshwater streams)]
Apogon trifasciatus [Lorentz River]
Arius augustus = Neoarius augustus - Short Barbelled Catfish [Fly River]
Arius berneyi = Neoarius berneyi - Berney's Catfish [Fly River]
Arius carinatus = Cinetodus carinatus - Comb-spined Catfish [Fly and Lorentz Rivers]
Arius coatesi = Potamosilurus coatesi - Coates' Catfish [Sepik and Ramu River systems]
Arius crassilabris = Pachyula crassilabris - Thick-lipped Catfish [Purari and Fly-Strickland River systems]
Arius danielsi = Cochlefelis danielsi – Daniel's Catfish [Timika, Purari and Fly Rivers]
Arius dioctes = Cochlefelis dioctes – Catfish [Timika, Fly, Yongsu region, Vailala Creek (near Port Moresby), Lorentz, Merauke, Bensbach, Fly, Lorentz, Merauke, Bensbach, Fly-Strickland River systems]
Arius graeffei = Neoarius graeffei - Lesser Salmon Catfish [Timika, Bensbach, Purari, Fly Rivers and Lake Jamur]
Arius latirostris = Potamosilurus latirostris - Broad-snouted Catfish [Timika, Laloki, Lorentz, Purari, Digul and Fly Rivers]
Arius leptaspis = Sciades leptaspis - Triangular-shield Catfish [Timika, Bensbach, Purari, Fly, Lakekamu and Sapoi Rivers]
Arius macrorhynchus = Potamosilurus macrorhynchus - Sharp-nosed Catfish [Purari, Digul, Lorentz and Fly Rivers]
Arius nox = Brustiarius nox - Comb-gilled Catfish [Sepik and Ramu Rivers]
Arius nudidens = Cochlefelis spatula – Catfish [Lorentz River]
Arius polystaphylodon = Plicofollis polystaphylodon - Mozambique Sea Catfish [Sepik River]
Arius spatula = Cochlefelis spatula – Catfish [Lorentz region]
Arius solidus = Brustiarius solidus - Hard-plate Catfish [Mamberamo, Ramu and Sepik Rivers]
Arius thalassinus = Netuma thalassinus – Giant Catfish [Timika]
Arius taylori = Potamosilurus robertsi - Taylor's Catfish [Fly River]
Arius utaratus = Sciades utaratus - Northern Rivers Catfish [Mamberamo, Ramu and Sepik Rivers]
Arius velutinus = Potamosilurus velutinus - Papillate Catfish [Wapoga, Mamberamo, Tami, Tawarin, Ramu, Sepik, Fly Rivers and Lake Sentani]
Arrhampus scleroplepis scleroplepis - Northern Snubnose Garfish [Laloki and Fly Rivers]
Aseraggodes klunzingeri – Tailed Sole [Timika, Merauke, Mappi, Digul, Fly, Lorentz and Bensbach Rivers]
Lentipes multiradiatus [Male]

Allomogumda insularis [Male]

Photo: Gerald Allen
Awaous acritosus - Roman-nosed Goby [Laloki, Lakekamu and Sapoi Rivers; Yongsu region]
Awaous grammopomus - Scribbled Goby [Laloki]
Awaous guamensis - Goby
Awaous melanophageus - Largesnout Goby [Wapoga, Tirawiwa Rivers, Streams of northern Papua New Guinea between Lae and Madang]
Awaous n.sp. – Largescale Goby [Kim Bay Region]

Belothrictyus aruensis - Island Gudgeon [Aru Island]
Belothrictyus strigogenys - Striped-cheek Gudgeon [Timika, Digul, Ok Tedi, Oriomo and Fly Rivers]
Belothrictyus zonatus - Barred Gudgeon [Merauke River]
Brachymylgraphys brachysoma - Goby
Bunaka gynnoides - Greenback Gudgeon [Timika, Waigeo Island, Gogol, Ramu, Lakekamu, Tirawiwa, Wapoga and Sapoi Rivers, Kimbe Bay Region]
Butis amboinensis - Olive Flathead Gudgeon [Timika, Wapoga, Sepik and Ramu Rivers]
Butis butis - Crimson-tipped Gudgeon [Timika, Batanta Island, Fly and Wapoga Rivers]
Butis melanostigma - Black-spotted Gudgeon (Occurrence questionable?)

Caragobius urolepis - Scaleless Worm Goby [Bintuni, Ramu, Fly, Oriomo, Sepik and Ramu River systems]
Carax sexfasciatus - Bigeye Trevally [Yongsu region, Sepik and Ramu Rivers]
Carcharhinus leucas - Bull Shark [Freshwater localities include Timika, Sepik, Ramu, Fly Rivers and Lakes Yamur (West Papua)]
Carcharhinus amboinensis - Pigeye Shark [Bensbach, Binaturi R., Bougainville, Ramu R. mouth, Yule Is., Bootless Bay and Port Moresby]
Cestraeus goldiei - Goldie River Mullet [Laloki, Rakua, Lakekamu, Wapoga and Sapoi Rivers]
Cestraeus plicatilis - Lobed River Mullet
Chanos chanos – Milkfish [Sepik-Ramu Rivers]
Chilatherina alleni - Allen's Rainbowfish [Tirawiwa, Wapoga and Aiborei River (Siriwo)]
Chilatherina axelrodi - Axelrod's Rainbowfish [Yungkiri Stream, a tributary of the Pual River in the Bewani Mountains]
Chilatherina bleheri – Bleher`s Rainbowfish [Mamberamo River, Lake Holmes]
Chilatherina bulolo - Bulolo Rainbowfish [Markham, Bulolo, Ramu (Whege River) and Sepik River systems]
Chilatherina campsi - Highland Rainbowfish [Markham, Ramu, Sepik, Purari, Wahgi (Purari R. system), Pima, and Omsis River systems]
Chilatherina crassispinosa - Silver Rainbowfish [Tawarin River, Markham, Gogol, Ramu, Sepik, Pual, and Mamberamo River systems. It also occurs in many smaller independent drainages along the north coast.]
Chilatherina fasciata - Barred Rainbowfish [Mamberamo, Markham, Ramu, Sepik, Neumayer Rivers and Yapen Island]
Chilatherina lorentzii - Lorentz's Rainbowfish [Puive Creek (Pual River) and Tawarin River, Mamberamo]
Chilatherina pricei - Price's Rainbowfish [Reifafeif River (Yapen Island)]
Chilatherina sentaniensis - Sentani Rainbowfish [Lake Sentani]
Cinetodus carinatus – Comb-spined Catfish [Timika, Digul, Fly and Strickland Rivers]
Cinetodus crassilabris – Thick-lipped Catfish [Timika]
Cinetodus froggatti - Froggatt's Catfish [Timika, Purari and Fly-Strickland River systems]
Clupeoides pappensis - Papuan River Sprat [Timika, Digul, Fly and Strickland Rivers]
Clupeoides venulosus - West Irian River Sprat [Lorentz and Fly Rivers]
Cochlefelis danielsi – Daniel's catfish [Lorentz River]
Cochlefelis spatula - Duckbilled Catfish [Digul, Purari and Fly-Strickland Rivers]
Coius campbelli – Four-banded River Perch [Timika, Bensbach, Fly, Lorentz and Oriomo Rivers]
Coius quadridascarius - Four-barred Tigerfish [Lorenz River (maybe the same as above?)]
Craterocephalus fistularis [Lake Kamaka]
Craterocephalus kailolae - Kailola's Hardyhead [Known only from creeks near Safia in eastern Papua New Guinea]
Craterocephalus lacustris - Kutubu Hardyhead [Lake Kutubu, Lake Jamur, Balimo Lagoon, Morehead, Kubuna and Bensbach Rivers]
Craterocephalus nouhyusi - Mountain Hardyhead [Timika, Fly, Strickland, Lorenz River system]
Craterocephalus pimataue - Pima Hardyhead [Pima and Tua Rivers, mountainous tributaries of the Purari River]
Craterocephalus randi - Kubuna Hardyhead [Timika, Kubuna, Fly-Strickland, Morehead, Bensbach, Lakekamu and Sapoi Rivers]
Crenimugil heterochelus - Fringe-lipped Mullet [Yongsu region, Fly and Kemp Welsh Rivers]
Ctenotrypauchen microcephalus - Comb Goby [Sepik River]
Cynoglossus venulosus - Freshwater Tongue Sole [Digul, Fly, Oriomo, Oetoemboewe, Lakekamu, Lorenz and Sapoi River systems]

Denariusa bandata – Pennyfish [Bensbach and Fly River systems]
Doichthys novaeguineae – Spoon-snouted Catfish [Purari, Lorenz and Aramia Rivers]
Drombus globiceps – Slender-fin Goby [Madang]

Eleotris acanthopoma - Spinecheek Gudgeon [Kim Bay Region]
Eleotris aquadulcis - Freshwater Gudgeon [Sepik and Ramu Rivers]
Eleotris fusca - Brown Gudgeon [Yongsu region, Fly, Ramu and Wapoga Rivers]
Eleotris margaritacea [Sepik River]
Eleotris melanosoma - Black Gudgeon [Wapoga, Sepik and Ramu Rivers]
Epinephelus polystigma - White-dotted Grouper [Popondetta]

Ecsualosa thoracata - White Sardine [Ramu River]

Eugnathogobius tigrellus - Tiger Goby [Mamberamo River]

Gerres filamentosus - Threadfin Silver-biddy [Hermes River, Raja Ampat Islands]

Giurus hoelti – False Snakehead Gudgeon [Timika region]

Giurus margaritaceae – Snakehead Gudgeon [Timika, Wapoga, Mamberamo, Sepik and Ramu Rivers, Kimbe Bay Region]

Glossamia abo [Sepik River]

Glossamia aprion - Mouth Almighty [Timika, Digul, Lake Jamur, Fly (including Lake Murray), Oriomo and Bensbach Rivers]

Glossamia beauforti - Beaufort's Mouth Almighty [Tirawiwa, Mamberamo, Wapoga, Logari, Lorenz Rivers and Lake Sentani]

Glossamia gellneri - Gellner's Mouth Almighty [Mamberamo, Gogol, Lake Wannam, Markham, Ramu and Sepik Rivers]

Glossamia heurni [Mamberamo]

Glossamia narindica - Slender Mouth Almighty [Bensbach and Fly Rivers]

Glossamia sandei - Sande's Mouth Almighty [Timika, Digul, Mimika, Purari, Fly, Strickland, Lorenz, Lakekamu and Sapoi Rivers]

Glossamia timika – Timika Mouth Almighty [Timika region]

Glossamia trifasciata - Three-barred Mouth Almighty [Fly, Strickland, Lorenz River system]

Glossamia wichmanni - Wichmann's Mouth Almighty [Mosso, Sermowai, Tawarin, Luap Creek, coastal rivers west of Wewak, Sepik, Bulolo, Markham Rivers and Lake Sentani]

Glossogobius aureus - Golden Goby [Creek near Wewak, Timika, Fly and Strickland Rivers]

Glossogobius bicirrhosus – Goby [Madang, north of Maiwara River]

Glossogobius biocellatus - Sleepy Goby [Popondetta]

Glossogobius brunnoideos - Dusky Mountain Goby [Purari, Asaro and Wahgi Rivers]

Glossogobius bulmeri - Bulmer's Goby [Tirawiwa, Wapoga, Mamberamo, Asaro, Sepik and Ramu Rivers]

Glossogobius circumcinctus - Circumspect Goby [Madang, Milne Bay, Bristow Island, Fly and Wapoga Rivers]

Glossogobius coatesi - Coates' Goby [Sepik and Ramu Rivers]

Glossogobius concavifrons - Concave Goby [Timika, Fly-Strickland River system]

Glossogobius giurus - Flat-headed Goby [Timika, Maiwara (extreme eastern tip of Papua New Guinea), Port Moresby, Murnass, Ramu, Fly and Sepik River systems]

Glossogobius hoesei - Hoese's Goby [Ajamaru Lakes in the centre of the Vogelkop Peninsula]

Glossogobius koragensis - Koragu Tank Goby [Wapoga, Mamberamo, Sepik and Ramu Rivers]

Glossogobius torrens - White Water Goby [Sepik and Ramu River systems]

Glossogobius sp. – Spotfin Goby [Timika region, Lakekamu and Sapoi Rivers]

Glossogobius sp.1 – False Celebes Goby [Yongsu region, Timika, Waigeo Island, Milne Bay, Oro Bay, Lae, Madang, Bogia, Wewak, Fly River, Manus Island, New Ireland, Bougainville, Lakekamu and Sapoi Rivers]

Glossogobius sp.2 – Square Blotch Goby [Timika region]

Glossogobius sp.3 – Dwarf Goby [Timika region]

Glossogobius sp.8 [Lake Kutubu]

Glossogobius sp.10 [Lake Sentani]

Glossogobius sp.12 [Lake Kutubu]

Glossogobius sp.13 [Lake Tebera]

Glossogobius sp.14 [Sepik-Ramu-Markham Basin]

Glossogobioides n.sp. – Kuloy Goby [Kimbe Bay Region]

Glossolepis dorityi - Dority's Rainbowfish [Grime (pronounced gree-may) River]

Glossolepis incissus - Salmon-red Rainbowfish [Lake Sentani]

Glossolepis leggetti - Leggett's Rainbowfish [Tirawiwa and Wapoga River systems]

Glossolepis maculosus - Spotted Rainbowfish [Markham, Ramu, Sepik and Omsis Rivers]

Glossolepis multisquamatus - Sepik Rainbowfish [Mamberamo, Sepik and Ramu Rivers]

Glossolepis pseudoincisus - Tami River Rainbowfish [Tami River]

Glossolepis ramuensis - Ramu Rainbowfish [Gogol, Ramu and Sepik Rivers]

Glossolepis wamansen – Lake Wamansen Rainbowfish [Lake Wamans]

Gymnothorax polyuradon

Gymnoamblyopus novaeguineae

Gobiopterus semivestita

Glyphis glyphis - Speartooth Shark

Gobiopeterus semivestita - Glass Goby [Fly River]

Gymnothorax polyuradon - Freshwater Moray [Timika region]

Hemigobius hoevenii - Mullet Goby [Binaturi River]

Herhaestias adamsoni - Adamson's Grunter [Lake Kutubu]

Hephaestias fuliginosus - Sooty Grunter [Purari, and Fly River systems]

Hephaestias haememai - Mountain Grunter [Digul, Timika region, Mimika, Fly, Strickland, Lorenz Rivers]

Hephaestias komaensis [Koma River]

Hephaestias lineatus - Lined Grunter [Djarua, Yakati, Karabra and Kamundan river systems]

Hephaestias obtusifrons - Striped Grunter [Sermowai, Pual (formerly Nemayer or Neumayer River) River systems]

Hephaestias raymondi - Raymond's Grunter [Fly, Morehead and Bensbach Rivers]

Hephaestias roemeri - Röemer's Grunter [Fly, Dligul and Binge River]

Hephaestias transmontane - Sepik Grunter [Tirawiwa, Wapoga, Mamberamo, Ramu and Sepik Rivers]

Hephaestias trunculatus - Threespot Grunter [Laloki River and its tributaries including the Brown and Golde Rivers; Lakekamu and Sapoi Rivers]

Herrkotschthys castelnau - Castelnau's Herring [Fly River]

Himantura caophylia - Freshwater whipray [Fly River]

Hippichthys heptagonus - Lined Grunter [Djarua, Yakati, Karabra and Kamundan river systems]

Hippichthys heptagonus - Reticulated Freshwater pipefish

Hippichthys penicillus - Steep-nosed Pipefish [Meiro River]

Hyphseleotris compressa - Empire Gudgeon [Timika, Fly and Bensbach Rivers]

Hyphseleotris cypriocidus [Gogol and Sepik Rivers]
**Hypseleotris guentheri** - Guenther's Gudgeon [Madang, Manus Island, Wewak and New Ireland; Sepik-Ramu River systems, Kimbe Bay Region]

**Hypseleotris sp.** - Black and White-finned Prigi [Wapoga River]

**Iriatherina wernerii** - Threadfin Rainbowfish [Merauke, Fly, Bensbach, Morehead and Pahoturi Rivers]

**Johnius australis** - Bottlenose Jewfish [Known along the coasts of northern Australia and New Guinea (Inhabits shallow coastal waters, estuaries and rivers)]

**Kiunga ballochi** - Balloch's Rainbowfish [Fly River system]

**Kiunga bleheri** - [Fly River system]

**Kuhlia marginata** - Dark-margined Flagtail [Yongsu region, Sepik, Ramu, Lakekamu and Sapoi Rivers]

**Kuhlia rupestris** - Rock Flagtail [Yongsu region, Matalamoia, Tuabeda River (Goodenough Island), Sepik, and Ramu Rivers]

**Kurtus gulliveri** - Nurseryfish [Bintuni, Otokwa, Ajkwa, Timika, Lorenz, Bensbach, Sambu, Fly, Strickland, Kikori, Oriomo and Panaroa Rivers]

**Lamnostoma kampeni** - Freshwater Snake-eel [Gogol River (Madang)]

**Lamnostoma mindora** - Snake-eel

**Lates calcarifer** - Barramundi [Timika, Fly, Bensbach, Morehead and Pahoturi Rivers]

**Lates equulus** - Common Ponyfish [Sepik and Ramu Rivers]

**Leiognathus equulus** - Common Ponyfish [Sepik and Ramu Rivers]

**Lentipes crittersius** - Aiyindor Creek (Biak Island)

**Lentipes dimetrodon** - Clinging Goby [Lakekamu and Sapoi creeks)

**Lentipes multiadiatus** - Cyclops Cling-goby [Yongsu region, Matalamoia Creek (West Papua)]

**Lentipes venustus** - Matalamoia and Tuabeda Rivers (Goodenough Island), Awaetowa River (Fergusson Island)

**Lentipes watsoni** - Clinging Goby [Lakekamu and Sapoi Rivers]

**Lepidotrama muelleri** - Beach Salmon

**Liza argentea** - Flat-tail Mullet [Timika]

**Liza alata** - Diamond Mullet [Sepik, Fly and Purari Rivers]

**Liza macrolepis** - Largescale Mullet [Mimika, Bensbach, Sepik and Ramu Rivers]

**Liza melinoptera** - Cream Mullet [Sepik and Ramu Rivers]

**Liza parma** - Broad-mouthed Mullet [Fly River]

**Liza subviridis** - Greenback Mullet [Yongsu region, Timika region, Tirawija, Bensbach, Wapoga Rivers]

**Liza tade** - Tade Mullet [Sepik, Kikori and Purari Rivers]

**Liza vaigiensis** - Squaretail Mullet

**Lujanus argentumcalactus** - Mangrove Jack [Yongsu region, Fly River]

**Lujanus fuscescens** - Freshwater Snapper [Yongsu region, Wapoga River]

**Lujanus goldiei** - Papuan black Snapper [Wapoga, Fly, Sepik and Ramu Rivers]

**Lujanus maxweberi** - Pygmy Snapper

**Marilyna pleurosticta** - Spotted Toadfish

**Megalonus cyprinoides** - Indo-Pacific Tarpon [Timika, Fly, Sepik, Ramu and Bensbach Rivers]

**Meiacanthus anema** - Threadless Benny [Meiro and Maiwara Rivers]

**Melanotaenia affinis** - New Guinea Rainbowfish [Markham, Ramu and Sepik Rivers]

**Melanotaenia ajamaruensis** - Ajamaru Lakes Rainbowfish [Ajamaru Lakes]

**Melanotaenia angla** - Yakati Rainbowfish [Yakati River]

**Melanotaenia arfakensis** - Arfak Rainbowfish [Prapi River system near Manokwari, West Papua]

**Melanotaenia batanta** - Batanta Rainbowfish [Batanta Island]

**Melanotaenia boesemani** - Boeseman's Rainbowfish [Ajamaru Lakes region in Vogelkop Peninsula, West Papua (The lakes are located at the headwaters of the Ajamaru River which drains into the Kais River, eventually flowing into the Ceram Sea to the south)]

**Melanotaenia cadiola** - Blue Rainbowfish [Kikori River system and Mubi River]

**Melanotaenia catherineae** - Waigeo Rainbowfish [Waigeo Island (Collected from several streams including the Rabiai River, Wai Semie and the Wai Meniei)]

**Melanotaenia corona** - Corona Rainbowfish [Known only from two male specimens collected in 1911 from the Sermowai River]

**Melanotaenia fredericki** - Sorong Rainbowfish [Samson River system and streams near Sorong]

**Melanotaenia goldiei** - Goldie River Rainbowfish [Timika, Fly, Ok Tedi, Laloki, Goldie, Lakekamu and Sapoi Rivers]

**Melanotaenia herbertaxelrodi** - Lake Tebera Rainbowfish [Lake Tebera, Purari River]

**Melanotaenia irianjaya** - Irian Jaya Rainbowfish [Vogelkop Lowlands - Collected from the Djarua River system of the Bomberai Peninsula and the following Vogelkop drainages: Karabra-Kladuk, Kamundan, Timofofo and Bintuni]

**Melanotaenia iris** - Strickland Rainbowfish [Known only from 5 specimens collected in 1984 from the Logatyu River, a mountain tributary of the Strickland River near Wankipe. Also known from Fly and Ok Tedi Rivers]

**Melanotaenia japenensis** - Yapen Rainbowfish [Yapen Island]

**Melanotaenia kamaka** - Kamaka Rainbowfish [Lake Kamaka (Kamakawair, West Papua]

**Melanotaenia lacastris** - Lake Kutubu Rainbowfish [Lake Kutubu and its outlet, the Soro River]

**Melanotaenia lakamora** - Lakamora Rainbowfish [Lake Lakamora and nearby Lake Aiwaso, West Papua]

**Melanotaenia maccullochi** - Macculloch's Rainbowfish [Fly, Ok Tedi and Bensbach Rivers]

**Melanotaenia maylandi** - Mayland's Rainbowfish [Mamberamo River system, Lake Holmes (occurs in nearby creeks)]

**Melanotaenia misoolensis** - Misool Rainbowfish [Tama River (Misool Island)]

**Melanotaenia monticola** - Mountain Rainbowfish [Purari River system]

**Melanotaenia mubiensis** - Mubi Rainbowfish [Mubi River (Kikori River system) and the outlet for Lake Kutubu]
Melanotaenia papuae [Male]

Glossolepis incisus [Males]
Chilatherina fasciata [Male]

Glossolepis wanamensis [Male]

Photo: Neil Armstrong
Melanotaenia praecox [Males]

Melanotaenia kamaka

Photo: Günther Schmida
Melanotaenia papuae [Male]

Melanotaenia oktedensis [Male]

Photo: Neil Armstrong
Melanotaenia ogilbyi - Ogilby's Rainbowfish [Lorentz River and streams in the Timika region]
Melanotaenia okiediensis - Oktedi Rainbowfish [Ok Tedi River and its tributaries, in the Upper Fly River system]
Melanotaenia papuae - Papuan Rainbowfish [Collected from numerous streams within a 33 km radius of Port Moresby]
Melanotaenia parkinsoni - Parkinson's Rainbowfish [Widespread along the southern coast of eastern Papua New Guinea between the Kemp Welsh River and Milne Bay]
Melanotaenia parva - Lake Kuromai Rainbowfish [Lake Kuramoi]
Melanotaenia pierucciae - Pierucci's Rainbowfish [Werfyang Creek near Lake Kamakawaiar, Lake Kamaka (occurs in nearby creeks)]
Melanotaenia pimaensis - Pima River Rainbowfish [Pima River (Oima River on some maps) at the junction with Tua River, Purari River system, Papua New Guinea. In 1991 further collections were made in the Pio (Purari) River]
Melanotaenia praecox - Dwarf Rainbowfish [Tirawia, Mamberamo and Wapoga River systems]
Melanotaenia rubripinnis - Red-finned Rainbowfish [Tirawia and Wapoga River system]
Melanotaenia sexlineata - Fly River Rainbowfish [Fly River, Ok Tedi]
Melanotaenia splendida rubrostrata - Red-striped Rainbowfish [Timika, Bensbach, Etta Bay, Aru Islands, Daru Island, Armania, Fly, Ok Tedi, Lakekamu and Sapoi Rivers]
Melanotaenia sylvatica - Forest Rainbowfish [Lakekamu and Sapoi River systems]
Melanotaenia vanheurni - Van Heurn's Rainbowfish [Mamberamo, Idenburg (Taratitu) and Doorman Rivers]
Melanotaenia sp. [Gumini River near Aloitau (Milne Bay, PNG)]
Mesopristes argenteus - Silver Grunter [Yongsu region, Wapoga, Sepik and Ramu Rivers]
Mesopristes cancellatus - Tapiroid Grunter [Yongsu region (Inhabits salt and brackish waters of bays and estuaries, penetrating into fresh water)]
Mesopristes iravi (Inhabits salt and brackish waters of bays and estuaries, penetrating into fresh water)
Microphis brachyurus - Short-tailed Pipefish [Yongsu region, Timika, Wapoga, Sepik and Ramu Rivers]
Microphis brevidorsalis - Porthole Pipefish
Microphis caudocarinatus - Slender Pipefish [Tawarin River]
Microphis keiaspis - Barhead Pipefish [Yongsu region, Timika, Fly River]
Microphis manadensis - Menado Pipefish
Microphis mento
Microphis retzii - Ragged-tail Pipefish
Microphis spinachioides - Spinach Pipefish [Sepik and Ramu Rivers]
Mogurnda aiwasoensis [Lake Aiwaso]
Mogurnda aurifodinae - Northern Mogurnda [Mamberamo, Markham, Gogol, Ramu and Sepik rivers]
Mogurnda cingulata - Banded Mogurnda [Timika, Digul, Fly-Strickland River system]
Mogurnda furva - Black Mogurnda [Lake Kutubu]
Mogurnda kaifayama [Lake Kaifayama]
Mogurnda kutubuensis - Lake Kutubu Mogurnda [Lake Kutubu, Soro River (outlet of Lake Kutubu and headwater stream of the Kikori River) and the Sura River and its tributaries]
Mogurnda lineata - Kokoda Mogurnda [Kali, Ejava and Oivi creeks (Kokoda)]
Mogurnda maccuneae [Lake Kutubu, Lake Wanam, Soro River (Commonly seen around the mouth of the Soro River over beds of the matted algae Nitella pseudoflabellata and the eel-grass Valisneria natans)]
Mogurnda magna [Lakes Lakamora and Aiwaso]
Mogurnda malsmithi [Koma and Pio Rivers (Purari River system)]
Mogurnda mbuta [Lake Mbuta]
Mogurnda mogurnda – Purplespotted Gudgeon [Fly, Bensbach Rivers]
Mogurnda moso - Mosa Gudgeon [Lake Kutubu, Lake Wanam]
Mogurnda orientalis - Eastern Mogurnda [Safia on the north-eastern side of the Owen Stanley Range]
Mogurnda pardinis [Lake Kamakawaiar]
Mogurnda pulchra - Moresby Mogurnda [Laloki, Purari, Lakekamu and Sapoi Rivers]
Mogurnda spilota - Banded Mogurnda [Lake Kutubu]
Mogurnda spilota - Variegated Mogurnda [Lake Kutubu]
Mogurnda vitta - Striped Mogurnda [Lake Kutubu]
Mogurnda wapoga - Wapoga Mogurnda [Tirawia and Wapoga Rivers]
Mogurnda sp.5 [Bewani, Torricelli and Prince Alexander Mountains, Pual River in the Bewani Mountains]
Monodactylus argenteus - Silver Mono [Timika]
Mugil cephalus - Flathead Mullet
Mugilogobius duospilus - Dual-spotted Goby
Mugilogobius filifer - Goby
Mugilogobius fusculus - One-thread Goby [Sepik and Ramu Rivers]
Mugilogobius rambiae – Shoulder-spot Goby [Yongsu region]
Mugilogobius rivulus - Goby
Nedystoma dayi - Day's Catfish [Purari, Lorenz and Fly Rivers]
Nematalosa erebi - Bony Bream [Fly, Bensbach and Digoel River]
Nematalosa flyensis - Fly River Gizzard Shad [Fly-Strickland River system]
Nematalosa papuensis - Strickland River Gizzard Shad [Fly-Strickland River system]
Neopomacentrus taeniurus - Freshwater Damselfish [Raja Ampat Islands]
Neosilurus ater - Narrow-fronted Tandan [Timika, Digul, Lake Jamur, Fly, Bensbach, Lorenz, Lakekamu and Sapoi Rivers]
Neosilurus brevidorsalis - Short-finned Tandan [Timika, Kemp Welsh, Fly, Lakekamu and Sapoi River systems, Lorentz River]
Neosilurus equinus - Southern Tandan [Timika, Kikori (including Lake Kutubu), Fly, Strickland, Lorenz Rivers, Mamberamo]
Neosilurus giglerupi - Northern Tandan [Sepik, Ramu and Purari Rivers]
Neosilurus idenburghi - Idenburg Tandan [Mamberamo, Markham, Ramu, Sepik, Pual Rivers and Lake Sentani]
Neosilurus novaeguineae - New Guinea Tandan [Tirawiwa, Wapoga, Fly, Mamberamo, Ramu, Sepik Rivers and Lake Sentani]
Nebia soldado - Soldier Croaker [Sepik and Ramu Rivers]
Nebia squamosa - Scale Croaker [Timika region]
Nebia semijaculans - Sharpnose Croaker [Fly River]

Oedalechilus labiosus - Holmip Mullet [Fly River]
Oligolepis acutipennis - Sharptail Goby [Oriomo River]
Oligolepis stomioides [Murnass River (Madang)]
Oloplotosus lutesus - Pale Yellow Tandan [Fly-Strickland River system]
Oloplotosus mariae - Maria’s Tandan [Nomad River (Fly-Strickland system), and Lorenz River]
Oloplotosus torobo - Kutubu Tandan [Lake Kutubu]
Omobranchus ferox - Gossamer Blenny
Opheleotris aoros = Giurus margaritacea (see above)
Ophioheterus parasepia - Spangled Gudgeon [Yongsu region, Fly, Sepik and Ramu Rivers, Kimbe Bay Region]
Ophiopteron bengalense - Bengal Eel [Timika region, Mimika, Bensbach, Sepik and Ramu Rivers]
Ophiopteron gutturale - Australian Swamp Eel

Oxuderces wirzi - Wirz's Goby [Turanma River]
Oxyeleotris aruensis - Aru Gudgeon [Fly and Bensbach Rivers]
Oxyeleotris caeca - Mubi River (Inhabits limestone caves and sinkholes in the hilly terrain of the Upper Kikori River system)]
Oxyeleotris fimbriata - Fimbriate Gudgeon [Klipong, Mamapiri, Dogura Creek (Port Moresby) and Meiro River (Madang)]
Oxyeleotris hermeroni - Blackbanded Gudgeon [Purari and Lake Murray]
Oxyeleotris heterodon - Sentani Gudgeon [Mamberamo, Kubuna, Ramu, Sepik and Lake Sentani]
Oxyeleotris lineolata - Sleepy Cod [Fly River, Lake Sentani, Lorenz River]
Oxyeleotris nullipora - Poreless Gudgeon [Timika, Fly and Bensbach Rivers]
Oxyeleotris paucipora - Fewpored Gudgeon [Timika, Fly and Bensbach Rivers]
Oxyeleotris sellheimi – Black-banded Gauvina [Timika region]
Oxyeleotris stagnicola – Swamp Gudgeon [Timika region]
Oxyeleotris urophthalimus
Oxyeleotris wisselensis – Paniai Gudgeon [Digul, Lorenz, Oriomo, Alice, Pie, Purari, Wissel Lake and its tributary streams, Tage and Tigi Lakes and their outlet streams as well as the Dimija River]
Oxyrinchys papuensis – Frogface Goby [Fly River, Daru and Yule Islands]

Parambassis altipinnis - High-finned Glassfish
[Maerbaromo, Gogol and Taritatu (Idenburg) Rivers]
Parambassis confines - Sepik Glassfish [Gogol, Mosso, Sapi, Mamberamo, Ramu, Sermowai and Sepik Rivers]
Parambassis gulliveri - Giant Glassfish [Timika, Digul, Bensbach, Oriomo, Pie, Fly, Lorentz, Ok Tedi, Purari and Strickland Rivers]
Parastromateus niger – Black Pomfret [Timika region]
Pardachirus poropterus - Estuary Sole
Pelangia mbutaenesis [Lake Mbuta]
Periophthalmus argenteolus - Barred Mudskipper
[Timika region, Wapoga River]
Periophthalmus gracilis – Mudskipper [Timika region]
Periophthalmus malaccensis – Mudskipper [Timika region]
Periophthalmus novaeguineaeae - New Guinea Mudskipper [Bensbach River]
Periophthalmus freycineti - Pug-headed Mudskipper [Bensbach River]
Pingalla lorentzi - Lorentz's Gritter [Fly, Lorenz, Morehead and Bensbach Rivers]
Plecthorhinus gibbosus – Brown Sweetlip [Yongsu region]
Plecthorhinus lineatus - Yellowbanded Sweetlip
Plotosus canius - Gray Eel-catfish [Fly River]
Plotosus papuensis - Papuan Eel-catfish [Fly River, Timika region, Lorentz River]
Polydactylus macchir - King Threadfin [Purari River]
Pomacentrus taeniometopon – Brackish Damsel [Yongsu region]
Porochillus meranaeus - Merauke Tandan [Bensbach, Merauke and Fly Rivers]
Porochillus obbesi - Obbes’ Catfish [Timika, Oriomo, Lorenz and Fly Rivers]
Prionobutis microps - Small-eyed Gudgeon [Wapoga River]
Pristis microdon - Largetooth Sawfish [Timika, Digul, Bensbach, Fly, Sepik, Ramu, Digul, Laloki, Oriomo Rivers and Lake Murray]

Pseudogobioides poicilosomus [Klipong, Mamapiri, Dogura Creek (Port Moresby) and Meiro River (Madang)]
Pseudomugil conniae - Popondetta Blue-eye [Found within a 50 km radius of Popondetta]
Pseudomugil furcatus - Forktail Blue-eye [Known from lowlands between Dyke Ackland Bay and Collingwood Bay. Abundant near Safia in clear rainforest streams with thick vegetative cover]
Pseudomugil gertrudae - Spotted Blue-eye [Pahoturi, Fly and Bensbach Rivers]
Pseudomugil inconspicuus - Inconspicuous Blue-eye [Timika, Fly River and Bristow Island near Daru Island]
Pseudomugil ivantsoffi – Ivantsoff’s Blue-eye [Timika region]
Pseudomugil novaeguineae - New Guinea Blue-eye [Timika, Fly River and Aru Islands]
Pseudomugil paludicola - Swamp Blue-eye [Binariti, Pahoturi, Kikori and Morehead Rivers]
Pseudomugil paskai - Paska’s Blue-eye [Timika region, Fly and Bensbach River systems]
Pseudomugil cfehricatrus – Transparent Blue-eye [Timika, Iweka and Kopi Rivers]
Pseudomugil reticulatus - Vogelkop Blue-eye [Ayamaru Lakes (previous records of this species from elsewhere in New Guinea are in error)]
Pseudomugil tenellus - Delicate Blue-eye [Bensbach River]
Pseudosclencia soldado – Silver Perch [Ramu and Sepik Rivers]
New Guinea Freshwater Biodiversity

Pseudomugil connaeae [Male]

Pseudomugil furcatus [Male]

Photo: Günther Schmida
Pseudomugil paskai (Male) ▲

▲ Pseudomugil paludoicola

Photo: Günther Schmida

Pseudomugil paludoicola

Photo: Neil Armstrong

New Guinea Freshwater Biodiversity
Redigobius balteatus - Black-bar Goby [Madang region]
Redigobius bikolanus - Speckled Goby [Wapoga, Bensbach, Sepik and Ramu Rivers]
Redigobius chrysosoma - Spotfin Goby [Daru Island, Timika]
Redigobius roemer - Roemer's Goby [Fly River]
Redigobius leptochilus
Redigobius tambujon
Rhinomugil nasutus - Shark Mullet [Paruri and Kikori Rivers]
Rhyacichthys aspro - Loach Goby [Tirawia, Wapoga Rivers]
Scatophagus argus
Sicyopus discordipinnis (New Hanover) and Bougainville
Sicyopus balinense - Bali Goby [Bismarck Archipelago]
Sicyopterus sp - Crescent Perch [Kimbe Bay]
Sicyopterus cynocephalus - Blue Streamgoby [Yongsu region, Tirawia, Wapoga, Rivers, Kimbe Bay Region]
Sicyopterus hageni - Hagen's Goby [Prafi River]
Sicyopterus lagocephalus - Blue Streamgoby [Yongsu region, Matalamaia and Tuabeda Rivers (Goodenough Island), Awaetowa River (Fergusson Island)]
Sicyopterus longifilis - Threadfin Goby [Wapoga region, Tirawia, Wapoga, Nabire, Gogol River and from a creek near Wewak]
Sicyopterus macrostetholepis - Yellowtail Rock Climbing Goby [Goodenough Island]
Sicyopterus micrurus - Clinging Goby [Mandi Stream near Wewak]
Sicyopterus ouwensi - Ouwen's Goby [Sumba, Flores, Wetar, Balimo Rivers and Goodenough Island]
Sicyopterus sp. - Golden Goby [Tirawia, Wapoga Rivers]
Sicyopterus sp. - Golden Long-finned Goby [Kimbe Bay Region]
Sicyopterus sp.1 - Nuru Goby [Kimbe Bay Region]
Sicyopus balinense - Bali Goby [Bismarck Archipelago (New Hanover) and Bougainville]
Sicyopus discordipinnis - Presently occurs in single stream localities from northern New Guinea and the islands of New Hanover and Bougainville
Sicyopus mystax - Moustached Cling-goby [Yongsu region, Arjindor Creek (Biak Island)]
Sicyopus zosterophorum - Ornate Stream-goby [Yongsu region, Matalamaia River, Tuabeda River (Goodenough Island), small rocky creek at Oro Bay near Popondetta]
Siganus vermiculatus - Vermiculated Spinefoot [Yongsu region]
Silago sihama - Northern Whiting [Yongsu region]
Stenogobius allenii - Allen's Goby [Tovara Stream (New Britain)]
Stenogobius beauforti - Beaufort's Goby [Wewak, Yongsu and Maiwara regions]
Stenogobius genivittatus - Chin-stripe Goby [Fly River]
Stenogobius hoesei - Small freshwater creek (Manus Island)
Stenogobius lachneri - Bintuni Goby [Bintuni River]
Stenogobius laterisquama - River Goby [Tirawia, Wapoga, Mamberamo, Ramu, Gogol, Sepik, Mosso River]
Stenogobius pisolinosium - Barcheek Goby [Fly River]
Stiphodon atraurus - Matalamaia and Tuabeda Rivers (Goodenough Island)
Stiphodon birdsong - Birdsong's Cling-goby [Letak Creek (Wewak), Yongsu region]
Stiphodon elegans - Recorded from northern Papua, Finschafnen Peninsula and Wewak Island
Stiphodon larson - Gogol River
Stiphodon rutilaureus - Red and Gold Cling-goby [Yongsu region, Matalamaia and Tuabeda Rivers (Goodenough Island)]
Stiphodon semoni - Neon Goby [Yongsu region, Tirawia, Wapoga Rivers, Matalamaia and Tuabeda Rivers (Goodenough Island)]
Stiphodon weberi - Reifafeif River - Yapen Island, West Papua
Stiphodon sp. 1 - Neon Goby [Kimbe Bay Region]
Stiphodon sp. 2 - Bronze-checked Goby [Kimbe Bay Region]
Stiphodon sp. 3 - Translucent Goby [Kimbe Bay Region]
Stiphodon sp. 4 - Barred Goby [Kimbe Bay Region]
Stolephorus indicus - Indian Anchovy [Fly River]
Stolephorus waitet - Spotty-face Anchovy [Fly River]
Strongylura krefftii - Freshwater Long-tom [Digul, Bensbach, Lorenz, Lake Jamur, Mimika, Fly River]
Strongylura strongylura - Spottail Needlefish [Kemp Welch River, Bootless Bay, Toro Pass, Purari River, Port Romilly, Daru Island and Fly River]
Symphurus villosus - Velvety Sole [Timika, Merauke, Mimika, Fly, Lorenz, Lakekamu and Sapoi Rivers]
Taenioides anguillaris - Eel Worm Goby [Sepik and Ramu Rivers]
Taenioides cirratus - Bearded Worm Goby [Fly River]
Tateurmdina ocellicauda - Peacock Gudgeon [Found in the rainforest streams in the vicinity of Popondetta and Safia]
Terapon jamoerensis - Omba River, Fakfak
Terapon jarbua - Crescent Perch [Kimbe Bay]
Tetracentrum apogonoides - Four-spined Glassfish [Brown, Goldie, Laloki and Kemp Welsh Rivers]
Tetracentrum caudovittatuse - Kokoda Glassfish [Moni River and creeks near Kokoda]
Tetracentrum honess - Honess' Glassfish [Moni River and its tributaries near Safia and in lowland streams around Popondetta]
Tetracentrum caulovittatus - Kokoda Glassfish [Moni River and creeks near Kokoda]
Tetrawogre barbatus - Freshwater Waspfish [Yongsu region]
Thyssia hamiltonii - Hamilton's Anchovy [Fly River]
Thyssia rastrosa - Fly River Thryssa [Fly River]
Thryssa scratchley - Freshwater Anchovy [Timika, Bensbach, Strickland, Fly and Lorentz Rivers]
Toxotes chatareus - Northern Whiting [Yongsu region]
Toxotes chatareus - Northern Whiting [Yongsu region]
Toxotes jugularis - Banded Archerfish [Timika region, Wapoga River]
Tateurndina ocellicauda ▲ Male ▼ Female

Photo: Günther Schmida

Photo: Neil Armstrong
**Toxotes lorentzi** - Primitive Archerfish [Balimo Lagoon, Bensbach and Fly River]

**Valamugil buchanani** - Bluetail Mullet [Kimbe Bay (Inhabits coastal waters, including estuaries and rivers. Young fish frequent estuaries and also ascend rivers and coastal creeks)]

**Valamugil seheli** - Blue-spot Mullet

**Varioichthys jamaroensis** - Yamur Grunter [Fly River, Lake Yamur]

**Varioichthys lacustris** - Lake Grunter [Fly, Bensbach and Morehead Rivers]

**Yongeichthys nebulosus** – Shadow goby [Kimbe Bay Region]

**Zappa confluentus** - New Guinea Slender Mudskipper [Bintuni, Fly, Sepik, and Ramu Rivers]

**Zenarchopus alleni** - Allen’s River-garfish [Mamberamo River]

**Zenarchopus caudovittatus** - Long-jawed River-garfish [Merauke River]

**Zenarchopus dispar** - Feathered River-garfish [Fly River]

**Zenarchopus kempeni** - Sepik River Halfbeak [Mamberamo, Sepik and Ramu Rivers]

**Zenarchopus novaeguineae** - Fly River Garfish [Timika, Fly, Lorenz, Laloki, Lakekamu and Sapoloi Rivers]

**Zenarchopus ornithocephala** - Vogelkop River Garfish [Senop and Fruata Rivers]

**Zenarchopus robertsi** - Robert's River-garfish [Known only from creeks in the vicinity of Kokoda]

### Introduced Exotics

In 1991 Gerald Allen reported the presence of 22 species of exotic fishes that had been introduced into New Guinea. The reasons for the introductions included sport, aquaculture, ecological manipulation, control of pests, ornamentation, and improvement of subsistence welfare. However, not all introductions were successful. Of the successful introductions, most have had a negligible impact as either food fishes or in the control of mosquitoes. Tilapia rendalli introductions were successful and the species has formed a significant population in the middle Sepik. It is interesting to note that in 1989, a consultant's report stated that *Tilapia rendalli* had the potential to create severe ecological disturbances in the Sepik on account of being a voracious macrophyte feeder. It was stated that if substantial amounts of macrophytes were systematically removed there may be a subsequent effect on the rest of the food chain through the removal of epiphytic algae (food for *Oreochromis mossambica*), habitats for invertebrates (food for endemic species of fish) and an ultimate reduction in primary productivity. However, they went ahead with the introduction and their population is still increasing.

The Cyprinidae dominate the ichthyofauna of other tropical regions and *Cyprinus carpio* has been widely introduced throughout the world. This species is well-established in the Sepik system in Papua New Guinea and is also found in certain Southern Province rivers. The species is known to increase water turbidity, and directly and indirectly destroy rooted vegetation. This is often accompanied by a decline in native fish populations and spread and build-up of carp populations. The Java Carp (*Barbonymus gonionotus*) has also been introduced to the highlands streams in the Sepik catchment.

Two species of trout, *Salmo trutta* and *Oncorhynchus mykiss*, have been introduced into the highland regions of Papua New Guinea, with an introduction of *Salvelinus fontinalis* having been unsuccessfully attempted. Only *Oncorhynchus mykiss* seems to have become established and widespread. Their potential impact, well-recognised in Australia and New Zealand, is as predators and competitors with native fish species, but as Allen (1991) notes, as most introductions have taken place above 2000 metres in Papua New Guinea where there are few native fish species, their impact on other fish is likely to be minimal, but they will have an impact on other species and on general stream ecology.

The family Poeciliidae are live-bearing ovoviviparous fishes originating in Central and Southern America. Two species (*Poecilia reticulata* & *Xiphophorus helleri*) are somewhat localised within the country, whereas *Gambusia affinis* introduced for its supposed ability to control mosquitoes, is more widely distributed. All three species have been recognised as having a detrimental effect on small surface feeding native fish species belonging to the genera Melanotaenia, Pseudomugil and Craterocephalus.

Two species of gourami (*Trichogaster pectoralis* & *Trichogaster trichopterus*) are also common in Papua New Guinea. The former is widely distributed, particularly in Central and Gulf Provinces. Two studies have shown this species to be extremely abundant in Southern Highlands Province rivers. *Anabas testudensis*, the Indian climbing perch, has been introduced into Papua New Guinea from West Papua and the spread of this species has been the subject of various press releases from the Department of Fisheries and Marine Resources. The earliest record of the species is from 1976 in the Morehead River.
Present observations indicate that it is widespread throughout the Fly/Ok Tedi system and also the lower Strickland River. It seems to be particularly abundant in shallow weedy habitats. Anecdotal evidence indicates that Anabas may cause the death of predatory fish species, file snakes and even crocodiles by becoming lodged in the pharynx of these species by means of its spines on the opercula and fins.

Recent introductions include *Neolissochilus hexagonolepis* (Copper mahseer), *Schizothorax richardsonii* (Snow trout) and *Tor putitora* (Golden mahseer), *Piaractus brachypomus* (syn. *Colossoma bidens*) and *Prochilodus lineatus* (Streaked prochilod), as well as further introductions of *Tilapia rendalli*.

The freshwater fish fauna of New Guinea is particularly susceptible to the effects of introduced fish species because of the lack of specialisation. Nine species of introduced fish are widely established in Papua New Guinea and, while there is limited direct evidence to substantiate the case, these species have resulted and are likely to result in loss of biodiversity in the freshwater ichthyofauna. Recently (2005), a fish biologist who was involved in some stream monitoring in the upper reaches of the Ramu River reported that native species had declined from about six to only one or two while the exotics were the dominant biomass.

Lake Kutubu is the home of eleven endemic fishes; no other mountain Lake in New Guinea has such a wealth of species, and Allen (1991) makes the following plea: “At present the lake remains in a pristine condition, but its future is clouded. Oil deposits were discovered nearby, and now the exotic calls of birds of paradise, parrots and hornbills compete with the drone of helicopters. There are no roads in the area, therefore these aircraft are used to ferry personnel and supplies to the drilling site.”

**Fish Species List (Exotics)**

- *Anabas testudineus* - Climbing Perch
- *Aplocheilus panchax* - Blue Panchax
- *Barbonymus gonionotus* - Java Barb
- *Channa striata* - Snakehead
- *Clarias batrachus* – Walking Catfish
- *Cyprinus carpio* – Common Carp
- *Gambusia affinis* – Mosquitofish
- *Neolissochilus hexagonolepis* - Copper Mahseer
- *Oncorhynchus mykiss* - Rainbow Trout
- *Oreochromis mossambica* - Mozambique Tilapia
- *Osphronemus goramy* - Giant Gourami
- *Piaractus brachypomus* (Colossoma bidens) – Red Pacu
- *Poecilia reticulata* - Guppy
- *Prochilodus lineatus* - Streaked Prochilod
- *Salmo trutta* - Brown Trout
- *Salvelinus fontinalis* - Brook Trout
- *Schizothorax richardsonii* - Snow Trout
- *Tilapia rendalli* - Redbreast Tilapia
- *Tor putitora* - Golden Mahseer
- *Trichogaster pectoralis* - Snakeskin Gourami
- *Trichogaster trichopterus* - Three Spot Gourami
- *Xiphophorus helleri* – Swordtail

Lake Kutubu
New Guinea Freshwater Decapods

New Guinea also shares with Australia a diverse freshwater crab (Parathelphusidae), crayfish (Parastacidae) and shrimp (Atyidae and Palaemonidae) fauna. Freshwater decapod crustaceans (crabs, crayfish, etc.) include at least 87 species, with at least 31 endemic species.

In many cases, information is only available from collecting surveys in either West Papua or Papua New Guinea, so data from West Papua must be extrapolated to Papua New Guinea. Moreover, the Papua New Guinea biota cannot be understood in isolation because much of the biota is shared with West Papua, the Solomon Islands and Australia.

Decapoda literally means “ten legs”. The name indicates the five pairs of pereiopods. Decapoda is a diverse order, containing almost all of the best known, edible crustacean species; shrimps (Atyidae), prawns (Palaemonidae), crayfish (Parastacidae) and crabs (Parathelphusidae).

Decapods are primarily marine, but also occur in estuarine, fresh surface water, underground water, mountain and desert habitats. Surface water habitats encompass lentic and lotic waters, permanent, ephemeral and areas subject to seasonal torrential flow. Such habitats include; lakes, swamps lagoons, billabongs and pools; creeks and streams flowing through open grassland and forested areas. Underground waters tend to be limestone caves but also include freshwater bores and wells.

Most decapod species crawl along the substratum or burrow into it. Some species such as Atyidae and Palaemonidae are active swimmers. They swim forwards by pulling with the modified swimming legs or dart backwards by flicking the tail. Burrowing species prefer the softer sand and clay substrata whilst other species are found on gravel and rocky substrata. Burrowing decapods create short burrows forming a catacomb of holes in soft stream banks or long narrow and meandering burrows extending twenty to thirty centimetres into the bank. The burrows are connected to open waters or the watertable. If the water dries out the burrows are sealed with a mud chimney.

Decapods can be found in sheltered littoral areas particularly amongst vegetation, in packs of leaf litter, under stones, rocks or under rotting logs and also in interstitial waters. They may be migratory, gregarious, cryptic, diurnal, nocturnal or noctidiurnal.

Decapods are often the largest invertebrates in a stream and so play an important part in the food chain. Many are opportunistic feeders upon detritus and dead animal matter, some are filter feeders and others are predators upon smaller invertebrates and fish.

Females of the families Atyidae and Palaemonidae attach eggs to their pleopods. Freshwater species do not have long planktonic juvenile stages like the marine decapods. The young start life as smaller versions of the parents with claws and strong legs.

Decapods maintain their balance when swimming and crawling by means of a sand grain structure called a statolith inside a sensory organ called a statocyst at the base of 1st antennae. When the animal is horizontal the statolith sits squarely on a set of hairs in the base of the statocyst. As the animal moves around so does the statolith, helping the animal to know which way is really up. When decapods shed their exoskeleton they lose their statoliths. New ones are gained by either rubbing their antennal bases in the sand while the new exoskeleton is soft or by carefully putting sand grains into the pores with their smaller pincer legs.

Caridina species are small, transparent (almost invisible except for their black eyes), quick moving animals. Not a lot of information is available on shrimps of this genus. They are said to attain an adult size of around 2-4 cm. These shrimp occur in fresh and brackish waters of lakes, creek pools, pools and streams flowing through open grassland and forested areas. They can be found amongst leaf litter, on and around rocks, gravel or on sandy substrates and amongst aquatic vegetation. The swim slowly in quiet waters but when they flick their tail they shoot backwards very quickly. Caridina generally have an annual life cycle and breed when water temperatures exceed 20°C (i.e. spring and summer). The females brood their black eggs under their tails, giving them a very dark like appearance and these are quite noticeable. The juveniles are then released after a short incubation period. The New Guinea fauna currently comprises around 17 species, with at least 5 still to be described.

Species List
Caridina blancoi cf. longirostris
Caridina brevicarpalis brevicarpalis
Caridina buhleri [New Ireland]
Caridina celebensis
Caridina cognata
Caridina demani
Caridina fecunda
Caridina gracilirostris - Slender-beaked Caridina
Caridina longirostris
Caridina nilotica
Caridina opaensis [Aru Islands]
Caridina papuana
Caridina rouxi [Bougainville]
Caridina serratirostris - Spiny-beaked Caridina
Caridina tragolydanus [New Ireland, subterranean pools]
Caridina typus - Typical Caridina
Caridina weberi
New Guinea Freshwater Biodiversity

Caridina serratirostris ▲ Caridina longirostris ▼

Photos: Dave Wilson
Macrobrachium rosenbergii ▲

Macrobrachium Handschiini ▼

Photo: Neil Armstrong

Photo: John Short
**Macrobrachium**

Decapod crustaceans with a prominent rostrum and the abdomen bearing a tail fan. Eyes on stalks. A carapace completely covers the dorsal and lateral thorax. Legs long and thin, the second pair longer than the first and carrying moderately large chelae. Palaemonidae can be distinguished from Parasiticidae (crayfish) and Atyidae (shrimps) by the relative proportions of the first and second legs, by the relatively slender chelae on those legs, and by the third pair of legs lacking chelae.

River prawns of the genus Macrobrachium inhabit freshwater and estuarine ecosystems throughout tropical and warm temperate areas of the world. Although members of the genus are commonly referred to as “freshwater” prawns, some are entirely restricted to estuaries and many require marine influence during larval development. Most members of the genus are easily recognizable by the well developed, often elongated second chelipeds, which in the males of many species may exceed the body length. The New Guinea fauna currently comprises around 22 species, with at least 2 still to be described.

**Species List**

- *Macrobrachium australis*
- *Macrobrachium baritense*
- *Macrobrachium equidens*
- *Macrobrachium gracilirostre*
- *Macrobrachium grandimanus*
- *Macrobrachium handschini*
- *Macrobrachium horstii*
- *Macrobrachium idae - Ida's River Prawn*
- *Macrobrachium lar - Giant Jungle Prawn*
- *Macrobrachium latidactylus - Broad-fingered River Prawn*
- *Macrobrachium latimanus*
- *Macrobrachium lepidactyloides*
- *Macrobrachium mammillodactylus*
- *Macrobrachium microps*
- *Macrobrachium minutum*
- *Macrobrachium natatorum*
- *Macrobrachium oenone*
- *Macrobrachium placidum*
- *Macrobrachium rosenbergii*
- *Macrobrachium sophronicum*
- *Macrobrachium weberi*

**Freshwater Crabs**

Crabs are decapod crustaceans in which the abdomen is reduced and tightly folded under the cephalothorax. The rostrum is reduced and the tail fan is absent. Sundathelphusidae are squarish crabs with the lateral margin of the carapace approximately straight and the lateral margins without prominent teeth. Adult specimens may measure up to 5 cm across the widest part of the carapace.

Sundathelphusidae (freshwater crabs) are distinguished from Hymenosomatidae (small spider crabs) by their straight anterior margin and from Grapsidae (shore crabs) by lack of lateral teeth on the carapace. These true freshwater crabs occur across a wide area of northern Australia where they can be found in creeks, swamps, river pools and dams.

Relatively little research has been directed towards freshwater crabs in New Guinea. Consequently, little is known of their ecological or habitat requirements. Freshwater crabs are amphibious rather than purely aquatic and regularly need to get out of the water. They have adapted to living in highly seasonal wet/dry climates, where they breathe water for extended periods during the wet season and air during the dry season. All species prefer shallow areas where they can easily reach the waters surface. Most require atmospheric air for their spongy gill structures within the branchial (gill) chambers. They possess both normal gill material and other gill material for atmospheric air exchange - the ratio of each probably varying according to species and its habitat.

Freshwater crabs complete their life cycles exclusively in freshwater habitats, are incapable of surviving prolonged exposure in brackish or saline environments, and are characterized by the production of a small number of yolk-rich (lecithotrophic) eggs followed by direct development and the absence of free-swimming planktonic larval phases with low assumed dispersal capacity. The eggs hatch not as larvae but as miniature crabs which are carried for a few days by the female.

It is likely that the ancestral freshwater crabs may have been able to withstand higher salinities compared with contemporary forms, since they were more closely related to marine taxa. The current distribution of freshwater crabs is more likely the result of the invasion of a marine ancestral group with a globally or circumtropical distribution that has since gone extinct, since these crabs cannot be allied to any living marine decapod families. It is widely believed that no marine crabs are closely allied to freshwater crabs and a comprehensive phylogeny for all brachyuran decapod crabs are lacking at this point in time. Alternatively, an older vicariance divergent event, prior to continental drift may explain the contemporary distribution of freshwater crabs.

**Species List**

- *Austrothelphusa alba*
- *Austrothelphusa biroi*
- *Austrothelphusa boesemani*
- *Austrothelphusa festiva*
- *Austrothelphusa subconvexa*
- *Austrothelphusa wollastoni*
**Freshwater Crayfish**

Decapod crustaceans with a prominent rostrum and a tail fan. The abdomen is disproportionately small in some species. Eyes on stalks. A carapace completely covers the dorsal and lateral thorax. The first pair of legs (chelipeds) are particularly robust and terminate in strong pincers (chelae).

Parastacidae can be distinguished from Atyidae (shrimps) and Palaemonidae (prawns) by their robust chelipeds. In addition, unlike in Palaemonidae the third pair of pereopods bear chelae, and unlike in Atyidae the rostrum is somewhat dorsoventrally compressed.

Cherax species are found widely throughout southern New Guinea. New Guinea Cherax, which contains around 18 species that unambiguously define areas of endemism south of the island’s central divide, and contains certain lacustrine endemics, particularly in the Paniai Lakes and Lake Kutubu.

A number of Cherax species are being collected in New Guinea (mostly from West Papua) for the aquarium trade and many of them are new to science. The taxonomy of and number of species is the subject of continued debate amongst taxonomists. However, based on the recent revisions and new descriptions the following species of Cherax are currently recognised as being in New Guinea.

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**Species List**

- Cherax albertisii
- Cherax angustus
- Cherax aruanus
- Cherax boschmai
- Cherax buitendijkiae
- Cherax communis
- Cherax divergens
- Cherax holthuisi
- Cherax longipes
- Cherax lorentzi
- Cherax lorentzi auratus [Aru Islands]
- Cherax misolicus
- Cherax monticola
- Cherax murido
- Cherax pallidus
- Cherax paniaicus
- Cherax papuanus
- Cherax solus

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![Cherax holthuisi](image)
Cherax (Hoa Creek) ▲ Cherax (Blue Brick) ▼

Photos: Chris Lukhaup

New Guinea Freshwater Biodiversity
Cherax (Blue Moon) ▲ Cherax (West Papua) ▼
New Guinea Freshwater Biodiversity

Photos: Chris Lukhaup

▲ Cherax (Orange tip) ▼ Cherax (Green-Orange tip)
New Guinea Freshwater Biodiversity

▲ Cherax (Zebra) ▼ Cherax (Red Brick)

Photos: Chris Lukhaup
The aquatic flora of New Guinea has not been studied to any significant degree. Many of the river mainstreams are turbid, which precludes the establishment of submerged aquatic macrophytes. The number of species is probably less than 300. However, species-level treatments exist for only a small portion of the flora. The vegetation of New Guinea is more closely allied to the flora of western Asia than to that of the Australian continent. For this reason it has been termed “Malesian”, part Asian and part Melanesian.

Aquatic vegetation consists of free-floating, floating-leaved and submerged plants. These either form a mixture or are arranged in concentric zones. They occupy the shallow margins between open water and grass swamp, and in places cover entire lakes that have a uniform depth. Herbaceous communities consisting of sedges, herbs and ferns are characteristic of stagnant, permanent, relatively deep swamps. Phragmites karka often dominates along gently sloping swamp margins whereas Pseudoraphis spinescens and Ischaemum polystachyum form narrow bands along more steeply sloping, wet-dry margins. Grasses occupy permanently swampy plains that may be less than three metres of water in the flood season. Herbs such as Polygonum spp., Ludwigia spp. and Ipomoea aquatica may be anchored in the grass mat and reach out over open water. Tall swamp grasses grow in swamps that are shallow and may be intermittently dry. Pseudoraphis spinescens is a low creeping swamp grass that is most extensive in south-western Papua New Guinea. Here it forms dense, almost pure stands on floodplains that are seasonally dry.

Mixed aquatic plant zones comprising either a mixture of cosmopolitan species or one of the following species as a single species stand: Hydrilla verticillata, Ceratophyllum demersum, Najas tenuifolia, Vallisneria natans, Ottelia alismoides and Potamogeton malaianus. The mixed community generally occurs in shallow waters to depths of 3 to 4 metres, although it may extend locally into deeper waters. Two invasive exotic pest species, Salvinia molesta and Eichhornia crassipes are now widespread in many of the lowland wetlands of Papua New Guinea.

**Species List (partial)**

- Blyxa aubertii var. aubertii
- Blyxa aubertii var. echinosperma
- Blyxa japonica var. japonica
- Blyxa novoguineensis
- Blyxa octandra
- Brachiaria mutica*
- Cabomba caroliniana*
- Caldesia oligococca var. oligococca
- Caldesia pannassifolia
- Caldesia sp. aff. grandis
- Callitriche palastris
- Carex pseudocyperus var. fascicularis
- Ceratophyllum demersum
- Ceratophyllum submersum
- Ceratopteris thalictroides
- Chara corallina
- Chara fibrosa
- Chara globularis
- Chara setosa
- Colocasia esculenta
- Cryptocoryne ciliata var. ciliata
- Cryptocoryne dewitti
- Cryptocoryne verssteegii
- Cyclosorus interruptus
- Cyperus cephalotes
- Cyperus imbricatus
- Cyperus platystylus
- Eichhornia crassipes*
- Elatine triandra
- Eleocharis acutangula
- Eleocharis dulcis
- Eleocharis philippinensis
- Eleocharis retroflexa
- Eleocharis sphacelata
- Equisetum debile
- Eriocaulon setaceum
- Echinochloa praestans
- Hanguana malayana
- Hydrilla verticillata
- Hydrocharis dubia
- Hydrocotyle sibthorpioides
- Hydrostemma motleyi
- Hymenachne acutigluma
- Imperata cylindrica
- Ipomoea aquatica
- Ischaemum polystachyum
- Ischaemum timorense*
- Isoëtes frigida
- Isoëtes habbemensis
- Isoëtes neoguineensis
- Isoëtes stevensii
Lasia spinosa
Leersia hexandra
Lemma perpusilla
Lemma trisulca
Limnophila aromatica
Limnophila indica (brownii)
Lobelia alsinoides
Ludwigia adscendens
Ludwigia hyssopifolia
Ludwigia octovalvis
Lychnothamnus barbatus

Macareria rubiginosa
Marsilea crenata
Microsorium brassii
Microsorium pteropus
Microsorium schneideri
Monochoria hastata
Monochoria vaginalis
Montia fontana
Myriophyllum coronatum
Myriophyllum dicoccum
Myriophyllum pedunculatum
Myriophyllum pygmaeum

Najas browniana
Najas graminea var. graminea
Najas indica
Najas malesiana
Najas tenuifolia ssp. pseudograminea var. pseudograminea

Nasturtium officinale*
Nelumbo nucifera
Nephrlepis biserrata
Nephrlepis radicans
Nitella cristata
Nitella farcata
Nitella pseudoflabellata
Nymphaea dictyophlebia
Nymphaea gigantea
Nymphaea macrosperrna
Nymphaea noucally
Nymphaea pubescens
Nymphaea violacea
Nymphoides aurantiaca
Nymphoides exiliflora
Nymphoides geminata
Nymphoides indica
Nymphoides parvifolia

Oryza longiligumis
Oryza minuta
Oryza ridleyi
Oryza rufipogon
Oryza sativa
Ottelia alismoides

Panicum auritum
Panicum paludosum
Persicaria attenuata
Persicaria barbata
Persicaria lapathifolia

Pistia stratiotes
Pogostemon stellatus var. roxburgianus
Pogostemon stellatus var. stellatus
Polygonum attensatum
Polygonum minus
Potamogeton javanicus
Potamogeton malaianus
Potamogeton pusillus
Potamogeton sp. A
Potamogeton sp. B
Pseudoraphis spp.

Rotala mexicana

Saccharum robustum
Sacciolepis myosuroides
Sagittaria platyphyilla*
Sagittaria subulata*
Salvinia molesta*
Schoenus spp.
Scirpus articulatus
Scirpus crassiusculus
Scirpus grossus
Scirpus inundoatus
Scirpus littoralis
Scirpus mucronatus ssp. mucronatus
Scirpus mucronatus ssp. clemensii
Scleria spp.
Sesbania javanica
Sparganium simplex
Spirodea polyrhiza
Stenochlaena areolaris
Stenochlaena milnei
Stenochlaena palustris

Thelypteris confinens
Torrenticola queenslandica
Triglochin procera
Typha orientalis

Utricularia aurea
Utricularia australis
Utricularia bifida
Utricularia exoleta
Utricularia minor
Utricularia muelleri

Vallisneria natans

Wolffia globosa

Note * = introduced (naturalised) species
Cryptocoryne ciliata var. ciliata ▲ Kikori Waterplants

Photos: Bruce Hansen
Freshwater Turtles

There are 11 species of freshwater turtles found in New Guinea. Nine of these occur in the Trans-Fly region, making it the richest part of New Guinea for turtles. One of the most interesting species, Carettochelys insculpta, has a large geographic range along the south coast of New Guinea and also inhabits a few drainage basins in northern Australia. It is the sole living representative of the family Carettochelyidae. This family has an extensive fossil record that suggests it may have once had a nearly worldwide distribution. Carettochelys insculpta is clearly relictual and has occurred in New Guinea since at least the Miocene. Although it is present in large numbers along the south coast of New Guinea, it is heavily exploited by coastal villagers for meat and eggs. In addition, it is a valuable species in the pet trade. For these reasons, and on account of its special taxonomic status, it is a species of special concern.

A distant relative, the trionychids, Pelocheys bibroni and Pelocheys signifera, are endemic to New Guinea. This family is characterised by a combination of fully webbed feet and a relatively flat, partly cartilaginous carapace (The carapace of these turtles lacks scutes and is covered instead with a leathery skin). The long neck ends in a short proboscis, a mini-version of the pig-nosed turtle, Carettochelys insculpta, with the two families closely related. A recent taxonomic revision restricts Pelocheys bibroni to southern New Guinea, with the designation of Pelocheys signifera for the species found in the north of the island. The animal has a thick, relatively long neck and a robust head. The carapace shows very distinctive thick, radiating yellow or white streaks. Further taxonomic work may result in the description of several new species within the Pelocheys complex.

The remaining turtles, are all members of the Chelidae, a family that is today restricted to South America and the Australia–New Guinea region (an outlying species occurs on Roti near Timor), suggesting that the family is of Gondwanan origin. Two species, Emydura subglobosa and Chelodina rugosa also occur in Australia. The rest are endemic to New Guinea and all but Elseya novaeguineae are endemic to southern New Guinea. In contrast to the Australian fauna, very little indeed is known of the life history and ecology of the New Guinea forms.

At present there is controversial discussion over the correct taxonomy of the Chelodina species in northern Australia and southern New Guinea. As a result of some recent investigations, the Australian species of Chelodina novaeguineae was described as an independent species by Scott Thomson and it was named Chelodina canni after John Cann the famous turtle researcher.

Freshwater turtles and their eggs are regularly harvested for food by the people of New Guinea. All species are eaten with the exception of Chelodina novaeguineae, whose pungent odour discourages many from consuming them. The impact of the pet trade in New Guinea is poorly documented. However, it is clear from anecdotal reports that large numbers of New Guinea reptiles may be illegally collected for the pet trade. West Papuan freshwater turtles received a high value in some pet market in Jakarta, Surabaya and Denpasar as well as imported to Hong Kong as tonic component.

Species List

Family Carettochelyidae

Carettochelys insculpta Ramsay 1886 [Pig-nosed Turtle]

Family Trionychidae

Pelochelys bibroni Owen, 1853 [Southern New Guinea Giant Soft-shell Turtle]


Family Chelidae

Chelodina novaeguineae Boulenger, 1888 [New Guinea Long-necked Turtle]

Chelodina parkeri Rhodin and Mittermeier, 1976 [Parker’s Snake-necked Turtle]

Chelodina pritchardi Rhodin, 1994 [Pritchard’s Snake-necked Turtle]

Chelodina reimanni Phillippen and Grossmann, 1990 [Reimann’s Snake-necked Turtle]

Chelodina rugosa Ogilby, 1890 [Northern Long-necked Turtle]

Elseya branderhorsti (Ouwens, 1914) [Southern New Guinea Snapping Turtle]

Elseya novaeguineae (Meyer, 1874) [New Guinea Snapping Turtle]

Emydura subglobosa (Krefft, 1876) [Red-bellied Short-necked Turtle]

Carettochelys insculpta Ramsay 1886 [Pig-nosed Turtle]

Carettochelys insculpta is reported to be widespread in southern New Guinea. It was first described as a new genus and species by Dr E.P. Ramsay from an incomplete specimen collected in the Strickland River, a tributary of the Fly River in Papua New Guinea by Walter Froggatt and Jas H. Shaw while on an expedition with the Geographical Society of Australasia.

The discovery and description of this peculiar species generated great interest in Europe, and the species was often specifically sought by explorers and travellers visiting New Guinea. The species was soon recorded from the Strickland, Fly, Morehead, Bensbach, Aramia, Omati, Binaturi, Purari and Kikori Rivers of Papua New Guinea. It is known in West Papua from the Setekwa, Heron and other southern flowing rivers. It was also reported from Lake Jamur, but
Carettochelys insculpta
the specimen consisted of fragments of shell and may have been carried there by natives. It seems likely that *Carettochelys insculpta* occurs in all of the major and some of the smaller southern-flowing rivers of New Guinea, but the exact boundaries to its distribution are unknown. No published records of the species exist for rivers east of the Purari, but local native information indicates that its range extends to the Vailala River in the east.

Speculation that the species might be a recent invader of northern Australia from New Guinea are disproved by Australian Aboriginal rock paintings up to 7,000 years old depicting the species, as well as the differentiation between the Australian and New Guinea populations being significant enough to warrant subspecific distinction. Animals of Australian populations may on average be smaller.

*Carettochelys insculpta* is a heavy bodied turtle, up to 22.5 kg in weight and 56.3 cm in length. Colouration is rich grey, olive-grey or grey-brown above and white, cream or yellowish below. The jaws are cream and there is a pale streak behind the eye. The species is cryptodirous, that is, the vertebral column in its neck flexes in the vertical plane upon sand banks adjacent to water in the middle reaches and but also nests in mud and loams at some localities. It nests in the late dry season between September and December, but as eggs are not swim like other freshwater turtles, but instead rows itself through the water by simultaneous movements of its forelimbs, the paddle-like structure of its forelimbs, *Carettochelys* does not swim like other freshwater turtles, but instead rows itself through the water by simultaneous movements of its forelimbs, as do marine turtles. Prominent folds of skin extend laterally on each side from the undersurface of the tail across the thigh region and down the hind limbs. The nostrils are at the end of a prominent fleshy proboscis. Mature males can be distinguished from females of the same size by the tail, which is larger in males to enable successful copulation.

*Carettochelys insculpta* inhabits rivers (including estuarine reaches and river deltas), grassy lagoons, swamps, lakes and waterholes of the southern lowlands. They nest in the late dry season between September and December, but as eggs appear in the Kikori markets as late as February; the nesting season may extend to the end of January. They typically chooses clean fine sand adjacent to water in which to nest, but also nests in mud and loams at some localities. It nests upon sand banks adjacent to water in the middle reaches and mouths of rivers, on sandy shores of islands in river deltas, and on coastal beaches. Nesting activity has been reported from the Strickland, Setekwa, Purari, Kikori, Turama, Era, Pai and Fly Rivers.

The hatching sex ratio of *Carettochelys insculpta* is influenced by the temperature that prevails during incubation, both under constant conditions in the laboratory and under fluctuating conditions in field nests. Embryos incubated at a constant 28°C and 30°C become males whereas those incubated at 32°C become females. The laboratory threshold for sex determination is not known precisely (between 30 and 32°C), but under field conditions, the threshold of 31.6°C agrees very well with the average nest temperature in New Guinea of 31.6°C. There is little information on natural levels of survivorship (83.2% from 30 nests) and none on rates of recruitment to the parent population, nor is it known how long the young turtles take to reach maturity.

*Carettochelys* is omnivorous. In the dry season, it feeds predominantly on fruits, seeds and leaves of a wide variety of riverside vegetation, including *Ficus racemosa*, *Syzygium forte* and *Pandanus aquaticus*, and mangroves (*Sonneratia* species) in both Australia and New Guinea. When available, aquatic plants such as *Vallisneria*, *Najas tenuifolia*, and algae are also eaten. Molluscs, crustaceans, fishes, bats and other mammals also feature in the diet, the latter presumably indicating scavenging. The wide range of food eaten provides great scope for opportunism, and the diet varies greatly between localities, according to the foods available. Locals of the Purari region claim that the hatching turtles congregate in the lower delta and feed on vegetation and fruits of mangroves.

Populations in New Guinea are thought to be declining because of increased exploitation for meat and eggs. This exploitation has been exacerbated in recent times by the introduction of modern technology, principally outboard motors. In addition, clan warfare has ceased, and people have moved from the hinterland to more convenient positions along river banks. Moreover, levels of industrial activity such as mining and exploration for oil, gold and copper, logging and fishing have increased in recent times. The activities of any one of these have the potential to impact on wildlife populations including those of the pig-nosed turtle.

*Chelodina novaeguineae* Boulenger, 1888

[New Guinea Long-necked Turtle]

*Chelodina novaeguineae*, which has previously been thought to also occur in Australia, is now regarded as endemic to New Guinea. It inhabits coastal swamps and slow-flowing rivers in southern New Guinea from the Fly River westward to at least the Lorentz River. Although *Chelodina novaeguineae* has a large geographic range, it appears to be relatively uncommon, a matter of possible conservation concern.

The oval carapace (to 30 cm) is broadest behind the centre, and has a smooth posterior rim, depressed vertebrae, and a pronounced medial groove on the 2nd to 4th vertebrae. Vertebrals are broader than long in adults; the 1st is the largest and is flared anteriorly, the 4th is the smallest, and the 5th is flared posteriorly. Although neural bones are usually absent, Rhodin and Mittermeier (1977) found 5 of
New Guinea Freshwater Biodiversity

20 New Guinea specimens had one to four scattered neurals. Surfaces of the carapacial scutes, at least in young individuals, are covered with rugose radiations. Lateral marginals are not upturned as in Chelodina longicollis, and those over the tail are at best only slightly raised. This species emits a rather pungent defensive odour from its scent glands when first captured, but soon ceases this objectionable habit in captivity.

The carapace is chestnut to dark brown. The plastron is large, covering most of the carapacial opening, and is deeply notched posteriorly. Its fore lobe is broad, but does not reach the marginals; the hind lobe tapers toward the rear. The bridge is moderate in size. Plastron, bridge, and undersides of the marginals vary from cream to yellow; their seams may be narrowly bordered in black. The head is broad and flat with a slightly protruding snout and an unnotched upper jaw. The jaws are wide and the maxillae compose more of the palate than in other Chelodina. The neck is comparatively short and thin, only about 55-60% of the carapace length, and its dorsal surface is covered with large, rounded tubercles. Head and neck are olive brown to brown above and cream to yellow below. Limbs are olive to brown. Each foreleg has a series of five enlarged transverse scales on its anterior surface. Males have longer tails than do females.

Chelodina novaeguineae is found in semi-permanent, seasonally ephemeral swamps. The habits of Chelodina novaeguineae are poorly known, but they either aestivate or migrate to a more permanent waterbody when the swamps dry up. Courtship and mating involves the male swamps around the female and approaches from the rear. He rubs his chin over her carapace, progressing forward from her posterior marginals. By the time his chin touches the base of her neck; his forefeet are able to reach her carapace. He climbs onto her back and places his hind feet over hers and continues to caress her neck with his chin. She then bobs her head in response. Intromission soon follows. Nesting takes place during the dry season. Females collected in West Papua had clutches of 17 to 21 eggs in September. Several emerged from eggs after a 9-week incubation period. Natural foods include snails, prawns, insects, amphibians, and probably small fish. Various aquatic plants are also consumed.

Chelodina parkeri Rhodin and Mittermeier, 1976
[Parker’s Snake-necked Turtle]
One of four species of long-necked chelid turtles found in New Guinea, this species is closely related to Chelodina rugosa, but can be distinguished by its unique head pattern of light vermiculations. Its carapace is oval, flattened, and elongated (to 26.7 cm) with a smooth posterior border. Laterally it is nearly parallel. No medial keel or depressions is present. Its fore lobe is anteriorly rounded and usually broader than the hind lobe, which tapers to the rear and has a shallow posterior notch. The intergular is broad and not as elongated as in Chelodina rugosa, being only about 1.5 times as long as broad. Both plastron and narrow bridge are cream to yellow. The broad head is elongated and flattened with a slightly protruding snout and an unnotched upper jaw. Its dorsal surface is covered with many small irregularly shaped scales.

Usually only two small chin barbels are present, but the number is variable. The head is grey to dark brown with an extensive pattern of fine white, cream, yellow, or green vermiculated lines or dots. There is also a large, bright blotch on the mid-posterior surface of the tympanum. The neck is long and thick (about 75% of the carapace length), with small pointed tubercles on the dorsal surface. The forelimbs have several large transverse scales on the anterior surface. The dorsal surfaces of the neck and limbs are grey; the undersides are white to pink. Males have longer, thicker tails and flatter shells than do females.

Chelodina parkeri occurs mainly in inland swamps and shallow water areas from the Fly River in the east to the Digul River in the west, particularly within the tributaries of the Fly River, being found in Lake Murray and Lake Balimo and the Fly and Aramia Rivers. Chelodina parkeri is restricted to large inland grass swamps in savannah areas; it inhabits the open edges of lakes and rivers where a dense growth of grass and aquatic vegetation occurs in shallow water. These areas are dominated by inundated grasses and extensive floating mats, subject to seasonal reduction but only complete drying in exceptionally dry seasons.

Nothing is known of its breeding behaviour in the wild. In captivity it was observed that head bobbing is the most characteristic courtship behaviour by the male, but, once mounted, he also initiated snout to snout contact with the female. Sometimes the contact was only at her lower jaw. The female produces two clutches of 8-11, nearly spherical eggs between November and February. After incubation at 27-33°C, the young hatched in about 90 days. Hatchlings averaged 35 mm in carapace length. The hatchlings exhibit the nice marbled coloration on head and carapace. This coloration gets even more distinctive when the hatchlings grow. The plastron itself appears creamy-white.

This species was named in honour of Fred Parker of Townsville, Queensland, an Australian naturalist and explorer who collected multitudes of specimens that are deposited in several museums.

Chelodina pritchardi Rhodin, 1994
[Pritchard's Snake-necked Turtle]
The oval, chestnut-brown, rugose carapace (to 22.8 cm) has flared posterior marginals with smooth edges and depressed vertebrals. It is broadest behind the centre, and a slight medial groove is present on some individuals. Adult vertebrals are broader than long; the 1st is the largest and broadest; vertebrals 5 and 4 are the shortest, respectively.
No neural bones are present. The plastron is large, almost covering the entire carapacial opening, and it has a deep posterior notch. The fore lobe is broader than the hind lobe. Plastron, bridge, and undersides of the marginals are yellowish with dark seams. The head is somewhat narrow with a slightly upturned, protruding snout. The upper jaw is not notched. Dorsally the neck is covered with small rounded tubercles. Skin is greyish brown dorsally, cream ventrally. Females are larger than males, and have small tails compared to the longer, thicker tail of males.

*Chelodina pritchardi* is currently known only from the Kemp Welch River of southeastern Papua New Guinea.

**Chelodina reimanni** Philippen and Grossmann, 1990

[Reimann’s Snake-necked Turtle]

The keelless, oval, olive to chestnut brown, rugose carapace (to 21 cm, but possibly to 35 cm) is broadest behind the centre, somewhat flattened dorsally, with unserrated posterior marginals. The vertebrals are broader than long; the 1st is the largest, the 4th the smallest. Neural bones are absent. The plastron is large, almost covering the entire carapacial opening, and contains a posterior notch. The fore lobe is broader than the hind lobe. The plastron, bridge and undersides of the marginals are tan to cream or yellow with dark seams; some greyish pigment may be present along the midseam of the plastron. The head is broad for a Chelodina, and the neck is rather short. The snout is slightly upturned and protruding, the upper jaw is not notched. Dorsal surface of the neck has small, round tubercles. The skin is greyish brown dorsally and more yellowish ventrally. Females (to 20.6 cm) are larger than males (to 15.5 cm); males have longer, thicker tails than females. Specimens from the Merauke region and further westward have the typical broad head of this species. To the east, towards the border with Papua New Guinea, *Chelodina reimanni* have narrower heads. Close to the border, this species very much resembles *Chelodina novaeguineae*, to which it may be very closely related. *Chelodina reimanni* is recognized on the basis of published morphological evidence only, being indistinguishable from *Chelodina novaeguineae* using electrophoresis.

*Chelodina reimanni* is found from the Merauke River to the mouth of the Digul River in south-eastern West Papua to south-western Papua New Guinea. Recently it was also found in Mating, West Papua. *Chelodina reimanni* inhabits shallow pools in marshy areas with water temperatures exceeding 30°C over a considerable period. In the dry period, from mid August to mid October, it may aestivate in the mud.

*Chelodina reimanni* breeds easily in captivity when warm, clean water, enough protein-rich food, and a place to nest are provided. Two or 3 clutches of 6-16 hard-shelled, greyish white, oval (31-34 x 20-24 mm) eggs are laid each year. Incubation in captivity at 28°C takes 65 to 80 days; hatchlings are 27.6 to 32.1 (30.46 ± 1.35) mm and have dark-spotted red plastra. *Chelodina reimanni* is thought to be an active carnivorous forager.

*Chelodina rugosa* Ogilby, 1890

[Northern Long-necked Turtle]

*Chelodina rugosa* has an oblong dark-brown or black carapace (to 30 cm) which is broader behind the centre and flattened dorsally. No vertebral keel is present, and females may have a slight medial depression. All vertebrals are broader than long; the 1st is flared anteriorly and is the largest, the 4th is the shortest, and the 5th is flared posteriorly. Normally no neural bones are present. The posterior marginals are neither flared nor serrated. The plastron is short, narrow, and elongated, leaving much of the carapacial opening uncovered. Its fore lobe rounds to a point and the hind lobe is deeply notched posteriorly. The intergular scute is long and narrow (about twice as long as broad). The bridge is narrow.

The plastron is yellow to light brown, and some individuals may have darkened seams. The broad head is large and flattened with a slightly protruding snout and an unnotched upper jaw. Numerous small irregularly shaped scales cover the dorsal surface. A variable number of chin barbels is present, often four or more. The neck is long and thick, reaching about 75% of the length of the carapace, and is covered with blunt tubercles. Head and neck are grey to brown dorsally, cream coloured ventrally. The forelimbs contain enlarged transverse scales on their anterior surfaces, and the toes are webbed. The limbs and tail are grey. Males have longer, thicker tails than do females, and are flatter shelled than are the more domed females.

Mating takes place in water, with the male mounting the female from the rear. The female digs a nest at the end of the wet season in May and lays 4 to 19 elongated eggs (31.6-38.3 x 27.2-31.7 mm); the frequency of nesting in captivity suggests the potential of two clutches per season. Hatching occurs at the start of the next wet season in November or Decembers and may take three to six months in captivity. Hatchlings have carapace lengths of about 36 mm. Their carapaces are brown with small black spots; each marginal tends to have one spot but the number varies on the vertebrals and pleurals.

Hatchlings appear after 100 days if incubated at 30°C. Females accept normal humidity nesting conditions as preferred by most other Chelodina species. However it has been reported several times that *Chelodina rugosa* prefer to nest in absolute wet (saturated) substrate or even lay their eggs under water. The eggs start to develop as soon as the substrate dries out. Therefore the developing time may extend up to 6 month or longer for these clutches. *Chelodina rugosa* is apparently carnivorous, using its long neck to strike for food. Despite this, it is unaggressive and does not bite when handled. It does not bask, but instead spends most of the time on or in deep mud.

*Chelodina rugosa* is found from the Fly River in the east to the Digul River in the west and occurs across much of northern Australia and on certain islands in the Torres Strait. *Chelodina rugosa* is restricted to the coastal swamps. Its habitat is consistent with that found in Australia – seasonally dry Melaleuca swamps where it survives the dry-
This species was formerly known as *Chelodina siebenrockii*. *Chelodina siebenrockii* was found to be an invalid species, not having enough differences to *Chelodina rugosa* in terms of electrophoresis data and/or lacking reliable morphological differences. Therefore in the absence of any substantive diagnostic morphological and allozyme differences, Georges et al. 2002, synonymises *Chelodina siebenrockii* with *Chelodina rugosa* (the latter has precedence).

**Chelodina sp.5** [undescribed New Guinean species closely related to *Chelodina reimanni*]

*Elseya branderhorsti* (Ouwens, 1914)  
[Southern New Guinea Snapping Turtle]

*Elseya branderhorsti* which is restricted to the south coast of New Guinea, occurring from just inside the Papua New Guinea border in the east to the Lorentz River in the west. *Elseya branderhorsti* primarily inhabits large rivers, lakes and freshwater swamps. This species was named in honour of Dr. Bastiaan Branderhorst, a military doctor taking part in excursions to New Guinea. Peter A. Ouwens, who originally described the species as *Emydura branderhorsti* in 1914, was a Dutch scientist and a director of the Java Zoological Museum and Botanical Gardens in Bogor.

*Elseya branderhorsti* lays white, hard-shelled ellipsoid eggs that are deposited in nests in soil on banks adjacent to the streams or swamps it inhabits.

*Elseya novaeguineae* (Meyer, 1874)  
[New Guinea Snapping Turtle]

The round to oval, medially keeled, deep adult carapace (to 30 cm) is broadest behind thecentre, and has at least a slightly serrated posterior rim. The median keel and posterior serrations are well-developed in juveniles, and, although they become less pronounced with age, are never entirely lost. The serrations are never as prominent in adults as they are in *Elseya lattisternum*. No neurals are present. The cervical scutes are well-developed. All vertebrals are broader than long; the 5th is the smallest and is expanded posteriorly; the 2nd is the largest. Lateral and posterior marginals are outwardly expanded.

The adult carapace is uniformly brown to black. The plastron is long and narrow, allowing much of the carapacial opening to remain uncovered, and is posteriorly notched. Its fore lobe tapers gradually toward the front, is rounded anteriorly, and broader at the bridge than is the hind lobe, which tapers toward the rear. The bridge is well-developed. The intergular is very narrow, almost three times as long as broad, and completely separates the gulars. Plastron and bridge are cream to yellow. The head is small and narrow with a projecting snout and an unnotched upper jaw. There is no medial ridge on the maxillary triturating surface. Dorsally, the head is covered with a large horny plate instead of smooth skin; there are two small chin barbels. Flattened tubercles are present in front of the tympanum; those on the neck are small and pointed. The skin of the head, neck, and limbs is grey. Males have much longer tails than do females. The large eggs are ellipsoidal (55 x 33 mm) and brittle shelled. Hatchlings have carapaces ranging from 35-48 mm that are brown with a small black blotch on each carapacial scute. *Elseya novaeguineae* inhabits rivers and swamps, especially those along the coast.

A number of undescribed taxa related to *Elseya novaeguineae* have been reported from New Guinea. *Elseya novaeguineae* is restricted to New Guinea, where it occurs over much of the island. The record from the Palau Islands may represent an introduction. McDowell (1983) has placed novaeguineae in the synonymy of dentata, but an electrophoretic study by Georges and Adams determined *Elseya novaeguineae* as a diagnosable taxon. The species was originally described as Platemys Novaie Guineae by German Dr Adolf Bernard Meyer (1840-1911) in 1874. Dr Meyer of Anthropological and Ethnographic Museum of Dresden, Germany was an anthropologist, naturalist and explorer of Malay Archipelago and New Guinea.

*Elseya sp.* [The Pink-bellied Short-necked Turtle]  
[An unidentified form found in the Timika area and may be a new species.]

*Emydura subglobosa* (Krefft, 1876)  
[Red-bellied Short-necked Turtle]

The brown oblong carapace (to 25.5 cm) is broader posteriorly than anteriorly. It is somewhat domed but lacks a vertebral keel in adults; small juveniles are keeled. The cervical scute is well-developed, and the vertebrals are broader than long. Posteriorly, the marginal rim is smooth and somewhat flared; undersides of the marginals are red. The narrow plastron is notched posteriorly and lacks a hinge. It is yellow with a broad lateral border of red pigment. The intergular scute is longer than broad, longer than the length of the interhumeral seam. The bridge is composed of parts of the pectoral and abdominal scutes with no axillary and only small inguinal scutes present. It is yellow with some reddish markings.

On the olive head, a yellow stripe runs from the tip of the snout through the orbit to and above the tympanum, and another yellow stripe may be present along the upper jaw. A broken red stripe runs along the lower jaw to the neck, often extending to the plastron. Two yellow barbels are present on the chin, and the light-coloured maxillary and mandibular sheaths are prominent. The neck is dark grey dorsally, but ventrally lighter grey with red streaks. Limbs and tail are grey anteriorly and white posteriorly with red streaks. A series of enlarged narrow horizontal scales occurs on the anterior surface and lateral margin of the forelegs and on the outer margins of the hindlegs. The red pigment is more prominent in juveniles, but fades to a pinkish salmon with age. Males have long, thick tails and narrow posterior plastral notches, while females have short tails and wide posterior plastral notches.

Female *Emydura subglobosa* mature at a carapace length of 14-15 cm. Males also mature in the range 14-15 cm CL.
During courtship the male closely trails the female with neck and head extended and directed towards her rear. He brings his nose close to or touches the female’s cloacal region, which often causes her to twitch her tail. The male then moves around the side of the female’s carapace until he faces her in front in an off-centre position. If she continues to swim on, he increases his efforts, but if she stops swimming he performs a series of rapid strokes toward her face with his forefeet (palms toward her). His claws do not always brush her cheeks during this behaviour, and the stroking is often alternated from one side of her face to the other. The male follows this with rapid head bobbing and repetitive blinking of his eyes. The female usually surfaces at this time, and the male follows, surfacing in front of her, touches his nose to hers, and expels water through his nostrils. These last behaviours may be repeated several times.

The females lay an average clutch of 10 eggs in September. A 21 cm female in captivity laid 5 eggs. These had white, brittle shells and were elongated. Their measurements ranged from 31 x 19 mm to 44 x 20 mm (all but one was over 40 mm in length). Hatchlings and juveniles have a bright pink or red plastron which fades to pale yellow-orange with age. There are also bright markings on the head of youngsters which will fade with age.

*Emydura subglobosa* are primarily carnivorous. They sport broad jaws as adults which are used to crush molluscs. Snails, fish, insects and worms are eagerly eaten, as are leafy greens, fruits and aquatic plants.

*Emydura subglobosa* inhabit slow-flowing rivers, lakes and swamps across much of southern New Guinea, but it has also been found in top of Cape York Peninsula, Queensland.

Remarks
The diamond-head or Worrell’s turtle is found in the rivers from the Daly River in the west to the rivers flowing into the Gulf of Carpentaria along the west coast of Cape York. This form is electrophoretically indistinguishable from populations of *Emydura subglobosa* in New Guinea, but lacks the red suffusion of the New Guinea populations. *Emydura subglobosa* is traditionally regarded as having a shell, neck and limbs suffused with red; such a form is found in Australia only at the tip of Cape York, Queensland. The yellow-faced form lacks the red suffusing, but this may be diet related. Until such time as a morphological study is undertaken, and shows the contrary to be true, Georges regards the second yellow-faced turtle to be *Emydura subglobosa*. He states that at the very best, it might be regarded as a subspecies, in which case it would be *Emydura subglobosa worrelli*. The ‘painted’ form would be *Emydura subglobosa subglobosa*, restricted to New Guinea and the tip of Cape York. Georges and Adams (1996) consider the Australian yellow-faced *Emydura australis* in part synonymous with *Emydura subglobosa*.

*Emydura sp.* (An unidentified form found in the Fly River and may be a new species. It resembled most closely *Emydura worrelli* from northern Australia.)

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**Pelochelys bibroni** Owen, 1853
[Southern New Guinea Giant Soft-shell Turtle]
*Pelochelys bibroni* extends across the southern lowlands of New Guinea, from the Port Moresby region in the east to the southern lowlands of West Papua, where its western extent is not well documented, but reaches at least as far as the Timika region. They can grow to a very large size reaching a carapace length of over one metre. The carapace is a uniform dull olive-brown with a cream coloured plastron. Typically these omnivorous species are found in large rivers, preferring areas with a muddy or sandy bottom but they can also be found in brackish water. A maximum clutch size of 27 eggs has been recorded; females may produce more than one clutch per season.

*Pelochelys bibroni* is considered uncommon and population trends are unknown. They are hunted for food and are often encountered in trade across land borders into China. Curios made from Pelochelys shells are frequently offered for sale in substantial numbers in Papua New Guinea.

Trionychids were widespread through Queensland in the late Cainozoic and possibly as early as the Miocene. *Pelochelys bibroni* probably reached the Australasian region from New Guinea. Fossil material from Australian deposits is fragmentary, but has been diagnosed as Trionychidae on the basis of surface texture pattern and a natural distal edge to the costals, rather than a suture, suggesting that peripheral bones were absent.

**Pelochelys signifera** Webb, 2002
[Northern New Guinea Giant Soft-shell Turtle]
The distribution of *Pelochelys signifera* in New Guinea includes the northern lowlands as far east as Madang, including the Sepik and Ramu drainages and in the west into the northern lowlands of West Papua including the Jayapura region, the Mamberamo drainage, and the Nabire region on the southern shore of Cenderawasih Bay.


