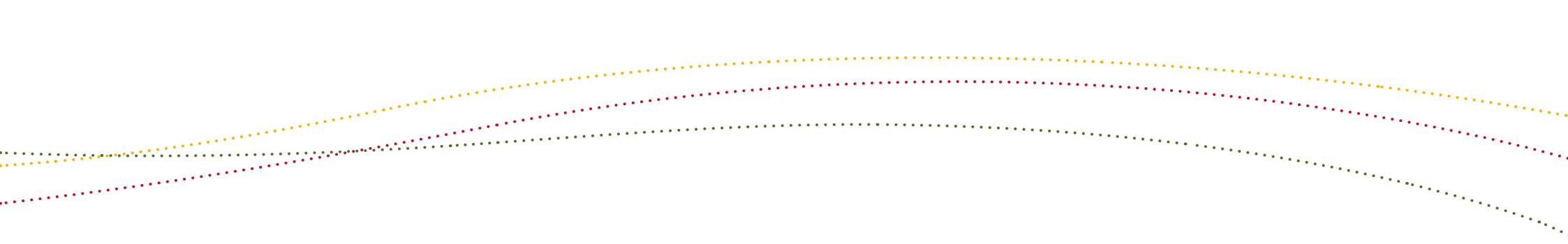




EXECUTIVE SUMMARY





Numbers of Living Species in Australia and the World was first published in 2006. It was a collation of information from taxonomic literature, online resources and previous compilations, augmented by discussions with systematists. It is updated and revised in this new edition, taking into account newly published species, and refined estimates and corrections, again with considerable input from the taxonomic community. Insects are subdivided further than before, with separate figures being given for the component orders, and the algae and fungi are rearranged in line with more recent classifications.

The total number of accepted described species in the world is estimated to be close to 1,900,000, well above the 1,786,000 given in 2006. Worldwide, about 18,000 new species are being described each year and for the year 2007, 75% of these were invertebrates, 11% vascular plants and nearly 7% vertebrates.

For Australia a figure of 147,579 accepted described species is now determined, below the 2006 figure of 172,200, and the estimate of the number of species overall is 566,398. The reduction in numbers is due in large part to refinement of the estimates of numbers of insects, and feedback on the earlier edition of this report which led to more extensive collaboration to develop revised estimates. In a coarse

breakdown of these figures, the estimates for Australia are 8,128 accepted described chordate species, 98,703 invertebrates, 24,716 plants (including plant algae and bryophytes), 11,846 fungi and around 4,186 in other groups. These figures include new records and newly described species for Australia for the past three years, among them approximately 1,184 vascular plants, 48 reptiles, 8 frogs and 8 mammals, 904 arachnids, 148 myriapods and 60 sponges. Endemism is high in some groups. For example, 41.3% of the chordates are endemic (including 87% of mammals, 45% of birds, 93% of reptiles, 94% of frogs) and some 92% of the vascular plants.

Nationally, the number of Australian species under threat are 246 chordates (3% of chordate species, including 20% of mammals and 14% of amphibians), 1,260 vascular plants (6.5%), 32 invertebrates, two algae and one bryophyte.

Chordates

Brusca and Brusca (2003) estimated that there are 49,693 published and accepted vertebrate species for the world, whereas Groombridge and Jenkins (2002) gave an estimate of 52,000 accepted vertebrate species and an estimate of about 55,000 chordate species in total. Adding up the individual estimates documented in the previous report

provided a much higher figure of 60,979 published chordate species (Chapman 2006). This report has again increased that figure, to 64,791—an increase of about 6.2%. The group with the greatest increase was the fishes, but all groups have had new species published since the previous report. The number of published species in Australia has increased from

7,561 to ~8,128 (an increase of 7.5%) again with most of the increase in the number of fish species. It is estimated that just over 40% of Australian chordate species are endemic.

| Taxon | World Descr./ Accepted | Australia Descr./ Accepted | Austral. Percent. | Estimate World | Estimate Australia | World Threat. ⁵ | World Threat. Percent. | Austral. Threat. ⁶ | Austral. Threat. Percent | % of World's Threat. | Percent. Endemic |
|-----------------|------------------------|----------------------------|-------------------|----------------|--------------------|----------------------------|------------------------|-------------------------------|--------------------------|----------------------|------------------|
| Mammals | 5,487 | 386 | 7.0% | ~5,500 | ~390 | 1,141 | 20.8% | 78 | 20.2% | 6.8% | 87% |
| Birds | 9,990 | 828 | 8.3% | >10,000 | ~900 | 1,222 | 12.2% | 50 | 6.0% | 4.1% | 45% |
| Reptiles | 8,734 | 917 | 10.5% | ~10,000 | ~950 | 423 | 4.8% | 46 | 5.0% | 10.9% | 93% |
| Amphibia | 6,515 | 227 | 3.5% | ~15,000 | ~230 | 1,905 | 29.2% | 31 | 13.7% | 1.6% | 94% |
| Fishes | 31,153 | ~5,000 | 16.0% | ~40,000 | ~5,750 | 1,275 | 4.1% | 41 | 0.8% | 3.2% | 24% |
| Agnatha | 116 | 5 | 4.3% | unknown | ~10 | 0 | 0% | 0 | 0% | – | 60% |
| Cephalochordata | 33 | 8 | 24.2% | unknown | ~8 | 0 | 0% | 0 | 0% | – | 50% |
| Tunicata | 2,760 | 757 | 27.4% | unknown | ~850 | 0 | – | 0 | – | – | 50% |
| TOTAL (2005) | 60,979 | 7,561 | 12.4% | ~71,000 | ~8,444 | 5,188 | 8.5% | 247 | 3.3% | 4.8% | 39% |
| TOTAL (2009) | 64,788 | ~8,128 | 12.5% | ~80,500 | ~9,088 | 5,966 | 9.2% | 246 | 3.0% | 4.1% | 41.3% |

5 The IUCN Red List of Threatened Species (2009b).

6 Includes listed Extinct and Vulnerable species (DEWHA 2009a, b).



Invertebrates

The number of published, accepted invertebrate species in the world has increased since the previous report to 1,359,367—largely due to an increase in the number of insects. In this report I have been able to report on the numbers of insects by Order and this has allowed for a more accurate estimate for the total number of species.

By contrast, the estimate for the total number of published insect species in Australia has decreased from approximately 80,000 to 62,000. The estimates for the total numbers of species, however, has altered very little. Estimates for endemism have now been supplied for many more groups, but an overall estimate is still not possible due to the

unknowns in most of the larger groups, including the spiders, nematodes and platyhelminths.

Note: Where a range is given in number of species for a group the higher figure of the range is used in this table.

| Taxon | World Descr./ Accepted | Australia Descr./ Accepted | Austral. Percent. | Estimate World | Estimate Australia | World Threat. ⁷ | World Threat. Percent. | Austral. Threat. | Austral. Threat. Percent | % of World's Threat. | Percent. Endemic |
|-----------------|------------------------|----------------------------|-------------------|----------------|-----------------------|----------------------------|------------------------|------------------|--------------------------|----------------------|------------------|
| Hemichordata | 108 | 17 | 15.7% | ~110 | 22 | 0 | – | 0 | – | – | ~25% |
| Echinodermata | 7,003 | 1,475 | 21.1% | ~14,000 | ~2,000 | 0 | – | 0 | – | – | 31% |
| Insecta | ~1,000,000 | ~62,000 | 6.2% | ~5,000,000 | ~205,000 | 626 | 0.06% | 8 | 0.01% | 1.2% | ~70% |
| Arachnida | 102,248 | 6,615 | 6.5% | ~600,000 | 31,338 | 18 | 0.02% | 0 | – | 0% | unknown |
| Pycnogonida | 1,340 | 215 | 16.0% | unknown | unknown | 0 | – | 0 | – | – | ~50% |
| Myriapoda | 16,072 | 553 | 3.4% | ~90,000 | ~3,100 | 15 | 0.1% | 0 | – | 0% | 86% |
| Crustacea | 47,000 | 7,266 | 15.5% | 150,000 | ~9,500 | 606 | 1.3% | 9 | 0.1% | 1.5% | unknown |
| Onychophora | 165 | 71 | 43.0% | ~220 | ~80 | 9 | 5.5% | 0 | – | – | 100% |
| Hexapoda | 9,048 | 338 | 3.7% | 52,000 | ~2,070 | 0 | – | 0 | – | – | ~17.6% |
| Mollusca | ~85,000 | ~8,700 | 10.2% | ~200,000 | ~12,250 | 978 | 1.2% | 14 | 0.2% | 1.4% | 38% |
| Annelida | 16,763 | 2,192 | 13.1% | ~30,000 | ~4,230 | 6 | 0.04% | 1 | 0.05% | 16.7% | 67% |
| Nematoda | <25,000 | ~2,060 | 8.2% | ~500,000 | ~30,000 | 0 | – | 0 | – | – | unknown |
| Acanthocephala | 1,150 | 56 | 4.9% | ~1,500 | ~160 | 0 | – | 0 | – | – | unknown |
| Platyhelminthes | 20,000 | 1,593 | 8% | (~80,000) | ~10,000 | 0 | – | 0 | – | – | unknown |
| Cnidaria | 9,795 | 1,705 | 17.4% | unknown | ~2,200 | 236 | 2.4% | 0 | – | – | unknown |
| Porifera | ~6,000 | 1,476 | 24.6% | ~18,000 | ~3,500 | 0 | – | 0 | – | – | 56% |
| Others | 12,673 | ~2,371 | 18.7% | ~20,000 | ~5,015 | 30 | 0.2% | 0 | – | 0% | unknown |
| TOTAL (2005) | 1,263,600 | 114,600 | 9.1% | ~5,500,000 | ~250,000 ⁸ | 1,992 | 0.17% | 14 | 0.01% | 0.7% | unknown |
| TOTAL (2009) | ~1,359,365 | ~98,703 | 7.3% | ~6,755,830 | ~320,465 | 2,524 | 0.2% | 32 | 0.04% | 1.3% | unknown |

7 The IUCN Red List of Threatened Species (2009b).

8 This figure is a midpoint between estimates of 200,000 to 300,000.

Plants

In this report, I have included plant algae, including the green algae, red algae and glaucophytes, making a direct comparison with the previous report impossible, however

I have added a comparison for plants excluding the algae. Estimates for published species of the Magnoliophyta for the world have increased by about 10,000 since the previous

edition, but the estimate for the total number of species has dropped considerably from ~422,000 to ~352,000 in line with recent research.

| Taxon | World Descr./ Accepted | Australia Descr./ Accepted | Austral. Percent. | Estimate World | Estimate Australia | World Threat. ⁹ | World Threat. Percent. | Austral. Threat. | Austral. Threat. Percent. | % of World's Threat. | Percent. Endemic |
|--------------------------------|------------------------|----------------------------|-------------------|----------------|--------------------|----------------------------|------------------------|------------------|---------------------------|----------------------|------------------|
| Bryophyta | 16,236 | 1,847 | 11.4% | ~22,750 | ~2,200 | 82 | 0.4% | 1 | 0.05% | 1.2% | 25% |
| Algae (Plant) | 12,272 | ~3,545 | ~29% | unknown | ~3,000 | 9 | 0.07% | 2 | 0.06% | 22% | unknown |
| Vascular Plants | 281,621 | 19,324 | 6.9% | ~368,050 | ~21,645 | 8,366 | 3.0% | 1,260 | 6.5% | 15% | 91.8% |
| <i>Ferns and allies</i> | (~12,000) | (498) | (4.2%) | (~15,000) | (~525) | (139) | (1.2%) | (41) | (8.2%) | (29.5%) | (33.8%) |
| <i>Gymnosperms</i> | (~1,021) | (120) | (11.7%) | (~1,050) | (~120) | (323) | (31.6%) | (17) | (14.2%) | (5.3%) | (96%) |
| <i>Magnoliophyta</i> | (~268,600) | (18,706) ¹⁰ | (7.0%) | (~352,000) | (~21,000) | (7,904) | (2.9%) | (1,202) | (6.4%) | (15.2%) | (93.25%) |
| TOTAL 2009 | ~310,129 | ~24,716 | 7.9% | ~390,800 | 26,845 | 8,457 | 2.7% | 1,263 | 5.1% | 14.9% | ~86% |
| TOTAL 2005 excl. Algae (Plant) | 289,000 | ~20,000 | 6.9% | ~444,000 | 23,000 | 8,321 | 2.9% | 1,195 | 6.0% | 14.4% | 84% |
| TOTAL 2009 excl. Algae (Plant) | 297,857 | 21,171 | 7.1% | ~390,800 | 23,845 | 8,448 | 2.8% | 1,261 | 5.9% | 14.9% | 86% |

Fungi

In the previous report, lichens were included as a separate group to the fungi. In this edition the lichens (or more correctly lichen-forming fungi) have been included under the

fungi, although the numbers for lichens are included in the table in brackets. A number of groups previously regarded as fungi but which are now regarded as belonging to either

Chromista or Protoctista have been excluded from the fungi and included under those groups respectively—in the previous report they were included in the fungi.

| Taxon | World Descr./ Accepted | Australia Descr./ Accepted | Austral. Percent. | Estimate World | Estimate Australia | World Threat. ¹¹ | World Threat. Percent. | Austral. Threat. | Austral. Threat. Percent. | % of World's Threat. | Percent. Endemic |
|----------------|------------------------|----------------------------|-------------------|----------------|--------------------|-----------------------------|------------------------|------------------|---------------------------|----------------------|------------------|
| Fungi | 98,998 | 11,846 | 11.9% | 1,500,000 | 50,000 | 3 | >0% | 0 | 0% | 0% | unknown |
| <i>Lichens</i> | (17,000) | (3,495) | (20.6%) | (~25,000) | (~4,500) | (2) | (0.01%) | (0) | 0% | 0% | (34%) |
| TOTAL 2009 | 98,998 | 11,846 | 11.9% | 1,500,000 | 50,000 | 3 | >0% | 0 | 0% | 0% | unknown |



Others

This group includes mainly single-celled, heterotrophic, eukaryotic organisms. It includes many species that were previously thought to be fungi or algae, but which are now regarded as belonging to Chromista or Protoctista. In the

previous report, fungi and lichens were included within this category, but have now been transferred to a separate section. Algae were also included here, but have now been included under plants except for those species more

correctly regarded as belonging to the Chromista, Protoctista or Cyanophyta, which are included here under those groups respectively.

| Taxon | World Descr./ Accepted | Australia Descr./ Accepted | Austral. Percent. | Estimate World | Estimate Australia | World Threat. ¹² | World Threat. Percent. | Australia Threat. ¹³ | Australia Threat. Percent. | % of World's Threat. | Percent. Endemic |
|-------------------|------------------------|----------------------------|-------------------|-------------------|--------------------|-----------------------------|------------------------|---------------------------------|----------------------------|----------------------|------------------|
| Prokaryota | 7,643 | ~40 | 0.5% | ~1,000,000 | 40,000 | 0 | – | 0 | – | – | unknown |
| Cyanophyta | 2,664 | 270 | 10% | unknown | ~500 | 0 | – | 0 | – | – | unknown |
| Chromista | 25,044 | 2,130 | 8.5% | ~200,500 | >15,000 | 6 | 0.02% | 0 | 0% | 0% | unknown |
| Viruses | 2,085 | ~400 | ~19.2% | 400,000 | unknown | 0 | – | 0 | – | – | ~50% |
| Protoctista | ~28,871 | >1,346 | 4.7% | >1,000,000 | ~65,000 | 0 | – | 0 | – | – | unknown |
| TOTAL 2009 | ~66,307 | >4,186 | 6.2% | ~2,600,500 | (~160,000) | 6 | 0.01% | 0 | 0% | 0% | unknown |

All Species

| Taxon | World Descr./ Accepted | Australia Descr./ Accepted | Austral. Percent. | Estimate World | Estimate Australia | World Threat. ¹⁴ | World Threat. Percent. | Aust Threat. ¹⁵ | Austral Threat. Percent | % of World's Threat. | Percent. Endemic |
|-------------------|------------------------|----------------------------|-------------------|--------------------|--------------------|-----------------------------|------------------------|----------------------------|-------------------------|----------------------|------------------|
| Chordates | 64,788 | ~8,128 | 12.5% | ~80,500 | ~9,088 | 5,966 | 9.2% | 246 | 3.0% | 4.1% | 41.3% |
| Invertebrates | 1,359,365 | 98,703 | 7.3% | ~6,755,830 | ~320,465 | 2,524 | 0.2% | 32 | 0.04% | 1.3% | unknown |
| Plants | 310,129 | 24,716 ¹⁶ | 7.9% | ~390,800 | 26,845 | 8,457 | 2.7% | 1,263 | 5.1% | 14.9% | 86% |
| Fungi | 98,998 | 11,846 | 11.9% | 1,500,000 | 50,000 | 3 | >0% | 0 | 0% | 0% | unknown |
| Others | ~66,307 | >4,186 | 6.2% | 2,600,500 | ~160,000 | 6 | 0.01% | 0 | 0% | 0% | unknown |
| TOTAL 2009 | 1,899,587 | 147,579 | 7.8% | ~11,327,630 | ~566,398 | 16,956 | 0.9% | 1,541 | 1.1% | 9.1% | unknown |

9 The IUCN Red List of Threatened Species (2009b).

10 Does not include 824 undescribed species, but which have been given either manuscript or phrase names.

11 The IUCN Red List of Threatened Species (2009b).

12 The IUCN Red List of Threatened Species (2009b).

13 Includes listed Extinct and Vulnerable species (DEH 2005). NB This figure includes about 88 undescribed species, and excludes infraspecific taxa.

14 The IUCN Red List of Threatened Species (2009b).

15 Includes listed Extinct and Vulnerable species (DEWHA 2009a, b). Does not include infraspecific or undescribed taxa.

16 Includes an estimate of 3,236–3,545 accepted and described species of plant algae for Australia, and 12,205 for the world. This grouping was not included within the 'Plants' grouping in the previous report, but was treated within 'Algae' under the group 'Others'.