CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Meeting of the Nomenclature Committee
Geneva (Switzerland), 19 August 2003, 18h00

Implementation of Decision 12.55

TOWARDS A STANDARDISED TAXONOMY FOR SEAHORSES, GENUS *HIPPOCAMPUS*

This document has been prepared by Project Seahorse for the Nomenclature Committee.

The entire genus *Hippocampus* was listed on CITES Appendix II at CoP 12, November 2002. The listing was based on the 32 species (Annex 1) listed in the taxonomy of Lourie *et al*. (1999). Six of these species (*H. barbouri, H. comes, H. erectus, H. ingens, H. reidi* and *H. spinosissimus*) were listed under Article II, paragraph 2 (a) of the Convention, while the rest were included under Article II, paragraph 2 (b) of the Convention.

Decisions 12.55, which accompanied the seahorse listing, directed the Nomenclature Committee to "propose a standard taxonomy for species in the genus *Hippocampus*". It seems best that this taxonomy continue to be based on Lourie *et al*. (1999), with the addition of one new species *H. denise* (Lourie and Randall, 2003). Future revisions may be incorporated as further morphological distinction and genetic evidence allow.

The adoption of a standardised taxonomy for seahorses is crucial, as taxonomic confusion hinders communication and can make comparisons across research studies and trade analysis unreliable; for example, two people using the same name may be discussing two completely different species. Lack of standardization also precludes accurate assessments of total population size and geographic range for a species, thus hampering conservation assessments. Even when an assessment is possible, naming uncertainties make it difficult to apply conservation measures, undertake trade research, and develop protective legislation.

Seahorses comprise one genus (*Hippocampus*) of the family Syngnathidae, which consists of about 52 genera of pipefishes, pipehorses and seadragons. Although the genus is easily recognized, many seahorse species are superficially similar in appearance. The problems regarding species identification and the large number of names in the literature (over 130) means that seahorse names have often been unreliable. Until the publication of Lourie *et al*. (1999) it was not clear which names represented real species, and which were simply synonyms, misidentifications, incorrect museum labels or even mis-spellings (like *H. shitrix* for *H. histrix* or *H. hiacary* for *H. jayakari*).

Formal seahorse taxonomy began with an entry in Linnaeus' *Systema Naturae* (1758). Over 30 authors have since described new species of seahorses. The majority of these descriptions were published during the 19th century. Arguably, the single most important figure in the study of IndoPacific fishes in the latter part of the 19th century was Pieter Bleeker. Bleeker wrote about 520 ichthyological papers and described over 1100 new fish species (Boeseman, 1973; Harting, 1973) including eight seahorse species. Johann Jacob Kaup (1856), Albert Günther (1870) and Auguste Duméril (1870) attempted to rationalise seahorse taxonomy while preparing catalogues for the European museums. Isaac Ginsburg (1937) undertook a revision of the seahorses of the Atlantic. He created many new species and subspecies from the relatively small number of specimens at his disposal, often with very little evidence. Ronald Fritzsche (1980) published a revision of the syngnathids of the Eastern Pacific including fossils as well as recent species. Richard Vari (1982)

revised the Western Atlantic seahorses, and reduced the plethora of names. These many, but incomplete, revisions resulted in much duplication and synonymy because:

- each revision was based on a limited geographical area;
- access or knowledge of variation in the genus as a whole was lacking;
- original species descriptions were often inadequate;
- original type specimens were not always examined in revising species designations;
- limited characters make seahorse species inherently difficult to distinguish;
- genetic data were not available.

The need to resolve seahorse taxonomy to help bring it to consensus for conservation purposes led to further global research, and publication of a comprehensive identification manual for seahorses (Lourie *et al.*, 1999). The book is broad in its treatment of the group compared to previous taxonomic revisions. Because of its cautious and technical approach, and clear explanation of diagnostic features, the volume is currently used as the basis for the CITES Appendix II listing and for the international IUCN Red List assessments. Lourie *et al.* (1999) examined more than 1,000 specimens from around the world, based their nomenclature conclusions on an extensive literature survey and examination of type specimens, and used genetic data to supplement morphometric data in defining species. Their account is thus considered to be the most thorough to date. It was reviewed by taxonomists at the Australian Museum, Smithsonian Institution and other seahorse specialists before publication.

The recent discovery of a new species of pygmy seahorse (*H. denise*: Lourie and Randall, 2003) creates a total of 33 widely-recognised seahorse species. Fifteen log-transformed morphometric variables combined with five meristic variables were used to establish *H. denise* as a new species.

Seahorse taxonomy must undoubtedly be further revised, with due caution. Taxonomic uncertainty surrounds two species complexes in particular, awaiting greater resolution. The principal confusions lie with *H. histrix* and *H. kuda*, names that have been haphazardly used for virtually any smooth or spiny seahorse respectively in the Indo-Pacific (Lourie *et al.*, 1999). Among spiny seahorses, *H. histrix* is a distinctive species, but its wide range suggests that it may incorporate cryptic species that are genetically isolated (Lourie *et al.*, 1999). The other spiny seahorse species from this region are more geographically restricted, and have been allocated to *H. angustus*, *H. barbouri*, *H. jayakari* and *H. spinosissimus*. Among smooth Indo-Pacific seahorses, five species have thus far been isolated from the previous *H. kuda* complex, including *H. borboniensis*, *H. comes*, *H. fisheri*, *H. fuscus* and *H. kelloggi* (Lourie *et al.*, 1999). Genetic data also indicated that *H. algiricus*, *H. capensis*, *H. ingens*, and *H. reidi* are also closely related to *H. kuda* (Lourie *et al.*, 1999).

A full global taxonomic revision is in preparation, with the intent of further resolving the taxonomy of seahorses. A growing awareness of finer-scale variation in seahorse characteristics may lead to designation of new species in some cases. In other cases, the variation will reflect ecological or geographic differences, without warranting a new species. Until a complete and rigorous revision of the genus emerges (with genetic and morphological evidence producing clear species distinctions), it is preferable to be conservative wherever a decision had to be made rather than splitting a species prematurely. Proliferation of names can only complicated conservation management.

A recent review of Australian seahorse species suggests 27 species in Australian waters (Kuiter, 2001), nine more than the 13 species recognised in the previous global assessments (Lourie *et al.*, 1999). Further morphometric and genetic research will certainly prove some of these species designations valid, but there is reason to be cautious in accepting this revision:

- The new species definitions cannot be applied consistently to all specimens.

- Diagnostic distinctions were often insufficient to distinguish among the purported Australian species, and certainly to separate them from neighbouring Indo-Pacific species. Few specimens from outside Australia were examined, even though Australian species extend into other regions.

- Putative species were sometimes based on diagnostic characters that need not indicate reproductive isolation.

- Species designations were derived from examination of relatively few specimens, and only some of the available literature. Only 179 specimens were examined for 27 species (average of 6.6 specimens per species, and 6.7 per new species), a very restricted survey for a taxonomic revision, especially when many more specimens were available.

- Type specimens of material which had already been described were not re-examined. For example, only a photograph for the type specimen of *H. tristis* was consulted, whereas the original specimen should be been evaluated. As a consequence, old names were sometimes re-assigned to 'new species' (e.g. *H. tristis*) or new names were created for 'old species' (e.g. *H. biocellatus* for *H. planifrons*).

- Cited meristic counts (e.g. tail rings), important for distinguishing species, differed from those previously made (Lourie *et al.*, 1999) on the same specimens, a discrepancy that needs resolution.

- Some of the descriptions of proposed new 'species' do not match the photographs of the same putative species, or appear rather different.

CITES identification materials (a combined effort of WWF, TRAFFIC North America and Project Seahorse, with support from United States National Marine Fisheries Service) are already well advanced for the 32 species on which the listing was based (Annex 1), and for *H. denise* (Lourie and Randall, 2003),. Funding has not been secured to develop materials for any other species that may be added to the list.

Given temporal and financial constraints, and the uncertainty inherent in Kuiter (2001), it is both practical and expedient for the CITES Nomenclature Committee to adopt the 33 species in Lourie *et al*., (1999) (Annex 1) and Lourie and Randall (2003) as the standardised checklist for *Hippocampus*, to help bring standardization to global conservation assessments. Resolving seahorse taxonomy is an ongoing area of research, and the checklist can be revised upon completion of (a) morphometric keys that clearly and distinctly incorporate new species and (b) genetic studies to complement morphometrics. Until such analysis has been completed (with adequate financial support), a renewed proliferation of *Hippocampus* species would seem incautious and likely to increase confusion.

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List of 32 *Hippocampus* species from Lourie *et al.*, 1999

H. abdominalis
H. algiricus
H. angustus
H. barbouri
H. bargibanti
H. borboniensis
H. breviceps
H. camelopardalis
H. capensis
H. comes
H. coronatus
H. erectus
H. fisheri
H. fuscus
H. guttulatus
H. hippocampus
H. histrix
H. ingens
H. jayakari
H. kelloggi
H. kuda
H. lichtensteinii
H. minotaur
H. mohnikei
H. reidi
H. sindonis
H. spinosissimus
H. subelongatus
H. trimaculatus
H. whitei
H. zebra
H. zosterae