Ute Grimm - RE: Hippocampus taxonomy and nomenclature - report to AC28

Von:	"Foster, Sarah" <s.foster@fisheries.ubc.ca>
An:	"Ute.Grimm@BfN.de" <Ute.Grimm@BfN.de>
Datum:	Donnerstag, 25. Juni 2015 06:48
Betreff:	RE: Hippocampus taxonomy and nomenclature - report to AC28
CC:	"Daniel.Rothenfluh@environment.gov.au" <Daniel.Rothenfluh@environment.go...
Anlagen:	Meristic data for AustralianSpecies of Hippocampus 2015June24.pdf

Dear Ute,

I am writing to submit a report for your consideration with respect to Australia's proposal to add six*Hippocampus* species to the list of CITES species. As the member of the IUCN Seahorse, Pipefish and Stickleback Specialist Group (IUCN SPS SG) charged to work on this issue, I have collaborated with Dr Sara Lourie to produce a novel synthesis of meristic data that does the following:

a) Makes a strong case against the resurrection of *H. dahli, H. kampylotrachelos, H. taeniopterus* and *H. tristis*.

b) Supports *H. planifrons* as a valid species name.*Hippocampus planifrons* should replace *H. biocellatus* on the CITES list of species based on synonymy and the Principle of Priority (Act 23, International Code of Zoological Nomenclature).

c) Suggests that additional information is needed before a decision can be made whether to include*H. tuberculatus* on the CITES list of seahorse species.

This report has been submitted for publication as a Fisheries Centre Working Paper and will be available online, and citable, by the end of this week (in time for the official deadline for submission of AC documents of July 1). However I am mindful of your request to get any supporting information on this matter to you by June 26 – and so am sending it to you now. This report will also be incorporated into the checklist of seahorse species which we continue to prepare for publication.

I look forward to your and our Australian colleagues comments on our report.

Sincerely yours,
Sarah

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~ Advancing Marine Conservation

Response from IUCN SSC Seahorse, Pipefish and Stickleback Specialist Group regarding AC27 Doc 25.1: REPORT OF THE SPECIALIST ON ZOOLOGICAL NOMENCLATURE with respect to item 2: *Hippocampus* taxonomy
June 2015

Background:

Australia requested at AC27 that eight species of seahorse described in Kuiter 2001[1] be recognized as valid species under CITES: *H. bleekeri, H. dahli, H. elongatus, H. kampylotrachelos*, *H. planifrons*, *H. taeniopterus, H. tristis*, and *H. tuberculatus*. The IUCN Seahorse, Pipefish and Stickleback Specialist Group (IUCN SPS SG) has long been aware of and concerned about this challenge of the Australian *Hippocampus* without having the resources to address it directly.

Seahorses are notoriously difficult to identify to species. We acknowledge that it is vital for each species to represent a monophyletic lineage and, as the Nomenclature Specialist noted during the Nomenclature Working Group at AC27, have diagnostic features (preferably morphological) that clearly separate it from other species. This would be particularly true in the CITES context, of course, where agents for Parties are required to identify species rapidly and reliably.

At AC27 the IUCN SPS SG brought together all available evidence to support the Nomenclature Specialist in making decisions about Australia's proposal to revise the species list for the genus *Hippocampus*. Based on our initial response to Australia's request, Australia withdrew two of the eight species from consideration: *H. bleekeri* (a junior synonym of *H. abdominalis*) and *H. elongatus* (a junior synonym of *H. subelongatus*). There remain, therefore, six species to be addressed: *H. dahli, H. kampylotrachelos, H. planifrons, H. taeniopterus, H. tristis,* and *H. tuberculatus.*

Methods summary:

In order to address the remaining species proposed by Australia we have synthesized original meristic data. The data come from Dr Sara Lourie (SL), a trained seahorse taxonomist with a PhD in the field. She was lead author of the original seahorse identification guide, "A Guide to the Identification of Seahorses" (Lourie et al 1999[2]), and the follow-up Project Seahorse and TRAFFIC North America joint publication in support of CITES implementation (Lourie et al 2004[3]). Dr Lourie has independently measured over 400 seahorses from Australia (and examined hundreds more in less detail). These include a subset of the same specimens that Rudie Kuiter (RK) used as the basis of his revised taxonomy for Australian seahorses (Kuiter 2001) (see Figure 1). Dr Lourie has also collaborated with the Barcode of Life Initiative (BOLD, University of Guelph, Canada) to obtain genetic 'barcode' data (cytochrome c oxidase 1 gene) for as many seahorse species as possible. The details of our analysis and results are included as an Annex to this report.

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[1] Kuiter, RK. 2001. Revision of the Australian seahorses of the genus Hippocampus (Syngnathioformes: Synganthidae) with description of nine new species. Records of the Australian Museum. 53: 293-340.
[2] Lourie, SA, Vincent, ACJ and Hall, HJ. 1999. Seahorses : An Identification Guide to the Worlds Species and Their Conservation. London, UK: Project Seahorse. 206 pp.
[3] Lourie, SA, Foster, SJ, Cooper, EWT, Vincent, ACJ. 2004. A Guide to the Identification of Seahorses. Washington, DC: University of British Columbia and World Wildlife Fund. 114 pp

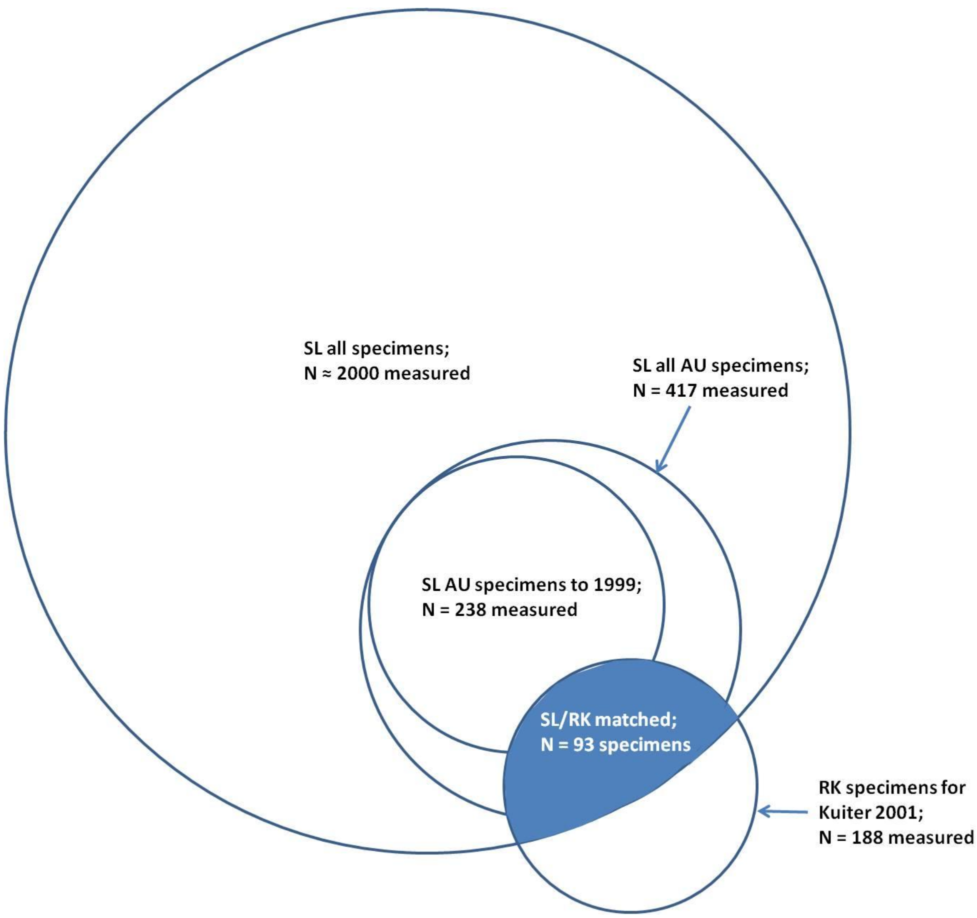

Figure 1. Diagram showing number of seahorse specimens measured by SL and RK, including overlap.

***Results summary*:**

The data, presented in detail in the Annex to this report, do the following:

a) Make a strong case against the resurrection of *H. dahli* (Annex Tables 2a and 2b), *H. kampylotrachelos* (Annex Tables 3a and 3b), *H. taeniopterus* (Annex Tables 5a and 5b) and *H. tristis* (Annex Tables 6a and 6b).

b) Support *H. planifrons* as a valid species name (Annex Tables 4a and 4b). *Hippocampus planifrons* should replace *H. biocellatus* on the CITES list of species based on synonymy and the Principle of Priority (Act 23, International Code of Zoological Nomenclature).

c) Suggest that additional information is needed before a decision can be made whether to include *H. tuberculatus* on the CITES list of seahorse species.

Our evidence for the above statements comes from the following key results extracted from the Annex to this report:

a) Dr Sara Lourie's (SLs) counts of a subset of the same specimens used for Kuiter 2001 do not support resurrection of the purported species *H. dahli, H. kampylotrachelos, H. taeniopterus* or *H. tristis*, as is proposed by Australia. Her counts in each case fit within the meristic range of existing species as described in Lourie et al 1999 (*H. trimaculatus, H. trimaculatus, H. kuda* and *H. kuda*, respectively).

   Although there are many discrepancies in SL and Rudie Kuiter (RKs) counts of the same specimens, RKs own counts of specimens he named *H. dahli, H. kampylotrachelos, H. taeniopterus* and *H. tristis* fit within the meristic range for existing species as described in Lourie et al 1999 (*H. trimaculatus, H. trimaculatus, H. kuda* and *H. kuda*, respectively). Thus his own counts do not support resurrection these purported species names, as is proposed by Australia.

   Furthermore, both SL and RKs counts of specimens used for Kuiter 2001 are different from counts for type specimens of *H. kampylotrachelos* and *H. tristis*, providing no support for resurrecting these names based on specimens in Kuiter 2001.

b) SLs counts of a subset of the same specimens used for Kuiter 2001 support the validity of *H. planifrons*.

   RKs own counts also support the validity of *H. planifrons*. RKs pectoral and dorsal fin ray counts fit within the meristic range of *H. planifrons*, and his tail ring counts for specimens identified as *H. planifrons* and *H. biocellatus* in Kuiter 2001 match one another, supporting synonymization of these species names.

   Finally, available genetic data from BOLD also support *H. planifrons* as valid species name.

c) Unfortunately, available data were not sufficient to make a decision about purported species *H. tuberculatus*. SLs counts of a subset of the same specimens used for Kuiter 2001 to describe *H. tuberculatus* fit within the meristic range of *H. breviceps* as described in Lourie et al 1999, and so do not support resurrection of the purported species.

   However, RKs counts of tail rings for specimens used for Kuiter 2001 may suggest a species other than *H. breviceps*, although his counts for pectoral and dorsal fin rays match those of *H. breviceps* as described in Lourie et al 1999. The differences in SL and RKs counts for the specimens Kuiter calls *H. tuberculatus* were substantial, and so it would be prudent to defer a decision on this putative species until third party counts can be carried out.

ANNEX

Supplemental Methods:

This Annex presents the results from a synthesis of original meristic data in order to address the validity of six species of *Hippocampus* being proposed by Australia for inclusion in the CITES list of species: *H. dahli*, *H. kampylotrachelos*, *H. planifrons*, *H. taeniopterus*, *H. tristis*, and *H. tuberculatus*. The meristic data used here are a subset from more than 2000 specimens measured by Dr Sara Lourie (SL) in support of seahorse taxonomy and biogeography, and include a subset of the specimens measured by Rudie Kuiter (RK) in support of Kuiter 2001[4]. Other sources of information used in this analysis include diagnostic counts for existing seahorse species from Lourie et al 1999[5], meristic data collected by RK in support of Kuiter 2001, and genetic information (cytochrome c oxidase 1 gene) from Barcode of Life Database (BOLD, http://www.barcodeoflife.org/).

We used these different datasets to make the following comparisons for each proposed species (see also Table 1):

1) Compare SLs meristic counts for the specimens that both she and RK have measured (SL/RK matched specimens, see Figure 1 above) to the diagnostic counts for the species that Dr Lourie considers to be valid (as given in Lourie et al 1999).

2) Compare the overlapping subsets of SL and RK meristic data to each other. Note that all SL/RK matched specimens should be encompassed within the total of RK specimens used for Kuiter 2001.

3) Compare the meristic counts given in Kuiter 2001 to the diagnostic counts for the species that Dr Lourie considers to be valid (as given in Lourie et al 1999).

4) Compare SL and RKs meristic counts for specimens used in Kuiter 2001 to the diagnostic counts of the type specimen(s) for the species proposed by Kuiter.

5) Provide any available supporting genetic information from the Barcode of Life Database (BOLD). Dr Sara Lourie approximates distinctions in seahorse species to 2% divergence in mtDNA sequence data (cytochrome c oxidase 1 gene). This rule of thumb, which is larger than the average within-species divergence for fish (0.39% for CO1[6]), reflects the fact that seahorses tend to exhibit significant geographical structure due to limited dispersal capabilities. This rule is a good starting point, but we encourage further molecular and ecological investigation into seahorse species distinctions. Information from BOLD is used to supplement decisions for two species only.

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[4] Kuiter, RK. 2001. Revision of the Australian seahorses of the genus Hippocampus (Syngnathioformes: Synganthidae) with description of nine new species. Records of the Australian Museum. 53: 293-340.
[5] Lourie, SA, Vincent, ACJ and Hall, HJ. 1999. Seahorses : An Identification Guide to the Worlds Species and Their Conservation. London, UK: Project Seahorse. 206 pp.
[6] Ward, RD, Zemlak, TS, Innes, BH, Last, PR and Hebert, PDN. 2005. DNA barcoding Australia's fish species. Philosophical Transactions of the Royal Society B. 360: 1847-1857.

Table 1. Comparisons made between different datasets in order to address the validity of six *Hippocampus* species being proposed by Australia.

Datasets	SLs counts of a subset of specimens used for Kuiter 2001	RKs counts of specimens used for Kuiter 2001
Diagnostic counts of existing species in Lourie et al 1999	Comparison 1	Comparison 3
SLs counts of a subset of specimens used for Kuiter 2001	NA	Comparison 2
RKs counts of specimens used for Kuiter 2001	Comparison 2	NA
Type specimen information for purported species	Comparison 4	Comparison 4

The tables that follow detail the results and supporting data from these comparisons for each of the purported species.

Notes for Tables:

- Valid species are highlighted in bold.
- Species names in parentheses are not supported by the available taxonomic data.
- N = number of specimens examined.
- TaR = tail ring count; PF = pectoral fin ray count; DF = dorsal fin ray count; most common (modal) count is followed by range of counts in parentheses.
- SL/RK matched = specimens used for Kuiter 2001 that have been independently measured by both SL and RK.

Table 2a. Purported species *Hippocampus dahli*.

Purported Spp.	Notes on comparisons	Conclusion
H. dahli – supporting data in Table 2b.	1) SLs meristic counts for a subset of purported *H. dahli* specimens used for Kuiter 2001 (n=10/17) fit within the meristic range for *H. trimaculatus* as described in Lourie et al 1999 (with only very minor modal difference in dorsal fin rays (DF)). This holds true when counts for specimens from Kuiter 2001 are compared to *H. trimaculatus* specimens from Lourie et al 1999 with Australian specimens removed, and to Australian *H. trimaculatus* specimens only. 2) RKs counts of specimens used for Kuiter 2001 differ from SLs counts for a subset of the same specimens with respect to number of tail rings (TaR) and pectoral fin rays (PF). This is unexpected as SLs counts should be entirely encompassed within RKs counts for the purported species – but they are not. 3) Although RKs counts for specimens used in Kuiter 2001 differ from SLs counts for a subset of the same specimens, his counts still fall within the meristic range for *H. trimaculatus* as described in Lourie et al 1999. 4) No type information available to us for *H. dahli*. 5) Genetic data from Barcode of Life Database (BOLD) suggest that a single seahorse specimen from eastern Australia (Queensland), purportedly *H. dahli*, is 4.86% different from *H. trimaculatus*, however the details of this single specimen are not publicly accessible and so cannot be considered here properly.	Synonym of *H. trimaculatus*

Table 2b. Supporting data for Table 2a; *H. trimaculatus* and putative species synonymized.

Putative Species	N	TaR	PF	DF	Reference
H. trimaculatus	**54**	**40-41 (38-43)**	**17-18 (16-19)**	**20 (18-22)**	***H. trimaculatus* Lourie et al 1999**
(H. dahli)	17	39 (37-40)	17 (17-18)	21 (21-22)	Kuiter 2001
(H. dahli)	10	41 (38-41)	17 (16-18)	21	SL/RK matched
(H. kampylotrachelos)	1	39	16	19	Kuiter 2001[7]
(H. kampylotrachelos)	1	damaged	16	18	SL/RK matched
H. trimaculatus	40	41 (38-42)	17 (16-19)	20 (18-21)	*H. trimaculatus* (no Australian specimens), data for Lourie et al 1999
H. trimaculatus	14	41 (40-42)	17 (17-18)	21 (21-22)	*H. trimaculatus* (only Australian specimens), data for Lourie et al 1999 = *(H. dahli)*[8]
(H. kampylotrachelos) (TYPE)	1	39	17	20	Holotype specimen (data for Lourie et al 1999)

[7] note Kuiter 2001 provides a tail ring count but doesn't mention that the tail of the specimen that he examined is damaged (clearly seen in photograph he provides).

[8] note that values in this row may not exactly match those given above for SL/RK matched because they are only based on specimens examined prior to 1999 whereas those in the SL/RK matched row includes all specimens measured to date.

Table 3a. Purported species *Hippocampus kampylotrachelos*.

Purported Spp.	Notes on comparisons	Conclusion
H. kampylotrachelos – supporting data in Table 3b.	Purported species *H. kampylotrachelos* was resurrected by Kuiter 2001 on the basis of a single specimen found amongst nesting birds on Ashmore Reef. The type specimen (not included in Kuiter 2001) of *H. kampylotrachelos* matches *H. trimaculatus* as described in Lourie et al 1999 based on meristics (TaR = 39, PF = 17, DF = 20) and general morphology. 1) SLs meristic count of the same specimen RK measured for Kuiter 2001 fits within the meristic range of *H. trimaculatus*. The specimen used for the paper is also a morphological match to *H. trimaculatus*. 2) It is important to note that SL could not reliably count the tail rings (TaR) for the single specimen used by RK to resurrect *H. kampylotrachelos* because the tail was damaged. The damage can be clearly seen in the photograph provided in Kuiter 2001. There is also a difference in SL and RKs count of dorsal fin rays (DF) for the single specimen. 3) Although RKs counts for the single specimen used in Kuiter 2001 differ from SLs counts for same, RKs counts still fall within the meristic range of *H. trimaculatus* as described in Lourie et al 1999. 4) Data from the holotype specimen of *H. kampylotrachelos* collected for Lourie et al 1999 do not match either SL or RKs counts of the single specimen used to resurrect the species in Kuiter 2001. 5) No additional information from BOLD.	Synonym of *H. trimaculatus*

Table 3b. Supporting data for Table 3a; *H. trimaculatus* and putative species synonymized.

Putative Species	N	TaR	PF	DF	Reference
H. trimaculatus	**54**	**40-41 (38-43)**	**17-18 (16-19)**	**20 (18-22)**	***H. trimaculatus* Lourie et al 1999**
(H. dahli)	17	39 (37-40)	17 (17-18)	21 (21-22)	Kuiter 2001
(H. dahli)	10	41 (38-41)	17 (16-18)	21	SL/RK matched
(H. kampylotrachelos)	1	39	16	19	Kuiter 2001[9]
(H. kampylotrachelos)	1	damaged	16	18	SL/RK matched
H. trimaculatus	40	41 (38-42)	17 (16-19)	20 (18-21)	*H. trimaculatus* (no Australian specimens), data for Lourie et al 1999
H. trimaculatus	14	41 (40-42)	17 (17-18)	21 (21-22)	*H. trimaculatus* (only Australian specimens), data for Lourie et al 1999 = *(H. dahli)*[10]
(H. kampylotrachelos) (TYPE)	1	39	17	20	Holotype specimen (data for Lourie et al 1999)

[9] note Kuiter 2001 provides a tail ring count but doesn't mention that the tail of the specimen that he examined is damaged (clearly seen in photograph he provides).

[10] note that values in this row may not exactly match those given above for SL/RK matched because they are only based on specimens examined prior to 1999 whereas those in the SL/RK matched row includes all specimens measured to date.

Table 4a. Purported species *Hippocampus planifrons.*

Purported Spp.	Notes on comparisons	Conclusion
H. planifrons – supporting data in Table 4b.	*Hippocampus planifrons* is the correct name for *H. biocellatus* based on synonymy and the Principle of Priority (Act 23, International Code of Zoological Nomenclature). 1) SLs meristic counts for subset of specimens used for Kuiter 2001 (n=3/4) fall within the meristic range of the "split-spot" form of *H. trimaculatus* described in Lourie et al 1999, and differ from *H. trimaculatus*. 2) RKs counts of specimens used for Kuiter 2001 differ from SLs counts for a subset of the same specimens with respect to pectoral fin rays (PF) and tail rings (TaR). This is unexpected as SLs counts should be entirely encompassed within RKs counts for the purported species – but they are not. 3) RKs tail ring counts (TaR) for the specimens used in Kuiter 2001 may suggest a different species, although his pectoral and dorsal fin ray counts (PF and DF) are suggestive of *H. planifrons*. That said, both SL and RKs tail ring counts (TaR) for specimens identified as *H. planifrons* and *H. biocellatus* in Kuiter 2001 match one another supporting synonymization. 4) Data from the holotype specimen of *H. planifrons* collected for Lourie et al 1999 match SLs meristic counts of specimens used for Kuiter 2001 to describe *H. planifrons*. This is also the case for RKs counts of pectoral and dorsal fin rays (PF and DF), but not his tail ring counts (TaR) (but see point under 3, above). 5) Genetic data from BOLD suggests that *H. planifrons* (given as *H. biocellatus* in BOLD) is 6.9% different from *H. trimaculatus*.	Valid as *H. planifrons* (note that *H. biocellatus* is a synonym of *H. planifrons; H. planifrons* should take the place of *H. biocellatus* which is currently recognized by CITES)

Table 4b. Supporting data for Table 4a; *H. planifrons* and putative species synonymized.

Putative Species	N	TaR	PF	DF	Reference
H. planifrons	**9**	**39 (39-41)**	**17 (16-18)**	**23 (21-23)**	***split-spot trimaculatus*, data from Lourie et al 1999**
H. planifrons	4[11]	37-38	18-19	23 (23-24)	Kuiter 2001
H. planifrons	3	39	18 (16-18)	21-23	SL/RK matched
(H. biocellatus)	6	36 (36-38)	16 (16-18)	22 (22-23)	Kuiter 2001
(H. biocellatus)	4	39 (39-41)	17	23 (22-23)	SL/RK matched
H. planifrons (TYPE)	1	39	18	22	Holotype specimen (data for Lourie et al, 1999)

[11] one specimen examined was only a photo that SL provided to RK.

Table 5a. Purported species *Hippocampus taeniopterus.*

Purported Spp.	Notes on comparisons	Conclusion
H. taeniopterus – supporting data in Table 5b.	Kuiter 2001 resurrected the purported name *H. taeniopterus* as a replacement for *H. kuda* east of Wallace's Line based on 'slight morphological and meristic differences' and 'dermal appendages' (that have been shown to be a poor taxonomic character, Curtis 2006[12]). The photographs provided in Kuiter 2001 match specimens from elsewhere in *H. kuda's* range. 1) SLs meristic counts of a subset of specimens used for Kuiter 2001 (n = 4/6) fall within the range of meristic counts for *H. kuda* as described in Lourie et al 1999, even with Australian specimens excluded from the comparison. 2) RKs counts of specimens used for Kuiter 2001 differ from SLs counts for a subset of the same specimens with respect to pectoral fin rays (PF) and tail rings (TaR). This is unexpected as SLs counts should be entirely encompassed within RKs counts for the purported species – but they are not. 3) RKs meristic counts of specimens used for Kuiter 2001 fall within the range of counts for *H. kuda* as described in Lourie et al 1999. 4) No type information available to us for *H. taeniopterus*. 5) No additional information from BOLD.	Synonym of *H. kuda*

[12] Curtis, JMR. 2006. A case of mistaken identity: skin filaments are unreliable for identifying *Hippocampus guttulatus* and *Hippocampus hippocampus*. Journal of Fish Biology 69: 1855-1859.

Table 5b. Supporting data for Table 5a; *H. kuda* and putative species synonymized.

Putative Species	N	TaR	PF	DF	Reference
H. kuda	**80**	**36 (34-38)**	**16 (15-18)**	**17-18**	**Lourie et al 1999**
(H. taeniopterus)	6	34-35	16 (16-18)	17-18	Kuiter 2001
(H. taeniopterus)	4[13]	36-37 (one 30)	16	17-18	SL/RK matched
H. kuda (TYPE)	11	37 (35-37)	16 (15-17)	17 (16-18)	Syntype specimens from BMNH and RMNH (data for Lourie et al, 1999, and SL unpublished)

Table 6a. Purported species *Hippocampus tristis.*

Purported Spp.	Notes on comparisons	Conclusion
H. tristis – supporting data in Table 6b.	The type specimens of purported *H. tristis* were obtained from the Melbourne fish market and may not even be of Australian origin. Furthermore, they conform morphologically and meristically to *H. kuda*. 1) SLs meristic counts for subset of specimens used for Kuiter 2001 (n=6/12) fall within the range of meristic counts for two species, referred to under *H. kelloggi* as 'Australian specimens' (n=4/6) and under *H. kuda* as 'extra specimens' (n=2/6) in Lourie et al 1999. 2) RKs counts of specimens used for Kuiter 2001 differ substantially from SLs counts for a subset of the same specimens with respect to tail rings (TaR), pectoral fin rays (PF) and dorsal fin rays (DF). This is unexpected as SLs counts should be entirely encompassed within RKs counts for the purported species – but they are not. 3) RKs counts of specimens used for Kuiter 2001 are inconclusive as his tail ring counts (TaR) fit within the meristic range for *H. kuda* 'extra specimens', and his pectoral and dorsal fin ray counts (PF and DF) fit within count range for *H. kelloggi* 'Australian specimens' – both as described in Lourie et al 1999. 4) RKs counts of specimens used for Kuiter 2001 do not match the diagnostic counts for the *H. tristis* type specimen measured for Lourie et al 1999. Indeed RKs counts for the specimens used in Kuiter 2001 do not match any known seahorse species. 5) No additional information from BOLD.	Name is synonym of *H. kuda*, but specimens referred to in Kuiter 2001 should be identified as *H. kelloggi*, *H. kuda* or possibly *H. alatus* although validity of the latter species is still undetermined.

[13] one specimen was tiny and may represent a new species. It had the following counts according to SL: TaR = 38, PF = 16?, DF = 15?

Table 6b. Supporting data for Table 6a; *H. kelloggi* and putative species synonymized.

Putative Species	N	TaR	PF	DF	Reference
H. kelloggi	**22**	**40 (39-41)**	**18 (17-19)**	**18 (17-19)**	**Lourie et al 1999**
(H. tristis)	12	35-37	18-19	18-19	Kuiter 2001
(H. tristis) 'Australian kelloggi' 'Australian kuda'	 4 2	 39-40 (39-41) 37	 19 (17-19) 16	 18 (18-19) 16-17	 SL/RK matched
(H. tristis) (TYPE)	2	35-36	16	17	Syntype specimens (data for Lourie et al 1999)
H. kelloggi (TYPE)	1	40	17	17	Holotype specimen (data for Lourie et al 1999)

Table 7a. Purported species *Hippocampus tuberculatus*.

Purported Spp.	Notes on comparisons	Conclusion
H. tuberculatus – *supporting data in Table 7b.*	Purported species *H. tuberculatus* may be one of two separate taxonomic units of *H. breviceps*, however the proposed units are almost meristically identical, and we have insufficient evidence with which to distinguish them. 1) SLs meristic counts for subset of specimens used for Kuiter 2001 (n=7/12) fall within the range of meristic counts for *H. breviceps* as described in Lourie et al 1999. 2) RKs counts of specimens used for Kuiter 2001 differ substantially from SLs counts of a subset of the same specimens with respect to tail rings (TaR). This is unexpected as SLs counts should be entirely encompassed within RKs counts for the purported species – but they are not. 3) RKs counts of tail rings (TaR) for specimens used for Kuiter 2001 may suggest a species other than *H. breviceps*, although counts for pectoral and dorsal fin rays match those of *H. breviceps* as described in Lourie et al 1999. Given the discrepancies in RK and SLs counts for the same specimens, it may be prudent to defer a decision on this species until third party counts can be carried out. 4) RKs counts of specimens used for Kuiter 2001 match diagnostic counts for the *H. tuberculatus* type specimen measured for Lourie et al 1999 with respect to tail rings (TaR) and pectoral fin rays (PF), but not dorsal fin rays (DF). SLs counts of specimens used for Kuiter 2001 match diagnostic counts for the *H. tuberculatus* type specimen measured for Lourie et al 1999 with respect to dorsal and pectoral fin rays (DF and PF), but not tail rings (TaR). 5) No additional information from BOLD.	Synonym of *H. breviceps*

Table 7b. Supporting data for Table 7a; *H. breviceps* and putative species synonymized.

Putative Species	N	TaR	PF	DF	Reference
H. breviceps	**40**	**40 (39-43)**	**14-15 (13-15)**	**20-21 (19-23)**	**Lourie et al 1999**
H. breviceps	4	38-42	13-14	22 (21-22)	Kuiter 2001
(H. tuberculatus)	12	36-37	15	20-21	Kuiter 2001
(H. tuberculatus)	7	40 (39-40)	15 (14-15)	20 (19-20)	SL/RK matched
H. breviceps *eastern specimens only* *western specimens only* *northwestern only*	 7 20 7	 39 (37-44) 40 (39-43) 40 (38-40)	 15 15 (13-15) 15 (14-15)	 20 (19-21) 21 (19-23) 20 (19-21)	Data for Lourie et al 1999
(H. tuberculatus) (TYPE)	1	37	15	19	Data for Lourie et al 1999