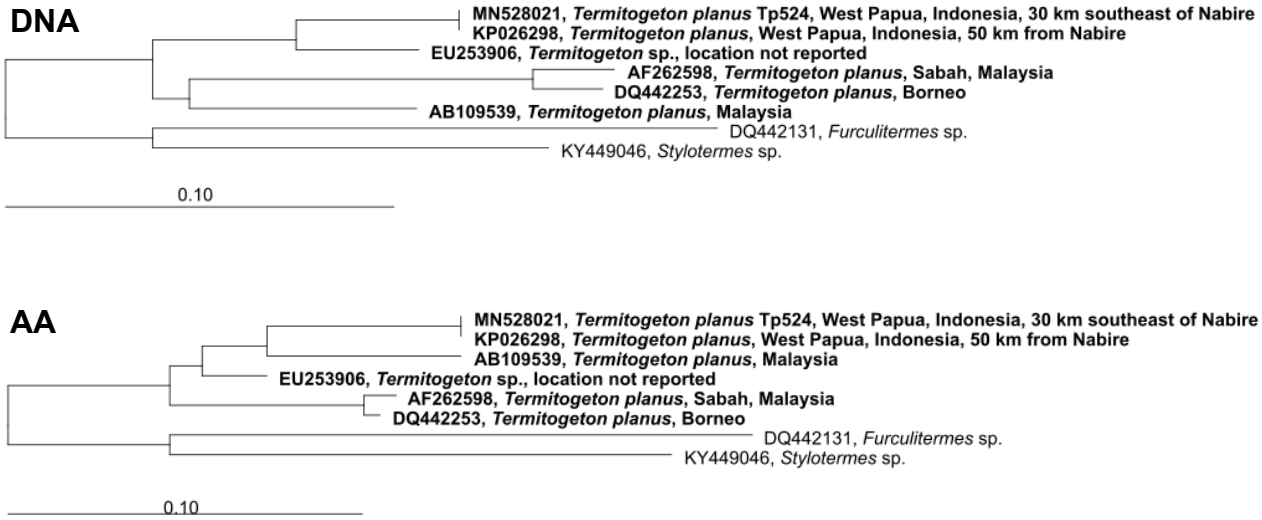
Supplementary Material

1 Supplementary Figures



Similarity matrix

	MN528021	KP026298	EU253906	AB109539	DQ442253	AF262598
MN528021, *Termitogeton planus* Tp524, West Papua, Indonesia	0	0	4.2	9.5	10.5	11.2
KP026298, *Termitogeton planus*, West Papua, Indonesia	0	0	4.2	9.5	10.5	11.2
EU253906, *Termitogeton* sp., no location reported	5.5	5.5	0	7.5	6.6	7.1
AB109539, *Termitogeton planus*, Malaysia	12.4	12.4	12.3	0	8.2	8.4
DQ442253, *Termitogeton planus*, Borneo	12.6	12.6	12.3	11.7	0	1.9
AF262598, *Termitogeton planus*, Sabah, Malaysia	13.5	13.5	13.2	11.7	3.3	0

DNA sequence dissimilarity (%)

AA sequence dissimilarity (%)

Supplementary Figure 1. Phylogenetic trees illustrating the relationship of *Termitogeton planus* Tp524 from West Papua to other samples of this species collected in different locations. The trees are based on maximum-likelihood analysis (RAxML) of the aligned COII gene sequences (DNA) and the deduced amino acid sequences (AA); the similarity matrix was calculated from the respective alignments. Sequences from *Furculitermes* and *Stylotermes* were used as outgroup.

Supplementary Figure 2. Phylogenetic analysis of the SSU rRNA genes of Trichonymphida. This is an expanded version of the tree in Figure 4, showing all species and their accession numbers. The maximum-likelihood tree is a consensus tree from 1,000 bootstrap trees reconstructed with IQ-TREE, using *Lophomonas striata* and members of Trichomonadea as outgroup. Results of ultrafast bootstrap analysis are shown at internal nodes.

2 Supplementary Tables

Supplementary Table 1: List of all species in the genus *Pseudotrichonympha* and their morphological traits. If a species has been reported to occur in more than one host, the type host is listed in the first place. Characters of a species occurring in secondary hosts are shown if given in the corresponding publication. Genbank accession numbers (Acc. no.) are given for those species whose SSU rRNA genes have been sequenced. Reports of the occurrence of undescribed *Pseudotrichonympha* spp. were included at the end of this table. f1, series-1 rostral flagella adjacent to the operculum; f2, series-2 flagella at the base of the rostrum; f3, series-3 postrostral flagella on cell body.

Species (Acc. no.)	Host	Body shape	Body length × width (mean) [µm]	Rostrum length × width (mean) [µm]	Nucleus length × width [µm]	Flagella [µm]			References
						f1	f2	f3	
P. aurea (MF278669)	*Heterotermes aureus*	spindle-like	190-250 (223) × 62-98 (78)	42-62 (55) (25% of body length)	20 × 19	short	long	medium	Jasso-Selles et al., 2017
P. bachmani	unidentified termite from Puerto Rico	obtusely pointed at ends	118-175 (131.7) × 35-51 (42.4)	ca. 20 (measured from drawing)	17 (spherical)		slightly longer than f3		Calkins, 1936
P. belari	*Heterotermes indicola*	variable: elongated, globular	80-561 × 60-187	18-22	17-30 (spherical)	5-6	20-25	8-12	De Mello, 1927
P. cardiformis	*Heterotermes malabaricus*	variable: heart-shaped, globular, elongated	100-125 × 50-150	7-18	14-27 (spherical)	6-8	18- 20	12- 14	Karandikar and Vittal, 1954
	Coptotermes heimi	heart-shaped	125-220 × 100-130	7.5	14-18 (spherical)	5-7	17-18	9-10	Karandikar and Vittal, 1954
P. grassei	*Psammotermes hybostoma*	fusiform	150						Hollande and Carruette-Valentin, 1971

P. grassii (AB032211, AB262486)	*Coptotermes formosanus*	spindle-shaped	200-300 × 50-120	30-40 × 40-50	16-20 (spherical)	6-8	25-30	16-20	Koidzumi, 1921 Noda et al., 2005; 2007
	Coptotermes heimi								Saleem, 1952
	Heterotermes indicola								Saleem, 1952
P. hertwigi (HQ683706)	*Coptotermes testaceus*		160-330 × 80	short (5% of body length)	oval				Hartmann, 1910; Saldarriaga et al., 2011
	Coptotermes acinaciformis,								Grassi and Foà, 1911
	Coptotermes sjoestedti								Cleveland, 1926
	Prorhinotermes flavus								Sutherland, 1933
	Heterotermes longiceps								Dini and Cesar, 1960
- var. *major*	*Coptotermes lacteus*								Grassi, 1917
- var. *minor*	*Coptotermes sjoestedti*								Grassi, 1917
- var. *simplex*	unidentified Indian termite from Daman	pisciform	110-370 × 13-90						De Mello, 1937
P. indica	*Heterotermes indicola*	elongated	200-300 × 38-55		10.3-11.4 (spherical)				Chakravarty and Banerjee, 1956
	Coptotermes heimi	elongated	165-221.2 (193.8) × 22.5-52.5 (38.2)	6-6.5	10.2-18.7 × 10.2-15	5- 6	11- 12	7-8	Das, 1976
P. introflexibilis	*Schedorhinotermes putorius*	elongated, worm-like	215-250 × 55-80						Dogiel, 1922

P. leei (MF373810)	*Coptotermes gestroi*	elongated	280-330 (303) × 56-71 (62)						Del Campo et al., 2017
P. lifesoni (MF373812)	*Coptotermes* cf. *acinaciformis*	ovoid with strongly elongated posterior tip	332-448 (392) 94-108 (100)						Del Campo et al., 2017
P. magni-papillosa	*Schedorhinotermes putorius*	elongated							Grassi, 1917
P. parvipapillosa	*Schedorhinotermes intermedius*	elongated							Grassi, 1917
P. paulistana (HQ683705)	*Heterotermes tenuis*	elongated	100-250 (mostly 145-210)		12-16	8-9 immobile	17- 20	7-9	De Mello, 1954a; Saldarriaga et al., 2011
P. pearti (MF373811)	*Prorhinotermes simplex*	elongated	200-316 (262) × 89-180 (122)						Del Campo et al., 2017
P. pisciformis	*Heterotermes malabaricus*	fusiform, posteriorly tapering	100-230 × 35-75	10-14 rostrum oblique		6-8	14-16	8-14	Karandikar and Vittal, 1954
	Coptotermes heimi	fusiform, posteriorly tapering	100-230 × 35-75 (longer + broader)	7-10 rostrum oblique		6-8	14-16	8-14	Karandikar and Vittal, 1954
P. ramani	unidentified Indian termite from Brancavará	amphore-like	100-210 (164) × 80-132 (132)	includes bottle-shaped structures		short	long	short	De Mello, 1937
P. ramani seminuda	*Heterotermes* sp.	pisciform		elongated operculum, rostrum includes bottle-shaped structures			very long, 21		De Mello, 1937
P. sertaneja	*Rugitermes* sp.	narrow, elongated	250-320 × 45-60		spherical	short	long	very short	De Mello, 1954b

P. solitaria (MN523346)	*Termitogeton planus*	slender	140-235 (194) × 14-30 (23)	15	9.3-13.7 (11.8) × 5.3-9.4 (7.2) (oval)	very short	22	8	present study
P. sphaerophora	*Rhinotermes nasutus*	oval	230 × 65		25 (spherical)				Dunkerley, 1923
P. subapicalis	*Coptotermes heimi*	rounded, anteriorly swollen	200-300 × 100-210	7-10 rostrum subapical	15-25 (spherical)				Karandikar and Vittal, 1954
	Heterotermes malabaricus	rounded, anteriorly swollen	200-300 × 100-210	11-16 rostrum subapical	15-25 (spherical)				Karandikar and Vittal, 1954
Pseudotricho-nympha spp.	*Coptotermes amanii*		200-300 × 50-70						Mannesmann, 1969
	Coptotermes ceylonicus		153-305 × 37-104						Cleveland, 1935
	Coptotermes curvignathus		200-458 × 73-183						Cleveland, 1935
	Coptotermes niger		300-400 × 70-80						Mannesmann, 1969
	Coptotermes travians		159-366 × 43-122						Cleveland, 1935
(AB262487, AB262488)	*Coptotermes* spp.								Noda et al., 2007
	Heterotermes (*Leucotermes*) *aureus*								Kirby, 1932
(AB262490)	*Heterotermes longiceps*								Noda et al., 2007
(AB262491)	*Heterotermes tenuis*								Noda et al., 2007
(AB262499)	*Parrhinotermes queenslandicus*.								Noda et al., 2007

(AB262500)	*Parrhinotermes buttel-reepeni*	Noda et al., 2007
(AB262498, AB262508, AB262509)	*Parrhinotermes* spp.	Noda et al., 2007
	Prorhinotermes simplex	Cleveland, 1965
(AB262493)	*Psammotermes allocerus*	Noda et al., 2007
(AB262495)	*Rhinotermes hispidus*	Noda et al., 2007
(AB262494)	*Rhinotermes marginalis*	Noda et al., 2007
(AB262496, AB262497, AB262510)	*Schedorhinotermes* spp.	Noda et al., 2007
(MT936309)	*Stylotermes halumicus*	This study
(AB262492)	*Termitogeton planus*	Noda et al., 2007
	Termitogeton umbilicatus	Grassi, 1917

3 References

Calkins, G. N. (1936). Some polymastigote and hypermastigote flagellates from Puerto Rican termites. *Puerto Rico J. Publ. Health Trop. Med.* 12, 169–187.

Chakravarty, M. M., and Banerjee, A. K. (1956). Observations on the holomastigotid and trichonymphid flagellates from an Indian termite. *Proc. Zool. Soc., Calcutta*, 9, 35–44.

Cleveland, L. R. (1926). Symbiosis among animals with special reference to termites and their intestinal flagellates. *Q. Rev. Biol.* 1, 51–60.

Cleveland, L. R. (1935). The centrioles of *Pseudotrichonympha* and their role in mitosis. *Biol. Bull.* 69, 46–51.

Cleveland, L. R. (1965). Fertilization in *Pseudotrichonympha*. *Arch. Protistenkd.* 108, 6–7.

Das, A. K. (1976). Studies on some hypermastigids (protozoa) from the termites of West Bengal, India. *Acta Protozool.* 15, 101–124.

Del Campo, J., James, E. R., Hirakawa, Y., Fiorito, R., Kolisko, M., Irwin, N. A. T., Mathur, V., Boscaro, V., Hehenberger, E., Karnkowska, A., Scheffrahn, R. H., and Keeling, P. J. (2017). *Pseudotrichonympha leei*, *Pseudotrichonympha lifesoni*, and *Pseudotrichonympha pearti*, new species of parabasalian flagellates and the description of a rotating subcellular structure. *Sci. Reports*, 7, 16349. doi: 10.1038/s41598-017-16259-8

De Mello, F. (1927). Revision de trichonymphids du *Leucotermes indicola* Wasm. *Arch. Esc. Med. Cirurg. Nova Goa, Ser. A*, 1, 1–28.

De Mello, I. F. (1937). Sur des trichonymphides nouveaux des termites indiens. *C. R. 12 Congr. Int. Zool. Lisbon*, 2, 1353–1381.

De Mello, I. F. (1954a). Contribution à l´étude des microparasites des termites brésiliens. Flagellés du contenu intestinal d´*Heterotermes tenuis* (Hagen 1858). *Mem. Inst. Oswaldo Cruz*, 52, 17–51.

De Mello, I. F. (1954b). *Pseudotrichonympha sertaneja* n. sp. (Protozoa, Mastigophora), from the intestine of a new termite (*Rugitermes* sp.) collected in Brazil. *Parasitology*, 44, 24–29. doi: 10.1017/S0031182000018734

Dini, W., and Cesar, H. C. (1960). Métodos para estudo de protozoários de térmita. *Rev. Bras. Biol.* 20, 403–407.

Dogiel, V. (1922). Researches on the parasitic protozoa from the intestine of termites. III Trichonymphidae. *Ruskii Arkhiv Protistologii*, 1, 172–234.

Dunkerley, J. S. (1923). A new structure in the flagellate *Pseudotrichonympha sphaerophora* sp. n. *Parasitology*, 15, 211–213.

Grassi, B. (1917). Flagellati viventi nei termiti. *Atti Accad. Naz. Lincei (Roma), Mem. Ser*. 5, 12, 331–394.

Grassi, B., and Foà, A. (1911). Intorno ai protozoa dei termitidi. *Rendi. Reale Accad. Lincei, Ser. 5, 1*, 20, 725–741.

Hartmann, M. (1910). Untersuchungen über Bau und Entwicklung der Trichonymphiden (Trichonympha hertwigi n. sp.). Festschr. 60. Geb. Richard Hertwigs. Arb. Gebiet Zellenlehre Protozoenkd. 1, 351–396.

Hollande, A., and Carruette-Valentin, J. (1971). Les attractophores, l'induction du fuseau et la division cellulaire chez les hypermastigines: Étude infrastructurale et révision systématique des trichonymphines et des spirotrichonymphines. *Protistologica,* 7, 5–100.

Jasso-Selles, D. E., De Martini, F., Freeman, K. D., Garcia, M. D., Merrell, T. L., Scheffrahn, R. H., and Gile, G. H. (2017). The parabasalid symbiont community of *Heterotermes aureus*: Molecular and morphological characterization of four new species and reestablishment of the genus *Cononympha*. *Europ. J. Protistol.* 61, 48–63. doi: 10.1016/j.ejop.2017.09.001

Karandikar, K. R., and Vittal, M. (1954). Flagellates in the termites from Dharwar. *J. Univ. Bombay*, 23, 1–24.

Kirby, H. (1932). Flagellates of the genus *Trichonympha* in termites. *Univ. Calif. Publ. Zool.* 37, 349–476.

Koidzumi, M. (1921). Studies on the intestinal protozoa found in the termites of Japan. *Parasitology*, 13, 235–309. doi: 10.1017/S0031182000012506

Mannesmann, R. (1969). Vergleichende Untersuchungen über den Einfluß der Temperatur auf die Darmsymbionten von Termiten und über die regulatorischen Mechanismen bei der Symbiose. Zeitschr. Angew. Zool. 56, 385-440.

Noda, S., Iida, T., Kitade, O., Nakajima, H., Kudo, T., and Ohkuma, M. (2005). Endosymbiotic *Bacteroidales* bacteria of the flagellated protist *Pseudotrichonympha grassii* in the gut of the termite *Coptotermes formosanus. Appl. Environ. Microbiol.* 71, 8811–8817. doi: 10.1128/AEM.71.12.8811-8817.2005

Noda, S., Kitade, O., Inoue, T., Kawai, M., Kanuka, M., Hiroshima, K., Hongoh, Y., Constantino, R., Uys, V., Zhong, J., Kudo, T., and Ohkuma, M. (2007). Cospeciation in the triplex symbiosis of termite gut protists (*Pseudotrichonympha* spp.), their hosts, and their bacterial endosymbionts. *Mol. Ecol.* 16, 1257–1266. doi: 10.1111/j.1365-294X.2006.03219.x

Saldarriaga, J. F., Gile, G. H., James, E. R., Horak, A., Scheffrahn, R. H., and Keeling, P. (2011). Morphology and molecular phylogeny of *Pseudotrichonympha hertwigi* and *Pseudotrichonympha paulistana* (Trichonymphea, Parabasalia) from neotropical rhinotermitids. *J. Eukaryot. Microbiol.* 58, 487–496. doi: 10.1111/j.1550-7408.2011.00575.x

Saleem, M. (1952). Taxonomic studies on termite flagellates. *Proc. Pak. Sci. Conf.* 4, 65.

Sutherland, J. L. (1933). Protozoa from Australian termites. *Q. J. Microsc. Sci.* 76, 145–173.

Yamin, M. A. (1979). Flagellates of the orders Trichomonadida Kirby, Oxymonadida Grassé, and Hypermastigida Grassi and Foà reported from lower termites (Isoptera families Mastotermitidae, Kalotermitidae, Hodotermitidae, Termopsidae, Rhinotermitidae, and Serritermitidae) and from the wood-feeding roach *Cryptocercus* (Dictyoptera: Cryptocercidae). *Sociobiology,* 4, 1–119.