

Current text	Proposed new text	Comments
<p>APPENDIX 11. THE PROVISIONAL STATUS CANDIDATUS¹</p>	<p>APPENDIX 11. THE PROVISIONAL STATUS CANDIDATUS¹</p>	<p>The Editorial Board believes that with the increasing use of the <i>Candidatus</i> designation there is a need to improve the organization and content of Appendix 11, including adding the requirement that <i>Candidatus</i> names should be correctly formed following the rules of the ICNP and Appendix 9 - Orthography</p>
<p>Footnote: 1. This appendix is adapted from Murray and Stackebrandt [2].</p>		
<p>(1) The provisional status "<i>Candidatus</i>" may be used to record the properties of putative taxa of prokaryotes [1].</p> <p>This category should be used for describing prokaryotic entities for which more than a mere nucleic acid sequence is available but for which characteristics required for description according to the Code are lacking.</p>	<p>Introduction of the category called <i>Candidatus</i> was first proposed by Murray and Schleifer in 1994 [1]. The provisional status <i>Candidatus</i> was intended for putative taxa of any rank that could not be described in sufficient details to warrant establishment of a novel taxon, usually because of the absence of a pure culture. Following discussions of the International Committee on Systematics of Bacteria (ICSB; now the International Committee on Systematics of Prokaryotes, ICSP) [2], further guidelines were published for <i>Candidatus</i> taxa in 1995 [3].</p> <p>This category should be used for describing prokaryotic taxa for which more than a nucleic acid sequence is available but for which the requirements for valid publication of a name according to the Code are not met.</p>	
<p>(2) The following information should be included in the description of a <i>Candidatus</i>:</p>	<p>The following information should be included in the description of a <i>Candidatus</i> taxon:</p>	

<p>(a) Genomic information, i.e. nucleic acid sequences apt to determine the phylogenetic position of the organism.</p> <p>(b) All information so far available on</p> <p>(c) structure and morphology (appropriate illustration)</p> <p>(d) physiology and metabolism</p> <p>(e) reproductive features</p> <p>(f) the natural environment, in which the organism can be identified by <i>in situ</i> hybridization or similar techniques for cell identification.</p> <p>(g) Any other available and suitable information.</p>	<p>(a) Genomic information, i.e., nucleic acid sequences apt to determine the phylogenetic position of the organism.</p> <p>(b) All information so far available on structure and morphology (appropriate illustration), physiology and metabolism, reproductive features, the natural environment, in which the organism can be identified by <i>in situ</i> hybridization or similar techniques for cell detection and identification, and any other available and suitable information.</p>	
<p>(3) A name of an organism in the status of <i>Candidatus</i> consists of the word <i>Candidatus</i>, followed by a “vernacular epithet” that consists of either a genus name with a specific epithet, or only a genus name, or only a specific epithet.</p> <p>Examples: <i>Candidatus</i> Liberobacter asiaticum; <i>Candidatus</i> magnetobacterium; <i>Candidatus</i> intracellularis.</p> <p>Note that the word <i>Candidatus</i>, but not the vernacular epithet is printed in italics.</p>	<p>A name of an organism in the status of <i>Candidatus</i> consists of the word <i>Candidatus</i>, followed by a name, based on one of the ranks defined in this Code (species, genus, family, etc.), formed in accordance with the nomenclature rules of the Code and its etymology appendix (Appendix 9); see also [4].</p> <p>Examples: <i>Candidatus</i> Methanoflorentaceae (family rank), <i>Candidatus</i> Methanoflorens (genus rank), <i>Candidatus</i> Methanoflorens stordalenmirensis (species rank).</p> <p>Note that the word <i>Candidatus</i>, but not the name that follows, is printed in italics.</p>	<p>Reference format to be determined</p>
<p>(4) A <i>Candidatus</i> name is by definition a preliminary name and therefore has no standing in prokaryote nomenclature.</p>	<p>A <i>Candidatus</i> name is, by definition, a preliminary name and therefore has no standing in prokaryote nomenclature. A proposal to include names of <i>Candidatus</i> taxa under Rules of the ICNP and to grant</p>	

	<p>nomenclatural priority to <i>Candidatus</i> names [5,6] was rejected by the ICSP in 2020 [7].</p>	
<p>(5) A list in the form of a codified record of organisms of the status <i>Candidatus</i> is kept by the Judicial Commission of the ICSP in cooperation with the Editorial Board of the IJSEM and is published in that journal in appropriate intervals.</p>	<p>Murray & Stackebrandt [3] proposed compiling a list of <i>Candidatus</i> taxa based on requests for inclusion submitted by the authors describing them. Starting 2020, lists of proposed <i>Candidatus</i> taxa have been published periodically in the IJSEM as a service to the scientific community [5,6]. Rather than proposed listing of a 'codified record' of each <i>Candidatus</i> taxon (as suggested in [3]), these lists, compiled by the IJSEM List Editors, include the etymologies and references to the publications in which the names were proposed. If necessary, names were corrected, based on the rules of the Code and its Appendix 9 [8,9,10]. Those corrections are proposals only, and alternative corrected names are possible. The <i>Candidatus</i> lists published in the IJSEM are not to be considered as 'Approved Lists of Names' that may serve as Validation Lists if, in the future, the ICSP may decide to include <i>Candidatus</i> taxa under the Rules of the Code. At the time of publication of the first two <i>Candidatus</i> lists in the IJSEM, the rank of phylum was not included in the Code, and, therefore, names of <i>Candidatus</i> phyla were not listed. As the ICSP has voted to include the rank of phylum in the Code [11], the List Editors of the IJSEM will also prepare an initial list of <i>Candidatus</i> phyla. Authors and other individuals wishing to have</p>	

	new names of <i>Candidatus</i> taxa included in future lists should send an electronic copy of the published paper to the IJSEM List Editors.	
(6) The items for inclusion in the codified record are listed in Table 1.		
(7) When an organism of the status <i>Candidatus</i> is later on isolated and the pure culture sufficiently described, it has to be classified and named according to the Rules of the Code. The former <i>Candidatus</i> organism's name is deleted from the <i>Candidatus</i> list.	When an organism of the status <i>Candidatus</i> is later isolated and the pure culture sufficiently described, the name can be submitted for validation according to the Rules of the Code. The former <i>Candidatus</i> name is then deleted from the <i>Candidatus</i> list.	
Recommendation: For more information, authors planning to describe a <i>Candidatus</i> are recommended to read the articles by Murray and Stackebrandt [2] and Murray and Schleifer [3].		
Table 1. Items for inclusion in the codified record of a provisional taxon.a	TO BE DELETED	
TABLE 1 HERE	TO BE DELETED	
Example: " <i>Candidatus magnetobacterium</i> " ((new subclass of <i>Proteobacteria</i> or new lineage) NC; G; R; NAS (EMBL number X71838), oligonucleotide sequence complementary to unique region of 16s rRNA 5'-GCCATCCCTCGCTTACT-3'; FL (freshwater lake sediment); microaer., magnetosomes, sulfur inclusions; M]. Spring et al., <i>Appl. Environ. Microbiol.</i> 59:2397, 1993.	TO BE DELETED	

		<p>An interesting issue recently came up in an e-mail exchange with a colleague who wrote: I am confused as to what the Code counts as pure culture. In your first <i>Candidatus</i> names paper you reject some <i>Candidatus</i> names as you say the organism has been cultured, but for organisms like <i>Rickettsia</i> this is only possible in association with host cells, so these cannot be considered a pure culture?</p> <p>Reply (redacted): See Chapter 4 of the ICNP, section C: "Maintenance may be by a variety of methods, e.g., in a medium, in a host by passage, in cells or exudates, or in the frozen or dried state. ..." ... The Code (Rule 18a) does not state that the pure culture must be maintained on agar etc. and that cell lines etc. are not acceptable to maintain pure cultures of prokaryotes. Therefore, the List Editors agreed that names could be validated. ... Many <i>Rickettsia</i> species designated <i>Candidatus</i> maintained in pure culture in cell lines are not <i>bona fide Candidatus</i> taxa as the names can be validated when the culture is available from two culture collections.</p> <p>Further comments are welcome.</p>
REFERENCES		
<p>1. Judicial Commission of the IJSB. Minutes of the meetings, 2 and 6 July 1994, Prague, Czech Republic. <i>Int J Syst Bacteriol</i> 1995;45:195–196.</p> <p>2. Murray RGE, Schleifer KH. Taxonomic notes: a proposal for recording the properties of putative taxa of prokaryotes. <i>Int J Syst Bacteriol</i> 1994;44:174–176.</p>	<p>1. Murray RGE, Schleifer KH. Taxonomic notes: a proposal for recording the properties of putative taxa of prokaryotes. <i>Int J Syst Bacteriol</i> 1994;44:174–176.</p> <p>2. Judicial Commission of the IJSB. Minutes of the meetings, 2 and 6 July 1994, Prague, Czech Republic. <i>Int J Syst Bacteriol</i> 1995;45:195–196.</p>	

<p>3. Murray RE, Stackebrandt E. Taxonomic Note: Implementation of the Provisional Status Candidatus for Incompletely Described Prokaryotes. <i>Int J Syst Bacteriol</i> 1995;45:186–187.</p>	<p>3. Murray RE, Stackebrandt E. Taxonomic Note: Implementation of the provisional status <i>Candidatus</i> for incompletely described prokaryotes. <i>Int J Syst Bacteriol</i> 1995;45:186–187.</p>	
	<p>4. Oren A. A plea for linguistic accuracy – also for <i>Candidatus</i> taxa. <i>Int J Syst Evol Microbiol</i> 2017;67:1085–1094.</p> <p>5. Whitman WB. Modest proposals to expand the type material for naming of prokaryotes. <i>Int J Syst Evol Microbiol</i> 2016;66:2108–2112.</p> <p>6. Whitman WB, Sutcliffe IC, Rossello-Mora R. Proposal for changes in the International Code of Nomenclature of Prokaryotes: granting priority to <i>Candidatus</i> names. <i>Int J Syst Evol Microbiol</i> 2019;69:2174–2175.</p> <p>7. Sutcliffe IC, Dijkshoorn L, Whitman WB, on behalf of the ICSP Executive Board. Minutes of the International Committee on Systematics of Prokaryotes online discussion on the proposed use of gene sequences as type for naming of prokaryotes, and outcome of vote. <i>Int J Syst Evol Microbiol</i> 2020;70:4416–4417.</p> <p>8. Oren A, Garrity GM, Parker CT, Chuvochina M, Trujillo ME. Lists of names of prokaryotic <i>Candidatus</i> taxa. <i>Candidatus</i> List no. 1. <i>Int J Syst Evol Microbiol</i> 2020;70:3956–4042.</p> <p>9. Oren A, Garrity GM, Trujillo ME. Registration of names of prokaryotic</p>	

	<p>Candidatus taxa in the IJSEM. <i>Int J Syst Evol Microbiol</i> 2020;70:3955.</p> <p>10. Oren A, Garrity GM. Lists of names of prokaryotic Candidatus taxa. Candidatus List no. 2. <i>Int J Syst Evol Microbiol</i> 2021;71:004671.</p> <p>[11] Oren A, Arahal DR, Rosselló-Móra R, Sutcliffe IC, Moore EJB. Emendation of Rules 5b, 8, 15, and 22 of the International Code of Nomenclature of Prokaryotes to include the rank of phylum. <i>Int J Syst Evol Microbiol</i> 2021;71:004851</p>	
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Table 1. Items for inclusion in the codified record of a provisional taxon.^a

Order of mention	Example responses
Status	<i>Candidatus</i>
Vernacular epithet	"another"
Phylogenetic lineage or possible genus	e.g., <i>Deltaproteobacteria</i> , possible (probable) <i>Desulfovibrio</i>
Cultivation	Cultivated or Not Cultivated
Gram reaction	G+, G-, Variable, or Not Applicable
Morphology	R (rod), C (coccus), F (filamentous), M (mycolial), O (other), U (unknown)
Basis of assignment	Nucleic Acid Sequence (data bank no.), morphology, etc.
Specific identification of morphotype	Probe identity
Habitat, association, or host	Symbiotic (name host and tissue), Free-Living (sea, etc.), etc.
Metabolism and unusual features	<u>Aer.</u> , <u>Anaer.</u> , <u>Microaer.</u> , etc.
Growth temperature	<u>M.</u> , <u>P.</u> , <u>T.</u> (meso-, psychro-, thermophilic)
Source	Natural environment
Author(s)	Essential reference

^aModified from Murray and Schleifer, 1994 [2].