2006-020: DRAFT ANNEX TO ISPM27: *IPS* SPP.

Summary of comments

Name	Summary
Cuba	No hay comentarios al PD
EPPO Σ	Finalised by the EPPO Secretariat on behalf of its 51 Member Countries.
European Union	Comments finalised by the European Commission on behalf of the EU and its 28 Member States on 29/09/2017.
Samoa	no further comments
South Africa	No comments from the National Plant Protection Organisation of South Africa.

#	Para	Text	Comment	SC's response
1	G	(General Comment)	**Cameroon** Ce protocole de diagnostic est complet, détaillé et richement illustré. Il va constituer un outil supplémentaire pour identifier ce nuisible du bois. Il soutiendra le travail des ONPV *Category : TECHNICAL*	**NOTED**
2	G	(General Comment)	**Myanmar** This pest is absent in Myanmar. *Category : SUBSTANTIVE*	**NOTED**
3	G	(General Comment)	**Nicaragua** Nicaragua no tiene comentarios en esta propuesta de protocolo. *Category : TECHNICAL*	**NOTED**
4	G	(General Comment)	**Peru** We agree with the DRAFT ANNEX TO ISPM 27: IPS SPP. (2006-020) *Category : TECHNICAL*	**NOTED**
5	G	(General Comment)	**United States of America** The United States has no comments on this draft standard. *Category : SUBSTANTIVE*	**NOTED**
6	G	(General Comment)	**Canada** Canada supports the draft annex to ISPM 27: Ips spp. (2006-020). *Category : SUBSTANTIVE*	**NOTED**

#	Para	Text	Comment	SC's response
7	G	(General Comment)	**Guyana** Guyana has no objection to the contents of this Annex *Category : SUBSTANTIVE*	**NOTED**
8	G	(General Comment)	**Panama** Panama has no comments on this document. *Category : EDITORIAL*	**NOTED**
9	G	(General Comment)	**Tajikistan** I support the document as it is and I have no comments *Category : SUBSTANTIVE*	**NOTED**
10	G	(General Comment)	**Bahamas** Based on the Bahamas' close proximity to the Southern United States, the vast distribution of IPS spp. and the immense economic impact that it can have on our pine industry, the Bahamas supports the adoption of this diagnostic protocol. *Category : SUBSTANTIVE*	**NOTED**
11	G	(General Comment)	**Uruguay** We do not have comments on this draft DP *Category : TECHNICAL*	**NOTED**
12	G	(General Comment)	**Thailand** agree with the proposed draft DP for Ips spp. *Category : SUBSTANTIVE*	**NOTED**
13	G	(General Comment)	**Lao People's Democratic Republic** Lao PDR agreed with this drafted annex ISPM. *Category : SUBSTANTIVE*	**NOTED**
14	G	(General Comment)	**Honduras** HONDURAS NO TIENE COMENTARIOS *Category : TECHNICAL*	**NOTED**
15	G	(General Comment)	**Honduras** HONDURAS NO TIENE COMENTARIOS *Category : TECHNICAL*	**NOTED**
16	G	(General Comment)	**Lao People's Democratic Republic** Lao PDR so far no comment on draft annex to ISPM 27. *Category : SUBSTANTIVE*	**NOTED**
17	G	(General Comment)	**Colombia** El Instituto Colombiano Agropecuario (ICA), como Organización Nacional de Protección Fitosanitaria de Colombia, revisó y analizó el borrador en cuestión, encontrando que el protocolo de diagnóstico propuesto cumple con los requisitos y esta actualizado de acuerdo con la evidencia científica existente. *Category : TECHNICAL*	**NOTED**
18	G	(General Comment)	**China** Clarify the object of diagnostic protocol is the	**Modified**

#	Para	Text	Comment	SC's response
			adult of Ips. The protocol includes the diagnostic characteristic of larva, but it should not be the diagnostic criteria. *Category : EDITORIAL*	The scope of the protocol is to identify Ips using available methods and life stages. It is correct that the protocol cannot identify the larvae to genus or species with confidence using morphology. This is explained in Sections 4 main text and section 4.2. The text has been modified to make it clearer. Inclusion of the 4.2 section on final instar larvae is helpful to document process to sort larvae that are not Ips.
19	G	(General Comment)	**Algeria** No comment *Category : TECHNICAL*	**NOTED**
20	31	**Please note that some paragraph numbers may be missing from the document or not be in a chronological order. This is due to technical problems in the OCS but it does not affect the integrity of the content of the document.**	**Nicaragua** NICARAGUA RECOMIENDA QUE SE CORRIJA EL ORDEN CRONOLOGICO EN LA NUMERACIÓN DE LOS PARRAFOS *Category : EDITORIAL*	**NOTED**
21	37	*Ips* bark beetles (Coleoptera: Curculionidae: Scolytinae: Ipini) are sub-cortical phloem feeders in Pinaceae (conifer trees), especially *Pinus* (pine), *Picea* (spruce) and *Larix* (larch) species (Cognato, 2015). In non-outbreak times, *Ips* beetles mainly inhabit weak or dead trees (Cognato, 2015). Adults and larvae kill healthy trees during outbreaks (Cognato, 2015) by destroying the phloem and cambium in tree trunks and limbs when feeding and tunnelling (Furniss and Carolin, 1977). Outbreaks can destroy thousands of hectares of healthy trees (Cognato, 2015). Some or all *Ips* bark beetles also transmit pathogenic fungi (Krokene and Solheim, 1998; Meng *et al.*, 2015)~~. *Ips* beetles can transmit pathogenic~~ , in particular blue stain fungi (genera *Grosmannia* and *Ceratocystis*, Ascomycota: Sordariomycetes, Figure 1). *Ceratocystis* fungi from *Ips* beetles also interfere with biological control of the conifer pest *Sirex noctilio* Fabricius (Hymenoptera, Siricidae) (Yousuf *et al.*, 2014). Drought conditions may promote *Ips* outbreaks (Breshears *et al.*, 2005). Trees injured in outbreaks are sometimes later killed by *Dendroctonus* bark beetles (Furniss and Carolin, 1977).	**European Union** Shorter. *Category : EDITORIAL*	**Incorporated**
22	37	*Ips* bark beetles (Coleoptera: Curculionidae: Scolytinae: Ipini) are sub-cortical phloem feeders in Pinaceae (conifer trees), especially *Pinus*	**European Union** "Drought conditions may promote Ips outbreaks (Breshears et al., 2005)"	**Modified**

#	Para	Text	Comment	SC's response
		(pine), *Picea* (spruce) and *Larix* (larch) species (Cognato, 2015). In non-outbreak times, *Ips* beetles mainly inhabit weak or dead trees (Cognato, 2015). Adults and larvae kill healthy trees during outbreaks (Cognato, 2015) by destroying the phloem and cambium in tree trunks and limbs when feeding and tunnelling (Furniss and Carolin, 1977). Outbreaks can destroy thousands of hectares of healthy trees (Cognato, 2015). Some or all *Ips* bark beetles also transmit pathogenic fungi (Krokene and Solheim, 1998; Meng *et al.*, 2015). *Ips* beetles can transmit pathogenic blue stain fungi (genera *Grosmannia* and *Ceratocystis*, Ascomycota: Sordariomycetes, Figure 1). *Ceratocystis* fungi from *Ips* beetles also interfere with biological control of the conifer pest *Sirex noctilio* Fabricius (Hymenoptera, Siricidae) (Yousuf *et al.*, 2014). Drought conditions may promote *Ips* outbreaks (Breshears *et al.*, 2005). Trees injured in outbreaks are sometimes later killed by *Dendroctonus* bark beetles (Furniss and Carolin, 1977).	This is incomplete. The major driver for Ips typographus outbreaks are, first, wind storms, and then, drought. See, e.g.; Wermelinger, B. (2004). Ecology and management of the spruce bark beetle Ips typographus - a review of recent research. Forest Ecology and Management, 202, 67–82. http://doi.org/10.1016/j.foreco.2004.07.018 Kausrud, K., Økland, B., Skarpaas, O., Grégoire, J.-C., Erbilgin, N. and Stenseth, N. C. 2011. Population dynamics in changing environments: the case of an eruptive forest pest species. Biological Reviews, 87(1):34-51. doi: 10.1111/j.1469-185X.2011.00183. Grégoire, J.-C., Raffa, K.F., Lindgren, B.S., (2015). Economics and Politics of Bark Beetles. Pp. 585-613 in F.E. Vega and R.W. Hofstetter (Eds.), Bark Beetles. Biology and Ecology of Native and Invasive Species. Elsevier. Marini, L., Økland, B., Jönsson, A. M., Bentz, B., Carroll, A., Forster, B., Grégoire, J.-C., Hurling, R., Nageleisen, L.-M., Netherer, S., Ravn, H. P., Weed, A., Schroeder, M. (2017). Climate drivers of bark beetle outbreak dynamics in Norway spruce forests. Ecography. doi: 10.1111/ecog.02769. *Category : SUBSTANTIVE*	Replaced "Drought" with "Climatic" to be more inclusive and added the references for Wermelinger (2004) and Marini et al. (2017).
23	37	*Ips* bark beetles (Coleoptera: Curculionidae: Scolytinae: Ipini) are sub-cortical phloem feeders in Pinaceae (conifer trees), especially *Pinus* (pine), *Picea* (spruce) and *Larix* (larch) species (Cognato, 2015). In non-outbreak times, *Ips* beetles mainly inhabit weak or dead trees (Cognato, 2015). Adults and larvae kill healthy trees during outbreaks (Cognato, 2015) by destroying the phloem and cambium in tree trunks and limbs when feeding and tunnelling (Furniss and Carolin, 1977). Outbreaks can destroy thousands of hectares of healthy trees (Cognato, 2015). Some or all *Ips* bark beetles also transmit pathogenic fungi (Krokene and Solheim, 1998; Meng *et al.*, 2015). *Ips* beetles can transmit pathogenic blue stain fungi (genera *Grosmannia* and *Ceratocystis*, Ascomycota: Sordariomycetes, Figure 1). *Ceratocystis* fungi from *Ips* beetles also interfere with biological control of the conifer pest *Sirex noctilio* Fabricius (Hymenoptera, Siricidae) (Yousuf *et al.*, 2014). Drought conditions may promote *Ips* outbreaks (Breshears *et al.*, 2005). Trees	**EPPO** "Drought conditions may promote Ips outbreaks (Breshears et al., 2005)" This is incomplete. The major driver for Ips typographus outbreaks are, first, wind storms, and then, drought. See, e.g.; Wermelinger, B. (2004). Ecology and management of the spruce bark beetle Ips typographus - a review of recent research. Forest Ecology and Management, 202, 67–82. http://doi.org/10.1016/j.foreco.2004.07.018 Kausrud, K., Økland, B., Skarpaas, O., Grégoire, J.-C., Erbilgin, N. and Stenseth, N. C. 2011. Population dynamics in changing environments: the case of an eruptive forest pest species. Biological Reviews, 87(1):34-51. doi: 10.1111/j.1469-185X.2011.00183.	**Modified** Replaced "Drought" with "Climatic" to be more inclusive and added the references for Wermelinger (2004) and Marini et al. (2017).

#	Para	Text	Comment	SC's response
		injured in outbreaks are sometimes later killed by *Dendroctonus* bark beetles (Furniss and Carolin, 1977).	Grégoire, J.-C., Raffa, K.F., Lindgren, B.S., (2015). Economics and Politics of Bark Beetles. Pp. 585-613 in F.E. Vega and R.W. Hofstetter (Eds.), Bark Beetles. Biology and Ecology of Native and Invasive Species. Elsevier. Marini, L., Økland, B., Jönsson, A. M., Bentz, B., Carroll, A., Forster, B., Grégoire, J.-C., Hurling, R., Nageleisen, L.-M., Netherer, S., Ravn, H. P., Weed, A., Schroeder, M. (2017). Climate drivers of bark beetle outbreak dynamics in Norway spruce forests. Ecography. doi: 10.1111/ecog.02769. *Category : SUBSTANTIVE*	
24	37	*Ips* bark beetles (Coleoptera: Curculionidae: Scolytinae: Ipini) are sub-cortical phloem feeders in Pinaceae (conifer trees), especially *Pinus* (pine), *Picea* (spruce) and *Larix* (larch) species (Cognato, 2015). In non-outbreak times, *Ips* beetles mainly inhabit weak or dead trees (Cognato, 2015). Adults and larvae kill healthy trees during outbreaks (Cognato, 2015) by destroying the phloem and cambium in tree trunks and limbs when feeding and tunnelling (Furniss and Carolin, 1977). Outbreaks can destroy thousands of hectares of healthy trees (Cognato, 2015). Some or all *Ips* bark beetles also transmit pathogenic fungi (Krokene and Solheim, 1998; Meng *et al.*, 2015)~~. *Ips* beetles can transmit pathogenic~~ , in particular blue stain fungi (genera *Grosmannia* and *Ceratocystis*, Ascomycota: Sordariomycetes, Figure 1). *Ceratocystis* fungi from *Ips* beetles also interfere with biological control of the conifer pest *Sirex noctilio* Fabricius (Hymenoptera, Siricidae) (Yousuf *et al.*, 2014). Drought conditions may promote *Ips* outbreaks (Breshears *et al.*, 2005). Trees injured in outbreaks are sometimes later killed by *Dendroctonus* bark beetles (Furniss and Carolin, 1977).	**EPPO** Shorter. *Category : EDITORIAL*	**Incorporated**
25	37	*Ips* species (Coleoptera: Scolytidae: Scolytinae: Ipini), commonly known as bark beetles, are sub-cortical phloem feeders in Pinaceae (conifer trees), especially ~~(Coleoptera: Curculionidae: Scolytinae: Ipini) are sub-cortical phloem feeders in Pinaceae (conifer trees), especially~~ *Pinus* (pine), *Picea* (spruce) and *Larix* (larch) species (Cognato, 2015). In non-outbreak times, *Ips* beetles mainly inhabit weak or dead trees (Cognato, 2015). Adults and larvae kill healthy trees during outbreaks (Cognato, 2015) by destroying the phloem and cambium in tree trunks and limbs when feeding and tunnelling (Furniss and Carolin, 1977). Outbreaks can destroy thousands of hectares of healthy trees (Cognato, 2015). Some or	**Singapore** Proposed to update the revised taxonomy information for this beetle to reflect that it is in Family Scolytidae instead of Curculionidae. This revised Family classification is in use in CABI online Crop Protection Compendium as well as other new publications. Also, proposed editorial edits for better flow of sentence. *Category : EDITORIAL*	**Modified** Proposed sentence structure changes are incorporated but not the use of Scolytidae. The correct classification is Curculionidae. See Jordal et al. 2014 paper on topic (ZooKeys 439: 1–18 (2014) doi: 10.3897/zookeys.439.8391 www.zookeys.org)

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		all *Ips* bark beetles also transmit pathogenic fungi (Krokene and Solheim, 1998; Meng *et al.*, 2015). *Ips* beetles can transmit pathogenic blue stain fungi (genera *Grosmannia* and *Ceratocystis*, Ascomycota: Sordariomycetes, Figure 1). *Ceratocystis* fungi from *Ips* beetles also interfere with biological control of the conifer pest *Sirex noctilio* Fabricius (Hymenoptera, Siricidae) (Yousuf *et al.*, 2014). Drought conditions may promote *Ips* outbreaks (Breshears *et al.*, 2005). Trees injured in outbreaks are sometimes later killed by *Dendroctonus* bark beetles (Furniss and Carolin, 1977).		
26	38	Native *Ips* species occur in all countries where *Pinus* and *Picea* occur naturally (Cognato, 2015). Some *Ips* species also occur as exotic species, especially in temperate southern hemisphere regions (Knizek, 2011; Cognato, 2015) where *Pinus* has been planted. Some Ips species use Larix as primary host genus (Table 1). A few species use *Abies* and *Cedrus* as primary hosts during outbreaks (Wood and Bright, 1992). *Pseudostuga* may be attacked occasionally outside its natural range (e.g. by *Ips acuminatus*).	**European Union** *Category : TECHNICAL*	**Modified.** Incorporated new sentence: "Some *Ips* species use *Larix* as principal host genus (Table 1)." The suggested addition about attack of Pseudostiga was not included because a citation was not provided. To address the concern that Ips attack other plants in Table 1, a general senetcne is added at end of papa 38: "*Ips* species are not limited to the principal host genera provided in Table 1, as other conifers could be attacked when a principal host is not available."
27	38	Native *Ips* species occur in all countries where *Pinus* and *Picea* occur naturally (Cognato, 2015). Some *Ips* species also occur as exotic species, especially in temperate southern hemisphere regions (Knizek, 2011; Cognato, 2015) where *Pinus* has been planted. A few species use *Abies* and *Cedrus* as primary hosts during outbreaks (Wood and Bright, 1992).	**European Union** Some Ips species also occur as exotic species, especially in temperate southern hemisphere regions (Knizek, 2011; Cognato, 2015) where Pinus has been planted. Are there other cases than Ips apache in Panama and I. grandicollis in Australia? If not, the authors should be specific and avoid generalities such as "Some Ips species". *Category : TECHNICAL*	**Modified** Specify now that "Two" species rather than some species.
28	38	Native *Ips* species occur in all countries where *Pinus* and *Picea* occur naturally (Cognato, 2015). Some *Ips* species also occur as exotic species, especially in temperate southern hemisphere regions (Knizek, 2011; Cognato, 2015) where *Pinus* has been planted. A few species use *Abies* and *Cedrus* as primary hosts during outbreaks (Wood and Bright, 1992).	**EPPO** Some Ips species also occur as exotic species, especially in temperate southern hemisphere regions (Knizek, 2011; Cognato, 2015) where Pinus has been planted." Are there other cases than Ips apache in panama and I. grandicollis in Australia? If not, the authors should be specific and avoid generalities such as "Some Ips species"	**Modified** Specify now that "Two" species rather than some species.

#	Para	Text	Comment	SC's response
			Category : TECHNICAL	
29	38	Native *Ips* species occur in all countries where *Pinus* and *Picea* occur naturally (Cognato, 2015). Some *Ips* species also occur as exotic species, especially in temperate southern hemisphere regions (Knizek, 2011; Cognato, 2015) where *Pinus* has been planted. Some *Ips* species use *Larix* as primary host genus (Table 1). A few species use *Abies* and *Cedrus* as primary hosts during outbreaks (Wood and Bright, 1992). *Pseudostuga* may be attacked occasionally outside its natural range (e.g. by *Ips acuminatus*).	**EPPO** *Category : TECHNICAL*	**Modified.** Incorporated new sentence: "Some *Ips* species use *Larix* as principal host genus (Table 1)." The suggested addition about attack of Pseudostiga was not included because a citation was not provided. To address the concern that Ips attack other plants in Table 1, a general senetcne is added at end of papa 38: "*Ips* species are not limited to the principal host genera provided in Table 1, as other conifers could be attacked when a principal host is not available."
30	39	There are 37 valid *Ips* species worldwide (Table 1). Phylogenetic analyses of the Ipini prompted transfer of several species to the genera *Pseudips* (Cognato 2000) and *Orthotomicus* (Cognato and Vogler, 2001). Cognato (2015) reviews the phylogeny, taxonomy, diagnosis and biology of all *Ips* species. (The author better clarify that Ips concinnus, *I. mexicanus*, *I. acuminatus* has been transferred to Psedips Cognato. And Ips latidens has been moved to Orthotomicus.)	**China** The reference may be too long-time from now and the change is not known to the public. *Category : TECHNICAL*	**Considered, but not incorporated** The protocol is to provide current taxonomic classification. Those species are not listed in the Table of Ips species but are reported in the references provided for revisions (Cognato, 2015).
31	44	~~Host~~ Primary host genera	**European Union** More precise (please see title of the table). *Category : EDITORIAL*	**Modified.** A change was made to use "principal host genera" as the word principal is used in Cognato 2015.
32	44	~~Host~~ Primary host genera	**EPPO** More precise (please see title of the table). *Category : EDITORIAL*	**Modified.** A change was made to use "principal host genera" as the word principal is used in Cognato 2015.
33	112	*Picea, Pinus, Larix*	**China** This species also infect Pinus and Larix, refer to www.eppo.int/QUARANTINE/data_sheets/insects/DS_Ips_hauseri.pdf *Category : SUBSTANTIVE*	**Modified** The Table has been modified to indicate the principal host genera instead of host genera. There is no evidence that Pinus and Larix are primary hosts for I.

#	Para	Text	Comment	SC's response
				hunteri. While consulting the EPPO fact sheet for *I. hauseri, Pinus and Larix* are not included in entry for *Ips hauseri* principal hosts because they were not included as principal hosts in Cognato 2015. New text in Table caption explains the meaning of principal host genera.
34	187	Eurasia (north and west), Africa (north)	**European Union** Re "Africa (north)": We doubt it. The EPPO Global Database does not mention Ips typographus in Algeria. Cognato (2015) states that it is present in Algeria without supporting references. There appears to be no spruce in Algeria, according to FAO 2010 (www.fao.org/docrep/013/al439f/al439f.pdf). *Category : SUBSTANTIVE*	**Modified** Wood & Bright (1992) page 528 includes reference for *Ips typographus* from Africa (Algeria). Since the Table indicates native range it is possible that this record does not support inclusion. Removed.
35	187	Eurasia (north and west), Africa (north)	**EPPO** " Africa (north)" I do not think so. The EPPO Global Database does not mention Ips typographus in Algeria. Cognato (2015) states that it is present in Algeria without supporting references. There appears to be no spruce in Algeria, according to FAO 2010 (www.fao.org/docrep/013/al439f/al439f.pdf) *Category : SUBSTANTIVE*	**Modified** Wood & Bright (1992) page 528 includes reference for *Ips typographus* from Africa (Algeria). Since the Table indicates native range it is possible that this record does not support inclusion. Removed.
36	194	Most attacks are initiated by males, who create a nuptial chamber under the bark and release semiochemicals to attract males and females to colonize the same tree. The polygynous males attract up to six females to the nuptial chamber (diameter: 7 to 15 mm). Females mate with the resident male and then create radiating egg galleries along the inner bark (Cognato, 2015; Figures 2 and 3). Females each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962). Larval galleries radiate from the "Y"- or "H"-shaped egg galleries (Figures 2 and 3), spreading over a span of 10–30 cm. Development requires six weeks in warm temperatures, allowing up to five generations per year in warm areas. In cooler areas, development requires up to two years (Furniss and Carolin, 1977). Adult beetles overwinter within	**European Union** Re: "Females each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962). These figures are too general and too restricted and, by the way, they do not stem from Chararas (1962), who, for example, gave 7-42 eggs per female for Ips typographus, and 12-40 eggs for Ips sexdentatus. Pineau et al. (2017) counted 1- 60 offspring per female. Pineau X., Bourguignon M., Jactel H., Lieutier F., Sallé A. (2017). Pyrrhic victory for bark beetles: successful standing tree colonization triggers strong intraspecific competition for offspring of Ips sexdentatus. Forest Ecology	**Modified** Removed"20-30" and now text states they lay eggs

#	Para	Text	Comment	SC's response
		parental breeding galleries, in forest litter, or in living wood tissue (Chansler, 1964; Lanier, 1967).	and Management, in print. *Category : TECHNICAL*	
37	194	Most attacks are initiated by males, who create a nuptial chamber under the bark and release semiochemicals to attract males and females to colonize the same tree. The polygynous males attract up to six females to the nuptial chamber (diameter: 7 to 15 mm). Females mate with the resident male and then create radiating egg galleries along the inner bark (Cognato, 2015; Figures 2 and 3). Females each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962). Larval galleries radiate from the "Y"- or "H"-shaped egg galleries (Figures 2 and 3), spreading over a span of 10–30 cm. Development requires six weeks in warm temperatures, allowing up to five generations per year in warm areas. In cooler areas, development requires up to two years (Furniss and Carolin, 1977). Adult beetles overwinter within parental breeding galleries, in forest litter, or in living wood tissue (Chansler, 1964; Lanier, 1967).	**EPPO** Females each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962)" These figures are too general and too restricted and, by the way, they do not stem from Chararas (1962), who, for example, gave 7-42 eggs per female for Ips typographus, and 12-40 eggs for Ips sexdentatus. Pineau et al. (2017) counted 1- 60 offspring per female. Pineau X., Bourguignon M., Jactel H., Lieutier F., Sallé A. (2017). Pyrrhic victory for bark beetles: successful standing tree colonization triggers strong intraspecific competition for offspring of Ips sexdentatus. Forest Ecology and Management, in print. *Category : TECHNICAL*	**Modified** Removed"20-30" and now text states they lay eggs
38	194	Most attacks are initiated by ~~males~~the male insect, who create a nuptial chamber under the bark and release semiochemicals to attract males and females to colonize the same tree. The polygynous ~~males~~ male insect attract up to six ~~females~~ female insect to the nuptial chamber (diameter: 7 to 15 mm). ~~Females~~ Female insect mate with the resident male and then create radiating egg galleries along the inner bark (Cognato, 2015; Figures 2 and 3). ~~Females~~ Female insect each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962). Larval galleries radiate from the "Y"- or "H"-shaped egg galleries (Figures 2 and 3), spreading over a span of 10–30 cm. Development requires six weeks in warm temperatures, allowing up to five generations per year in warm areas. In cooler areas, development requires up to two years (Furniss and Carolin, 1977). Adult beetles overwinter within parental breeding galleries, in forest litter, or in living wood tissue (Chansler, 1964; Lanier, 1967).	**PPPO** *Category : EDITORIAL*	**Modified** The first use of the word males is changed to be male beetles. This should clarify that the text is about insects rather than other organism.
39	194	Most attacks are initiated by males, who create a nuptial chamber under the bark and release semiochemicals to attract ~~males~~ male and ~~females~~ female insect to colonize the same tree. The polygynous males attract up to six females to the nuptial chamber (diameter: 7 to 15 mm). Females mate with the resident male and then create radiating egg galleries along	**PPPO** *Category : EDITORIAL*	**Modified** The first use of the word males is changed to be male beetles. This should clarify that the text is about insects rather than other organism.

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		the inner bark (Cognato, 2015; Figures 2 and 3). Females each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962). Larval galleries radiate from the "Y"- or "H"-shaped egg galleries (Figures 2 and 3), spreading over a span of 10–30 cm. Development requires six weeks in warm temperatures, allowing up to five generations per year in warm areas. In cooler areas, development requires up to two years (Furniss and Carolin, 1977). Adult beetles overwinter within parental breeding galleries, in forest litter, or in living wood tissue (Chansler, 1964; Lanier, 1967).		
40	194	Most attacks are initiated by males, who create a nuptial chamber under the bark and release semiochemicals to attract ~~males~~ male and ~~females~~ female inscets to colonize the same tree. The polygynous males attract up to six females to the nuptial chamber (diameter: 7 to 15 mm). Females mate with the resident male and then create radiating egg galleries along the inner bark (Cognato, 2015; Figures 2 and 3). Females each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962). Larval galleries radiate from the "Y"- or "H"-shaped egg galleries (Figures 2 and 3), spreading over a span of 10–30 cm. Development requires six weeks in warm temperatures, allowing up to five generations per year in warm areas. In cooler areas, development requires up to two years (Furniss and Carolin, 1977). Adult beetles overwinter within parental breeding galleries, in forest litter, or in living wood tissue (Chansler, 1964; Lanier, 1967).	**PPPO** *Category : EDITORIAL*	**Modified** The first use of the word males is changed to be male beetles. This should clarify that the text is about insects rather than other organism.
41	194	Most attacks are initiated by ~~males~~the male insect, who create a nuptial chamber under the bark and release semiochemicals to attract males and females to colonize the same tree. The polygynous males attract up to six females to the nuptial chamber (diameter: 7 to 15 mm). Females mate with the resident male and then create radiating egg galleries along the inner bark (Cognato, 2015; Figures 2 and 3). Females each lay 20–30 eggs along their tunnel, these hatching after about seven days (Chararas, 1962). Larval galleries radiate from the "Y"- or "H"-shaped egg galleries (Figures 2 and 3), spreading over a span of 10–30 cm. Development requires six weeks in warm temperatures, allowing up to five generations per year in warm areas. In cooler areas, development requires up to two years (Furniss and Carolin, 1977). Adult beetles overwinter within parental breeding galleries, in forest litter, or in living wood tissue (Chansler, 1964; Lanier, 1967).	**PPPO** *Category : EDITORIAL*	**Modified** The first use of the word males is changed to be male beetles. This should clarify that the text is about insects rather than other organism.

#	Para	Text	Comment	SC's response
42	201	**Table 2.** Common names and synonyms of target *Ips* species, sorted by subgenera. Synonymy follows Knizek (2011). Add Ips species (Subgenus, Common name and synonums): - Ips apache - Ips bolearis > borealis - Ips perroti - Ips hoppingi - Ips montanus - Ips cribricollis - Ips nitidus	**Viet Nam** Vietnam would like to add 7 Ips species in table 2, because these species had in 4.1.7 item, so identification expert do not know which species is synonym species of Ips to diagnostic. *Category : EDITORIAL*	**Considered, but not incorporated** These species are not targets of the protocol and should not be included in Table 2. The selection of target species was made by authors and in consultation/ comment of experts and TPDP when drafts were in review. The inclusion of these species in the key (4.1.7) treats each as non target (NT). Inclusion in the key by name does not equate with treatment as a target pest in this protocol.
43	202	Subgenus	**European Union** The first line of the table (titles of the columns) should be in grey (please see Table 1). *Category : EDITORIAL*	**Incorporated**
44	202	Subgenus	**EPPO** The first line of the table (titles of the columns) should be in grey (please see Table 1). *Category : EDITORIAL*	**Incorporated**
45	208	pine engraver, This species has three common names on the website of EPPO, eastern pine engraver, Oregon pine engraver and Pine engraver beetle. The most commonly used one is pine engraver beetle.	**China** Refer to https//ga.eppo.int/taxon/IPSXPI. For one species, it usually has different names in different languages. And sometimes, it has different names even in one language. According to the naming principal, we often choose the first officially published one or the generally accepted one as the common name and other names can be abandoned. So please refer to the website of EPPO and add common and synonym names in Table2. Please consult more data, especially the catalogue written by Wood&Bright which has been published three volumes and two supplementary issues. *Category : SUBSTANTIVE*	**Modified** Added "beetle" to end of common name to be consistent with most common usage
46	293	*Tomicus grandicollis* Eichhoff, 1868 Add a synonym, *Ips cloudcrofti* Swaine, 1924.	**China** See Wood (1982), page 699. *Category : SUBSTANTIVE*	**Modified** Incorporated change in Table 2
47	364	Larvae and pupae are found in the host plant or wood products only immediately underneath the bark or in the phloem, not deeper in the	**European Union** Redundant with third sentence of paragraph 365.	**Incorporated**

#	Para	Text	Comment	SC's response
		wood or xylem (although some overwintering adults tunnel into the xylem, Lanier, 1967). Trees can be examined externally for symptoms of infestation (circular holes and red-brown boring dust, Figure 4)~~.~~ . ~~*Pinus*, *Picea* or other coniferous wood products with bark, particularly unprocessed logs, dunnage, crates or pallets, may contain galleries and beetles (adults and larvae).~~	*Category : EDITORIAL*	
48	364	Larvae and pupae are found in the host plant or wood products only immediately underneath the bark or in the phloem, not deeper in the wood or xylem (although some overwintering adults tunnel into the xylem, Lanier, 1967). Trees can be examined externally for symptoms of infestation (circular holes and red-brown boring dust, Figure 4). ~~*Pinus*, *Picea* or other coniferous wood products with bark, particularly unprocessed logs, dunnage, crates or pallets, may contain galleries and beetles (adults and larvae).~~	**EPPO** Redundant with third sentence of paragraph 365. *Category : EDITORIAL*	**Incorporated**
49	365	*Ips* bark beetles can be found in boles and limbs of the tree genera *Pinus*, *Picea*, *Larix* (larch or tamarack) and *Cedrus* (true cedar). *Pinus* and *Picea* wood are of primary economic importance to the world lumber trade. If bark is present, round wood, handicrafts, dunnage, crates or pallets suspected of originating from these tree genera could harbour *Ips*. Flying ~~adults~~ adult insects are collected using a well-developed system of semiochemical lure-based traps (Fettig and Hilszczański, 2015).	**PPPO** *Category : EDITORIAL*	**Modified** Added beetles to describe adults.
50	372	Several months or more after successful colonization, the attacked tree may change leaf colour to yellow-green or red as the tree dies. *Ips* beetles sometimes kill ~~live~~ healthy trees when beetle populations are high, although some trees recover even after the beetles have successfully reproduced in their tissues.	**European Union** Please see paragraph 37, third line. Otherwise delete "live". *Category : EDITORIAL*	**Incorporated**
51	372	~~Several~~ After successful colonization over several months or ~~more after successful colonization~~more, the attacked ~~tree~~ tree's leaf may change ~~leaf~~ colour to yellow-green or red as the tree dies. *Ips* beetles sometimes kill live trees when beetle populations are high, although some trees recover even after the beetles have successfully reproduced in their tissues.	**Ghana** *Category : EDITORIAL*	**Considered, but not incorporated.** The text change would alter meaning. It is several months after colonization occurs. The change would suggest colonization occurs over several months.
52	372	Several months or more after successful colonization, the attacked tree may change leaf colour to yellow-green or red as the tree dies. *Ips* beetles sometimes kill ~~live~~ healthy trees when beetle populations are high, although some trees recover even after the beetles have successfully reproduced in their tissues.	**EPPO** Please see paragraph 37, third line. Otherwise delete "live". *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
53	375	Detected adults, larvae, pupae or eggs can be removed using forceps. Larvae can be placed for 30 to 60 seconds in near boiling water (90 °C to 100 °C) to fix for long-term preservation. Specimens should then be stored in a glass vial containing 70% to 80% ethanol. Adults can be killed in ethanol or by placement into a dry tube and then in a freezer at either −20 °C for at least 24 h or −80 °C for at least 6 h before card- or point-mounting on a pin. ~~Mounting will preserve specimens for morphological identification (see section 4.1).~~ If specimens are to be saved for DNA analysis it is recommended that they be stored in a preservative such as a high percentage (>95%) of ethanol or propylene glycol.	**European Union** Redundant with paragraph 376. *Category : EDITORIAL*	**Incorporated**
54	375	Detected adults, larvae, pupae or eggs can be removed using forceps. Larvae can be placed for 30 to 60 seconds in near boiling water (90 °C to 100 °C) to fix for long-term preservation. Specimens should then be stored in a glass vial containing 70% to 80% ethanol. Adults can be killed in ethanol or by placement into a dry tube and then in a freezer at either −20 °C for at least 24 h or −80 °C for at least 6 h before card- or point-mounting on a pin. ~~Mounting will preserve specimens for morphological identification (see section 4.1).~~ If specimens are to be saved for DNA analysis it is recommended that they be stored in a preservative such as a high percentage (>95%) of ethanol or propylene glycol.	**EPPO** Redundant with paragraph 376. *Category : EDITORIAL*	**Incorporated**
55	376	It is necessary to collect any adults present because adults have important diagnostic morphological characters. It is not possible to identify juveniles to genus or species based on morphology. In the laboratory, adult specimens should be mounted for examination while larvae, pupae or eggs should be ~~examined~~ stored and DNA analyzed in ethanol. See section 4.1 for details on preparation of specimens for identification.	**China** The subsequent work should be described cleared *Category : EDITORIAL*	**Considered, but not incorporated** Storage in ethanol is needed for identification. The storage method for insects to be used in DNA work is described in para 375.
56	378	The genus *Ips* can be recognized and identified to species by adult external morphology. Adult structures are illustrated in Figures 5 and 6. Descriptions and regional keys to the species of *Ips* based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier *et al.*, 1991; Pfeffer, 1995; Cognato and Sun, 2007). A generic key to Scolytinae larvae of eastern Canada is available (Thomas, 1957) but juvenile stages are only partially identifiable morphologically on a global scale. Although *Ips* species have been discovered and identified using DNA sequence data (Cognato and Sun, 2007), validated protocols for universal DNA identification of *Ips* species have not yet been developed (Chang *et al.*, 2012). Additional work is needed both to demonstrate that DNA sequence records provide accurate	**European Union** Re: "Descriptions and regional keys to the species of Ips based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier et al., 1991; Pfeffer, 1995; Cognato and Sun, 2007)." Two other important keys should be mentioned: Balachowsky A, 1949. Faune de France. 50. Coleoptères Scolytides. Lechevalier, Paris, 320 pp.; Schedl KE, 1981. 91. Familie: Scolytidae	**Incorporated**

#	Para	Text	Comment	SC's response
		identification of the target species and on how to interpret DNA similarity between the target and non-target species.	(Borken- und Ambrosiakäfer). In: Freude H, Harde KW and Lohse GA (eds.). Die Käfer Mitteleuropas. Goecke & Evers, Krefeld. pp. 34–99. *Category : TECHNICAL*	
57	378	The genus *Ips* can be recognized and identified to species by adult external morphology. Adult structures are illustrated in Figures 5 and 6. Descriptions and regional keys to the species of *Ips* based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier *et al.*, 1991; Pfeffer, 1995; Cognato and Sun, 2007). A generic key to Scolytinae larvae of eastern Canada is available (Thomas, 1957) but juvenile stages are only partially identifiable morphologically on a global scale. Although *Ips* species have been discovered and identified using DNA sequence data (Cognato and Sun, 2007), validated protocols for universal DNA identification of *Ips* species have not yet been developed (Chang *et al.*, 2012). Additional work is needed ~~both~~ to demonstrate that both DNA sequence records provide accurate identification of the target species and on how to interpret DNA similarity between the target and non-target species.	**Ghana** *Category : EDITORIAL*	**Modified** Text modified to provide clearer explanation of what is needed.
58	378	The genus *Ips* can be recognized and identified to species level by adult external morphology. Adult structures are illustrated in Figures 5 and 6. Descriptions and regional keys to the species of *Ips* based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier *et al.*, 1991; Pfeffer, 1995; Cognato and Sun, 2007). A generic key to Scolytinae larvae of eastern Canada is available (Thomas, 1957) but juvenile stages are only partially identifiable morphologically on a global scale. Although *Ips* species have been discovered and identified using DNA sequence data (Cognato and Sun, 2007), validated protocols for universal DNA identification of *Ips* species have not yet been developed (Chang *et al.*, 2012). Additional work is needed both to demonstrate that DNA sequence records provide accurate identification of the target species and on how to interpret DNA similarity between the target and non-target species.	**Ghana** *Category : SUBSTANTIVE*	**Incorporated**
59	378	The genus *Ips* can be recognized and identified to species by adult external morphology. Adult structures are illustrated in Figures 5 and 6. Descriptions and regional keys to the species of *Ips* based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier *et al.*, 1991; Pfeffer, 1995; Cognato and Sun, 2007). A generic key to Scolytinae larvae of eastern Canada is available	**EPPO** Descriptions and regional keys to the species of Ips based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier et al., 1991; Pfeffer, 1995; Cognato and Sun, 2007)." Two other important keys should be mentioned:	**Incorporated**

#	Para	Text	Comment	SC's response
		(Thomas, 1957) but juvenile stages are only partially identifiable morphologically on a global scale. Although *Ips* species have been discovered and identified using DNA sequence data (Cognato and Sun, 2007), validated protocols for universal DNA identification of *Ips* species have not yet been developed (Chang *et al.*, 2012). Additional work is needed both to demonstrate that DNA sequence records provide accurate identification of the target species and on how to interpret DNA similarity between the target and non-target species.	Balachowsky A, 1949. Faune de France. 50. Coleoptères Scolytides. Lechevalier, Paris, 320 pp. Schedl KE, 1981. 91. Familie: Scolytidae (Borken- und Ambrosiakäfer). In: Freude H, Harde KW and Lohse GA (eds.). Die Käfer Mitteleuropas. Goecke & Evers, Krefeld. pp. 34–99. *Category : TECHNICAL*	
60	378	The genus *Ips* can be recognized and identified to species by adult external morphology. Adult structures are illustrated in Figures 5 and 6. Descriptions and regional keys to the species of *Ips* based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier *et al.*, 1991; Pfeffer, 1995; Cognato and Sun, 2007). A generic key to Scolytinae larvae of eastern Canada is available (Thomas, 1957) but juvenile stages are only partially identifiable morphologically on a global scale. Although *Ips* species have been discovered and identified using DNA sequence data (Cognato and Sun, 2007), validated protocols for universal DNA identification of *Ips* species have not yet been developed (Chang *et al.*, 2012). Additional work is needed both to demonstrate that DNA sequence records provide accurate identification of the target species and on how to interpret DNA similarity between the target and non-target species.	**EPPO** Jean-Claude Grégoire:"Descriptions and regional keys to the species of Ips based on morphology are available (Kurenzov and Kononov, 1966; Grüne, 1979; Wood, 1982; Holzschuh, 1988; Lanier et al., 1991; Pfeffer, 1995; Cognato and Sun, 2007)." Two other important keys should be mentioned: Balachowsky A, 1949. Faune de France. 50. Coleoptères Scolytides. Lechevalier, Paris, 320 pp. Schedl KE, 1981. 91. Familie: Scolytidae (Borken- und Ambrosiakäfer). In: Freude H, Harde KW and Lohse GA (eds.). Die Käfer Mitteleuropas. Goecke & Evers, Krefeld. pp. 34–99. *Category : TECHNICAL*	**Incorporated**
61	388	Antennae (Figures 5, and 8(e) to ~~(f))~~ (g)) are geniculate (bent or elbowed) with: a long basal ~~segment~~segment (the scape); an angled junction with a series of one to seven bead-like antennomeres (the funicle); and a compressed 3-segmented apical club (intersegmental sutures visible or not).	**European Union** Technical comment - wrong citation of figures. *Category : TECHNICAL*	**Incorporated**
62	388	Antennae (Figures 5, and 8(e) to ~~(f))~~ (g)) are geniculate (bent or elbowed) with: a long basal ~~segment~~segment (the scape); an angled junction with a series of one to seven bead-like antennomeres (the funicle); and a compressed 3-segmented apical club (intersegmental sutures visible or not).	**EPPO** Technical comment - wrong citation of figures *Category : TECHNICAL*	**Incorporated**
63	389	The head anterior to the eyes is not elongated into a snout (Figures 6, and 8(a) to ~~(c))~~(d)). A snout or rostrum is present in most other Curculionidae (weevils).	**European Union** Technical comment - wrong citation of figures. *Category : TECHNICAL*	**Incorporated**

#	Para	Text	Comment	SC's response
64	389	The head anterior to the eyes is not elongated into a snout (Figures 6, and 8(a) to ~~(c))~~(d)). A snout or rostrum is present in most other Curculionidae (weevils).	**EPPO** wrong citation of figures *Category : TECHNICAL*	**Incorporated**
65	397	Compound eye (Figures 5, and 8(a) to ~~(c))~~ (d)) sinuate (narrowed at mid-height), ventral half narrower than dorsal part.	**European Union** Technical comment - wrong citation of figures. *Category : TECHNICAL*	**Incorporated**
66	397	Compound eye (Figures 5, and 8(a) to ~~(c))~~ (d)) sinuate (narrowed at mid-height), ventral half narrower than dorsal part.	**EPPO** Wrong citation of figures *Category : TECHNICAL*	**Incorporated**
67	398	Antennal scape (basal segment) slender elongate, funicle 5-segmented, club either obliquely truncate or sutures on posterior face strongly displaced toward apex (Figures 5, and ~~8(d)~~ 8(e) to ~~(f))~~(g)).	**European Union** Technical comment - wrong citation of figures. *Category : TECHNICAL*	**Incorporated**
68	398	Antennal scape (basal segment) slender elongate, funicle 5-segmented, club either obliquely truncate or sutures on posterior face strongly displaced toward apex (Figures 5, and ~~8(d)~~ 8(e) to (f)).	**Japan** Editorial *Category : EDITORIAL*	**Modified** **Incorporated change but also corrected 8(f) to 8(g).**
69	398	Antennal scape (basal segment) slender elongate, funicle 5-segmented, club either obliquely truncate or sutures on posterior face strongly displaced toward apex (Figures 5, and ~~8(d)~~ 8(e) to ~~(f))~~(g)).	**EPPO** Wrong citation of figures *Category : TECHNICAL*	**Incorporated**
70	399	Pronotum (Figures 5 and 10) is not maginate in the basal margin and strongly declivous on anterior portion and has short transberse asperities arranged in concenric rows on the anterior half (posterior half approximately horizontal, anterior half descends abruptly), with large asperities (broad spines).	**Viet Nam** As follow reference: Nobuchi, A. 1974. Studies on Scolytidae XII. The bark beetles of the tribe Ipini in Japan (Coleoptera). Bull. Gov. For. Exp. Sta.266:33–60 *Category : SUBSTANTIVE*	**Considered, but not incorporated** The requested change would follow species description text and not be beneficial for the intended use of completing a diagnosis. The text regarding concentric rows is not helpful for diagnosis and not appropriate for the protocol.
71	403	Elytral declivity moderately sulcate to strongly excavated, sides with tubercles or spines in most (Figures 7 and ~~12)~~12) and possesses two to five distinct teeth on each side.	**Viet Nam** As follow reference: Nobuchi, A. 1974. Studies on Scolytidae XII. The bark beetles of the tribe Ipini in Japan (Coleoptera). Bull. Gov. For. Exp. Sta.266:33–60 *Category : SUBSTANTIVE*	**Considered, but not incorporated** This addition is redundant as spines are already mentioned. Note that teeth are in a socket in scolytinae, e.g on forelegs.
72	408	Body length 2.1–6.9 mm ~~(most~~ (except sexdentatus; most are larger than 3 mm). Other Ipini are 1.0–4.3 mm long.	**Japan** Body length of I. sexdentatus is described as 4.5 to 8.0mm in para 500. *Category : TECHNICAL*	**Modified** To correct error the range of body length is adjusted to state 2.1-8.0 mm.
73	411	*Ips* is ~~most~~ almost like two other Ipini genera that also inhabit Pinaceae: *Orthotomicus* Ferrari, 1867 and *Pseudips* Cognato, 2000. *Ips* can be	**Ghana**	**Modified**

#	Para	Text	Comment	SC's response
		distinguished from *Orthotomicus* by the pointed second spine of its elytral declivity (right-angled in many *Orthotomicus*) and the broader explanate edge of its elytral declivity (Figure 12(f) vs 12(g)). *Ips* can be distinguished from *Pseudips* by its straight, bisinuate or acutely angulate antennal club sutures (Figure 8(e) to (g)). These sutures are broadly procurved (curved away from the antennal base at the midline of the club) in *Pseudips*, and also in the tropical, angiosperm feeding *Acanthotomicus* Blandford, 1894 and the warm-climate, ambrosia feeding *Premnobius* Eichhoff, 1878. *Pityogenes* Bedel, 1888 and *Pityokteines* Fuchs, 1911 are conifer-feeding Ipini, recognized by their small size (1.8–3.7 mm) and the rounded edges of their elytral declivity. The tropical, ambrosia fungus feeding *Premnophilus* Brown, 1962 lacks visible antennal sutures.	*Category : EDITORIAL*	"Ips is most similar in appearance to two other Ipini genera…."
74	412	Most *Ips* species are grouped into subgenera based on phylogenetic results by Cognato and Vogler (2001) and Cognato and Sun (2007). Diagnostic characteristics (external morphology only) of subgenera are as follows: *Cumatotomicus* Ferrari, body length >5 mm, spines on first and second elytral intervals on declivity; *Bonips* Cognato, elytral declivity with four spines per side, elytral disc without punctures on intervals; *Granips* Cognato, elytral declivity with 5–6 spines per side; *Ips* DeGeer, elytral declivity with four spines per side, elytral disc without punctures on intervals; ~~*insertae*~~ <u>*incertae*</u> *sedis*, several *Ips* species outside any named subgenus. It is not necessary to identify to subgenus level in order to identify *Ips* species.	**European Union** Typo (please see paragraph 515). *Category : EDITORIAL*	**Incorporated**
75	412	Most *Ips* species are grouped into ~~subgenera~~ <u>subgenera,</u> based on phylogenetic results by Cognato and Vogler (2001) and Cognato and Sun (2007). Diagnostic characteristics (external morphology only) of subgenera are as follows: *Cumatotomicus* Ferrari, body length >5 mm, spines on first and second elytral intervals on declivity; *Bonips* Cognato, elytral declivity with four spines per side, elytral disc without punctures on intervals; *Granips* Cognato, elytral declivity with 5–6 spines per side; *Ips* DeGeer, elytral declivity with four spines per side, elytral disc without punctures on intervals; *insertae sedis*, several *Ips* species outside any named subgenus. It is not necessary to identify to subgenus level in order to identify *Ips* species.	**Ghana** *Category : EDITORIAL*	**Incorporated**
76	412	Most *Ips* species are grouped into subgenera based on phylogenetic results by Cognato and Vogler (2001) and Cognato and Sun (2007). Diagnostic characteristics (external morphology only) of subgenera are as	**EPPO** Typo (please see paragraph 515). *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
		follows: *Cumatotomicus* Ferrari, body length >5 mm, spines on first and second elytral intervals on declivity; *Bonips* Cognato, elytral declivity with four spines per side, elytral disc without punctures on intervals; *Granips* Cognato, elytral declivity with 5–6 spines per side; *Ips* DeGeer, elytral declivity with four spines per side, elytral disc without punctures on intervals; ~~*insertae*~~ *incertae* *sedis*, several *Ips* species outside any named subgenus. It is not necessary to identify to subgenus level in order to identify *Ips* species.		
77	424	– Sutures of antennal club weakly to strongly bisinuate (Figure 8(e) to (g)); elytral declivity with all spines in line with edge of declivity (Figures 7, 10 and 12), second declivital spine acute in lateral profile; explanate apex of declivity wider than length of second declivital spine (Figure 12(f)). Body length 2.1–6.9 ~~mm.………………………………………………………………………………………~~mm(except I. sexdentatus).………………………………………………………………………………………….***Ips***	**Japan** Body length of I. sexdentatus is described as 4.5 to 8.0mm in para 500. *Category : TECHNICAL*	**Modified.** Range is corrected.
78	425	***4.1.6 Species identification of* Ips *adults***	**New Zealand** Could the author(s) state how these closely related species can be differentiated? Can molecular methods assist? Could references be recommended tht provide identification keys to identify no-target Ips (as stated in this key) that do cause economic damage? Such keys could be used worldwide by biosecurity agencies. *Category : TECHNICAL*	**Modified.** General references are provided in section 4 for identification of non-targets. The two closely related species can be separated but only by using character examination outside the scope of the current protocol. These are mentioned in section 4.1.8. DNA methods (Cognato et al 1995, Cognato & Sun 2007, and Stauffer etal. 2001) can be used to assist experts in identification, but these are not appropriate for a general IPPC protocol until methods have been documented and verified. These species identifications must be performed by specialists with proper reference material and data. An additional sentence is added to section 4.1.6 concerning this status.
79	425	***4.1.6 Species identification of* Ips *adults***	**China** It is now 20 years from 1997, The pest status	**Modified.**

#	Para	Text	Comment	SC's response
		Only 14 species (21 species though described in the key) were selected as targets based on their pest status according to a reference of 1997 from CABI and EPPO. We suggest that some species like Ips perturbatus, I. emarginatus, I. pilifrons, I. spinifer, I. woodi, I. hunter, I. khausi better be marked out instead of abbreviated as Non-Target species in the key.	may change a great deal dut to the development of world trade. For instance, The AQCIQ often intercepted I. perturbatus from timbers from Canada. *Category : SUBSTANTIVE*	The selection of target and non target species in the diagnostic protocol is based on a series of discussions and reviews by the experts. The request to include names of non targets in the key is consistent with this approach and should provide additional information to diagnosticians. These names are now included in key where appropriate.
80	426	Diagnostic characters of *Ips* spp. adults are based on key characters and diagnostic notes in Cognato (2015). The closely-related (Cognato and Sun, 2007) species *I. confusus* and *I. paraconfusus*, and also *I. cembrae* and *I. subelongatus*, are not fully distinguished from each other in the key to species. This may have little effect on biological interpretation because these pairs are also similar biologically (Cognato, 2015). The 14 species treated in this protocol as target species (section 4.1.8) were selected as targets based on their known pest status (CABI and EPPO, 1997). However, other *Ips* can also cause tree mortality, especially if introduced outside their native ranges.	**European Union** Comment on: "and also I. cembrae and I.◦subelongatus, are not fully distinguished from each other in the key to species.This may have little effect on biological interpretation because these pairs are also similar biologically (Cognato, 2015)." Stauffer et al. (2001) provide molecular tools for identifying Ips cembrae from Ips subelongatus. This is important because Ips cembrae is a regulated pests in the EU, whilst Ips subelongatus does not exist in the EU, and vectors pathogenic fungi different from those vectored by Ips cembrae (Stauffer et al. 2001). *Category : SUBSTANTIVE*	**Modified.** The text has been modified to state that ID is important and to explain what options are available for identification using morphology or DNA. In both cases access to expertise and reference material is required. These methods are considered outside the scope of the current protocol. Note that Stauffer et al. (2001) did not load all sequences generated in the study and the ICU82589 accession is not for *I. subelongatus* (as reported). Therefore, it is not possible to compare new data to the original method.
81	426	Diagnostic characters of *Ips* spp. adults are based on key characters and diagnostic notes in Cognato (2015). The closely-related (Cognato and Sun, 2007) species *I. confusus* and *I. paraconfusus*, and also *I. cembrae* and *I. subelongatus*, are not fully distinguished from each other in the key to species. This may have little effect on biological interpretation because these pairs are also similar biologically (Cognato, 2015). The 14 species treated in this protocol as target species (section 4.1.8) were selected as targets based on their known pest status (CABI and EPPO, 1997). However, other *Ips* can also cause tree mortality, especially if introduced outside their native ranges.	**EPPO** Comment on "and also I. cembrae and I.◦subelongatus, are not fully distinguished from each other in the key to species.This may have little effect on biological interpretation because these pairs are also similar biologically (Cognato, 2015)." Stauffer et al. (2001) provide molecular tools for identifying Ips cembrae from Ips subelongatus. This is important because Ips cembrae is a regulated pests in the EU, whilst Ips subelongatus does not exist in the EU, and vectors pathogenic fungi different from those vectored by Ips cembrae (Stauffer et al. 2001)	**Modified.** The text has been modified to state that ID is important and to explain what options are available for identification using morphology or DNA. In both cases access to expertise and reference material is required. These methods are considered outside the scope of the current protocol. Note that Stauffer et al. (2001) did not load all sequences

#	Para	Text	Comment	SC's response
			Category : SUBSTANTIVE	generated in the study and the ICU82589 accession is not *for I. subelongatus* (as reported). Therefore, it is not possible to compare new data to the original method.
82	461	16. Frons with central fovea weak or absent.............................**NT including *I. hoppingi* Lanier**	**New Zealand** Could this feature be imaged to show difference between weak as opposed to impressed? *Category : TECHNICAL*	**Modified.** This character has been difficult to photograph. No images are available that can demonstrate this. Additional text is included to help define state.
83	463	17. Elytral declivity with third spine pointed (Figure 14(a) to (c), acute or subacute)………………...~~1~~**18**	**European Union** Bold. *Category : EDITORIAL*	**Incorporated**
84	463	17. Elytral declivity with third spine pointed (Figure 14(a) to (c), acute or subacute)………………...~~1~~**18**	**EPPO** Bold. *Category : EDITORIAL*	**Incorporated**
85	466	– Frons with median tubercle separated from epistoma by distance equal to or more than half its diameter (Figure 8(a)), central carina present (Figure 8(a)) or absent..***I. montanus* (Eichhoff), part** (NT)	**New Zealand** Could a pointer be used to show the reader where the epistoma or the epistoma process is? Reader could be confused in thinkg the frontal tubecles are the epistoma. *Category : TECHNICAL*	**Modified.** An arrow has been included to note the epistoma. The text of the key in Section 4.1.7 has been modified. It now states: "Frons with median tubercle (Figure 8(a), circled) separated from epistoma (Figure 8(a), arrow) by distance equal to or more than half its diameter, central carina present (Figure 8(b)) or absent"
86	478	– Elytral declivity with distance between first and second spines greater than or equal to height of first spine…………………………………………………………………………………………………**25** 25. Elytral declivity with separation of the bases of the second and third spines……………………………***I. hauseri* Reitter** - Elytral declivity with close proximity of the bases of the second and third spines............................**26**	**Japan** Ips hauseri should also be described in this section. (Reference) 1.CABI PlantProtectionCompendium Ips duplicatus Description Adult Line 3rd-4th(http://www.cabi.org/isc/datasheet/28823 accessed on Aug. 21, 2017.) 2.CABI Plant Protection Compendium Ips hauseri Description Adult 2nd paragraph Line 6th.(http://www.cabi.org/isc/datasheet/28826 accessed on Aug. 21, 2017.) 3.Fernando E. Vega and Richard W. Hofstetter. 2015. BARK BEETLES, biology and ecology of native and invasive species. Academic Press.363pp.	**Modified.** The comment is correct. The key has been revised to include *I. hauseri*.

#	Para	Text	Comment	SC's response
			Category : TECHNICAL	
87	479	~~25~~26. Elytral declivity with third spine tapered and acute (Figure 14(a)), or straight-sided with tapered or rounded apex (Figure 14(b))………………………………………..***I. duplicatus* (Sahlberg) (some ♀)**	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
88	481	~~26~~27. Elytral disc without punctures between striae (Figure 13(c))……………………………………...**~~27~~28**	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
89	482	– Elytral disc with punctures on interstriae (Figure 13(d))…………………………………………….**~~30~~31**	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
90	483	~~27~~28. Elytral declivity with third spine evenly tapered (Figure 14(a)) or emarginate at apex (Figure 14(d))…………………………………………………………… ……..**non-target (NT) species**	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
91	484	– Elytral declivity with third spine pedunculate (Figure 14(c)) or straight-sided with tapered apex (Figure 14(b))…………………………………………………………… …………………………….**~~28~~29**	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
92	485	~~28~~29. Elytral declivity with matt appearance (Figure 12(c)); if declivity shiny then frons with median tubercle up to three times tubercle diameter from base of epistomal setae, frons median tubercle not connected to epistoma by carina, elytral declivity with third spine pedunculated…………………………………...***I. typographus* (Linnaeus) and *I. nitidus* Eggers** (NT)	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
93	486	– Elytral declivity shiny (Figure 12(b)) and frons with median tubercle two to three times tubercle diameter from base of epistomal setae, frons median tubercle connected to epistoma by carina or not, and elytral declivity with third spine pedunculate or ~~not……………………………………………….~~not…………………………………………….30~~29~~	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
94	487	~~29~~30. Head with median frontal tubercle connected to epistomal tubercle (Figure 8(a), requires magnification >50× and diffuse light)……………………………………***I. bonanseai* (Hopkins)** (NT)	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**
95	489	~~30~~31. Head without median epistomal carina; frons median tubercle separated from base of epistomal setae by at least twice its diameter (Figure 8(a)), median fovea present, vertex with many coarse punctures; elytral declivity with third spine straight-sided with acute apex, or pedunculate	**Japan** Editorial *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
		(Figure 14(c))……………………………………………….***I. duplicatus*** **(Sahlberg) (♂ & most ♀)**		
96	493	**Subgenus *Bonips*** According to the descriptions of Ips pini by Wood, elytral interstriae of this species smooth, shining, impuncate, usually each with one or two punctures near declivital margin. Therefore, the description in this paper: "lacks punctures on elytral intervals 2 and 3 near the midlength of the disc" is not entirely corrected. According to Congnato's view, this species lacks a major median tubercle on its frons. However, the photo of paratype specimen provided by internet, frons of this species is with a median tubercle. Please see http://www.barkbeetles.info/photos_target_species.php?lookUp=1725&image=MCZ-ENT00001023_Tomicus_rectus_hef&curPage=0. So, we suggest that authors of this paper provide all photos of the species belonging to the subgenus Bonips. The photos include head in frontal view and elytra in dorsal view.	**China** Please refer to Wood (1986):Page 692; Cognato(2015):page 365. *Category : SUBSTANTIVE*	**Considered, but not incorporated.** The impunctate intervals are clearly and correctly described by defining midlength in the protocol. It is true that Cognato was incorrect about frons of *Ips pini*. This eror was not followed in the protocol. Addition of photos of all *Bonips* spp. will not improve use of the diagnostic protocol for Ips pests.
97	494	~~*Ips*~~ *I. pini* (Say, 1826) (Figure 7). Main hosts: *Pinus* spp. Diagnosis: ~~*Ips*~~ *I. pini* has four spines on the elytral declivity, and lacks punctures on elytral intervals 2 and 3 near the midlength of the disc. Body length: 3.0 to 4.5 mm. ~~*Ips*~~ *I. pini* should be diagnosed using the key or a full description that includes interspecific variation and sexual dimorphism. This species differs from the related species *I. avulsus* and *I. bonanseai* as follows:	**European Union** *Category : EDITORIAL*	**Incorporated**
98	494	~~*Ips*~~ *I. pini* (Say, 1826) (Figure 7). Main hosts: *Pinus* spp. Diagnosis: ~~*Ips*~~ *I. pini* has four spines on the elytral declivity, and lacks punctures on elytral intervals 2 and 3 near the midlength of the disc. Body length: 3.0 to 4.5 mm. ~~*Ips*~~ *I. pini* should be diagnosed using the key or a full description that includes interspecific variation and sexual dimorphism. This species differs from the related species *I. avulsus* and *I. bonanseai* as follows:	**EPPO** *Category : EDITORIAL*	**Incorporated**
99	497	~~*Ips*~~ *I. plastographus* (Eichhoff, 1868), (*I. p. plastographus* (LeConte) and *I. p. maritimus* Lanier), (Figures 8(a) and 12(j)). Main hosts: *Pinus contorta* and *P. muricata*. Diagnosis: This species has four spines on the elytral declivity and is similar to *I. pini* (Figure 7). Body length: 3.5 to 6.5 mm. ~~*Ips*~~ *I. plastographus* lacks a frontal carinate elevation and differs from the related species *I. integer* as follows:	**European Union** *Category : EDITORIAL*	**Incorporated**
100	497	~~*Ips*~~ *I. plastographus* (Eichhoff, 1868), (*I. p. plastographus* (LeConte) and *I. p. maritimus* Lanier), (Figures 8(a) and 12(j)). Main hosts: *Pinus contorta* and *P. muricata*. Diagnosis: This species has four spines on the elytral declivity and is similar to *I. pini* (Figure 7). Body length: 3.5 to	**EPPO** *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
		6.5 mm. ~~*Ips*~~ *I. plastographus* lacks a frontal carinate elevation and differs from the related species *I. integer* as follows:		
101	500	~~*Ips*~~ *I. sexdentatus* (Boerner, 1767) (Figure 10(d)). Main hosts: *Pinus* spp. and *Picea* spp. Diagnosis: ~~*Ips*~~ *I. sexdentatus* has six spines on the elytral declivity. This species differs from all other *Ips* spp. in having the largest spine in the fourth position (Figure 10(d)). Body length: 4.5 to 8.0 mm. This Palaearctic species is not closely related to the North American six-spined species *I. calligraphus* (Figure 12(a)) and *I. apache*, which have the largest spine in the third position.	**European Union** *Category : EDITORIAL*	**Incorporated**
102	500	~~*Ips*~~ *I. sexdentatus* (Boerner, 1767) (Figure 10(d)). Main hosts: *Pinus* spp. and *Picea* spp. Diagnosis: ~~*Ips*~~ *I. sexdentatus* has six spines on the elytral declivity. This species differs from all other *Ips* spp. in having the largest spine in the fourth position (Figure 10(d)). Body length: 4.5 to 8.0 mm. This Palaearctic species is not closely related to the North American six-spined species *I. calligraphus* (Figure 12(a)) and *I. apache*, which have the largest spine in the third position.	**EPPO** *Category : EDITORIAL*	**Incorporated**
103	502	~~*Ips*~~ *I. calligraphus* (Germar, 1824) (Figure 12(a)). Main hosts: *Pinus* spp. Diagnosis: ~~*Ips*~~ *I. calligraphus* has six spines on the elytral declivity (Figure 12(a)) and its general appearance is like *I. apache*. Body length: 3.5 to 7.0 mm. This species differs from *I. sexdentatus* in that the third declivital spine of *I. calligraphus* is the largest. It is distinguished from other *Ips* spp. by the presence of three spines beyond the third declivital spine. It differs from *I. apache* (Lanier *et al.*, 1991) in the distance between the ridges of the pars stridens and by being a larger size, with a pronotal width of 2.0 to 2.1 mm (1.6 mm in *I. apache*).	**European Union** *Category : EDITORIAL*	**Incorporated**
104	502	~~*Ips*~~ *I. calligraphus* (Germar, 1824) (Figure 12(a)). Main hosts: *Pinus* spp. Diagnosis: ~~*Ips*~~ *I. calligraphus* has six spines on the elytral declivity (Figure 12(a)) and its general appearance is like *I. apache*. Body length: 3.5 to 7.0 mm. This species differs from *I. sexdentatus* in that the third declivital spine of *I. calligraphus* is the largest. It is distinguished from other *Ips* spp. by the presence of three spines beyond the third declivital spine. It differs from *I. apache* (Lanier *et al.*, 1991) in the distance between the ridges of the pars stridens and by being a larger size, with a pronotal width of 2.0 to 2.1 mm (1.6 mm in *I. apache*).	**EPPO** *Category : EDITORIAL*	**Incorporated**
105	503	~~*Ips*~~ *I. confusus* (LeConte, 1876) (Figure 10(b)). Main hosts: *Pinus edulis* and *P. monophylla*. Diagnosis: ~~*Ips*~~ *I. confusus* has five spines on the elytral declivity. Body length: 3.0 to 5.5 mm. ~~This species is a sibling to *I. hoppingi*, which is diagnosable by the distance between the ridges of~~	**European Union** Redundant with paragraph 504. *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
		~~the pars stridens~~ This protocol does not reliably distinguish ~~(Lanier, 1970) and by DNA sequence data (Cognato and Sun, 2007). This protocol does not reliably distinguish~~ *I. confusus* from *I. paraconfusus*. ~~*Ips*~~ *I.* *confusus* differs from *I. paraconfusus* in the distance between the ridges of the pars stridens.		
106	503	~~*Ips confusus*~~*I. confusus* (LeConte, 1876) (Figure 10(b)). Main hosts: *Pinus edulis* and *P. monophylla*. Diagnosis: ~~*Ips*~~ *I.* *confusus* has five spines on the elytral declivity. Body length: 3.0 to 5.5 mm~~. This species is a sibling to~~ ~~*I. hoppingi*, which is diagnosable by the distance between the ridges of the pars stridens~~ This protocol does not reliably distinguish ~~(Lanier, 1970) and by DNA sequence data (Cognato and Sun, 2007). This protocol does not reliably distinguish~~ *I. confusus* from *I. paraconfusus*. ~~*Ips*~~ *I.* *confusus* differs from *I. paraconfusus* in the distance between the ridges of the pars stridens.	**EPPO** Redundant with paragraph 504. *Category : EDITORIAL*	**Incorporated**
107	505	~~*Ips*~~ *I.* *montanus* (Eichhoff, 1881). Differs from *I. confusus* and *I. paraconfusus* in the absence of the frontal fovea; the male major median frontal tubercle displaced from the epistoma; and some specimens are larger, 4.6–5.4 mm.	**European Union** *Category : EDITORIAL*	**Incorporated**
108	505	~~*Ips*~~ *I.* *montanus* (Eichhoff, 1881). Differs from *I. confusus* and *I. paraconfusus* in the absence of the frontal fovea; the male major median frontal tubercle displaced from the epistoma; and some specimens are larger, 4.6–5.4 mm.	**EPPO** *Category : EDITORIAL*	**Incorporated**
109	506	~~*Ips*~~ *I.* *paraconfusus* Lanier, 1970. Main hosts: *Pinus attenuata*, *P. coulteri*, *P. jeffreyi*, *P. lambertiana* and *P. ponderosa*. Diagnosis: Body length: 3.5 to 5.0 mm. This species has five spines on the elytral declivity and is most like *I. confusus* (Figure 10(b)). The *Ips* species that are most similar to *I. paraconfusus* differ from it as follows: *I. confusus* differs in characters of the pars stridens (not presented here); *I. montanus* has more and larger frontal punctures, lacks a median frontal fovea, the male major median frontal tubercle is displaced from the epistoma, and some specimens are larger, 4.6–5.4 mm; and *I. hoppingi* is only partly distinguishable from *I. paraconfusus* by methods presented here.	**European Union** *Category : EDITORIAL*	**Incorporated**
110	506	~~*Ips paraconfusus*~~*I. paraconfusus* Lanier, 1970. Main hosts: *Pinus attenuata*, *P. coulteri*, *P. jeffreyi*, *P. lambertiana* and *P. ponderosa*. Diagnosis: Body length: 3.5 to 5.0 mm. This species has five spines on the elytral declivity and is most like *I. confusus* (Figure 10(b)). The *Ips* species that are most similar to *I. paraconfusus* differ from it as follows: *I. confusus* differs in characters of the pars stridens (not presented here);	**EPPO** *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
		I. montanus has more and larger frontal punctures, lacks a median frontal fovea, the male major median frontal tubercle is displaced from the epistoma, and some specimens are larger, 4.6–5.4 mm; and *I. hoppingi* is only partly distinguishable from *I. paraconfusus* by methods presented here.		
111	507	~~*Ips*~~ *I.* *grandicollis* (Eichhoff, 1868) (Figures 8(c, g), 12(b), 15). Main hosts: *Pinus* spp. Diagnosis: Body length: 2.5 to 5.0 mm. There are five spines on the elytral declivity and its general appearance is like *I. confusus* (Figure 10(b)). This species differs from *I. confusus* in that declivital spine 1 is closer to the second spine than to the suture, and from *I. cribricollis* in the width of the female pars stridens and the presence of a central fovea on the male frons in *I. grandicollis* (Lanier, 1987).	**European Union** *Category : EDITORIAL*	**Incorporated**
112	507	~~*Ips*~~ *I.* *grandicollis* (Eichhoff, 1868) (Figures 8(c, g), 12(b), 15). Main hosts: *Pinus* spp. Diagnosis: Body length: 2.5 to 5.0 mm. There are five spines on the elytral declivity and its general appearance is like *I. confusus* (Figure 10(b)). This species differs from *I. confusus* in that declivital spine 1 is closer to the second spine than to the suture, and from *I. cribricollis* in the width of the female pars stridens and the presence of a central fovea on the male frons in *I. grandicollis* (Lanier, 1987).	**EPPO** *Category : EDITORIAL*	**Incorporated**
113	508	~~*Ips*~~ *I.* *lecontei* Swaine, 1924 (Figure 12(i)). Main hosts: *Pinus ponderosa* and *P. pseudostrobus*. Diagnosis: Body length: 3.5 to 5.0 mm. This species has five spines on the elytral declivity and is most like *I. confusus* (Figure 10(b)). This species differs from all other species with five declivital spines in having a pair of median frontal tubercles on the epistoma (Figure 8(d)).	**European Union** *Category : EDITORIAL*	**Incorporated**
114	508	~~*Ips*~~ *I.* *lecontei* Swaine, 1924 (Figure 12(i)). Main hosts: *Pinus ponderosa* and *P. pseudostrobus*. Diagnosis: Body length: 3.5 to 5.0 mm. This species has five spines on the elytral declivity and is most like *I. confusus* (Figure 10(b)). This species differs from all other species with five declivital spines in having a pair of median frontal tubercles on the epistoma (Figure 8(d)).	**EPPO** *Category : EDITORIAL*	**Incorporated**
115	510	~~*Ips*~~ *I.* *amitinus* (Eichhoff, 1872) (Figure 10(a)). Main hosts: *Picea* spp. and *Pinus* spp. Diagnosis: ~~*Ips*~~ *I.* *amitinus* has four spines on the elytral declivity. Body length: 3.5 to 5.0 mm. This species differs from all other Eurasian *Ips* spp. in that the antennal club sutures are nearly straight (as in Figure 8(e)). Body length: 3.5 to 5.0 mm. It differs from the morphologically similar North American *I. perroti* (2.5 to 3.5 mm) in its larger size.	**European Union** *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
116	510	~~*Ips*~~ *I.* *amitinus* (Eichhoff, 1872) (Figure 10(a)). Main hosts: *Picea* spp. and *Pinus* spp. Diagnosis: ~~*Ips*~~ *I.* *amitinus* has four spines on the elytral declivity. Body length: 3.5 to 5.0 mm. This species differs from all other Eurasian *Ips* spp. in that the antennal club sutures are nearly straight (as in Figure 8(e)). Body length: 3.5 to 5.0 mm. It differs from the morphologically similar North American *I. perroti* (2.5 to 3.5 mm) in its larger size.	**EPPO** *Category : EDITORIAL*	**Incorporated**
117	511	~~*Ips*~~ *I.* *cembrae* (Heer, 1836) (Figure 12(l)). Main hosts: *Larix* spp. Diagnosis: Body length: 4.0 to 6.5 mm. ~~*Ips*~~ *I.* *cembrae* has four spines on the elytral declivity and is most like *I. typographus* (Figure 10(e)). This species differs from *I. typographus* by having a shiny elytral declivity and interstrial punctures of the elytral disc. It differs from the morphologically similar North American *Picea*-feeding species and *I. woodi* in the space between the first and second spines, which is less than the length of the first spine in *I. cembrae*. It differs from its sister-species *I. subelongatus* in its less setose elytral declivity, but these species are best diagnosed using DNA data.	**European Union** *Category : EDITORIAL*	**Incorporated**
118	511	~~*Ips cembrae*~~*I. cembrae* (Heer, 1836) (Figure 12(l)). Main hosts: *Larix* spp. Diagnosis: Body length: 4.0 to 6.5 mm. ~~*Ips*~~ *I.* *cembrae* has four spines on the elytral declivity and is most like *I. typographus* (Figure 10(e)). This species differs from *I. typographus* by having a shiny elytral declivity and interstrial punctures of the elytral disc. It differs from the morphologically similar North American *Picea*-feeding species and *I. woodi* in the space between the first and second spines, which is less than the length of the first spine in *I. cembrae*. It differs from its sister-species *I. subelongatus* in its less setose elytral declivity, but these species are best diagnosed using DNA data.	**EPPO** *Category : EDITORIAL*	**Incorporated**
119	512	~~*Ips*~~ *I.* *subelongatus* (Motschulsky, 1860) (Figure 12(k)). Main hosts: *Larix* spp. Diagnosis: There are four spines on the elytral declivity. Body length: 4.0 to 6.5 mm. This species differs from *I. typographus* (Figure 10(e)) in having a shiny elytral declivity and interstrial punctures of the elytral disc. This species differs morphologically from *I. cembrae* only slightly, in having a more densely setose elytral declivity. It differs from the morphologically similar North American *Picea*-feeding species and *I. woodi* in the space between the first and second spines, which is less than the length of the first spine in *I. subelongatus*.	**European Union** *Category : EDITORIAL*	**Incorporated**
120	512	~~*Ips subelongatus*~~*I. subelongatus* (Motschulsky, 1860) (Figure 12(k)). Main hosts: *Larix* spp. Diagnosis: There are four spines on the elytral	**EPPO** *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
		declivity. Body length: 4.0 to 6.5 mm. This species differs from *I. typographus* (Figure 10(e)) in having a shiny elytral declivity and interstrial punctures of the elytral disc. This species differs morphologically from *I. cembrae* only slightly, in having a more densely setose elytral declivity. It differs from the morphologically similar North American *Picea*-feeding species and *I. woodi* in the space between the first and second spines, which is less than the length of the first spine in *I. subelongatus*.		
121	513	~~*Ips*~~ *I.* *duplicatus* (Sahlberg, 1836) (Figure 10(c)). Main hosts: *Picea* spp. Diagnosis: ~~*Ips*~~ *I.* *duplicatus* has four spines on the elytral declivity. Body length: 2.5 to 4.5 mm. This species differs from many other *Ips* spp. in the position of the first spine of the elytral declivity, which is closer to the elytral suture than to the second spine. It differs from the morphologically similar Himalayan species, North American *Picea*-feeding species and *I. woodi*, in having a sparsely granulate frons. This species differs from the similar *I. hauseri* (Figure 12(h)) in the close proximity of the bases of spines 2 and 3 in *I. duplicatus* (less than the distance between the first and second spines).	**European Union** *Category : EDITORIAL*	**Incorporated**
122	513	~~*Ips duplicatus*~~ *I. duplicatus* (Sahlberg, 1836) (Figure 10(c)). Main hosts: *Picea* spp. Diagnosis: ~~*Ips*~~ *I.* *duplicatus* has four spines on the elytral declivity. Body length: 2.5 to 4.5 mm. This species differs from many other *Ips* spp. in the position of the first spine of the elytral declivity, which is closer to the elytral suture than to the second spine. It differs from the morphologically similar Himalayan species, North American *Picea*-feeding species and *I. woodi*, in having a sparsely granulate frons. This species differs from the similar *I. hauseri* (Figure 12(h)) in the close proximity of the bases of spines 2 and 3 in *I. duplicatus* (less than the distance between the first and second spines).	**EPPO** *Category : EDITORIAL*	**Incorporated**
123	514	~~*Ips*~~ *I.* *typographus* (Linnaeus, 1758) (Figure 10(e)). Main hosts: *Picea* spp. Diagnosis: ~~*Ips*~~ *I.* *typographus* has four spines on the elytral declivity. Body length: 3.5 to 5.5 mm. This species differs from most other species in its dull elytral declivity (in most specimens) and impunctate interstriae on the basal half of the elytral disc. ~~*Ips*~~ *I.* *nitidus* can be distinguished from most *I. typographus* specimens by its shiny declivity, and all specimens can be distinguished by phylogenetic analysis of DNA (Cognato and Sun, 2007). It differs from the morphologically similar Himalayan species, North American *Picea*-feeding species and *I. woodi* in having a major median frontal tubercle.	**European Union** *Category : EDITORIAL*	**Incorporated**

#	Para	Text	Comment	SC's response
124	514	~~*Ips*~~ *I.* *typographus* (Linnaeus, 1758) (Figure 10(e)). Main hosts: *Picea* spp. Diagnosis: ~~*Ips typographus*~~*I. typographus* has four spines on the elytral declivity. Body length: 3.5 to 5.5 mm. This species differs from most other species in its dull elytral declivity (in most specimens) and impunctate interstriae on the basal half of the elytral disc. ~~*Ips*~~ *I.* *nitidus* can be distinguished from most *I. typographus* specimens by its shiny declivity, and all specimens can be distinguished by phylogenetic analysis of DNA (Cognato and Sun, 2007). It differs from the morphologically similar Himalayan species, North American *Picea*-feeding species and *I. woodi* in having a major median frontal tubercle.	**EPPO** *Category : EDITORIAL*	**Incorporated**
125	516	~~*Ips*~~ *I.* *hauseri* Reitter, 1894 (Figure 12(h)). Main hosts: *Picea* spp. Diagnosis: Body length: 3.5 to 5.5 mm. There are four spines on the elytral declivity and its general appearance is like *I. duplicatus* (Figure 10(c)). This species differs from all other European *Ips* spp. in the position of the first spine of the elytral declivity, which is closer to the elytral suture than to the second spine. It differs from the morphologically similar Himalayan species, North American *Picea*-feeding species and *I. woodi* by having a sparsely granulate frons. This species differs from its sister species *I. duplicatus* in the separation of the bases of the second and third spines (nearly equal to the distance between the first and second spines in *I. hauseri*).	**European Union** *Category : EDITORIAL*	**Incorporated**
126	516	~~*Ips hauseri*~~*I. hauseri* Reitter, 1894 (Figure 12(h)). Main hosts: *Picea* spp. Diagnosis: Body length: 3.5 to 5.5 mm. There are four spines on the elytral declivity and its general appearance is like *I. duplicatus* (Figure 10(c)). This species differs from all other European *Ips* spp. in the position of the first spine of the elytral declivity, which is closer to the elytral suture than to the second spine. It differs from the morphologically similar Himalayan species, North American *Picea*-feeding species and *I. woodi* by having a sparsely granulate frons. This species differs from its sister species *I. duplicatus* in the separation of the bases of the second and third spines (nearly equal to the distance between the first and second spines in *I. hauseri*).	**EPPO** *Category : EDITORIAL*	**Incorporated**
127	542	~~**6. Contact points for further information**~~	**Viet Nam** This section move to Appendix 1 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
128	543	~~Further information on this protocol can be obtained from:~~	**Viet Nam** This para move to Appendix 1 *Category : EDITORIAL*	**Considered, but not incorporated**

#	Para	Text	Comment	SC's response
				The current format is in line with the IPPC protocol's format
129	544	~~Michigan State University, 288 Farm Lane, Room 243 Natural Science Building, East Lansing, MI 48824, United States of America (Anthony I. Cognato; e-mail: cognato@msu.edu, telephone: +1-517-432-2369).~~	**Viet Nam** This para move to Appendix 1 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
130	545	~~NPPO–NL, Ministry of Economic Affairs, NVWA (Dutch Food and Consumer Product Safety Authority), National Reference Centre, Geertjesweg 15, 6706 EA, Wageningen, Netherlands (Brigitta Wessels-Berk; e-mail:b.f.wessels@nvwa.nl; telephone: +31 317 49 68 35, +31 (0) 88 2232941).~~	**Viet Nam** This para move to Appendix 1 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
131	546	~~Canadian National Collection of Insects, Arachnids and Nematodes, Agriculture and Agri-Food Canada, K.W. Neatby Building, 960 Carling Avenue, Ottawa, Ontario, K1A0C6, Canada; (Hume Douglas; e-mail: hume.douglas@canada.ca; telephone: +1-613-759-7128).~~	**Viet Nam** This para move to Appendix 1 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
132	547	~~Norwegian Institute of Bioeconomy Research, Division of Biotechnology and Plant Health, Box 115, N-1431 Ås, Norway (Torstein Kvamme; e-mail: Torstein.Kvamme@nibio.no), telephone: +47 915 73 942).~~	**Viet Nam** This para move to Appendix 1 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
133	548	~~A request for a revision to a diagnostic protocol may be submitted by national plant protection organizations (NPPOs), regional plant protection organizations (RPPOs) or Commission on Phytosanitary Measures (CPM) subsidiary bodies through the IPPC Secretariat (ippc@fao.org), which will in turn forward it to the Technical Panel on Diagnostic Protocols (TPDP).~~	**Viet Nam** This para move to Appendix 1 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
134	549	~~**7. Acknowledgements**~~	**Viet Nam** This section move to Appendix 2 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
135	550	~~The first draft of this protocol was written by Hume Douglas (Agriculture and Agri-food Canada, Canada (see preceding section)), with content from Anthony I. Cognato (Michigan State University, United States of America (see preceding section)), and editing by Brigitta Wessels-Berk (Netherlands Food and Consumer Product Safety Authority, Netherlands (see preceding section)) and Norman Barr (United States Department of Agriculture, Animal and Plant Health Inspection Service, United States of America). K. Savard (Agriculture and Agri-Food Canada, Canada) provided additional images.~~	**Viet Nam** This para move to Appendix 2 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format

#	Para	Text	Comment	SC's response
136	551	~~Thanks are also due to the reviewers of this protocol, including: Bjørn Økland (Norwegian Institute of Bioeconomy Research, Norway), Torstein Kvamme (Norwegian Institute of Bioeconomy Research (see preceding section)), Hiroaki Shirato (Ministry of Agriculture, Forestry and Fisheries, Yokohama Plant Protection Station, Japan) and Graham S. Thurston (Canadian Food Inspection Agency, Canada).~~	**Viet Nam** This para move to Appendix 2 *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format
137	577	**Meng, X., Lu, Q., Liu, X., Jiao, X., Liang, J. & Zhang, X.** 2015. The species specific associations between *Ips subelongatus* and ophiostomatoid fungi. *Acta Ecologica Sinica*, 35: 313–323. Nobuchi, A. 1974. Studies on Scolytidae XII. The bark beetles of the tribe Ipini in Japan (Coleoptera). Bull. Gov. For. Exp. Sta.266:33–60	**Viet Nam** *Category : EDITORIAL*	**Considered, but not incorporated** This reference is not cited in text.
138	585	~~**9.**~~ ~~**Figures**~~	**European Union** *Category : EDITORIAL*	**Considered, but not incorporated** The current format is in line with the IPPC protocol's format. This text was removed from para 607 (see comment 141).
139	597	**Figure 5.** Morphology of an adult bark beetle (*Dendroctonus valens*) in dorsal view.	**Japan** Ips spp. should be shown instead of Dendroctonus valens in this figure. *Category : TECHNICAL*	**Considered, but not incorporated** This figure provides general morphology of bark beetle.
140	600	**Figure 6.** Morphology of an adult bark beetle (*Dendroctonus valens*) in ventral view.	**Japan** Ips spp. should be shown instead of Dendroctonus valens in this figure. *Category : TECHNICAL*	**Considered, but not incorporated** This figure provides general morphology of bark beetle.
141	607	~~**9.**~~ ~~**Figures**~~	**EPPO** *Category : EDITORIAL*	**Incorporated**