

Exon 1

ATGGGGTATGTTCTATTCTCACCCGTTGCCCTCTCGTTCATCAGCAGCATCTTCATCGTCCCTTTGGTCCCTTCAGGAATCGAGGCTGCCGTGATCCGACGCCCAATCCGCCAGCTATTGCTCAT  
M G

Intron 1

Exon 2

GCTAACCACATATGCTACAGTAAGGAGGAGAACCCCGCATATCAAGTTAAGGATCATATCGATCCGCCGCTCCATTAAGGCTCTGGCTGCTGCCCTTCGTCCAACTCGAAGAAGCATCGGAGCT  
K E E K P H I N

Intron 2

EF2F → EF1F

Exon 3

TGGGCTTGCAATATACATACTGGGACTCTTTCCCTAACTCTCTTTCTACAGGTCGTGGTCATCGGCCACGTCGACTCCGGCCACGTCGACTCCGGCAAGTCTACGACTACCGGGTCACTCCAGTTCGGTATCGAC  
V V V I G H V D S G K S T T T G H L I Y Q C G G I D

←

AAGCGTACCATCGAGAAGTTCGAGAAGGTTTCGTTTTTCCCTCTTGCTGCATCTACCTTACCCTACTGCACACGACACGTCCTCCCTTTTTCATTATCAGAATGTGGGGTTGGAGGGG  
K R T I E K F E K

Intron 3

CAAATCCTTCCCTGCTTCTGGCTTGTGGAACCTTGAAAATTTTTGGGGCGTCAAGTTCCAAAGCACAATCATCTTGGTGCACGGACCAACACAGATCCAACCCCAACCCCATACTCTATTATTACGG  
C A A T C C T T C C C T G C T T C T G G C T T G T G G A A C C T G A A A A T T T T T G G G G C G T C A A G T T C C A A G C A C A A C C A C C A C C C A C C C A T A C T C T A T T A T T A C C G

Exon 4

CATCTATCCCCACCTGCTTAGCATTTAGATTTGCCGCTAACACCCAAACCAGGAAGCCGCTGAGCTGGCCAAAGGGCTCTTCAAGTAGCGCATGGGTTCTTGACAAGCTCAAGGCCGAGCGGTGAGCG  
E A A E L G K G S F K Y A W V L D K L K A E R E R

Exon 5

CGGTATCACCATCGATAICGCTCTTGGGAAGTTCGAGACCCCAAGTACTACCGTCACTGACCTCCCGGTACCCGTTCAATCAAGAACAATGATCACGGGCACGTCGCAAGGCCGACTGC  
G I T I D I A L W K F E T P K Y V T V I D A P G H R D F I K N M I T G T S Q A D C

GCTATCCTGATCATTGCTGCTGCGTACGGGTGAGTTCGAGGCTGGTATCTCCAAGGATGGCCAGACCCCGGAGCACGCCCTCTGGCTTACCCCTGACCCCTTGGTGTCCGGCAGCTCAATTGTCGCCAATCAACA  
A I L I I A A G T G E F E A G I S K D G Q T R E H A L L A Y T L G V R Q L I V A I N

AGATGGACACCACCAAGTGGTCTGAGGCCGTTACCAGGAGATCAAGGAGACCTCCAACTTCAAGAAGTGGCTACACCCCAAGACCCTTGGCTTTGTGCCATCTCCGGCTTCAACC  
K M D T T K W S E A R Y Q E I I K E T S N F I K K V G Y N P K T V A F V P I S G F N

GGACAACATGCTGGCTGCC TCCACCAACTGGCCCTGGTACAAAGGCTGGGAGAAGGAGGGCAAGCGGCAAGACTCTGCTTGAAGCCATCGATGCTGTGAGATGCCCAA  
G D N M L A A S T N C P W Y K G W E K E G K S G K T L L E A I D A V E M P K

GCGCCCCACCGACAAAGCCCTGCTGCCCCCTCCAGGACGCTTACAAGATTGGCGGTATCGGCACAGTCCCGGTATCGAGACGGGCATCAACAAGCCCGGTATGGTGTGTCACCTTCGC  
R P T D K P L R L P L Q D V Y K I G G I G T V P V G R I E T G I I K P G M V V T F A

TCCCTCCAACGTCACCACGGAAAGTCAAGTCCGTCGAGATGCACCACGAGCAGCTTACCGAGGGTGTCCCGGTGACAACGTCGGCTTCAACGTCGAAGAACGTCCTCCGTCGAAGGAGATCCGCTCGT  
P S N V T T E V K S V E M H H E Q L T E G V P G D N V G F N V K N V S V K E I R R

GTAAAGTCCGCGGTGACAGCAAGAACGACCCCGCCATGGCCGCTGCTTCAACGCTCAGGTCATGTCTGAACCAACCCCGTCAAGGTCAGGTCGGCTTCTGGACTGCCAC  
G N V A G D S K N D P P M G A A S F N A Q V I V L N H P G Q V G A G Y A P V L D C H

ACTGCCACATTCGCGGAGATCCTTGAGAAGATCGACCGCCGTCACCGGCAAGTCGGTTGAGAACAACCCCAAGTTCATCAAGTCTGGTGCACCCCGCCATCGTCAAGCTGGTGGC  
T A H I A C K F A E I L E K I D R R T G K S V E N N P K F I K S G D A A I V K L V P

CTCCAAGCCCCATGTGCGTTGAGGCCCTCACCGACTACCCGCCCCCTGGCCGCTTCCGCGTCCGCTGACATGGCCAGACCCGTTGCCGTCATCAAGTCCGTCGAGAAGGCCCGCTGCTGGTGC  
S K P M C V E A F T D Y P P L G R F A V R D M R Q T V A V G V I K S V E K A A A G A

CGCCAAAGTCAACCAAGTCGGCTGCCAAGGCTGCCAAGAAATAG  
C G C C A A A G T C A A C C A A G T C G G C T G C C A A G G C T G C C A A G A A A T A G

A K V T K S A A K A A K K \*  
A K V T K S A A K A A K K \*

**Online Resource 4** Annotated map of the complete translation elongation factor 1 alpha gene of *Grosmanmia clavigera* (isolate kw1407), based on the genome sequence (GL629769) by Digiustini et al. (2011). The map was constructed by Yin et al. (2014) and the annotated sequence redeposited in Genbank as KP171177. Primers used by for amplification in the study by Yin et al. (2014) are indicated with arrows. # indicates the position of intron 4 absent in *G. clavigera*, but present in some other species in the Ophiostomatales (De Beer and Wingfield 2013). \* represents the stop codon.

De Beer ZW, Wingfield MJ (2013) Emerging lineages in the Ophiostomatales. In: Seifert KA, De Beer ZW, Wingfield MJ (eds) The Ophiostomatoid fungi: Expanding Frontiers. CBS Press, Utrecht, The Netherlands, pp 21-46

Digiustini S, Wang Y, Liao NY, et al. (2011). Genome and transcriptome analyses of the mountain pine beetle-fungal symbiont *Grosmanmia clavigera*, a lodgepole pine pathogen. PNAS 108:2504-2509.

Yin M, Duong TA, Wingfield MJ, Zhou XD, De Beer ZW (2014). Taxonomy and phylogeny of the *Leptographium procerum* complex, including *L. sinense* sp. nov. and *L. longiconidlophorum* sp. nov. Antonie van Leeuwenhoek doi:10.1007/s10482-014-0351-9