Oceanitalea nanhaiensis Fu et al. 2012 is a later heterotypic synonym of Georgenia satyanarayanai Srinivas et al. 2012

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Oceanitalea nanhaiensis JLT1488T was compared with Georgenia satyanarayanai KCTC 19802T to clarify the taxonomic relationship of both species because they are phylogenetically highly related. 16S rRNA gene sequence comparisons demonstrated that these species share 99.6 % sequence similarity. Investigation of fatty acid patterns and substrate utilization profiles displayed no striking differences of the type strains of both species. DNA–DNA hybridizations between both strains showed a 100 % similarity clearly demonstrating that both strains are members of a single species. Due to priority Oceanitalea nanhaiensis is reclassified as Georgenia satyanarayanai, based on the estimated phylogenetic position derived from 16S rRNA gene sequence data, fatty acid, polar lipid and biochemical data, and DNA–DNA hybridization results.

Oceanitalea nanhaiensis was proposed by Fu et al. (2012) as a novel genus represented by the type strain JLT1488T isolated from the South China Sea. In the same issue of the IJSEM, but a few pages before, Georgenia satyanarayanai was described by Srinivas et al. (2012) for an organism isolated from a soda lake in Lonar, India. Both species were described nearly at the same time and their names both appeared in Notification List No. 62 (Euzéby, 2013). Soon after the publication of both studies, it became obvious that these species were closely related on the basis of 16S rRNA gene sequencing for both strains (JLT1488T and G. satyanarayanai KCTC 19802T) and came to the same results. The phylogenetic tree was calculated with the maximum-likelihood algorithm using RAxML (Stamatakis, 2006) with GTR-GAMMA and rapid bootstrap analysis with 100 replications in ARB (Ludwig et al., 2004) using the LTPs database (version LTPs123; September 2015). The results of the phylogenetic analysis is shown in Fig. 1. The strains were placed within the monophyletic cluster containing all type strains of the genus Georgenia. A further comparative phenotypic analysis with the characteristics of the genus Georgenia, these chemotaxonomic characteristics were re-analysed as well. Quinones and polar lipids were extracted according to the integrated method reported by Tindall (1990a, b) and Altenburger et al. (1996). HPLC equipment for analysis of quinones and polar lipids were prepared, separated and identified according to the instructions of Microbial Identification System (MIDI; Microbial ID, Kämpfer & Kroppenstedt, 1996). The fatty acid profiles of the two strains are shown in Table 1. The fatty acid results obtained for O. nanhaiensis JLT1488T in this study were clearly different from those reported by Fu et al. (2012), but were in general congruence with the profiles reported for Georgenia species (Altenburger et al., 2002; Li et al., 2007; Hamada et al., 2009; Kämpfer et al., 2010; Tang et al., 2010; Woo et al., 2012; Wang et al., 2015). Although the reported quinone system and polar lipid profile of O. nanhaiensis JLT1488T (Fu et al., 2012) were well in congruence with the characteristics of the genus Georgenia, these chemotaxonomic characteristics were re-analysed as well. Quinones and polar lipids were extracted according to the integrated method reported by Tindall (1990a, b) and Altenburger et al. (1996). HPLC equipment for analysis of quinones...
was reported by Stolz et al. (2007). Whereas Fu et al. (2012) reported for *O. nanhaiensis* JLT1488\(^\text{T}\) only menaquinone MK-8(H\(_4\)) we found a quinone system consisting of MK-8(H\(_4\)) (75.2 %), MK-7(H\(_4\)) (24.2 %) and MK-9(H\(_4\)) (0.5 %). The polar lipid profiles (Fig. 2) consisted of the major compounds diphosphatidylglycerol, phosphatidylglycerol, phosphatidylinositol, a phosphatidylinositol-mannoside PIM1 and an unidentified phosphoglycolipid PGL1. In addition minor amounts of a phosphatidylinositolmannoside PIM2, an unidentified phosphoglycolipid PGL2, two polar lipids were only detectable after total lipid staining with a yellow pigment. This polar lipid profile can be only roughly compared to that of *O. nanhaiensis* JLT1488\(^\text{T}\) (Fu et al., 2012) because the authors only listed the detected polar lipids without showing an image. However, we also detected in *O. nanhaiensis* JLT1488\(^\text{T}\) the lipids diphosphatidylglycerol, phosphatidylglycerol, phosphatidylinositol, phosphatidylinositol mannosides whereas the unknown glycolipid and phospholipid were not detected. On the other hand, the unidentified two phosphoglycolipids (PGL1, 2) and the two lipids L1, L2 were not reported currently with both type strains, *O. nanhaiensis* JLT1488\(^\text{T}\) and *G. satyanarayanai* KCTC 19802\(^\text{T}\) we found a quinone system consisting of MK-7(H\(_4\)) (75.2 %), MK-7(H\(_4\)) (24.2 %) and MK-9(H\(_4\)) (0.5 %). The polar lipid profile (Fig. 2) was different from that of *O. nanhaiensis* JLT1488\(^\text{T}\) (Fu et al., 2012). The polar lipid profile of *G. satyanarayanai* KCTC 19802\(^\text{T}\) (Fig. 2) was different from that of *O. nanhaiensis* JLT1488\(^\text{T}\) only by the absence of minor lipid L2 and presence of minor lipids L3 and L4. Hence, the polar lipid profiles reflect very well the very close relatedness of *G. satyanarayanai* KCTC 19802\(^\text{T}\) and *O. nanhaiensis* JLT1488\(^\text{T}\).

Physiological/biochemical tests were also performed concurrently with both type strains, *O. nanhaiensis* JLT1488\(^\text{T}\) and *G. satyanarayanai* KCTC 19802\(^\text{T}\), with the methods as described previously (Kämpfer et al., 1991).

Both strains shared the following biochemical characteristics: Aesculin, p-nitrophenyl-\(\alpha\)-D-glucopyranoside, p-nitrophenyl-
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Emended description of the species
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The characteristics of this species are as described by Srinivas et al. (2012), with the following amendment. Results of carbon substrate utilization depend heavily on the method. With the method of Kämper et al. (1991) the following carbon sources were utilized: N-acetylglucosamine, L-arabinose, L-arbutin, cellobiose, D-fructose, D-galactose, D-glucanate, D-glucose, D-mannose, maltose, sucrose, D-ribose, trehalose, D-xyllose, maltitol, D-mannitol, D-sorbitol and fumarate. Major fatty acids are 15:0 anteiso, 16:0, 15:1 anteiso A, 14:0 and 17:0 anteiso.

The type strain is KCTC 19802T (=NBRC 107612T). Strain JLT1488 (JCM 17755=CGMCC 1.10826) is a second strain of this species.

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References


