

***Undaria pinnatifida* (Fucophyceae, Laminariales) spread in the central Mediterranean: its occurrence in the Mar Piccolo of Taranto (Ionian Sea, southern Italy)**

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(Received 4 May 1999, accepted 28 January 2000)

Abstract — The present short note reports the occurrence of the brown alga *Undaria pinnatifida* (Harvey) Suringar in the Mar Piccolo of Taranto (Ionian Sea, central Mediterranean, southern Italy), an enclosed basin subject to domestic and industrial pollution. © 2000 Adac/Éditions scientifiques et médicales Elsevier SAS

benthic marine brown algae / biogeography / Phaeophyceae / Mediterranean Sea / *Undaria pinnatifida*

Résumé — *Undaria pinnatifida* (Fucophyceae, Laminariales) s'étend en Méditerranée centrale: cette espèce est présente en Mar Piccolo de Taranto (mer Ionienne, Italie du sud). La présente note rapporte la présence de l'algue brune *Undaria pinnatifida* (Harvey) Suringar en Mar Piccolo de Taranto (mer Ionienne, Méditerranée centrale, Italie du sud), un bassin fermé soumis à une pollution d'origine domestique et industrielle. © 2000 Adac/Éditions scientifiques et médicales Elsevier SAS

algues brunes marines benthiques / biogéographie / Phaeophyceae / mer Méditerranée / *Undaria pinnatifida*

INTRODUCTION AND OBSERVATIONS

The present paper reports the occurrence of the brown alga *Undaria pinnatifida* (Harvey) Suringar in the Mar Piccolo of Taranto (Ionian Sea, southern Italy), an enclosed basin subject to domestic and industrial pollution (Cardellicchio *et al.*, 1991).

The laminarian kelp *U. pinnatifida*, belonging to the family of Alariaceae, is native to Japan where it is called 'wakame' and is extensively cultivated for food. It was reported outside its region of origin for the first time in Etang de Thau, a lagoon on the French Mediterranean coast (Pérez *et al.*, 1981; Boudouresque *et al.*, 1985) where it was probably introduced accidentally with Pacific oyster to be cultivated there. Subsequently, in 1983 it was transplanted to the coasts of Brittany for its commercial importance (Pérez *et al.*, 1984). In recent years many additional findings have been reported and *U. pinnatifida* is now present in several localities of the world (Fig.1).

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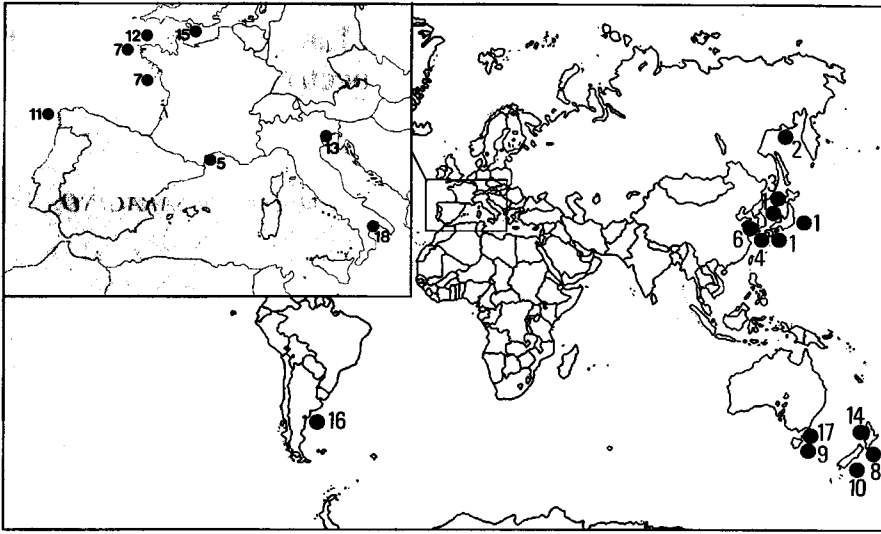


Fig. 1. Distribution of *Undaria pinnatifida* throughout the world and in particular (frame) in Europe. (1. Suringar, 1873; 2. Zinova, 1954; 3. Funahashi, 1966; 4. Kang, 1966; 5. Perez *et al.*, 1981; 6. Tseng, 1983; 7. Perez *et al.*, 1984; 8. Hay & Luckens, 1987; 9. Sanderson, 1990; 10. Hay, 1990; 11. Santiago-Caamano *et al.*, 1990; 12. Castric-Fey *et al.*, 1993; 13. Rismondo *et al.*, 1993; 14. Brown & Lamare, 1994; 15. Fletcher & Manfredi, 1995; 16. Casas & Piriz, 1996; 17. Campbell & Burridge, 1998; 18. This paper).

The Ionian sea population included plants of different sizes that were growing only on a restricted area of the wharf of the old city of Taranto and on ropes and pebbles lying in the nearby muddy bottom, from the upper sublittoral to a depth of 1.5 m. The longest specimens were slightly greater than 1 m in length, similar to those found in the other Mediterranean localities (Boudouresque *et al.*, 1985; Knoepffler-Peguy *et al.*, 1990; Curiel *et al.*, 1994). All the mature thalli were stocky with wide blades and short stipes. Nevertheless, plants exhibited a great morphological variability, a feature of the species described by many authors (*e.g.* Kito *et al.*, 1981; Castric-Fey *et al.*, 1999). Blades were more or less deeply indented, with pinnae of different width and length (Figs 2a–d).

Voucher specimens, including specimens presented in Fig. 2, were deposited at the herbarium of the Istituto Talassografico in Taranto.

DISCUSSION

Introduced species have recently been regarded as a potential cause of reducing biodiversity (Walker & Kendrick, 1998). The marine vegetation of the Mar Piccolo is already very poor due to the effects of pollution (Cecere *et al.*, 1991), and it is unlikely that the introduction of *U. pinnatifida* will cause any further damage. This is because the basin does not support a substantial attached community (Cecere *et al.*, 1992) and therefore the large canopy-forming *U. pinnatifida* might play a positive ecological role by providing food and shelter to many organisms. In fact, several algae and animals (*i.e.* Bryozoans, Ascidiaceans, Hydrozoans, mussel larvae, eggs of both squids and other

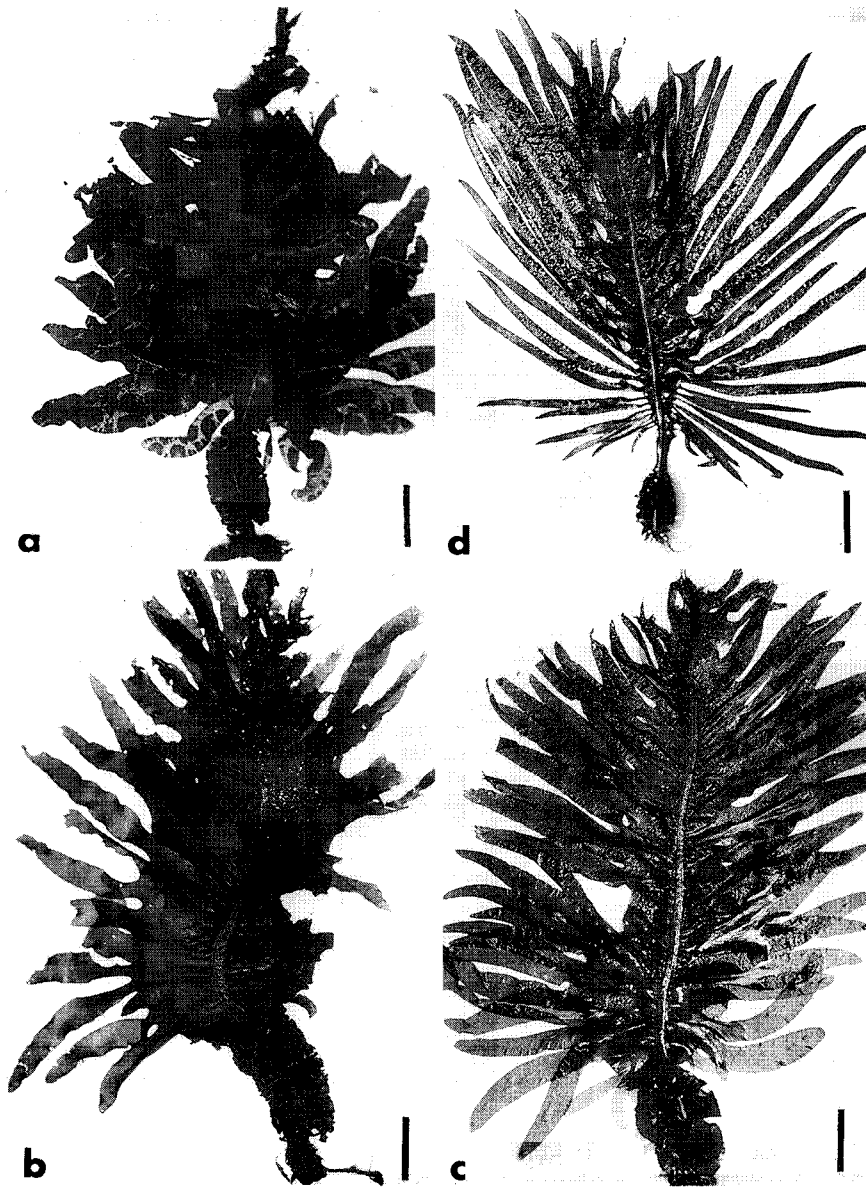


Fig. 2 a–d. Different morphs of *U. pinnatifida* from the Mar Piccolo of Taranto. The specimens are deposited at the herbarium of the Istituto Talassografico in Taranto. The specimen showed in Fig. 2d lacks its distal part. a: scale bar = 6.7 cm; b: scale bar = 9.9 cm; c: scale bar = 9 cm; d: scale bar = 6 cm.

molluscs) were found as epiphytes on both the blade and the holdfast of specimens of any size. On the other hand, the introduction of *U. pinnatifida* might be a problem for the local mussel (*Mytilus galloprovincialis* Lamarck) cultivation. In fact, as the local mussel

breeders use horizontally suspended ropes to collect mussel juveniles to be cultivated, *U. pinnatifida* zoospores might compete for the substrate with mussel larvae, as occurs in the Etang de Thau, where the large plants can foul the cultivation ropes (Verlaque, 1994).

The introduction of *U. pinnatifida* into the Mar Piccolo is certainly very recent, as the species is present in the basin at one site only, and is probably due to the importation of the Japanese oyster *Crassostrea gigas* (Thunberg) from France. Local mussel breeders reported that the imported oysters were covered by *U. pinnatifida* thalli which, most likely, were accidentally thrown into the sea by the mussel breeders themselves.

With the present finding, the distribution of *U. pinnatifida*, previously limited to the northern Mediterranean zone (Boudouresque *et al.*, 1985; Knoepffler-Peguy *et al.*, 1990; Rismondo *et al.*, 1993), is extended to the central zone.

RÉFÉRENCES

- BOUDOURESQUE C.F., GERBAL F. & KNOEPFFLER-PEGUY M., 1985 — L'algue japonaise *Undaria pinnatifida* (Phaeophyceae, Laminariales) en Méditerranée. *Phycologia* 24: 364–366.
- BROWN M.T. & LAMARE M.D., 1994 — The distribution of *Undaria pinnatifida* (Harvey) Suringar within Timaru harbour, New Zealand. *The Japanese Journal of Phycology (Sôru)* 42: 63–70.
- CAMPBELL S.J. & BURRIDGE T.R., 1998 — Occurrence of *Undaria pinnatifida* (Phaeophyta Laminariales) in Port Phillip Bay, Victoria, Australia. *Marine Freshwater Research* 49: 379–381.
- CARDELLICCHIO N., ANNICCHIARICO C., LEONE G., MARRA C., PATERNO P., PIRAINO S. & RAGONE P., 1991 — I mari di Taranto: problematiche di impatto ambientale. *Atti della Società Italiana di Ecologia* 12: 769–775.
- CASAS G.N. & PIRIZ M.L., 1996 — Surveys of *Undaria pinnatifida* (Laminariales, Phaeophyta) in Golfo Nuevo, Argentina. *Hydrobiologia* 326/327: 213–215 [In: Lindstrom S. C. & Chapman D. J. (eds), Fifteenth International Seaweed Symposium].
- CASTRIC-FEY A., GIRARD A. & L'HARDY-HALOS M.T., 1993 — The distribution of *Undaria pinnatifida* on the coast of St Malo (Brittany, France). *Botanica Marina* 36: 351–358.
- CASTRIC-FEY A., BEAUPOIL C., BOUCHAIN J., PRADIER E. & L'HARDY-HALOS M.T., 1999 — The introduced alga *Undaria pinnatifida* (Laminariales, Alariaceae) in the rocky shore ecosystem of the St Malo area: morphology and growth of the sporophyte. *Botanica Marina* 42: 71–82.
- CECERE E., CORMACI M. & FURNARI G., 1991 — The marine algae of Mar Piccolo, Taranto (Southern-Italy): a re-assessment. *Botanica Marina* 34: 221–227.
- CECERE E., SARACINO O.D., FANELLI M. & PETROCELLI A., 1992 — Presence of a drifting algal bed in the Mar Piccolo basin, Taranto (Ionian Sea, Southern Italy). *Journal of Applied Phycology* 4: 323–327.
- CURIEL D., RISMONDO A., MARZOCCHI M. & SOLAZZI A., 1994 — Distribuzione di *Undaria pinnatifida* (Harvey) Suringar (Laminariales, Phaeophyta) nella Laguna di Venezia. *Società Veneziana di Scienze Naturali - Lavori* 19: 121–126.
- FLETCHER R.L. & MANFREDI C., 1995 — The occurrence of *Undaria pinnatifida* (Phaeophyceae, Laminariales) on the South Coast of England. *Botanica Marina* 38: 355–358.
- FUNAHASHI S., 1966 — Marine algae from Vladivostok and its vicinity. *Bulletin of the Japanese Society of Phycology* 14: 127–145.
- HAY C.H., 1990 — The dispersal of sporophytes of *Undaria pinnatifida* by coastal shipping in New Zealand, and implications for further dispersal of *Undaria* in France. *British Phycological Journal* 25: 301–313.
- HAY C.H. & LUCKENS P.A., 1987 — The Asian kelp *Undaria pinnatifida* (Phaeophyta, laminariales) found in a New Zealand harbour. *New Zealand Journal of Botany* 25: 364–366.

- KANG J.W., 1966 — On the geographical distribution of marine algae in Korea. *Bulletin of the Pusan Fisheries Collection* 7: 1-136.
- KITO H., TANIGUCHI K. & AKIYAMA K., 1981 — Morphological variation of *Undaria pinnatifida* (Harvey) Suringar. II. Comparison of the thallus morphology of cultured F₁ plants originated from parental types of two different morphologies. *Bulletin Tohoku Region Fisheries Research Laboratory* 42: 11-18.
- KNOEPPFLER-PEGUY M., NOAILLES M.C., BOUDOURESQUE C.F. & ABELARD C., 1990 — Phytobenthos des Pyrénées-Orientales : complément à l'inventaire : présence d'espèces non-indigènes (*Sargassum* et *Undaria*). *Bulletin de la Société zoologique de France* 115: 37-43.
- PÉREZ R., LEE J.Y. & JUGE C., 1981 — Observations sur la biologie de l'algue japonaise *Undaria pinnatifida* (Harvey) Suringar introduite accidentellement dans l'Etang de Thau. *Science et Pêche* 325: 1-12.
- PÉREZ R., KAAS R. & BARBAROUX O., 1984 — Culture expérimentale de l'algue *Undaria pinnatifida* sur les côtes de France. *Science et Pêche* 343: 1-15.
- RISMONDO A., VOLPE S., CURIEL D. & SOLAZZI A., 1993 — Segnalazione di *Undaria pinnatifida* (Harvey) Suringar a Chioggia (Laguna Veneta). *Società Veneziana di Scienze naturali-Lavori* 18: 329-330.
- SANDERSON J.C., 1990 — A preliminary survey of the distribution of the introduced macroalga, *Undaria pinnatifida* (Harvey) Suringar on the east coast of Tasmania, Australia. *Botanica Marina* 33: 153-157.
- SANTIAGO CAAMANO J., DURAN NEIRA C. & ACUNA CASTROVIEJO R., 1990 — Aparición de *Undaria pinnatifida* en las costas de Galicia (España). Un nuevo caso en la problemática de introducción de especies foráneas. *C.I.S., Santiago de Compostela, Informes Técnicos* 3: 1-43.
- SURINGAR W.F.R., 1873 — *Illustration des Algues du Japon*. Musée botanique de Leide, Tome I, pls 26-29: 77-82.
- TSENG C.K., 1983 — *Common seaweeds of China*. Beijing, Science Press, 316 p.
- VERLAQUE M., 1994 — Inventaires des plantes introduites en Méditerranée : origines et répercussion sur l'environnement et les activités humaines. *Oceanologica Acta* 17: 1-23
- WALKER D.I. & KENDRICK G.A., 1998 — Threats to macroalgal diversity: marine habitat destruction and fragmentation, pollution and introduced species. *Botanica Marina* 41: 105-112.
- ZINOVA E.S., 1954 — Wodorosli Ochotskogo Mora. *Trudy Botanicheskogo Instituta Akademii Nauk S S R*, ser 2, 9: 259-310.