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Chemical and Biological Aspects of the Sponge Genus *Dysidea*, A Review[φ]

Y. Venkateswarlu*, P. Ramesh, and N. Srinivasa Reddy

Natural Products Laboratory, Organic Division-I
Indian Institute of Chemical Technology, Hyderabad 500 007, India

Abstract – The chemical constituents and their biological activities of the sponge genus *Dysidea* has been reviewed.

Key words – *Dysidea*, polybrominated diphenyl ethers, chlorinated amino acid derivatives, sequiterpenes, aromatic sesquiterpenes, polyhydroxy steroids.

Introduction

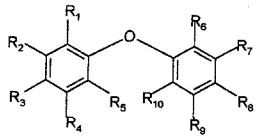
The chemistry of marine natural products has been reviewed time to time covering the literature on isolation and biological activity of secondary metabolites from marine flora and fauna (Faulkner, 1997). Literature survey revealed that the sponges (Porifera) have received increased attention from organic chemist, biochemist and pharmacologist, as sponges yielded variety compounds with unique structural features and high biological activity. The sponges of the genus *Dysidea* (family *Dysididea*, order *Dictyoceratida*) are cosmopolitan in nature, widely distributed throughout the tropical and subtropical waters and can be collected from inter tidal zones to deep waters. To the best of our knowledge, thirteen species of *Dysidea* have been subjected for chemical examination. The chemical examination of the genus *Dysidea*, so far afforded, polybrominated phenyl ethers, chlorinated amino acid derivatives, furano sesquiterpenes and polyhydroxy steroids.

Polybrominated phenyl ethers – The early studies on the sponge *D. herbacea* resulted in isolation of five [**1-5**] Gram positive and Gram negative antibacterial poly brominated diphenyl ethers [**1-5**] (Sharma *et al.*, 1969 and 1972). Subsequently, Carte and Faulkner reported that the sponge *D. herbacea* afforded compounds **1, 2** and a new compound **6** and *D. chlorea* contained only compound **3** (Carte and Faulkner, 1981). The structures of these compounds were determined by the study of spectral data. In the same year R. J. Wells group discovered five new poly brominated diphenyl ethers [**7-12**] from the sponges *D. herbacea* of Great Barrier Reef and Fijian coast (Norton *et al.*, 1981). Compounds **7-12** are related to the diphenyl ethers **1-6**, but differ in that they are all oxygenated on both of the phenyl rings instead of only one. The structures of the new compounds **7-12** have been determined by ^{13}C-spin lattice relaxation data for quaternary carbons (Norton and Wells, 1980). The sponge *D. fragilis* afforded a new hexabromodiphenyl ether **13** and two known brominated diphenyl ethers **1** and **11** (Utkina *et al.*, 1987). An unidentified species of *Dysidea* collected from the Philippines coast afforded a major new diphenyl ether [**14**] (Salva and Faulkner, 1990). A specimen of *Dysidea* sp. from Indo-Pacific Ocean afforded seven known diphenyl ethers [**1, 2, 3, 6, 7, 8** and

*Author for correspondence.

11], five new diphenyl ethers [**15-19**] and simple brominated phenols **25** and **26** (Fu *et al.*, 1995). All new compounds characterized by spectral studies. The sponge *D. herbacea* from Indian Ocean afforded a new tetra bromodiphenyl ether [**20**] (Anjaneyulu *et al.*, 1996). Very recently, four new polybrominated diphenyl ethers [**21-24**] were isolated from the sponge *D. herbacea* from west Sumatra coast, Indonesia (Handayani *et al.*, 1997).

Chlorinated Amino acid derived metabolites and cyclic peptides – The chlorinated metabolites from *Dysidea* show the strongest resemblance to metabolites of blue-green algae. This is particularly true of dysidin [**27**] (Hofneing and Oberhansli, 1977). From *D. herbacea* collected at Townsieille, which is molecule, that bears a striking resemblance to the tetramic acid portion of malyngamide A from *Lyrgbya majuscula* (Cardellina II *et al.*, 1979). The structure of dysidin [**27**] was established by X-ray diffraction analysis. A sample of *D. herbacea* from Cooktown, Australia gave the hexachlorinated metabolite dysidenin [**28**],



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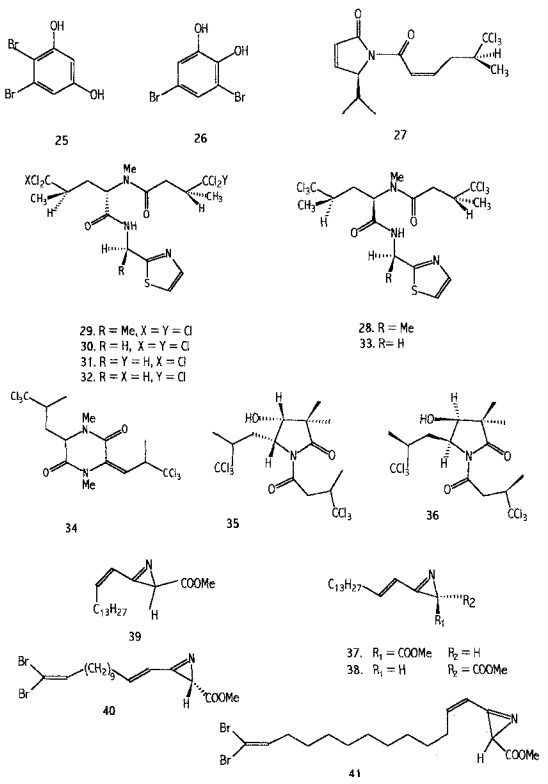
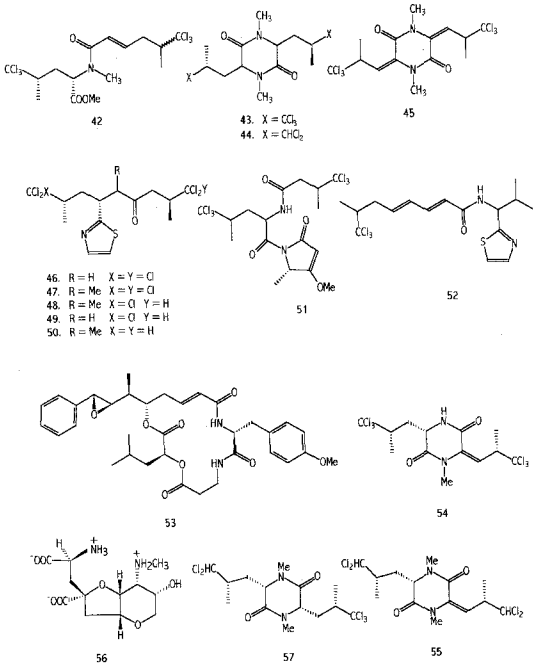
which was reported without stereochemical assignments (Kazlauskas *et al.*, 1977). The sponge *D. herbacea* from Papua-New Guinean, yielded isodysidenin [**29**] (Charles *et al.*, 1978a). The structure of isodysidenin was determined by X-ray analysis and was proposed that dysidenin [**28**] and isodysidenin [**29**] differ in stereochemistry at C-5. The absolute configurations of dysidenin [**28**] and isodysidenin [**29**] were established in 1984 (Biskupiak and Ireland, 1984). Erickson and Wells reported three new isodysidenin derivatives (**30, 31, 32**) and a new dysidenin derivative (**33**) from sponge *D. herbacea* collected near Bowen, Australia (Erickson and Wells, 1982). A diketopiperazine [**34**] derived from trichloro leucine was obtained from a specimen of *D. herbacea* that has been collected from near Gladstone, Australia (Kazlauskas *et al.*, 1978a). Two new hexachloro metabolites dysidamide [**35**] (Gebreyesus *et al.*, 1988), and its isomer **36** (Carmely *et al.*, 1990) have been isolated from a Red Sea sponge *Dysidea* sp. and the structure was determined by spectral studies and X-ray crystallography. Compounds **35** and **36** differ in stereochemistry of hydroxyl and trichloro isobutyl groups. A novel and unique azacycloprane lipid dysidazine [**37**] has been isolated (Molinski and Ireland, 1988) from *D. fragilis* and its structure was determined by using spectral data. Dysidazine is cytotoxic to L 1210 cells at 6.27 μg/ml. Subsequently, four new azacyclo propene derivatives [**38-41**] were isolated by Faulkner *et al.*, from the sponge *D. fragilis* collected from Pohnpei (Salomon *et al.*, 1995). A specimen of *D. herbacea* from the Great Barrier Reef has yielded herbaceamide [**42**] and was identified by chemical and spectroscopic methods (Lee and Molinski, 1992). Three new diketopiperazines, dysamines A [**43**], B [**44**] and C [**45**] were isolated from Hainin Island China (Su *et al.*, 1993). The structure of dysamine A [**43**] was established by X-ray

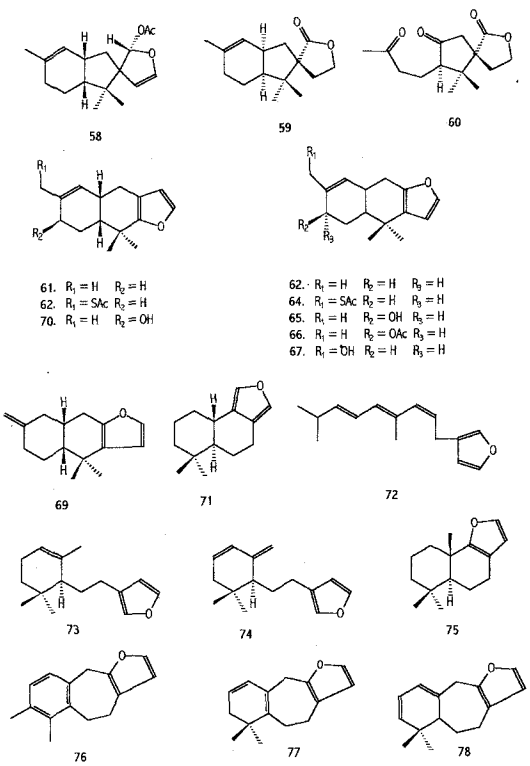




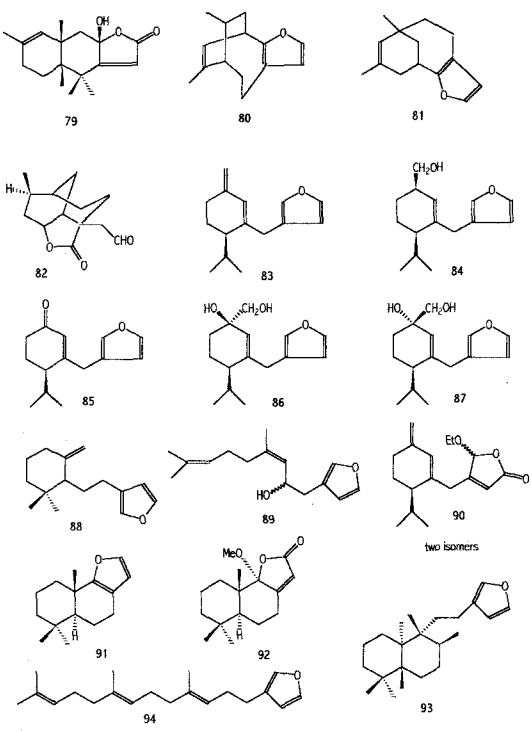
crystallography and those of dysamines B [**44**] and C [**45**] were elucidated by analysis of spectral data. The dysideathiazoles [**46-50**] are a new series of polychlorinated amino acid derivatives from Pacific Island collection of *D. herbacea* (Unson *et al.*, 1993). The structures of the compounds were determined by study of X-ray crystallography and spectral data. The same authors (Unson *et al.*, 1993) isolated an hexachloropyrrolidene derivative, dysidea pyrrolidone [**51**] from *D. herbacea* collected from Palau. Herbamide A [**52**], is a chlorinated amide that was isolated as minor constituent of a Papua New Guinea specimen of *D. herbacea* (Clark and Crews, 1995). Arenaslatin A [**53**] is a cyclic didepsipeptide isolated from Okinawan marine sponge *D. arenaria* and exhibited extremely potent cytotoxicity against KB cells at IC_{50} 5 μg/ml. Its structure was established by the study of spectral data (Kobayashi *et al.*, 1994). New chlorinated metabolites **54** and **55** from tropical marine sponge *D. herbacea* have been isolated. The absolute stereochemistry of **54** was determined by X-ray crystallography analysis (Dumdei *et al.*, 1997). Dysiherbaine [**56**] (Sakai *et al.*, 1997) a *cis* fused hexahydrofuro (**3, 2b**) pyran substituted with amino acid side chain has been isolated from the sponge *D. herbacea*. Compound **56** is neurotoxic to mice and showed no *in vitro* cytoxicity against L 1210 marine leukemia cells and anti-bacterial activity. Dysamide D [**57**] (Xiong *et al.*, 1997) a new diketopiperazine has been isolated from the sponge *D. fragilis* collected in the South China. The structure of dysamide D was determined by spectral data.

Sesquiterpenes – (+)-Spirodysin [**58**] was the first sesquiterpene to be isolated from the sponge *D. herbacea*, that had an unusual spiro-fused ring junction (Kazlauskas *et al.*, 1978b). A related lactone herbadysidolide [**59**] was isolated from a collection of *D. herbacea* together with the minor constituent herbasolide [**60**], which is a nor sesquiterpenoid (Charles *et al.*, 1978b). The structures of both were established by X-ray analysis. A

key reaction in the structure elucidation of spirodysin [**58**] was the $BF_3 \cdot Et_2O$ catalyzed elimination of acetic acid with concomitant rearrangement to obtain 1:1 mixture of furodysin [**61**] and furodysinin [**62**], (optical rotation of the both compounds are not reported) (Kazlauskas *et al.*, 1978c). Subsequently Kazlauskas *et al.* isolated compounds **61** and **62** from the sponge *Dysidea* collected near Sydney, Australia, together with thiofurodysin acetate [**63**] and furodysinin acetate [**64**]. The structures of **61** and **62** were determined by X-ray analysis. The structures of **63** and **64** were confirmed by chemical conversion to **61** and **62** respectively (Kazlauskas *et al.*, 1978c). In 1982, Dunlop *et al.* reported several sesquiterpenoids including furodysinin [**62**], five furodysinin derivatives [**65-69**], a furodysin derivative [**70**], euryfuran [**71**], and a linear sesquiterpene furan [**72**] (Dunlop *et al.*, 1982). Cortes *et al.*, reported absolute configuration of (−) euryfuran (Cortes *et al.*, 1987). The pallescensins, pallescensin-1 [**73**], pallescensin-2 [**74**], pallescensin-A [**75**], (Matsumoto and Usui, 1978), pallescensin-E [**76**] (Baker and Sims, 1981), pallescensin-F [**77**] and pallescensin-G [**78**] (Matsumoto and Usui, 1983) are group of sesquiterpene furans from *D. pallescens*. The structures and absolute configurations were confirmed by synthesis. A collection a *D. etheria* from Bermuda contained furodysinin [**62**] and furodysinin lactone [**79**] (Stephen and Cardellina-II, 1984). Nakafuran-8 [**80**] and nakafuran-9 [**81**] are two furanosesquiterpenes from Hawaian sponge *D. fragilis* (Schulte *et al.*, 1980a). Further, *D. fragilis* yielded a novel sesquiterpene aldehyde upial [**82**] (Schulte *et al.*, 1980b) and penlanfuran [**83**] (Guella *et al.*, 1983). In continuation of work on *D. fragilis* from Brittany (Guella *et al.*, 1985a) afforded six sesquiterpenes [**84-89**] and two related butenolide [**90** and **90a**]. A sample of *D. amblia* afforded pallescensin-A [**91**], pallescensolide [**92**], together with

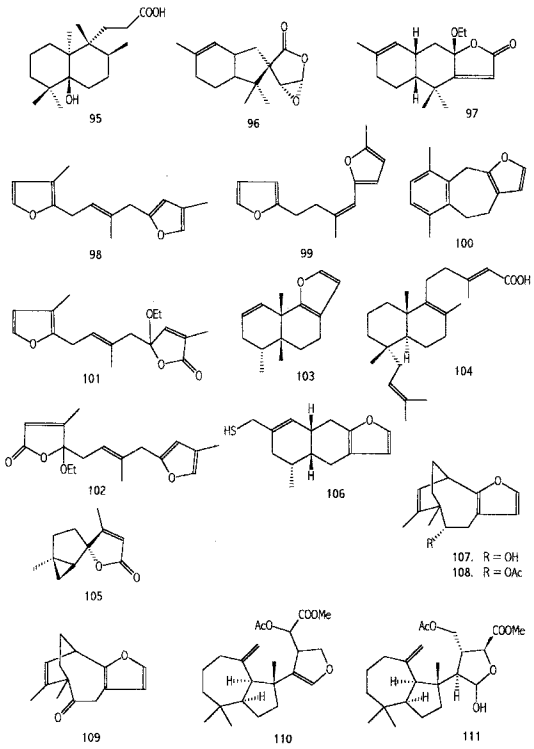


diterpenes ambliol [**93**], ambliofuran [**94**] (Walker and Faulkner, 1981). The structure



of ambliol [**93**] was determined based on X-ray crystal structure of related compound **95** (Walker *et al.*, 1984).

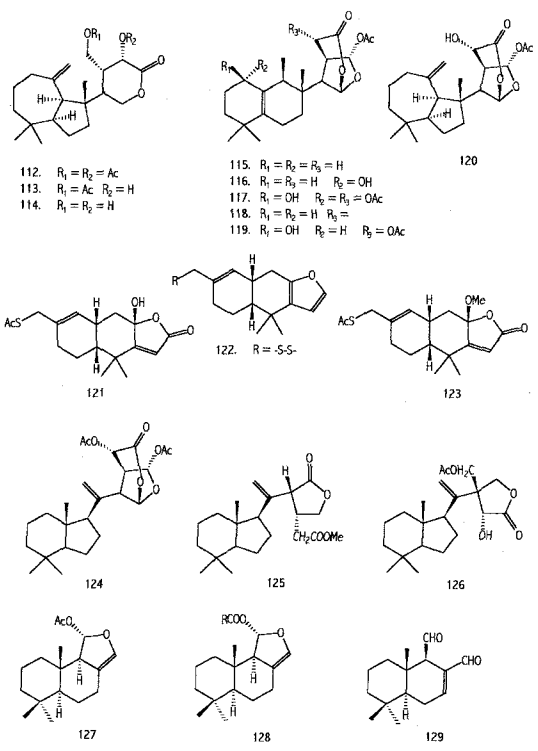
An unusual β, γ-epoxy γ-lactone, dysetherin [**96**] has been isolated from *D. etheria* (Schram, 1985). The Mediterranean sponge *D. tupha* contain ent-furodysinin, is optical enantiomer of furodysinin [**62**] and related ethoxy lactone tuphabutenolide [**97**] (Guella *et al.*, 1985b). A mixed collection of the sponge consists of *Pleraph spinifera* and *D. avara* was found to contain longifuran [**98**] as major metabolite, tavacfuran [**99**], tavacpallescensin [**100**], tavacbutinolide-1 [**101**], tavactutinolide-2 [**102**] as minor metabolites (Guella *et al.*, 1985a). Since the sponges were extracted with ethanol, it is possible that **83, 87** and **88** were all artifacts. Herbacin [**103**] is a new furanosesquiterpene that is a major metabolite of *D. herbacea* collected in India (Sarma *et al.*, 1986). A new sesterterpene acid [**104**] has been isolated from Palavan sponges of *Dysidea* (Nakagawa *et al.*, 1986) along with known compounds **2** and **135**. All these were showed aldose reductase inhibitory activity at 400 μg/ml and can be used in the treatment of galactosemic cataracts. The structure of **104** has been elucidated by spectroscopic data. A monoterpenoid adriadysiolide [**105**] has been isolated from a North Adriatic species of *Dysidea* (Mancini *et al.*, 1987). Thiofurodysinin [**106**] was the first sesquiterpene mercaptan isolated from an Australian specimen of *D. avara* (Capon and Macleod, 1987). Oxidized nakafuran-8 sesquiterpenes 5-hydroxynakafuran-8 [**107**], 5-acetoxynakafuran-8 [**108**], 5-ketonakafuran [**109**] have been isolated from *D. etheria* from Bermuda (Cardellina II and Barnekow, 1988). Ten new rearranged spongian diterpenes have been isolated from two Red Sea specimens of *Dysidea* (Carmely *et al.*, 1988). One species of *Dysidea* contained shahamines A-G [**110-116**] in addition to the known diterpenes macfarlandin E [**120**]

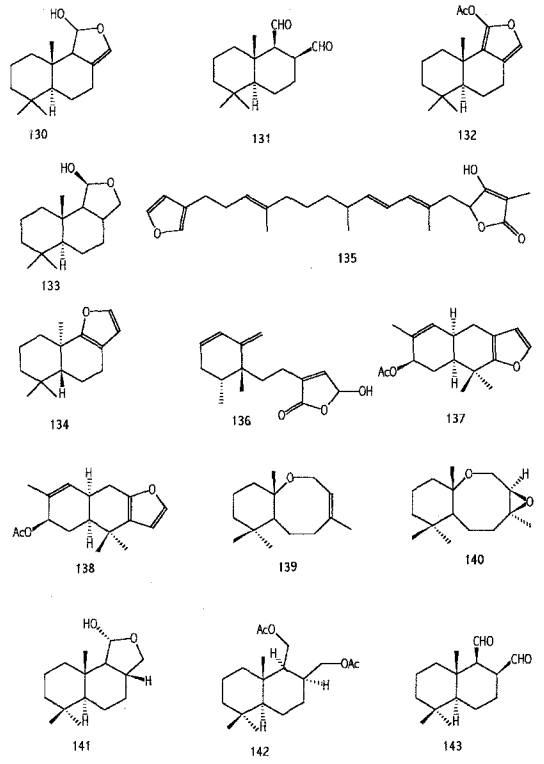


(Molinski *et al.*, 1986). The second *Dysidea* sp. contained shahamine-F [**115**], shahamine-H [**117**], shahamine-I [**118**] and shahamine-J [**119**]. The structures of the shahamines were proposed on the basis of their spectral data and supported by chemical interconversions (Carmely *et al.*, 1988).

A Palauan species of *Dysidea* contains 15-acetylthioxyfurodysinin lactone [**121**], which binds to the human leukotriene B_4 receptor. The structure of compound **121** was determined interpretation of spectral data and confirmed by synthesis (Carte *et al.*, 1989). The absolute stereochemistry (−)-6R, 11R-thiofurodysinin acetate [**64**] (Kazlauskas *et al.*, 1978c), (Capon and Macleod, 1987), (−)-6R, 11R-furodysinin disulfide [**122**] (Ksebati and Schmitz, 1988) and (+)-6R, 11R-methoxythiofurodysinin acetate lactone [**123**] which were isolated together with (−)-6R, 11R-furodysinin (**62**) (Kazlauskas *et al.*, 1978c), (Capon and Macleod, 1987), (Grode and Cardellina-II, 1984) from a Fijian specimen of *D. herbacea*, were determined

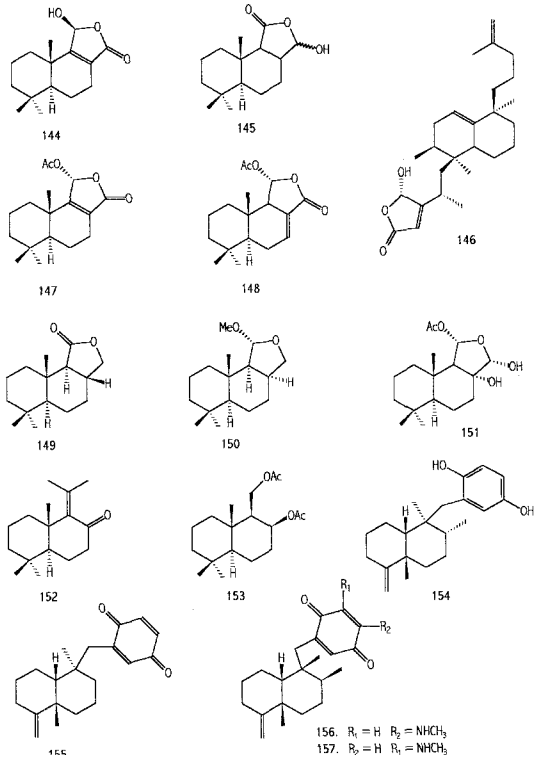
by chemical interconversions (Harton *et al.*, 1990). A Red Sea species of Dysidea contained three new diterpenes norslandin [**124**], seco-norrisolide B [**125**] and seco-norrisolide C [**126**] (Rudi and Kashman, 1990). A new bioactive terpene 7-deacetoxy-olepupane [**127**] (Garson *et al.*, 1992) has been isolated from the temperate marine sponge *Dysidea* sp. along with three known compounds euryfuran [**71**], sesquiterpene ester [**128**] (Aliva *et al.*, 1991), polygodial [**129**] (Cimino *et al.*, 1983). The structure of **127** has been established by using spectral data. Four new drimane sesquiterpenes [**130-133**] were isolated from southern Australian sponge *Dysidea* sp., together with (+)-euryfuran [**71**] (Dunlop *et al.*, 1982) and (−)-pallescensin [**134**] (Cimino *et al.*, 1975) which are antipodal (Butler and Capon, 1993). The mild protein phosphatase inhibitor isopalinurin [**135**] was isolated from *Dysidea* sp. from the Bass Strait (Murray *et al.*, 1993). A new sesquiterpene **136** has been isolated from an Indian Ocean specimen of *D. herbacea* (Venkateswarlu *et al.*, 1994). Two new furosesquiterpenes **137** and **138** were isolated from *D. herbacea* (Searle *et al.*, 1994) and structures were determined by the study of spectral data. Two cyclic sesquiterpene arenarian-A [**139**] and arenarian-B [**140**] have been isolated from the sponge *D. arenaria* (Horton and Crews, 1995). Arenarian-A was *in vitro* active against several types of cancer cell lines. Five drimane sesquiterpenes [**141-145**] were isolated from the sponge *D. fusca* (Montagnac *et al.*, 1996). The structures were determined by interpretation of spectral data. Dysidiolide [**146**], a rearranged sesquiterpene lactone has been isolated from Caribbean sponge *D. etheria* (Gunasekara *et al.*, 1996). The structure of dysidiolide [**146**] was established by single crystal X-ray diffraction and compound **146** was found to inhibit protein phosphatase and total synthesis of dysidiolide [**146**] has been achieved (Corey and Roberts, 1997). Recently, Paul *et al.* report-

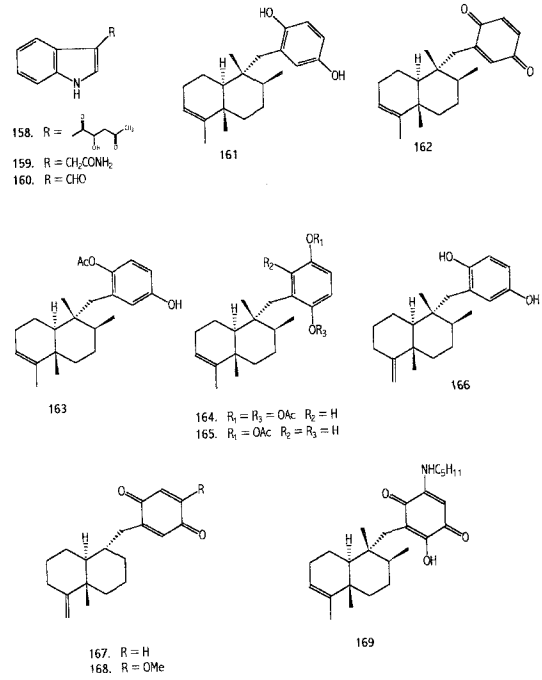




ed the isolation of seven new sesquiterpenoids of the drimane class [**147-153**] from a sponge of the genus Dysidea (Paul *et al.*, 1997) along with three known compounds **127, 129**, and **142**.

Aromatic Sesquiterpene – Prenylated aromatic compounds are not particularly common in sponges but they are important for their pharmacological activity. Among the simple hydroquinones and quinone are arenarol [**154**] and arenarone [**155**] from *D. arenaria* and were found to be cytotoxic (Schmitz *et al.*, 1984). The sponge *D. avara* yielded two new biologically active sesquiterpenoid amino-quinones **156** and **157** (Cimino *et al.*, 1982) along with avarone [**162**]. The structures of **156** and **157** are established by spectral data, the ethanol extract of the same sponge inhibits the cell cleavage of the fertilized eggs from the sea urchin Sphaerechinus granularis. *D. etheria* produce a new plant growth regulator 3-hydroxy-1-(indol-3-yl)pentane-1,4-dione [**158**] and also contains indole 3-actamide [**159**] and indole-3-carboxyaldehyde [**160**] (Cardellina-II *et al.*, 1986). Two new aromatic sesquiterpenes avarol [**161**] and avarone [**162**] have been isolated from *D. avara* (Minale *et al.*, 1974) were found to inhibit Human Immunodeficiency Virus (HIV) *in vitro* (Sarin *et al.*, 1987). Avarol monoacetate [**163**], which is a minor metabolite of *D. avara*, shows cytotoxicity in brine shrimp assay (Crispino *et al.*, 1989). Recently, avarol [**161**] and avarone [**162**] were found to exhibit anti-inflammatory activity (Ferrandiz *et al.*, 1994). Diacetylavarol [**164**] and 6'-hydroxy-5'-acetyl avarol [**165**] have been isolated as minor metabolites of *D. avara* (Giulio *et al.*, 1990), Neoaverol [**166**], which is a double bond isomer of avarol, and two new quinones neoaverone [**167**], 4'-methoxyneoavarone [**168**] were isolated as minor metabolites of an Okinawan species of *Dysidea* (Iquchi *et al.*, 1990) and the structures were established by interpretation of spectral data. A new sesquiterpene aminoquinone [**169**] from a *Dysidea* sp. from Indian Ocean (Utkina and Vesalova, 1990). Popolohuanone-A [**170**] and

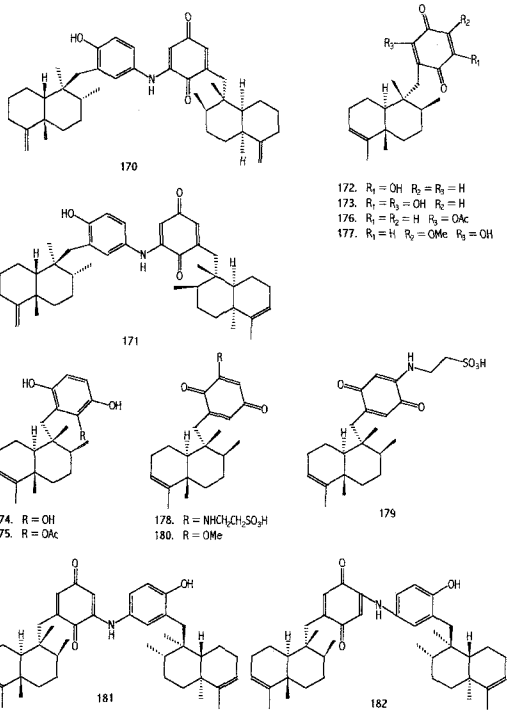


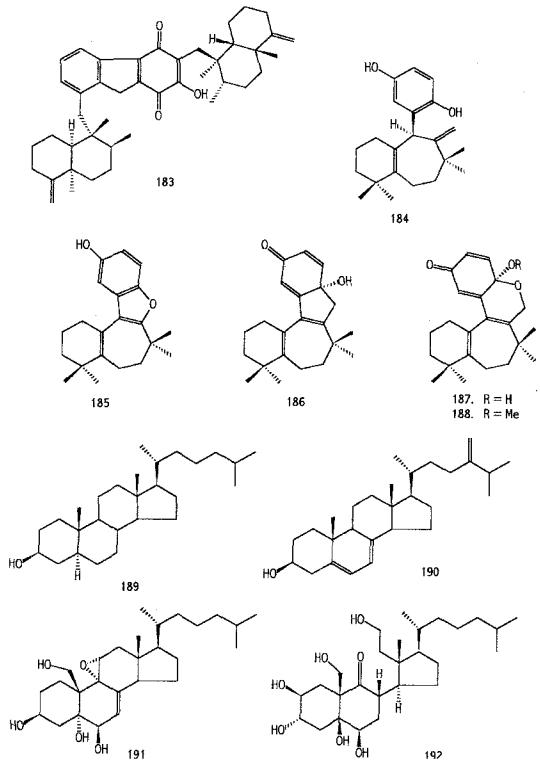


popolohuanone-B [**171**] are two isomeric quinones were isolated from Papua New Guinea species of *Dysidea* (Rodrighez *et al.*, 1990).

An Australian species of *Dysidea* contains both avarol [**161**] and the exocyclic double bond isomer isoavarol [**166**] (Shubina *et al.*, 1990). *D. cinerea* from the Red Sea yielded six new meroterpenoids, 3'-hydroxyaverone [**172**], 3',6'-dihydroxyavarone [**173**], 6'-hydroxyavarol [**174**], 6'-acetoxyavarol [**175**], 6'-acetoxyavarone [**176**] and 6'-hydroxy-4'-methoxyavarone [**177**] (Hirsch *et al.*, 1991). The absolute configurations of **172-177** were found to be the same as that of avarol [**161**]. Further the cytotoxicity, the antimicrobial activity and the anti-HIV-1 reverse transcriptase activities of new compounds were described. A specimen of *D. avara* from the Solomon Islands yielded four new compounds melemeleone-A [**178**], melemeleone-B [**179**], 18-methoxyavarone [**180**], popolohuanone-C [**181**] and popolohuanone-D [**182**] (Alvi *et al.*, 1992). A species of *Dysidea* from Pohnpei yielded popolohuanone -E [**183**] (Carney and Scheuer, 1993) which was found to inhibit topoisomerase-II with selective lung tumor cytotoxicity. Very recently, Patil *et al.* reported five new frondosins A-E [**184-188**] from bioassay guided fractionation of the EtOAc extract of the sponge *D. frondosa* collected from Pohnpei. The structures and relative stereochemistry of the frondosins were established by interpretation of spectral data and were found to be inhibitors of interleukin-8 receptors and protein kinase-c in the low macromolar range (Patil *et al.*, 1997).

Sterols – In addition to terpenoids and alkaloids, sterols also play an important role as secondary metabolites produced by marine organisms. Several excellent reviews on the structures, biosynthesis and distribution of marine sterols have been published. (D'Auria *et al.*, 1993, Goad, 1978). Delseth *et al.* reported two new sterols **189** and **190** together with some minor and trace sterols from pacific sponges Terpis zetirei and *D.*

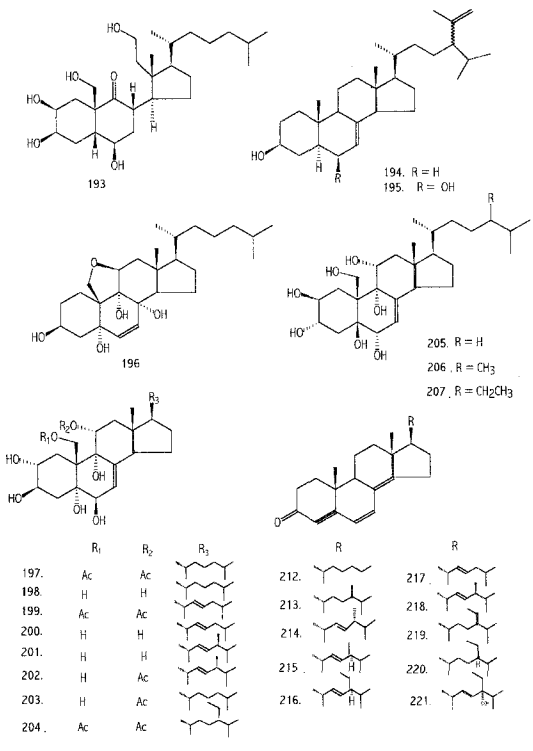




herbacea (Delseth *et al.*, 1979). Gunasekera *et al.* reported a polyhydroxylated epoxy steroid [**191**] from *Dysidea* sp. was found to be weakly cytotoxic (Gunasekera and Schmitz, 1983). Subsequently, the stereochemistry at C-6 in **191** and related compounds from *Dysidea* was revised (Fujimoto *et al.*, 1985) using ^{1}H-NMR method that involves pyridine induced deshielding.

A specimen of the sponge *D. herbacea* from Townsville, Australia contained two-ichyotoxic polyhydroxylated sterols herbasterol [**192**] and 19-nor herbasterol [**193**] (Capon and Faulkner, 1985). Two unusual C-30 sterols [**194** and **195**] have been isolated from the sponge *D. herbacea* (Rambabu and Sharma, 1987). Sica *et al.* reported the $\Delta^{5,7}$ sterols from the sponges *Ircinia pipetta* and *D. avara* (Sica *et al.*, 1987). A novel toxic polyhydroxylated steriod [**196**] has been isolated from the Mediterranean sponge *D. tupha* (Braekman *et al.*, 1988). West *et al.* isolated a group of eight new polyhydroxylated steroids [**197-204**] which were showing a common 5α-cholest-7-en-2α,3β,5,6β,9α,11α, 19-heptol frame work and various conventional side chains from *D. etheria* (West and Cardellina-II, 1988). Subsequently the same group reported three new polyhydroxylated sterols [**205-207**] from *D. etheria* (West and Cardellina-II, 1989). The structures of **197-207** were determined by spectral analysis. Isaacs *et al.* reported a group of polar sterols **208-211** from *D. herbacea* collected near Massawa, Ethiopia. The stereochemistry of **211** was determined by using extensive NOE measurements and the structures were determined by study of spectral data (Isaacs *et al.*, 1991). Kobayashi *et al.* isolated ten 3-oxo-4,6,8 (14)-triene steroids [**212-221**] from the sponge *D. herbacea* (Kobayashi *et al.*, 1992). The structures of **212-221** were elucidated from spectroscopic evidences.

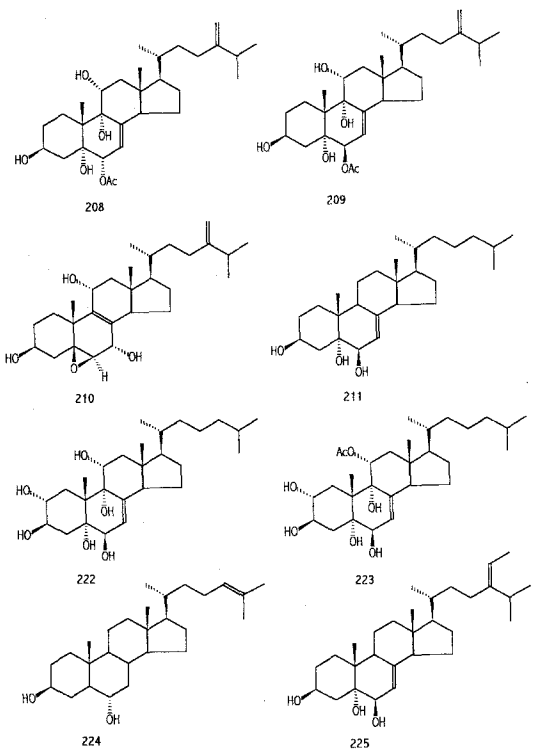
Milkova *et al.* reported two new polyhydroxylated sterols **222** and **223** from the sponge *D. fragilis* (Milkova *et al.*, 1992).

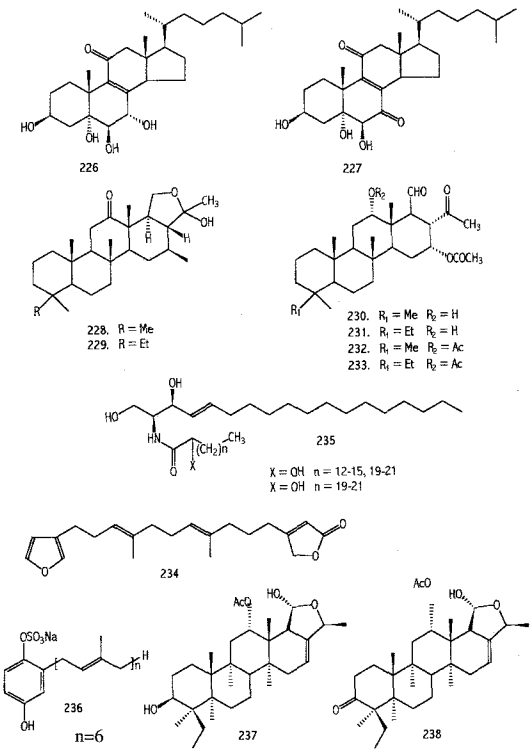


Yongli *et al.* isolated a novel sterol **224** from the South China Sea sponge *Dysidea* sp. (Yongli *et al.*, 1992). Subsequently, Yongli *et al.* reported a new sterol **225** along with **224** from the south china sponge *D. fragilis* (Yongli *et al.*, 1993). The structures of **224** and **225** were established by spectral analysis. Elenkov *et al.* reported the sterol composition and biosynthesis of the Black Sea sponge *D. fragilis* (Elenkov *et al.*, 1994). Casapullo *et al.*, reported two cytotoxic polyoxygenated steroids **226** and **227** from the sponge *D. incrustans* (Casapullo *et al.*, 1995).

Miscellaneous - In addition to above classified compounds from the genus Dysidea the following compounds have been isolated.

Six new biologically interesting alkylated scalarins, scalardysin A [**228**], scalardysin B [**229**], scalarherbacin A [**230**], scalarherbacin B [**231**] and acetates of scalarherbacin A [**232**], B [**233**] have been isolated from *D. herbacea* (Kashman and Zviely, 1979). A





new C_{21}-furanoterpene furospongolide [**234**] has been isolated from the marine sponge *D. herbacea* collected in the Gulf of Suez, Red Sea. (Kashman and Zviely, 1980). The sponge *D. etheria* yielded ceramide [**235**] (Grode and Cardellina-II, 1983) and the structure was determined by interpretation of spectral data. The sponge *D. herbacea* yielded hemagglutinins (Kamiya *et al.*, 1985). The major component DHA-I is a protein with a mol wt of 26,000, which dissociates into subunits of equal size (14,000). It contains large amounts of glutamic acid and asparitic acid, but no half-cystine, methionineor histidine. The sponge *Dysidea* sp. yielded a new hexaprenyl hydroquinone sulphate [**236**] (Fusetani *et al.*, 1987) and was found to inhibit proton-potassium ATPase. The Fatty acid composition of D. fragilis from Black Sea has been determined (Chirstie *et al.*, 1992) by analytical GC, Silver ion HPLC and GC-MS. More than a hundred different fatty acids were identified, which are similar to those tropical Seas and two new fatty acids 13-methyl-tetradec-4-enoic and 14-methyl-hexadec-6-enoic acids, together with demospongic acids. *i.e.*, 5,9,17-tetracosatrienoic, 5,9,17-pentacosatrienoic and 5,9,19-pentacosatrienoic acids. Jaspars *et al.*, isolated two new scalaranes, 3-hydroxy-20, 22-dimethyl-20-deoxosclarin [**237**] and 3-oxo-20, 22-dimethyl-20-deoxoscalarin 8 [**238**] from two different sponges and examined their taxonomic anomaly (Jaspars *et al.*, 1997).

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