

Subject Index

A

- Aerial surveillance, 164
- Alga
 - Effects of oil/dispersant on, 246, 270
 - Increased growth, 252, 253
- Alkane concentrations
 - b*-Alkane, 213
 - n*-Alkane, 213, 216, 218, 222
 - Branched, 213, 216, 222
 - In arctic sediments, 348–351
 - Degraded, 353, 354
 - In nearshore sediments, 283, 288
 - In surface sediments, 237
- American Petroleum Institute (API), 27
 - Offshore oil spill studies, 283, 296
- Amoco Cadiz* spill, 28
 - Clean-up, 300
 - DBT markers, 290
- Anas platyrhynchos*, 195
- Arabian crude oil, light
 - Dispersant effect on, 214
 - Dispersant product performance, 98, 107
 - In drop-weight test, 99, 100, 102
 - In mangrove ecosystem test, 7, 11–12
 - In oil penetration test, 104–105
 - Toxicity, 12, 21
 - VLH in, 210, 220, 221
 - Aromatic, 213, 217
 - And wind speed effect, 217
- Aramco, 428, 435
- Area of effect (AOE), 393–397, 412
 - And spill depth, 405
 - And spill volume, 409, 411
 - And time, 401–403, 406, 411
 - And wind speed, 407, 410
- Arctic environment (*see also* Temperature; Winter exposure)
 - Dispersant use in, 324–336
 - Fate of chemically dispersed vs. untreated oils, 338–360
- Arctic Marine Oil Spill Programme, 325
- Arenicola marina* L., 268–272
- Argo Merchant* disaster, 166, 300
- Aromatic weathering ratio (AWR), 341, 348
- Artemia* sp., acute dispersant toxicity, 180–184
- Aspartate amino transferase (AAT) activity, 300, 303–312
- Astarte borealis*, oil uptake, 353
- ASTM chemical dispersants for control of oil spills task force, 363–364
 - Recommendations of, 365–372
- ASTM Committee F-20 on Hazardous Substances and Oil Spill Response, 38
- ASTM Method D-2285, 95
- ASTM Symposium on Chemical Dispersants for the Control of Oil Spills, 24, 34, 38, 166
- Avicennia germinans*
 - Growth effects, 10–12
 - Sensitivity testing, 7, 10–12

B

- Baffin Island Oil Spill (BIOS) project, (*see also* Cape Hatt), 31, 325
- Countermeasure tests, 325
 - Dispersant application in, 41
 - Fate and effects program, 338–339, 343, 357
 - Biological monitors, 359
 - Shoreline dispersant tests, 325
- Baltic Sea, dispersant effectiveness in, 109
- Bancroft's rule, 45
- Barnacles, adult
- Larvae, colonization, 253
 - Oil dispersant effects on, 252
 - Spat, 254
- Benthic communities, nearshore
- Analysis, 281, 284
 - Risk to, 280, 281, 283
 - Short-term effects of oil spill, 300
 - Uptake of oil, 293
- Benthic species
- Depuration, 352–356, 359
 - Exposure to dispersed oil, 225
 - Oil concentration in, 353–356
 - Oil uptake, 352–356
 - Smothering, 421
- Benzenes
- Concentrations, 216–218, 222
 - Critical threshold concentration (CTC). 399, 401
 - In fish eggs and larvae, 400–401
 - In oils, 31
 - Toxicity of, 25
- Bioassays
- Of brown shrimp, 135, 139–140
 - Sensitive marine, 180
- Biochemical oxygen demand (BOD) test, 38–39
- Bird habitats, dispersant use guidelines, 368–370
- Birds
- Breeding, effects of oil on, 370
 - Mortality, 369–370
 - Moving methods, 369
 - Rehabilitation, 369
 - Surface oil, effects of, 369
- Bivalves (*see also* Clams; Mussels)
- Depuration, 309
 - Filter-feeding, 293–295, 296
 - Pollutants in, 297
 - Hydrocarbons in, 302
 - Oil spill effects on, 300–312
- Boat spray tests, 41
- Britain, southwest
- Intertidal experiment site, 241
 - Vulnerability Index of, 276
- British Petroleum (BP) Research Centre, Sunbury
- Labofina testing, 70, 72
 - Mackay testing, 74, 76
- British Petroleum (BP), toxicity, 180
- British Petroleum (BP) 1100 WD, 225
- Diluted, effects of, 264–272
 - Immediate effects, 249
 - Long-term effects, 248, 250
 - In Norwegian ocean tests, 51, 52
 - On rocky shores, 246, 247
 - On salt marshes, 254, 255, 258–263
- British Petroleum (BP) 1100X
- In arctic environment, 331, 332, 334, 335
 - Sublethal effects, 195
 - Undiluted, 251
- Bunker Fuel C, 7, 10–12
- Bunker Fuel IF-30, 52

C

- Calanoid copepods, 180–184
- California, Southern, offshore dispersant testing, 380
- Canada Centre for Remote Sensing (CCRS), 157
- Canadian Offshore Aerial Application Task Force (COAATF), 144, 161

- Abbotsford field trials (1979), 162, 163
- Hallifax, Nova Scotia, site, 165
- Protocol, 164, 165
- Sea trial (1981), 163-165
- Suffield trial, 162
- Cape Hatt, Baffin Island
- Eclipse Sound testing, 325
- Map, 326, 327
- Ragged Channel area testing, 339, 343
- CCG *Cape Islander* spill, 146
- Channel Island, California, tagging operation, 371
- Chemically dispersed oil (*see* Oil, chemically dispersed)
- Chemserve OSE-DH, 423
- Chromatographic analysis (*see also* Gas chromatographic analysis; Gas-liquid chromatographic analysis), 25
- Chthamalus* spp., 252
- Clams
- DBT in, 295
- Growth studies of, 229-230, 234-237
- Oil spill effects on, 284, 293
- Uptake of oil, 297
- Clean-up
- In coral reefs, 365
- On rocky shores, 367
- In sea grass beds, 366
- Along South African coast, 418, 419, 427
- Clean-up techniques, 277
- Dispersant, 276
- Mechanical, 325, 367, 368
- Equipment, 428, 429
- Natural, 325, 327, 331-335, 367-368
- Coast Guard, US, fire hazard control, 168-169
- Cod, Southern Grand Bank, 391, 395, 412
- "Code of Practice for the Use of Oil Slick Dispersants," 367
- Common murre, Funk Island, 391, 395, 412
- Conception Bay, Newfoundland, 163
- Cook Inlet crude oil, 27
- Coral reefs
- Dispersant use guidelines, 365-366
- Oil stranding, 365
- Corexit 7664
- In arctic environment, 331, 333
- Composition, 210-211
- Effectiveness, 211
- Hydrocarbon levels, 335
- Oil droplet formation, 213
- On rocky shores, 251
- In salt marshes, 260
- On sand and mud flats, 270
- And VLH concentrations, 213, 216, 218, 222-223
- And wind speed, 209-210
- Corexit 8667, 251
- Corexit 9527
- Application, 146, 162, 164
- In arctic nearshore environment, 339
- Composition, 211
- Effectiveness, 144, 145, 164
- Hydrocarbon concentration, 320
- In mangrove ecosystem testing, 7
- In Norwegian ocean tests, 51, 52
- Oil droplet formation, 213
- As reference dispersant, 27
- In sea grass bed, 318
- Sediment exposure testing, 225
- Solvent evaporation, 163
- Sublethal effects, 195
- Toxicity, 180, 184-187, 196
- VLH concentrations, 213, 216, 218, 220-223
- And wind speed, 209-210
- Crabs, mortality, 421
- Crangon crangon*, 135, 139, 140, 423

- Critical micelle concentrations (cmc), 101–103, 191
- Critical peak exposure concentration (CPEC) method, 405, 408, 421
- Crude oil composition, 91–93
- Crustaceans, planktonic, toxicity in (*see also individual species*), 27
- Cycloalkane concentrations, 213, 216, 222
- Cyclograpsus punctatus* mortality, 421
- D**
- Daphnia magna*, toxicity in, 187
- DART, 173
- DBT as marker, 290, 293–295
For hydrocarbons in Murban crude oil, 303, 309
Increments, 296
- Depuration (*see* Benthic species; Bivalves)
- Dilution
Continuous system, 136–137
Role in chemical oil dispersion, 125–141
- Dispersant application, 164, 211
Aerial, 41, 88, 127, 146, 410, 429
Evaluation program, 161–165
Response capability, 432–434
Spraying, 422–423
Boat spraying, 423
Marine response capability, 429–432
Multifaceted approach, 428–435
- Dispersant behavior in sea, 127–134
- Dispersant diffusion rate, 104
- Dispersant droplet size, 88
- Dispersant effectiveness, 38–53
Assessing, 69–85
Vs. dosage, 111, 112, 116
At low salinity/low water temperature, 108–119
And oil characteristics, 87–93
And oil viscosity, 118
Predicting, 94–107
- Remote sensing, 143–158
At sea, 69–85
And surfactant synergism, 77–79
And toxicity, 195–196
- Dispersant “efficiency,” 103
- Dispersant/oil combination, 7–12, 43, 178
- Dispersant/oil ratio, 32, 39
- Dispersant stockpiles, 434–435
- Dispersant Symposium in Toronto (1980), 23–24
- Dispersant testing
In Arctic, 324–336
In Canada, 39–46
Efficiency, 60–62, 63–66
In South Africa, 423–424
In United Kingdom, 57
- Dispersant toxicity (*see also* Toxicity)
Acute, 180–187
Effectiveness, 195–196
To fish, 366
To marine organisms, 177–195
Reduced, 300
- Dispersant use
Authorization, 281
Decision making, 322
Ecological considerations, 363–372
Experimental, on arctic beach spills, 324–336
Guidelines, 44, 378–389
Regions IX and X, 385–389
Monitoring, 384
- Dispersants
Composition and chemistry, 179–180
Effects in field, 196–197
First-generation, 188, 193
Initial action, 157
And oil viscosity, 88–93, 118
Preparation, 31–32
Resistance to, 88–93
Role of, 126
Second-generation, 180, 189
In treatment of fire hazard, 166–174

- And VLH in water column, 203-223
 - Volume, effects of, 58, 60
 - Dispersion
 - And dilution process, 127-141
 - And energy conditions, 83-85
 - Mathematical model for, 49-52
 - Process, 46-49
 - Stability, 116-117, 119
 - Dosage, and dispersant effectiveness, 111, 112, 116
 - Drop detachment time effect, 99
 - Drop-time interfacial tension test, 95, 102, 104
 - Drop-weight interfacial tension test, 94-107
 - Droplet size, and buoyancy, 296
 - Ducks, mallard, 195, 370
 - Du-Nouy ring interfacial tension test, 94
- E**
- Ecological impact
 - Considerations in dispersant use, 363-372
 - Mathematical model for predicting, 390-412
 - Ecotoxicity, and area of effect (AOE), 393-397, 401-412
 - Ecotoxicology, 392
 - Fish model, 397-409
 - Marine, 178-198
 - Seabird model, 395-397
 - Ekofisk crude oil, 52
 - Emulsions, 92, 126, 297
 - Endangered Species Act, 369
 - Energy Endurance* hull failure, 415
 - Enteromorpha*, 270
 - Environment Canada Baffin Island Oil Spill Project (*see* Baffin Island Oil Spill (BIOS) project)
 - Environmental Protection Agency, Massachusetts Department, 169
 - Environmental Protection Agency, US (EPA)
 - Clean-up coordination, 281
 - In fire hazard control, 168-169
 - Reference oil, 27, 29
 - Standard tests, 94, 104-105, 107
 - Esso Essen* oil spill, 419-420, 422
 - Exposure-dose-response (EDR) method, 405, 408, 412
 - Exposure regimes, 33-34
 - Aquatic toxicology test method of dispersed oils, 23-34
 - Sediment exposures, 27-29
 - Water exposures, 25-27
- F**
- Fay's spread equations, 152-156, 158
 - Field Studies Council intertidal experiments, 240
 - Finasol OSR7, 51, 52, 180
 - Fire department training, 173-174
 - Fire hazard treatment, 166-174
 - Fish population (*see also individual species*)
 - Bioaccumulation of hydrocarbons, 395, 397-403
 - Ecotoxicology model, 397-409
 - Oil toxicity to, 394, 397
 - Recovery, 391, 395
 - Fish and Wildlife Service, US Patuxent Wildlife Research Center, 380
 - Use of dispersants, 369
 - Florida Keys spill, 365, 367
 - Flotta crude, 251, 260
 - Effects of, 261-263
 - Fluorometry, flow-through, 287
 - Forties crude oil
 - Immediate effects, 249
 - Lightly weathered, 260, 261, 272
 - Long-term effects, 248, 250
 - On rocky shore, 246, 247
 - In salt marshes, 254, 255, 258-263
 - On sand and mud flats, 268-272
 - In sea grass beds, 263-268
 - Study, 225
 - Weathering, 246

Fucus sporelings, 246, 252–253
 Fuel oil No. 2, 7, 10–12
 Fuel oil No. 6, 104, 105, 106
Fundulus grandis, 195

G

Gas chromatographic analysis (GC)
 Fused silica capillary (FSCGC),
 339, 343–345, 348–351, 359
 Of hydrocarbons, 287–293
 Of oil/dispersant composition, 18
 Of oils, 29, 31, 32
 Gas chromatographic/mass spectro-
 graphic analysis (GC/MS),
 computerized, 268, 269, 272
 GC/MS/DS, 339–341, 343, 345,
 348
 Gas-liquid chromatographic analysis,
 257, 265, 268
 Gasoline tank truck accidents, 174
 Gasoline tanker accidents, 166, 167
 Gatwick, UK, workshop on oil spill
 dispersant chemicals, 125
Global Hope accident, 169
 Glucose-6-phosphate dehydrogenase
 (G6P) activity, 300, 302–312
 Gulf Area Oil Company Mutual Or-
 ganizations (GAOCMAO),
 429, 434
 Gulf of Mexico seawater testing, 205
 Gulls, herring, 370

H

Harrier spray systems, 429, 431
 Hazardous Substances and Oil Spill
 Response, ASTM Committee
 F-20, 38
Hemicentrotus pulcherrimus bioassay,
 180
 Herring, toxicity in, 399, 400, 401, 407
Hippolyte clarki toxicity testing, 15
 Hurstone experiments
 Point 1, 243–249
 Point 2, 244, 249–251

Point 3, 244, 251–253
 Vulnerability Index, 274
 Hydrocarbon analysis, 228, 229, 233,
 236
 Arctic beach sediment, 328, 330,
 333, 334
 In bivalve mollusks, 302
 In sediments, 256–257
 Total, 21
 Hydrocarbons
 Aliphatic
 In *Mya arenaria*, 303–304
 In nearshore sediments, 288,
 290–295, 297
 Aromatic
 In *Mya arenaria*, 303–304
 In *Mytilus edulis*, 304–305
 In nearshore sediments, 290, 292,
 293, 297
 And tide level, 228–229
 In sediments, 231
 Total, 21
 Availability, 195
 Bioaccumulation in fish, 395, 397–
 403
 In bivalve mollusks, 309, 311
 Concentrations
 Alterations in, 230–232
 And BP 1100X, 335
 And Corexit 7664, 335
 And Corexit 9527, 320
 Under oil slick, 130–132
 In Prudhoe crude oil, 318, 327
 Remote sensing, 152
 In sea grass, 265, 266, 268
 In surface sediments, 226, 227
 After treatment, 135
 Diffusion, 401
 Distribution, 18, 269
 Evaporation loss, 25
 Extraction, 146
 And fish mortality, 397
 Fractionation, 357
 High molecular weight, 343,
 346–347

Hydrocarbons (*continued*)

- Losses, 226, 228, 283
- Low molecular weight, 342-345
- In nearshore spills, 296
 - Analysis, 281, 284, 288, 290-293
 - Dissolved, 287, 309
- Saturates, 228-229, 231, 249
- In seawater, 342-357
- In sediments, 28, 288, 290-297
- Toxicity, 178, 195-196
 - To marine organisms, 391, 392
- Volatile liquid (VLH), 203-223, 283
- "Wash out," 234
- Weathering ratio, saturated (SHWR), 341, 345, 348

I

- IMP (Norwegian) tests, 44
- Infrared
 - Imagery of oil slick, 150-157
 - Spectrophotometry, 18, 226
- Institute of Petroleum (IP)
 - Guidelines for dispersant use, 367
 - Working group on dispersants, 56-58, 62-63
- Interfacial tension in predicting dispersant effectiveness, 94-107
 - And emulsions, 126
 - Measurements, 152
- Intertidal beaches, sediment characteristics, 327
- Intertidal habitats
 - Ecological effects of oil, 240-278
 - Sea grass beds, 263-268
 - Vulnerability Index, 277-278
- Ixotoc I* spill, 300, 357

J

- Jasus lalandii*, 419
- Johnstown, PA, sewer explosion, 174

K

- Kelp bed ecosystem, damage to, 421-422

- Killifish, 195
- Kilpaison experiments
 - Experiment 1, 263-265
 - Experiment 2, 265-268
 - Vulnerability Index, 277
- Kuwait crude oil, 92
 - I, 76
 - II, 77, 78, 81, 82

L

- Labofina Laboratory test, 46, 48, 70-71, 83-85
 - Advantages, 72
 - Compared with Mackay test, 76-77
 - Correlation with WSL sea test, 79-82
 - Disadvantages, 72
 - Materials used, 86
 - Modified, 45
 - Synergistic surfactant effects, 77-79
- Laboratory testing
 - Response of mangroves to oil/dispersants, 6-13
 - Sediment column tests, 272-274
- Lagomedio crude
 - In arctic environment, 339
 - Aged, 325, 328, 330, 357
 - In benthic species, 353-356
 - Biodegradation, 333, 353, 356
 - Emulsified, 325, 328, 330
 - On sea surface and beach, 342
 - In sediments, 348-353
 - In water column, 342-348
 - Effectiveness of Corexit 9527 with, 144, 145
 - Oil spill, 163, 164
 - Weathered, 77, 78, 80-83
- La Rosa crude oil, 92, 93
- Lethal concentration, median (LC₅₀), 140
 - Of dispersants, range in marine organisms, 183-184, 187
 - Of dispersed oil to turtle grass, 315-322
- 96-h LC₅₀ method, 15

- Lichen, 246
- Limpets
 Dispersant effects on, 195
 Oil/dispersant effects on, 246–247, 251, 254
 Long-term, 248
 Oil pollution effects on, 420
- Littorina* spp.
 Oil/dispersant effects on, 246, 248, 251, 254
 Immediate, 249
 Long-term, 250
- Lobster, rock, 419, 420
 Sanctuary, 421, 424, 426
- Long Cove, Maine, field experiment (1981), 281–297, 300
- Map, 282, 301
- Lugworm, 268–272
- M**
- Mackay-Nadeau-Steelman (MNS) test, 43–44, 48, 50–52
 Apparatus, 196
 Operational aspects, 118, 119
- Mackay oil spill behavior model, 155, 156, 158, 394
- Mackay test, 72–75, 83–85
 Advantages, 75
 Apparatus, 89, 92
 Disadvantages, 75–76
 Vs. Labofina test, 76–77
 Materials used, 86
 Synergistic surfactant effects, 77–79
 And WSL sea test, 79–82
- Macoma calcaria*, oil uptake, 353, 359
- Mangrove ecosystems, 5–13
- Mann-Whitney U-test, 255, 257, 260
- Marine ecotoxicology (*see* Ecotoxicology, marine)
- Marine mammal habitats, guidelines for dispersant use, 370–372
- Marine organisms, toxicity of dispersants to (*see* Toxicity)
- Marine Pollution Control Unit of United Kingdom Department of Trade, 57
- Migratory Bird Treaty Act, 369
- Milford Haven, UK, site, 225
- Ministry of Agriculture, Fisheries, and Food, 57
- Monoaromatics, crude oil (*see also* Aromatics; Hydrocarbons), 18
- Mousse
 Application of, 260, 261
 “Chocolate,” 420, 421
 Dispersant treatment of, 251
 Effects, 262, 263
 Formation of, 31
- Mud prawns, mortality, 421
- Murban crude oil, 92, 93
 Effect on enzyme activities, 300–312
 Premixed with dispersant, 281
 Untreated, 281, 283
- Mussel Watch Program, 297
- Mussels
 DBT in, 295
 Effect of oil spill on, 284, 293
 Uptake of oil, 297
- Mya arenaria*, 284, 300–312
- Mya truncata*, oil uptake, 353, 356, 358, 359
- Mytilus* sp.
 Oil uptake, 359
M. edulis, 284, 300–312
- N**
- Naphthalene concentrations
 In arctic beach oil spills, 342
 Critical threshold (CTC), 399, 401
 In crude oils, 18, 21, 31
 In fish eggs and larvae, 401, 402, 404
 Total, 229, 231, 236, 237
 In water, 403
- National Academy of Sciences, 27
 Petroleum in the Marine Environment Update/Workshop, 24

- National Institutes of Health/Environmental Protection Agency, Mass Spectral Search System, 206
- National Marine Fisheries Service, 371
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 379-380, 384
- Nearshore test spills, 280-297
- Nephelometric method, 129, 132
- New Britain, CT, sewer treatment, 170, 174
- Newfoundland Grand Banks, 391
- Nigerian crude oil, 225, 268-270
- Norwegian ocean tests, 51, 52
- Nuculana minuta*, oil uptake, 353, 359
- O**
- Offshore oil spills (*see also* Oil spills)
Oil slick changes, 148-149
Studies, 283, 296
- Oil
Absorption of, 296
Biodegradation, 297
Buoyancy, 296-297
Characteristics, 87-93
Chemically dispersed
Aquatic toxicology experiment, 23-34
Toxicity, 314-322
Toxicity testing method, 15-22
Composition, 210-211
And dispersant effectiveness, 56, 87-93
Dispersed
Acute toxicity, 283
Effects, 224-237
Fate, 224-237, 338-360
Potential biological hazard, 324
In sediments, 288-293
In water, 287-288
Testing methods, 224-237
- Oil (*continued*)
Dispersed vs. untreated, 338-360
Ecological effects of
Dispersed vs. nondispersed, 240-278
Mathematical model, 390-412
Fate, 393, 394
Dispersed, 224-237, 338-360
Dispersed vs. undispersed, 280-297
In intertidal habitats, 240-278
Fresh crude, 18
Fresh vs. weathered, 31
Quantitative analysis, 32
Resurfacing, 132, 157
In sediments, 27-28, 288-293, 296
Toxicity
Of chemically dispersed, 314-322
Of chemically vs. physically dispersed, 196
To fish, 394, 397
To sea grass, 314-322
Undispersed, 288-293
Uptake (*see individual species and sites*)
Viscosity, 45, 48, 56
And dispersant effectiveness, 118
And resistance to dispersants, 88-91
Weathered, 31
Weathering, 49, 56, 210
Oil/dispersant ratio, 32, 39
Oil penetration test, 95, 98, 103-104, 106
Oil persistence, 395-396
Oil pollution, 419-422
Oil Pollution Convention, 1969
Amendments, 415
Oil slick
Emulsification, 132-133
Geometry, 88
South African shore, 415
Stranding, simulation of, 243, 272
Thickness, 88

Oil spill

- Clean-up techniques (*see* Clean-up techniques)
 - Damage, 274–278
 - Effectiveness of chemical dispersants on, 38–53
 - Environmental pollution from, 420–421
 - Fire hazard, 166–174
 - Guidelines for use of dispersants, 363–372
 - Impact of, 411–412
 - Movement of, 417
 - Recovery, 420, 421–422
 - Tests, 300–312
 - Volume, effect, 409–411
- Oil spill impact model flow chart (*see also* Ecological impact, mathematical model, 393)
- Oilsperse 43, 191
- On-scene coordinators (OSCs), 378
- Responsibilities of, 380–383, 385–386
- Oriental Pioneer* stranding, 419
- Otters, sea, 370, 371

P

- Palaemon pacificus*, 423
- Pandalus danae*, toxicity in, 15, 18–22, 300, 408
- Patella* spp.
- Effects of oil/dispersant on, 246–247, 251, 254
 - Long-term, 248
- P. cochlear*, 420
- P. oculus*, 420
- P. vulgata*, 195
- Pectinaria granulosa*, oil uptake, 353, 356
- Penguin, jackass, 424, 426
- Periwinkles, 420
- Persian Gulf sea route, 415
- Phenanthrenes, 229, 231, 236, 237
- In crude oil, 18
- Phyllospadix torreyi*, 367

- Pinniped rookery, 370–371
- Piscataqua River, NH, accident, 168
- Polar bears, 370, 371
- Protecmar program, 127–134, 135
- Protothaca staminea* growth, 229, 234
- Protozoa, toxicity testing, 27
- Prudhoe Bay crude oil, 27
- Analysis, 318–319
 - Composition, 321
 - In sea grass bed, 317
 - Sediment exposure testing, 225
 - Toxicity, 19–21, 187
 - Chemically dispersed, 300
 - To turtle grass, 318, 321
 - WSF effects, 408
 - WSFs, 320
- Pseudocalanus minutus*, 180–184

R

- Ras Tanaura Terminal, Saudi Arabia, 434, 435
- Red Sea, toxicity of dispersants, 366
- Region X (federal) committee for dispersant use guidelines, 379
- Regional response teams (RRTs), 378–389
- Remote sensing, of dispersant effectiveness, 143–158
- Revolving flask test, 55, 57, 62
- Rhizophora mangle*, 6, 7, 10–12
- Rocky shore
- Clean-up, 367
 - Dispersant use guidelines, 367–368
 - Effects of dispersed and nondispersed oil, 243–254
 - Vulnerability Index, 274–276
- Rolling flask test (*see* Warren Spring, laboratory (WSL) test)
- “Roll-off” effect, 89, 90, 93
- Rotating flask test, 52
- Royal Commission of Environmental Pollution (UK) recommendations, 240
- Russian crude oil, light, 109–115

- S
- Saint John's, Newfoundland, 144, 163
- Salicornia* spp.
Density, 257, 259, 263
Effects of oil/dispersant on, 255, 257
Smothering, 263
- Salinity
And dispersant effectiveness, 45, 102, 113–119
Effect of, 102–103
- Salt marshes
Effects of oil/dispersant on, 254–263
Vulnerability Index, 276–277
- Sand, coarse, 225
- Sand and mud flats
Effects of oil/dispersant on, 268–274
Vulnerability Index, 277–278
- Sandyhaven experiments
Experiment 1, 269
Experiment 2, 269–270, 271
Experiment 3, 270–272, 273
- Santa Barbara spill, 367, 371
- Scientific support coordinator (SSC), responsibilities, 382, 386
- SCOPE Report 12 on ecotoxicity, 392
- Sea
Dispersants in (*see* Dispersant behavior; Dispersant effectiveness)
Energy conditions, 83–85, 132–133
Natural turbulence, 85, 144–145
- Sea grasses
Clean-up activities, 366
Dispersant use guidelines, 366–367
Oil toxicity to, 314–322
Uptake of oil WSFs, 366
- Sea urchins, 180, 193, 420
- Seabird population (*see also individual species*)
Ecotoxicology model, 395–397
Mortality, 392, 397
Oil toxicity, 394
Recovery, 391, 395
- Seals, pups, 371–372
- Sediments
Artificial, 27, 28
Defined, 27
Marine, 224–237
Nearshore, 284–286, 288–293, 348–353
Oil behavior in, 27–28
Porosity, 28
Sublethal analysis, 293
- Sequim Bay, WA, 15
- Serripes groenlandicus*, oil uptake, 353, 356, 358, 359
- Shrimp
In dispersant testing, 423
Toxicity, 191
Toxicity testing
Brine, 180–184
Brown, 135, 139, 140
Coonstripe, 15, 18–22
Grass, 15
- Simplex bucket systems, 432
- Skomer Island, South Wales, spill, 371
- South Africa
Coastal current systems, 415–419
Contingency planning, 424–426
Dispersant testing, 423–424
Dispersant use, 414–427
Government policy, 422–423
Oil spill effects, 419–422
- South Marsh Island oil
Dispersant effect on, 216, 218, 222
VLHs in, 211, 220
- Spartina Anglica*
Density, 255, 258, 261, 263
Oil/dispersant effects, 254–255, 257
Shoot heights, 260, 262
Smothering, 263
- Spectrofluorometry, 131, 132
- Spheniscus demersus*, 424, 426
- Spinning drop test, 45, 46
- Spreading, oil
Cessation of, 155–156

Spreading oil (*continued*)

- Theory
 - Fay's, 144, 152-156, 158
 - Three-regime, 144
 - To thin sheen, 150
- SRI interfacial tension test, 45
- S T Latirus* accident, 414-415
- Statfjord crude oil, 51
- Stearl Flats experiment, 268-269, 276
- Stearl Salt Marsh experiments, 263
 - Experiment 1, 254-255
 - Experiment 2, 255-260
 - Experiment 3, 260-262
 - Vulnerability Index, 276
- Storm-wave activity (*see also* Wave action; Wave energy), 325, 332
- Strongylocentrotus droebachiensis*, 353, 356-359
- Student's *t* test, 111
- Suffolk Down, fire hazard, 167-173
- Surface tension reduction, 191
- Surfactants
 - Action in marine organisms, 178
 - Acute toxicity, 195
 - Composition, 80, 81
 - In detergents, 191
 - Enhancement of oil/dispersion, 94
 - And synergism, 70, 77-79, 85
 - Hydrophobic groups, 187, 189
 - And interfacial tension, 91-92
 - And temperature, 101
 - Toxic action mechanisms, 191-193
- Swanson River oil, 215
 - VLH in, 210, 213, 219, 221

T

- Tarut Bay, Saudia Arabia, pollution, 365
- Temperature (*see also* Arctic environment; Winter exposure)
 - And dispersant effectiveness, 99-101, 115-119
 - And oil/dispersant, 115-116
 - Low, 115-119

- And VLH incorporation in water, 207-209
- Texanita/Oswego Guardian* collision, 419
- Thalassia* sp., 366, 367
 - T. testudinum*, 314-322
- Tidal area dispersant project, 280-297
- Tide levels, effects, 228, 229
- Toluene concentrations, 25, 218
- Torrey Canyon* spill, 195, 300, 368
- Toulon, France, 127
- Toxicity (*see also* Dispersant toxicity; Oil, toxicity)
 - Assessment, 135
 - Of dispersant, 180-184
 - Of dispersed oil, 23-34
 - To marine organisms, 177-198
- Toxicity Index
 - Alternative to ecotoxicology model, 405-409, 412
 - Concentration times exposure time, 126
 - In coonstripe shrimp, 15, 19-21
 - Method, defined, 392
 - And oil dilution, 140
- Toxicity testing, 15-25, 34
- Toxicity thresholds, 188-190
- Turbulence (*see also* Sea, natural turbulence), 132-133, 144, 145
- Turtle grass, oil toxicity to, 314-322

U

- Ultraviolet (UV) image of oil slick, 147, 155-157
- Ultraviolet spectrophotometry, 274
- Union Oil Terminal, Boston, oil leak, 167-173

V

- Venezuela crude oil, 27, 366
- Venoil/Venpet* collision, 414, 417, 418
 - Clean-up, 419, 423
 - Effects of, 420-421

Verrucaria spp., 246

Vulnerability Index

Intertidal sea grass beds, 277-278

Mud and sand flats, 277-278

Rocky shores, 274-276

Salt marshes, 276-277

W

Wafra stranding, 419, 420, 422

Warren Spring Laboratory

Boat spray test, 41, 45, 46

Laboratory (WSL) test, 50, 57-58
61

Open-Ocean and Mini-Spray
equipment, 429

Status of, 55-68

Sea test, 58-60, 61, 88-89

And Labofina test, 70, 79-83

And Mackay test, 79-83

Summary and procedures, 66-68

Watchet experiment, 244, 252, 274

Water column

Oil in, 342-348

VLHs in, 203-223

Water-soluble fractions (WSFs), 21,
25

LC₅₀, 319

In Prudhoe Bay crude, 320

In sea grass bed, 317, 318

In water column, 322

Wave action, 228

Wave damping effect, 74, 76-85

Wave energy, 325, 326

As natural clean-up, 327, 331-336,
367-368

Weathering, 31, 342

Ratios, 341, 345, 348

Whiting, IN, sewer treatment, 174

Wilcoxon matched-pairs signed-
ranks test, 247, 251, 263, 265

Williamsburg Bridge, NY, accident,
166

Wind speed

And AOE, 407, 409

And oil persistence, 395-396

And VLH incorporation into water,
208-210, 221

Winkles, 246, 248-251, 254

Winter exposure, effects, 19

World Glory accident, 417

X

Xylenes, 25

Z

Zoe Colocotronis spill, 366-367

Zostera noltii, toxicity in, 263-268