

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION

DIVISION of FISHERIES and OCEANOGRAPHY

Report No. 70

**AN INDEX TO ECOLOGICAL INFORMATION ON
ESTUARIES AND MARINE EMBAYMENTS
IN WESTERN AUSTRALIA**

By E. P. Hodgkin and K. Majer

2nd Edition (Revised)

Reprint No. 916

**P.O. Box 21,
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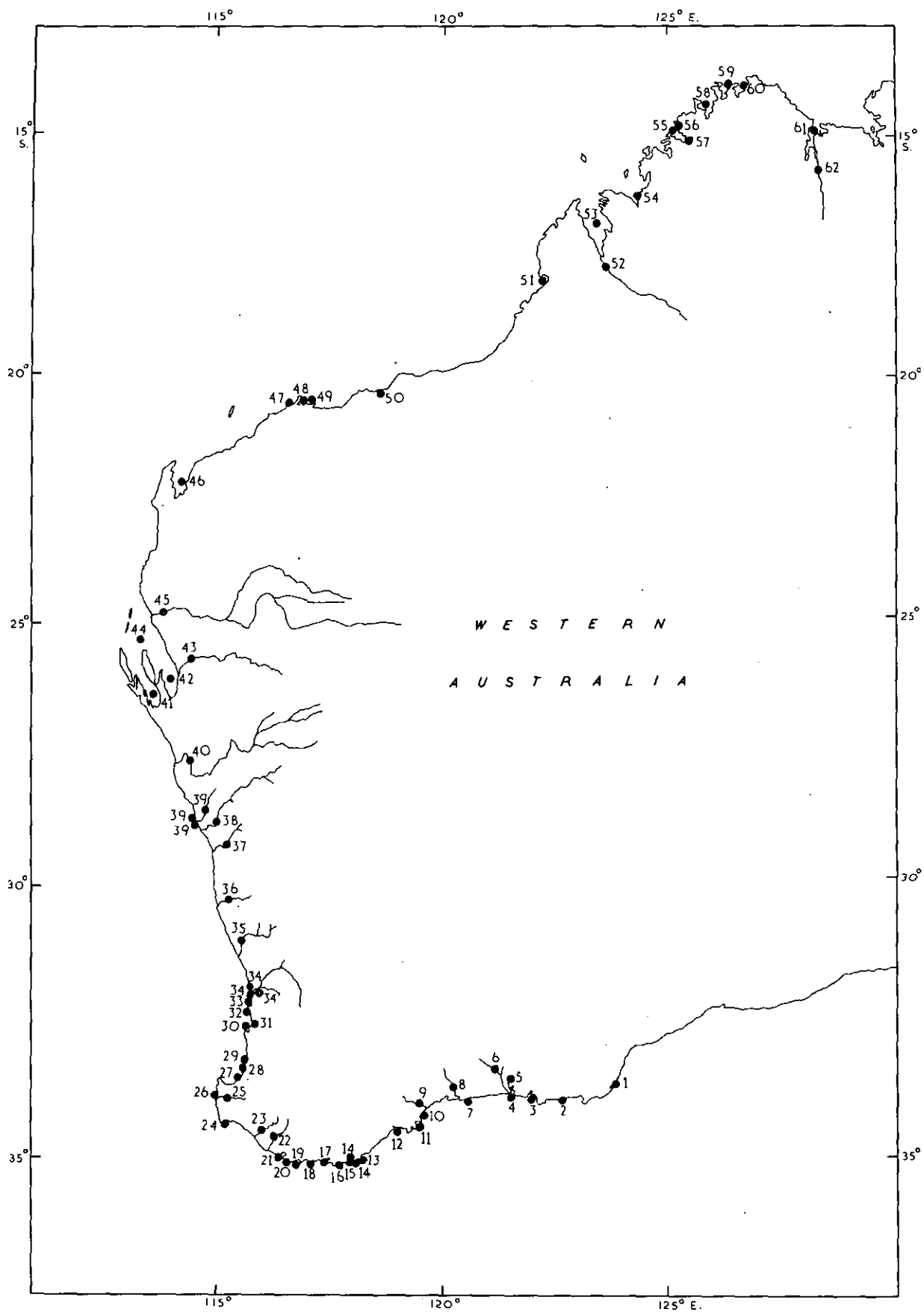


Fig. 1.- The estuaries and marine embayments of the Western Australia coast, numbered sequentially, from the southwest extremity to the northern border.

AN INDEX TO ECOLOGICAL INFORMATION ON ESTUARIES AND MARINE

EMBAYMENTS IN WESTERN AUSTRALIA

by

E.P. Hodgkin and K. Majer

In January 1975 the CSIRO Division of Fisheries and Oceanography undertook a feasibility study for an ecological survey of Australian estuaries on behalf of the Australian Department of the Environment. The immediate objective was to obtain a reasonably complete listing of information readily available and of institutions and individuals currently active in research on the estuarine environment. Within the constraint of a three month study period, a complete listing for all Australia could not be attempted, and the area within the political boundaries of Western Australia was chosen for a test project. A fairly complete listing for this area was obtained. This material is considered useful to others working in the estuarine environment. This report makes this information available.

The authors greatly appreciate the generous assistance of persons too numerous to list, but whose names appear in this report. It would have been impossible without their help to prepare such a complete documentation during the time at our disposal. We are especially grateful to Mr R. Lenanton for his help and also wish to thank the librarians of the CSIRO Regional Laboratory, the Western Australian Department of Fisheries and Wildlife, and several branch libraries of the University of Western Australia for their help and advice. Dr B.J. O'Brian, Director of the Western Australia Department of Conservation and Environment very kindly made available to us the facilities of his department for our work.

The search for information was not restricted to published material; manuscripts such as students theses, consultants reports and data in files are also listed. All sources were abstracted and coded for punch card sorting. From this treatment, a bibliography was compiled and cross referenced to subject and geographical location. The distinction between an estuary and a marine embayment is often arbitrary and inconsistent; these have been combined in this report.

Ecological information available on Western Australian estuaries and marine embayments has been listed in two tables. The first (Table 3) is the bibliography containing published or readily available reports. These are listed alphabetically by senior author, and prefaced by a sequential number. Unpublished status is indicated by "Ms". Table 4 contains a listing of agencies and individuals who were active in estuarine work in early 1975. A brief description of their work is given together with notes on the location of existing data. The status of the project is indicated by "c" (completed), "o" (ongoing) and "f" (proposal for future). Each project is also prefaced with an italicized sequential number.

Access to the listings in Tables 3 and 4 are through the Geographical Index (Table 1) and the Subject Index (Table 2). The Geographical Index lists Western Australia estuaries and marine embayments in alphabetical order,

prefaced by non-sequential numbers. These numbers are keyed to an outline map of Western Australia showing their locations (Fig. 1). In Figure 1, the estuaries and marine embayments are numbered in sequence, starting at the south-east extremity of the Western Australian Coast and proceeding clockwise.

Following the indices in Tables 1 and 2 are two sets of numbers. The first set, in bold face type refer the reader to items in Table 3, the bibliography. The second set, in italics, refer the reader to Table 4, the list of participants in estuarine research.

It is realized that some of the information contained in this report will soon be out of date, particularly the listings in Table 4. This report will, however, serve as a base from which to update information available on estuaries and marine embayments and on agencies and people involved in pertinent studies. In this respect it can serve as a continuing and valuable reference for those with a special interest in research and the management of Western Australian Estuaries.

Table 1.- Locality Index to Bibliography on Western Australian Estuaries and Marine Embayments.*

58	Admiralty Gulf	115, 177, 376, <i>15</i> , <i>52</i>
14	Albany	102, 233, 255, 256, 257, 258, 264, 320, 389, 397, 398, <i>100</i>
12	Beaufort Inlet (Pallinup)	102, 172, 277, 340, 360, 375, 385, 434, <i>24</i>
21	Broke Inlet (Shannon)	172, 347, 367, 370, 385, <i>12</i> , <i>16</i> , <i>25</i>
55	Brunswick Bay (Prince Regent R.)	177
28	Bunbury Harbour	29, 50, 103, 109, 110, 113, 128, 130, 216, 280, 305, 306, 380, 390, 393, 406, <i>38</i> , <i>68</i> , <i>75</i>
61	Cambridge Gulf (Ord)	109, 177, 271, 399, 476, 485, 486, <i>27</i> , <i>52</i>
49	Cape Lambert (Point Samson)	34
39	Champion Bay	No references
39	Chapman River	No references
33	Cockburn Sound	9, 18, 19, 20, 21, 22, 23, 39, 55, 58, 66, 72, 81, 90, 91, 92, 93, 94, 95, 96, 97, 98, 102, 121, 123, 124, 130, 137, 147, 148, 149, 158, 160, 175, 189, 193, 194, 203, 204, 205, 206, 222, 226, 227, 230, 282, 317, 325, 356, 357, 382, 408, 412, 419, 420, 422, <i>14</i> , <i>16</i> , <i>17</i> , <i>20</i> , <i>24</i> , <i>49</i> , <i>53</i> , <i>54</i> , <i>58</i> , <i>64</i> , <i>66</i> , <i>93</i> , <i>99</i> , <i>106</i> , <i>107</i>
54	Collier Bay (Walcott Inlet)	177
26	Cowaramup Bay	248
7	Culham Inlet (Steere & Phillips)	102, <i>25</i>

* Numbers in bold face type refer to items in Table 3, those in italics to items in Table 4.

23	Donnelly R.	29
2	Duke of Orleans	300
3	Esperance Bay	276, 12, 16, 18
46	Exmouth Gulf	57, 71, 78, 115, 195, 196, 213, 383, 404, 405, 1, 14, 15, 18, 24, 25, 40, 50, 70, 88
34	Fremantle	24, 35, 36, 37, 69, 90, 109, 110, 111, 113, 116, 254, 255, 256, 257, 258, 264, 282, 306, 317, 332, 387, 388, 391, 392, 394, 412
9	Fitzgerald R.	213, 39
52	Fitzroy R.	143, 214
41	Freycinet Estuary	86, 87, 104, 105, 106, 107, 114, 115, 159, 167, 168, 169, 171, 179, 180, 181, 182, 183, 184, 185, 186, 187, 195, 196, 212, 225, 228, 237, 238, 239, 270, 297, 311, 312, 313, 314, 315, 340, 347, 348, 352, 415 (see Shark Bay)
22	Gardner R.	29
45	Gascoyne	145, 159, 27, 30, 85
39	Geraldton Harbour	109, 110, 128, 130, 306, 400, 100
10	Gordon Inlet	25
38	Greenough R.	202, 100
42	Hamelin Pool	185, 470, 40 (see Shark Bay)
8	Hamersley R.	No references
24	Hardy Inlet (Blackwood)	1, 2, 43, 44, 45, 117, 126, 136, 172, 234, 252, 253, 262, 263, 269, 321, 327, 344, 345, 346, 347, 385, 435, 438, 439, 442, 443, 447, 449, 450, 453, 454, 455, 457, 461, 462, 463, 466, 475, 481, 482, 2, 3, 13, 18, 22, 23, 27, 32, 33, 39, 63, 72, 81, 88, 90, 93, 94, 95, 96, 100, 101, 102, 104, 105
36	Hill R.	25, 65
19	Irwin Inlet	172, 202, 347, 385, 25
37	Irwin R.	202
1	Israelite Bay	102, 300, 27, 76

13	King George Sound	40, 109, 110, 113, 123, 128, 133, 165, 320, 363, 364, 389, 397, 2
53	King Sound	177, 86
29	Leschenault Inlet (Preston & Collie)	24, 29, 50, 56, 87, 103, 132, 204, 205, 215, 216, 252, 253, 262, 263, 280, 284, 286, 287, 291, 321, 332, 340, 344, 346, 347, 353, 358, 363, 364, 380, 406, 2, 18, 27, 30, 37, 40, 57, 64, 66, 100
30	Mandurah (Coast)	51, 141, 150, 280, 294, 304, 309, 316, 331, 366, 368, 372, 401, 432, 38, 67, 68, 69 (See Peel-Harvey)
25	Margaret R.	213, 23, 32, 33, 65, 100, 102
35	Moore R.	202, 246, 72, 105
40	Murchison R.	49, 159, 213, 275, 303, 25, 39, 100
60	Napier Broom Bay (King Edward & Drysdale)	122, 177, 396, 52
48	Nickol Bay	78, 115, 384, 386, 1, 15, 50
20	Nornalup-Walpole Inlet (Frankland & Deep)	118, 165, 172, 221, 231, 252, 253, 262, 263, 321, 385, 2, 25, 39, 100
6	Oldfield R.	No references
62	Ord R.	156, 214, 336, 416, 16, 18, 30, 103
34	Owen Anchorage	(see Fremantle)
14	Oyster Harbour (King & Kalgan)	13, 154, 165, 172, 189, 190, 199, 200, 201, 342, 347, 363, 364, 385, 409, 418, 206
18	Parry Inlet	172, 347, 385, 25
31	Peel-Harvey Inlets (Harvey, Murray & Serpentine)	51, 52, 64, 67, 71, 77, 85, 87, 108, 135, 140, 141, 165, 217, 241, 243, 244, 245, 246, 249, 252, 253, 262, 263, 265, 266, 267, 273, 280, 284, 286, 291, 294, 296, 304, 316, 321, 323, 324, 331, 340, 344, 345, 346, 347, 355, 363, 364, 366, 367, 368, 372, 426, 432, 444, 467, 478, 484, 2, 3, 4, 5, 6, 9, 10, 18, 27, 30, 31, 32, 36, 37, 39, 41, 42, 44, 45, 46, 47, 56, 62, 71, 72, 77, 78, 80, 90, 92, 93, 96, 99, 100, 106,

50	Port Hedland	69, 109, 110, 113, 18, 40
57	Prince Frederick Harbour	No references
15	Princess Royal Harbour	106
47	Regnard Bay	78
51	Roebuck Bay	68
	Rottneest Island	102, 116, 123, 130, 160, 189, 209, 282, 317, 334, 421, 423, 427, 465, 472, 40 (See Cockburn Sound)
44	Shark Bay	41, 48, 63, 73, 74, 75, 86, 89, 104, 105, 106, 107, 114, 167, 168, 169, 171, 179, 180, 182, 183, 184, 186, 212, 225, 228, 237, 238, 239, 297, 311, 312, 313, 314, 352, 365, 369, 377, 378, 379, 383, 415, 445, 464, 480, 1, 14, 15, 17, 18, 25, 40, 52, 76, 82
4	Stokes Inlet (Lord & Young)	172, 385, 39
34	Swan R. Estuary (Canning, Swan, Avon)	3, 4, 6, 7, 8, 10, 11, 15, 16, 17, 24, 30, 31, 35, 37, 42, 43, 44, 45, 47, 54, 59, 60, 62, 70, 80, 82, 83, 84, 87, 100, 101, 102, 119, 120, 125, 131, 134, 138, 139, 140, 142, 144, 146, 151, 153, 155, 161, 162, 163, 164, 165, 166, 174, 178, 188, 189, 190, 192, 204, 207, 208, 210, 211, 220, 232, 240, 242, 246, 247, 251, 252, 253, 262, 263, 265, 266, 268, 272, 273, 274, 278, 279, 281, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 295, 299, 302, 321, 322, 323, 324, 326, 328, 329, 330, 333, 337, 338, 341, 347, 354, 363, 364, 373, 374, 381, 402, 403, 407, 409, 410, 411, 413, 418, 425, 428, 429, 430, 431, 437, 448, 458, 469, 473, 479, 487, 2, 18, 22, 27, 40, 43, 54, 55, 63, 72, 74, 76, 77
16	Torbay Inlet	No references
5	Torradup R.	No references
59	Vansittart Bay	No references

32	Warnbro Sound	55, 267, 270, 301, 61, 99
11	Wellstead Estuary (Bremer)	5, 172, 385
17	Wilson Inlet (Hay & Denmark)	165, 172, 173, 219, 229, 252, 253, 262, 263, 291, 321, 340, 345, 346, 347, 361, 362, 363, 364, 371, 385, 2, 12, 25, 106
27	Wonnerup Inlet (Ludlow)	14, 302, 347, 358, 359, 25
43	Wooramel R.	87
56	York Sound	115, 117

Table 2.- Subject Index to Bibliography on Western Australian Estuaries
and Marine Embayments.*

PHYSICAL FEATURES

Geomorphology 17, 23, 25, 26, 33, 39, 63, 73, 97, 100, 101, 104, 105,
Bathymetry 118, 125, 126, 142, 143, 145, 150, 169, 173, 179, 188,
194, 205, 218, 222, 224, 237, 248, 267, 272, 273, 322,
326, 366, 397, 398, 400, 415, 421, 445, 470, 471, 472,
476, 480, 23, 25, 27, 38, 40, 45, 47, 52, 61, 64, 66, 68,
82, 83

STRATIGRAPHY

73, 104, 105, 106, 107, 126, 143, 145, 159, 179, 182,
183, 186, 237, 239, 248, 273, 415, 445, 470, 471, 472,
480, 38, 82, 83, 85, 93

GEOLOGICAL HISTORY

17, 30, 31, 48, 60, 62, 72, 73, 104, 105, 106, 107, 143,
145, 159, 181, 183, 186, 199, 237, 238, 239, 248, 269,
272, 273, 334, 415, 416, 445, 451, 470, 471, 472, 480,
485, 40

SEDIMENTS

1, 23, 30, 48, 55, 63, 72, 73, 74, 75, 92, 93, 94, 95,
96, 97, 98, 101, 104, 105, 106, 107, 118, 126, 137, 143,
145, 149, 179, 180, 182, 183, 184, 185, 186, 187, 199,
201, 218, 222, 237, 238, 239, 248, 249, 251, 253, 263,
269, 273, 307, 309, 321, 325, 336, 352, 356, 358, 393,
397, 398, 399, 400, 401, 415, 445, 467, 470, 471, 472,
474, 480, 486, 2, 14, 23, 24, 38, 40, 62, 64, 82, 83,
84, 85, 86, 87, 88, 90, 91, 92, 93, 94

ORGANIC COMMUNITIES
(inc. fossils)

62, 63, 72, 73, 75, 79, 80, 104, 105, 107, 137, 151,
154, 179, 180, 185, 187, 200, 222, 233, 237, 240, 248,
352, 409, 415, 13, 22, 23, 24, 40, 66

METEOROLOGY II

HYDRODYNAMICS

2, 25, 26, 36, 37, 48, 56, 58, 63, 64, 69, 72, 73, 76,
83, 92, 94, 99, 100, 104, 105, 106, 107, 109, 110, 111,
112, 113, 118, 126, 128, 136, 143, 149, 169, 173, 177,
184, 193, 199, 201, 205, 207, 208, 218, 225, 236, 237,
238, 251, 302, 305, 306, 308, 310, 322, 325, 338, 352,
357, 365, 388, 395, 399, 416, 417, 435, 457, 472, 23, 27,
37, 43, 64, 71, 94, 95, 96, 99

HYDROLOGY

18, 19, 22, 24, 63, 64, 72, 73, 77, 91, 92, 93, 94, 95,
96, 97, 98, 99, 100, 104, 105, 106, 118, 126, 128, 130,
132, 165, 169, 173, 179, 184, 189, 192, 198, 201, 205,
207, 208, 215, 218, 224, 237, 250, 251, 252, 253, 254,
255, 256, 257, 258, 259, 260, 262, 263, 264, 265, 266,
268, 321, 322, 323, 324, 325, 352, 353, 357, 365, 387,
388, 410, 411, 415, 418, 428, 431, 458, 472, 2, 3, 4, 10,
12, 13, 16, 23, 24, 27, 29, 30, 31, 32, 35, 36, 38, 41,
42, 44, 49, 53, 54, 55, 56, 62, 64, 66, 71, 72, 73, 76,
78, 82, 83, 84, 85, 89, 94, 96, 97, 98, 104, 105, 106

* Numbers in bold face type refer to items in Table 3, those in italics to items in Table 4.

FLORA

General	9, 442, 443, 444, 452, 470, 471, 38, 76, 77, 79, 81, 82, 93
Bacteria, Fungi	91, 92, 93, 96, 97, 98, 161, 388, 49, 55
Algae	8, 10, 63, 64, 73, 75, 82, 91, 92, 93, 94, 95, 96, 97, 98, 104, 120, 123, 125, 126, 173, 180, 184, 185, 193, 199, 201, 223, 237, 243, 244, 245, 250, 268, 270, 290, 296, 317, 318, 319, 338, 350, 418, 419, 470, 471, 66, 73, 79, 80, 82
Sea Grasses	10, 33, 58, 63, 73, 74, 91, 92, 93, 94, 95, 96, 97, 98, 106, 125, 126, 184, 199, 201, 203, 205, 222, 237, 238, 252, 296, 303, 317, 319, 419, 17, 64, 82, 105, 107
Mangroves	73, 78, 132, 143, 184, 215, 216, 336, 352, 24
Rushes & Saltmarsh	125, 126, 132, 296, 429, 43
Other Riparian Vegetation	61, 89, 126, 194, 197, 202, 217, 273, 33, 34
Historical Notes	116, 119, 157, 320, 326, 407

FAUNA

Protozoa	33, 38, 57, 62, 63, 72, 82, 125, 126, 179, 184, 199, 200, 222, 233, 234, 237, 248, 290, 338, 441, 474, 482, 483, 38, 62, 63, 64, 72, 74, 76, 77, 78, 83, 107
Annelida	16, 33, 91, 125, 126, 146, 160, 203, 210, 230, 237, 338, 17
Mollusca	13, 33, 42, 54, 63, 79, 80, 91, 92, 93, 94, 95, 96, 97, 98, 104, 123, 126, 129, 134, 147, 148, 151, 152, 153, 162, 184, 193, 203, 221, 230, 237, 240, 248, 250, 335, 342, 352, 408, 409, 410, 411, 412, 413, 414, 423, 427, 428, 431, 16, 17, 20, 21, 22, 78, 104
Arthropoda	15, 33, 35, 43, 44, 45, 46, 59, 70, 71, 81, 91, 92, 93, 102, 114, 115, 125, 126, 127, 131, 135, 172, 173, 174, 184, 189, 190, 191, 192, 199, 201, 203, 204, 205, 211, 212, 226, 227, 228, 230, 232, 235, 242, 246, 247, 250, 261, 281, 284, 290, 296, 303, 311, 312, 313, 314, 315, 337, 338, 365, 373, 376, 379, 380, 382, 383, 384, 386, 404, 405, 418, 424, 425, 430, 462, 463, 1, 14, 15, 16, 70, 72, 73, 78, 105

Fish	12, 33, 47, 67, 87, 88, 92, 125, 126, 135, 155, 163, 164, 165, 169, 171, 172, 174, 175, 176, 195, 196, 203, 207, 209, 214, 218, 229, 284, 290, 298, 303, 339, 340, 341, 343, 344, 345, 346, 347, 348, 349, 359, 360, 361, 362, 363, 364, 365, 368, 369, 374, 377, 378, 381, 385, 433, 460, 462, 463, 464, 465, 466, 477, 481, 12, 13, 16, 17, 23, 65, 78, 106
Birds	4, 5, 7, 11, 29, 49, 50, 51, 52, 65, 67, 68, 84, 85, 86, 89, 103, 122, 125, 126, 135, 138, 139, 140, 144, 156, 166, 174, 178, 219, 229, 231, 241, 274, 275, 276, 277, 278, 279, 280, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 299, 300, 301, 304, 327, 328, 329, 330, 331, 365, 372, 375, 406, 426, 429, 434, 461, 18, 19, 23, 66, 76
Other Vertebrates	14, 53, 135, 213, 290, 296, 16, 17, 103
Historical Notes	3, 4, 5, 6, 157, 271, 326, 407, 459, 469, 75

HUMAN INFLUENCES

Pollution	24, 58, 67, 91, 92, 93, 94, 95, 96, 97, 98, 120, 124, 125, 132, 158, 161, 174, 208, 220, 224, 268, 332, 333, 357, 387, 388, 408, 419, 3, 6, 16, 18, 24, 30, 41, 42, 49, 55, 56, 57, 58, 64, 98, 108
Dredging & Filling	20, 21, 66, 67, 90, 121, 125, 126, 132, 173, 174, 288, 302, 325, 332, 353, 391, 392, 394, 399, 447, 12, 53, 64
Mining	58, 61, 126, 174, 358, 450, 451, 3, 4, 5, 6, 8, 25, 28, 29, 36, 38, 40, 41, 42, 44, 47, 48, 49
Fishing	12, 13, 40, 41, 53, 58, 67, 71, 87, 88, 108, 114, 115, 124, 126, 133, 155, 167, 168, 169, 171, 174, 175, 176, 205, 212, 214, 217, 218, 225, 226, 227, 228, 284, 290, 298, 311, 312, 313, 314, 315, 339, 341, 342, 345, 346, 349, 361, 362, 363, 364, 368, 369, 376, 377, 378, 379, 381, 382, 383, 384, 385, 386, 404, 405, 432, 439, 446, 466, 1, 12, 14, 15, 17, 70
Recreation	53, 58, 67, 124, 126, 141, 174, 206, 217, 332, 353, 402, 403, 438, 440, 450, 487, 12, 25, 31, 38, 39, 60, 61, 64, 65, 66, 67, 100
General	27, 117, 125, 243, 244, 245, 273, 309, 351, 354, 355, 432, 448, 449, 455, 456, 478, 479, 484, 25, 38, 40, 46, 50, 56, 57, 75, 101, 102
Historical Notes	32, 117, 316, 437, 453, 454

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Table 4. Listing of agencies/investigators, projects and unpublished data on Estuaries and Marine Embayments in Western Australia

Abbreviations: c = completed
 o = ongoing
 f = future proposals

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
AUSTRALIAN GOVERNMENT			
1. AUSTRALIAN DEPARTMENT OF AGRICULTURE (FISHERIES DIVISION) CANBERRA, A.C.T. Mr G. Evans	c. Economic survey of the Western Australian prawn fisheries - assessment of the economic position of fishermen in Shark Bay, Exmouth Gulf, Nickol Bay (North West Australia)	Data on 1973 survey of W.A. prawn fisheries.	
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION			
2. Division of Fisheries & Oceanography, Cronulla, N.S.W. (Leach Street, Marmion, W.A.) Mr R.S. Spencer Mr D.J. Rochford	c. (1944-1956) South Western Australian estuarine hydrology and analyses of bottom deposits. - Swan River Nornalup Inlet Peel-Harvey Estuary Wilson Inlet Leschenault Inlet King George Sound Hardy Inlet	Data unpublished in C.S.I.R.O. Oceanographical Station Lists (Numbers 8,12,13,15,16,21,26,29, 32) and other publications.	
3. Division of Land Resource Management, Underwood Avenue, Floreat Park, Perth, W.A. Dr A.J. Peck Mr E. Bettenay Dr F. Hingston Mr D.H. Hurle Dr M.L. Sharma Mr D.R. Williamson	o. Land use and stream salinity experiments. Changes in streamwater quality and hydrologic regime associated with changes in land use in nine instrumented catchments in south west W.A. Particularly concerned with the effects of agriculture and bauxite mining (Timescale approximately 10 years). Dr Peck on supervisory panel of projects on small stream salinity sampling (bauxite area) and paired catchment study (woodchip licence area).	Data resulting from 1-2 years monitoring in catchment areas, which will provide baseline data before land use changes. Includes data on major ions, sediment yields, electrical conductivity, phosphates, nitrates, heavy metals and trace elements (also some historical data on trends in salinity and total soluble salt concentration in the Blackwood River and Murray River, held by Dr A.J. Peck.	
4. Dr A.J. Peck	o. Estimating the possible effect of bauxite mining on stream salinity. A simple salinity model for application to catchments is operational. Other more accurate models to predict the impact of mining on the flow of underground water and stream salinity are being constructed.	Some data to apply the model to the Murray River sub-catchments supplied by Mr F. Batini and Mr J. Havel, Forests Department. Other data from P.W.A. "Streamflow" Records for W.A.	

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
C.S.I.R.O. (Contd.)		
5. Dr N. Barrow	o. Member of supervisory panel for a project on rehabilitation of bauxite mining sites in the Murray River catchment.	Data listed under the members of the working group.
6. Mr E. Bettenay	o. Member of a supervisory panel for projects on changes in the water table following bauxite mining and catchment monitoring at sites in the Murray River catchment. Member of supervisory panel of project to monitor fluctuations of ground water level and salinity through a period of logging and regeneration in woodchip licence area.	Data listed under the members of the working group.
7. Mr W.M. MacArthur	c. Member of supervisory panel of projects to identify areas vulnerable to salinity increase and to monitor surface and underground water in paired catchments in woodchip licence area	Soil survey maps supplied to Woodchip Steering Committee. Soil landform map together with data on salt storage in woodchip licence area.
8. Dr M.J. Mulcahy	o. Member of Steering Committees on Woodchip Industry and Bauxite Mining.	
9. Mr W.M. MacArthur Mr H.M. Churchward	c. Soil and landform mapping of the Murray-Hotham catchment area.	Soil map at scale 1:100,000 with more detailed surveys of selected areas. Text giving detailed description of units mapped.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
C.S.I.R.O. contd.. 9. Mr H.M. Churchward Mr W.M. MacArthur	Soils and Landforms of the Strelley and George catchments in the Pilbara	Soil maps at scale 1:250,000 with explanatory text.
10. Dr D. Bennett	o. Changes in water quality with changes in land use in Murray River catchment South West W.A. Model being devised to predict optimal land use in terms of total economic yield of catchment with respect to water, forestry and agriculture. Also interested in the effects of alternative dam sites on the Murray River on Peel Inlet - not researched.	Data for model supplied by Forestry Department, Agriculture Department, Metropolitan Water Supply Sewerage and Drainage Board, Public Works Department...Theoretical treatment of this data only.
11. BUREAU OF METEOROLOGY, 127 Wellington Street, PERTH. W.A.	o. Monitoring meteorological parameters, including coastal stations.	Data on temperature, humidity, wind speed and direction, rainfall and streamflow (Streamflow in liaison with Public Works Department). Parameters measured at specific sites close to estuaries and embayments in W.A. not ascertained at this stage. Enquiries to Special Services Section.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
WESTERN AUSTRALIAN GOVERNMENT DEPARTMENT OF FISHERIES AND WILDLIFE, W.A. MARINE RESEARCH LABORATORIES, Post Office Box 20, NORTH PERTH. W.A. 6020	Mr R.C. Lenanton	o. Historical survey of professional fishing, recreational usage and development in South and West coast estuaries. c. Study of the biology of King George Whiting in Wilson Inlet. c. Investigation of the catching ability of seine and set nets. c. Investigation of environmental changes resulting from dredging a navigational channel across Walpole Inlet. o. Investigation of seasonal changes in nutrient levels in south coast estuaries from Broke Inlet to Esperance.	Historical records of fisheries including commercial catch data. Data on King George Whiting trapped in Wilson Inlet by closure of the sand bar across the entrance. Includes population size, growth rate, relative catches of amateur and professional fishermen, rate at which fishing reduces population, how and when recruitment occurs and how the estuarine habitat is used. Data from field trials. Data on benthic macrofauna and fish before and after dredging Data from winter 1974 water samples. Analysed for total dissolved solids, nitrates, total nitrogen, phosphates, total phosphorus. In conjunction with Mr. J. Edmonds.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF FISHERIES AND WILDLIFE (Contd.) 13. Mr R.C. Lenanton Mr J. Wallace		o. Blackwood Estuary Study.	Hydrology, density and seasonal occurrence of fish and benthic fauna (Benthic fauna data collected by Mr J. Wallace). Biology of four species. (Black Bream, Snapper, Western Sand Whiting, and King George Whiting)
	Mr J.W. Penn	o. Monitoring Shark Bay and Exmouth Gulf prawn fisheries. o. Estimation of population parameters for Shark Bay prawn fishery. o. Determining relationship of sediment types and other environmental parameters to the distribution and migration of prawns in Shark Bay o. Laboratory investigation of the factors affecting the catchability of the King Prawn. o. Investigation of the reproductive cycles of King and Tiger prawns in Cockburn Sound and Shark Bay.	Logbook data and information on landings from commercial prawn fisheries, collected in conjunction with Mr N.G. Hall. Population parameters, in particular migration, estimated from catch data. Collected in conjunction with Geology Department, University of W.A. Laboratory data on prawns from Cockburn Sound. Will later use prawns from Shark Bay. Biological data (life cycle, growth migration, mortality, distribution, reproduction) from tagging experiment and histological studies. Also data on other fisheries in Cockburn Sound, including crabs and whiting.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF FISHERIES AND WILDLIFE (Contd.) 15. Mr N.G. Hall	o. Collection of logbook data and information on landings from the commercial prawn fisheries in Shark Bay, Exmouth Gulf, Onslow, Nickol Bay, Admiralty Gulf; measurement of factory samples. o. Production of computer summaries of rock lobster research logbooks, prawn research log books, estuarine holiday resort logbooks etc. o. Study of the population dynamics of prawn stocks and assessment of the status of the commercial prawn fisheries in W.A.	Collected in conjunction with Mr J.W. Penn. Concerned only with analysis of data. Data from 1961 on.
16. Mr J. Edmonds	c. Investigation of heavy metal residues in commercial fish species in Cockburn Sound. o. Investigation of heavy metal residues in sediments and fauna in Cockburn Sound. O. Analysis of pesticide residues from Ord River Fish. o. Investigation of seasonal changes in nutrient levels in south coast estuaries from Broke Inlet to Esperance.	Data on levels of mercury, cadmium, chromium, zinc and lead from tissues of fish, scallops, mussels, prawns and other benthic fauna in Cockburn Sound. Data collected in conjunction with Dr B. Logan, Geology Department, University of W.A. and co-ordinated by Environmental Protection Authority. Data on pesticides and organochlorines in tissues of fish samples from irrigation areas (since 1971) and tidal areas (since 1974) of Ord River. Project to be completed 1975. Data collected in conjunction with Mr R.C. Lenanton.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF FISHERIES AND WILDLIFE (Contd.) 17. Mr D. Heald	c. Monitoring catch and effort data for scallop fishery for <i>Pecten</i> spp in Cockburn Sound. o. Monitoring catch and effort data for scallop fishery for <i>Amusium</i> spp in Shark Bay. c. Development of a suitable tag for <i>Amusium</i> spp to use in tagging experiments, Shark Bay. o. Biological studies of <i>Amusium</i> spp (Shark Bay) and <i>Pecten</i> spp (Cockburn Sound) o. Development of management procedures for scallop fishery, W.A. o. Collection of data on shark landings W.A. c. Survey of benthic fauna and flora, Cockburn Sound.	Production figures 1971 to 1974. Production figures 1970 on. Tagging data on growth rates and migration stock size of <i>Amusium</i> spp. Most data for <i>Amusium</i> spp including histology, breeding cycle, growth rates, parasites. Similar for <i>Pecten</i> spp. A plan for rationalization of exploitation has been generated. Data from 1973 on numbers, species and locations, collected from fishermen and processing companies. Quantitative data on distribution and seasonal fluctuations of 80 or so species in Cockburn Sound, including sea grasses, algae, corals, sponges, annelids, echinoderms, crustaceans, molluscs and fish (from dredge hauls). Scrapbook kept from 1974 of W.A. newspaper articles on Fisheries, Environment, Ecology Conservation, Pollution, Government Legislation on fisheries, Mercury, Sharks and Whales. Fisheries Department also keeps a complete scrapbook of fisheries articles.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF FISHERIES AND WILDLIFE, W.A. WILDLIFE RESEARCH CENTRE, Mullaloo Drive, WANNEROO. W.A.	18. Mr J.A.K. Lane	o. Pelican banding study; Peel Inlet, Exmouth Gulf, Port Hedland, Derby, Onslow, Broome, Ord River, Shark Bay. f. Pelican wing tagging, as above o. Banding of resident and trans-equatorial migratory wading birds; Pelican Point, Swan River. f. Banding of trans-equatorial migratory wading birds at Hardy Inlet. o. Survey of birdlife of Leschenault Inlet. o. Blackwood Estuary Study - survey of birdlife of Hardy Inlet. f. Survey of birdlife of Peel and Harvey Inlets.	Data on banding of young pelicans - movement of individuals. Data held by Fisheries and Wildlife and by C.S.I.R.O. Wildlife Division. Data on local and migratory movements of estuarine waders since January 1973. Data on bird species present, total populations of each species and distribution within the estuary since July 1973. Data similar to Leschenault Inlet from 1974.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF FISHERIES AND WILDLIFE (Contd.)	18. Mr J.A.K. Lane (Contd.)	f. Survey of numbers of swans and pelicans on all major estuaries between Swan River and Esperance (south-west coast) from March 1975. (Biannual)	
		c. Monitoring of estuarine pollution using heavy metals and pesticide levels in the estuarine cobbler in Swan River estuary.	Data on heavy metals and organochlorines from tissue samples of cobbler. Copy of data held by Mr. J. Edmonds, Fisheries Department.
19.	Dr T. Riggert	o. Interest in wetlands, including estuaries, as a resource, with particular reference to their use by waterfowl.	Aerial surveys and background information. Report on wetlands submitted through Reserves Committee of E.P.A.
20.	WESTERN AUSTRALIAN MUSEUM, Francis Street, PERTH. W.A. Dr B.R. Wilson Mr G.W. Kendrick Mrs L.M. Marsh	c. Studies on marine invertebrate benthic fauna of Cockburn Sound.	Annotated checklist of molluscs, echinoderms, and corals; notes on their relative abundance and distribution.
21.	Dr B.R. Wilson	c. Biology of two marine mussels in relation to fouling problems (Honours project) and breeding biology of some Western Australian marine and estuarine mussels (Ph.D. Project).	Data in theses held in Zoology Dept. Library, University of Western Australia.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
WESTERN AUSTRALIAN MUSEUM (Contd.) 22.	Mr G.W. Kendrick	c. Study of middle-Holocene marine molluscs from Swan River (near Guildford). c. Faunal palaeoenvironmental study of fossil deposits in Swan River estuary. (Point Waylen) o. Study of living and fossil mollusc fauna and Quaternary history of Perth region.	Fossil mollusc fauna and living species of molluscs, W.A. Fossil deposits, Swan River Estuary.
DEPARTMENT OF CONSERVATION AND ENVIRONMENT, B.P. House, 1 Mount Street, PERTH. W.A. 6000			
ESTUARINE AND MARINE ADVISORY COMMITTEE OF THE ENVIRONMENTAL PROTECTION AUTHORITY 23.	Dr E.P. Hodgkin (Co-ordinator)	p. Blackwood Estuary Study - an environmental study of the Blackwood River Estuary.	Data on the geomorphology, hydrogeology and vegetation of the Blackwood River catchment, the geomorphology, hydrology, tides, currents, sediments, climate (temperature, rainfall, evaporation, winds), flow, biota (plants and plant nutrients, zooplankton, micro-biota, meiobenthos, macroinvertebrate fauna, fish, birds) of estuary.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
	Dr E.P. Hodgkin (Contd.)		Progress report available which also includes appendices on the geology, mineral potential and hydrology of the inlet, history of the bar, Swan Lakes, and Deadwater, and notes on the social characteristics of the Augusta-Margaret River area (1975)
24.	Dr R. Field (Secretary E.M.A.C.)	o. Heavy metal residues in sediments and benthic fauna, Cockburn Sound. c. Mangroves between Exmouth Gulf and Eighty Mile Beach. c. Study of the Pallinup River System and problems associated with trying to halt the natural cycles of deterioration of the waters of Beaufort Inlet which have been increased by agricultural development.	Sediments collected by Dr B.W. Logan Geology Department, University of W.A. Fauna collected by Mr J. Edmonds, Fisheries and Wildlife. Samples not yet analysed (heavy metals). Data submitted as information paper to the E.P.A.; 1974. Historical data, physiography, bar openings, salinity, and flow. Information paper to the E.P.A.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
CONSERVATION THROUGH RESERVES COMMITTEE OF THE ENVIRONMENTAL PROTECTION AUTHORITY	25. Mr L. Goodridge (Secretary C.T.R.C.)	o. Collection of data from many sources on conservation reserves in W.A. Areas include Vasse-Wonnerup estuary, Geographe Bay, Leeuwin Naturaliste Ridge, Scott-Blackwood River junction, Warren River, Scott River, Nornalup Inlet, Broke Inlet, Two People Bay, Hardy Inlet, Irwin Inlet, Parry Inlet, Wilson Inlet, Gordon Inlet, Culham Inlet, Barkers Inlet, Murchison River Gorge, Hill River Estuary, Exmouth Gulf, Shark Bay,	Conservation Through Reserves Committee Report to E.P.A. 1974 - recommendations for system of reserves to conserve principal environmental and scenic variety in W.A. Data: Recreational and scientific values, uses and potential uses; geology, geomorphology, biology, climate, land use, visitors and tourism, mining and industrial development.
PUBLIC WORKS DEPARTMENT, 2 Havelock Street, WEST PERTH. ENGINEERING DIVISION HARBOURS AND RIVERS BRANCH	26. Mr K.J. Kelsall	o. Chairman of Steering Committee on the Woodchip Industry	
27. Dr W.S. Andrew		c. Blackwood Estuary Study - physical topography of the Blackwood River estuary and ocean tide recording and prediction.	

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
PUBLIC WORKS DEPARTMENT. (Contd.)	Dr W.S. Andrew (Contd.)	o. See Annual Report, 1974, (Including work on water supplies, sewerage, irrigation drainage, flood control, marine works, ports and slipways, coastal and river works, water resources).	Information on water depths, tidal movements and ground conditions pertaining to the Ports and tidal waters of W.A. Sites recorded are generally those used by commercial (including fishing) vessels. (i) Tidal records and analyses are available for all main ports. (ii) Partial studies on foreshore movements at Perth Metropolitan beaches, Mandurah and Busselton, coast between Kalbarri and Israelite Bay (aerial photographs) and Gascoyne River delta. (iii) Full hydrographic surveys of Swan River estuary, Peel Inlet, Cambridge Gulf, Leschenault Inlet. This information is contained in:- (a) Files which are destroyed or deposited in the archives after 7 years. Tidal records are available but other information is not all systematically located and may not be easily accessible. (b) Plans which are kept in perpetuity and are listed in a plan register which lists locations. Annual Reports (1880 onwards) contain some relevant information

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
28. Mr D.B. Collett PLANNING DESIGN AND INVESTIGATION BRANCH	o. Member of Steering Committee on Research into the effects of Bauxite mining, and on supervisory panel of projects on salinity model, catchment monitoring, rehabilitation studies and paired catchment study. Member of Woodchip Steering Committee on research into the effects of the woodchip industry and convener of supervisory panel on projects monitoring surface and underground water on paired catchments and quantity and quality of runoff from large catchments.	
29. Mr K.L. Barrett	o. Recording of stream and river flows, rainfall, statewide. o. Effects of land use changes, bauxite mining and woodchip industry on stream salinity in catchments in South West W.A. f. Programme of water quality measurement in rivers throughout W.A. - assessment of volume and quality of W.A. water resources.	Annual catalogue lists, with gauged catchments area and period of record. Daily and monthly data on runoff, flow duration and flow rate (published). Monitoring changes in stream, salinity, water quality and flow in catchments of: Deep R., Weld R., Shannon R., Gardner R., Wilgarup R., Warren R., Dombakup R., Barlee R., Donnelly R., Data supplied to Woodchip Steering Committee. Monthly data on salinity, and temperature. Less frequent monitoring of about 26 elements.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
IRRIGATION AND DRAINAGE BRANCH 30. OPERATIONS SOUTH		o. Collection and analysis of water samples from rivers entering Peel Inlet (Harvey River, Mayfields Drain, Sth Coolup Drain), and Leschenault Inlet (Preston, Ferguson, Collie, Wellesley River) and Harvey River Division.	Monthly data on pH, turbidity, colour, odour, specific conductivity, total dissolved solids, sodium, chloride, nitrogen, nitrates, phosphorus and pesticides.
OPERATIONS NORTH		o. Ord River Irrigation project.	Concentration of pesticides and weedicides in drainage water.
		o. Collection and analysis of water samples from Gascoyne River when in flow.	Data on pH, colour, odour, specific conductivity, salinity and minerals.
		o. Also see Annual Report, 1974.	
INSTITUTE OF FOREST RESEARCH, George and Thelma St, COMO PERTH. W.A. 6152	31. Mr F. Batini Mr J. Havel	o. Land-use stream-salinity studies. Effects of alternative land uses of area within the Murray River catchment on stream salinity - a modelling approach.	Data on: (i) economic costs and returns from land use (forestry) activities (ii) estimation of water and salt yield from catchment within forestry area (iii) estimation of benefits of conservation and recreation. Supplied by Dr D. Bennett C.S.I.R.O.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
INSTITUTE OF FOREST RESEARCH (Contd.) 32.	Mr F. Batini (1) Mr P. Kimber (2) (Manjimup) Dr S. Shea (3) (Dwellingup) Dr F. McKinnell (4) (Busselton)	o. Stream salinity, groundwater and soil profile salinity in catchments of Helena River (1), South Dandelup River (3), Murray River (3), Margaret River (4), Blackwood River (4) and in woodchip licence area (2) See Dr E.R. Hopkins, Mr P. Kimbers, Effects of Woodchip Industry and Dr E.R. Hopkins, Mr F. Batini, Mr J. Havel, Dr S. Shea, Effects of Bauxite Mining).	Weekly salinity data.
33.	Dr F. McKinnell (Busselton)	o. Forestry - <i>Pinus radiata</i> and others, in "Sunklands" between Nannup and Margaret River (Blackwood River catchment)	
34.	Mr J. Havel	o. Site vegetation studies - relationship between site, vegetation, soils and alternative land use activities in northern jarrah forests.	Data (unpublished) held by Mr J. Havel. Papers in preparation.
35.	Dr E.R. Hopkins Mr P. Kimber	o. Effects of Woodchip Industry, Devising forest cutting strategies in response to land use studies. Dr E.R. Hopkins is member of Steering Committee on woodchip industry and on supervisory panel of projects to monitor surface and underground water on paired catchments, and fluctuations in ground water level and salinity through a period of logging and regeneration. Mr P. Kimber on panel of project to identify areas vulnerable to salinity increase. (Shannon River catchment)	Data on soil moisture, soil and vegetation survey, core analyses.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
INSTITUTE OF FOREST RESEARCH (Contd.) 36.	Dr E.R. Hopkins Dr S. Shea (Dwellingup) Mr A. Hatch Mr F. Batini Mr J. Havel	o. Effects of Bauxite Mining Dr E.R. Hopkins is member of Steering Committee on the effects of bauxite mining. Mr J. Havel is member of supervisory panels and working groups on projects on salinity modelling, changes in the water table following mining, catchment study and small stream salinity sampling study (Murray River catchment) Mr F. Batini supplied input data on salinity and other parameters to test simplified salinity model over a range of catchment areas (see Dr A.J. Peck, C.S.I.R.O.) Dr S. Shea and Mr A. Hatch working on the effects of bauxite mining and other land use changes in Murray River catchment and Jarrahdale on water yield and salinity. Rehabilitation studies in mined areas (rooting, regeneration, cover species) Dr S. Shea is member of working groups on the effects of bauxite mining (rehabilitation and paired catchment studies).	Data (unpublished) on ground water level and salinity in mined and undisturbed areas at Jarrahdale and Del Park for one season. Similar to be monitored at catchment areas near Dwellingup. Report (unpublished) presented to Project 7 Supervisory Panel. Data (unpublished) from weekly salinity samples (1973-1975) and on plant species used for regeneration following mining.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF LANDS AND SURVEYS Cathedral Avenue, PERTH. W.A.	37. Mr Casey (Custodian)	o. Mapping and aerial photography of coastline of W.A.	Maps and orthophotomaps of coast- line (including Army maps); Survey reports; Historical data in explorers diaries and field books (unpublished)
	f. Comparison of water levels of Harvey Estuary, Lakes Clifton and Preston and Leschenault Inlet.	(Specific information has not been extracted at this stage due to time limitations. See G. Rundle). Data to be supplied to Town Planning Department	

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
TOWN PLANNING DEPARTMENT 22 St. George's Terrace, PERTH. W.A. 38.	Mr J. Griffiths Mr R. Hiller	o. Mandurah-Bunbury Regional Planning Study. Identification of environmental constraints on urban development in the area. Measurement and projection of human demand on the area in relation to the capacity of the area to absorb such demand. Areas suitable for various land uses.	Records of development proposals relating to areas bordering on estuaries and in the river catchments. Data on subdivisions, location of caravan parks and recreational facilities. Data (unpublished) from Mandurah-Bunbury Regional Planning Study in the form of results of studies initiated by T.P.D., Consultants reports and data supplied by other departments. This includes: Maps of land uses of coastal plain (urban, agricultural or vacant), rivers and dams, tourist resorts, communications and settlements; aerial photographs; traffic surveys (volume and direction); day-visitor numbers; tourist surveys (including occupancy of cottages); surface and underground drainage; landscape analysis; economics of land uses; bathymetry and water levels of estuaries and lakes; sediments and stratigraphy; stability of dune systems; foreshore conditions; caves, soils and vegetation; wildlife; water catchments; impact of state and metropolitan population growth; potential industrial and mining development; South-West corridor planning. Further details of the data supplied by consultants and other departments listed under the relevant institutions. (A summary of the related research and data has been compiled by Mr J. Griffiths and a copy of this obtained)

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
NATIONAL PARKS BOARD OF W.A. Hackett Drive CRAWLEY, PERTH. W.A. 39.			National parks bordering on estuaries at Murchison River, Nornalup Inlet, Stokes Inlet, Fitzgerald River, Peel Inlet, Blackwood River.
MINES DEPARTMENT 66 Adelaide Terrace PERTH. W.A. 6000 GEOLOGICAL SURVEY BRANCH 40 & 41.	Mr J.H. Lord	o. Member of Steering Committee on effects of bauxite mining and woodchip steering committee. o. Geological mapping of sedimentary basins. Evaluation of fossil fuel resources. o. Research on Quaternary sedimentation and coastal geomorphology.	Data on bauxite mining and woodchip projects listed under working group members. Published bulletins, maps and unpublished records and reports. Data on Exmouth Gulf, Lake Macleod, Shark Bay and Zuytdorp Cliffs areas, Rottneest Island, Swan Coastal Plain. Publications on Rottneest, Hamelin Pool, Cape Range, and Lake Macleod areas. Published bulletins, maps and unpublished records and reports. Published bulletins, maps and unpublished records and reports.
Sedimentary Division	Dr P.E. Playford, Dr W.J.E. van de Graaff, Mr P.D. Denman, and Mr R.M. Hocking	o. Geological mapping in mineral fields and evaluation of mineral resources. o. Geological mapping in hard-rock areas. o. Specialist services in palaeontology, fossil identification, petrology, geophysics, library services and environmental. o. Examination of Quaternary fossils.	Published and unpublished reports.
Mineral Resources Division			
Regional Mapping Division			
Common Services Division			
Dr A.E. Cockbain			

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
MINES DEPARTMENT (Contd.) Common Services Division (Contd.)	Mr E.R. Biggs	o. Studies of Laporte effluent disposal - Leschenault Inlet. Environmental conditions on proposed mining in estuaries, on coasts, and elsewhere.	Published maps and unpublished reports.
	Mr R.H. Archer	o. Urban geology mapping (1:50 000) Manduarh/Peel Inlet, Dampier/Karratha. o. Urban geology mapping, Pinjarra/Peel Inlet, Port Hedland and Wickham/Roeburne.	Maps published or in press. Maps in press or in preparation.
Hydrology and Engineering Division	Mr E.P. O'Driscoll	o. Groundwater resources assessments.	Records of boreholes throughout the State and reports. Unpublished reports.
	Mr T.T. Bestow	o. Engineering investigations of dam sites, tunnels and other works. o. Evaluation of groundwater resources throughout the State. o. Studies of Laporte effluent disposal. o. Groundwater pollution studies.	Unpublished reports. Unpublished reports. Unpublished reports. UNESCO published paper and unpublished reports.
		o. Studies of water balance and aquifer characteristics in Gnangara area. o. Supervisory pannel of projects on the changes in hydrology resulting from mining, catchment monitoring, rehabilitation studies, paired catchment study and salinity model in bauxite mining area.	Published papers in annual report. Published and unpublished reports on the effects of bauxite mining, including salinity and hydrographic data from bores in mined and unmined areas of the Darling Range.

INSTITUTION	OUTLINE OF RESEARCH	DATA
PERSONNEL MINES DEPARTMENT (Contd.) Hydrology and Engineering Division (Contd.) Mr T.T. Bestow (Contd.) Mr L. Furness Mr A.S. Harley Dr A.D. Allen	o. Studies of water balance of certain lakes in SW division. o. Supervisory panel of paired catchment and monitoring studies in the woodchip licence areas. o. Member of Working Group studying the effects of bauxite mining and wood-chipping on hydrology. o. Ex-member of Working Group studying the effects of bauxite mining and wood-chipping on hydrology. o. Studies of the detailed geology and hydrogeology of the Perth metropolitan area, groundwater resources evaluation.	Unpublished reports. Unpublished reports. Geological, hydrographic and salinity data from monitoring bores (unpublished reports). Published and unpublished reports, borehole data.
DEPARTMENT OF AGRICULTURE Jarrah Road SOUTH PERTH. W.A. SOILS DIVISION 42. Mr T. Stoneman	Member of Steering Committee on the Effects of Bauxite Mining, and on supervisory panels for projects on catchment monitoring, paired catchment study and small stream salinity sampling study at mining sites within the Murray River catchment. Member of Steering Committee on the Woodchip Industry and on supervisory panels of projects to identify areas vulnerable to salinity increase, monitor surface	Data on bauxite mining projects listed under working group members. Data on effects of land type and use on water salinity in marri woodchip licence area.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF AGRICULTURE (Contd.) Mr T. Stoneman (Contd.)		and underground water in paired catchments in representative areas, and monitor fluctuations of ground water levels and salinity through the period of logging and regeneration. Member of working groups which reported on effects of land type and land use changes on water and salt yields by catchments in the marri woodchip licence area.	
43.	Mr J. Grasby Mr C.V. Malcolm	o. Treatment and prevention of erosion of river banks in the upper reaches of the Swan River.	Data on use of native rushes and grasses in the prevention of erosion supplied to Swan River Conservation Board.
44.	Mr C. Shedley	o. Effects of bauxite mining - small stream salinity sampling study at sites within the Murray River catchment.	Data on previous catchment parameters collected and analyzed for correlation with P.W.D. salinity data. Also data from intensive stream sampling programme on salinity and discharge.
45.	Mr K. Bligh	c. Estimation of water yields from agricultural areas of Murray River catchment (east of Darling Range).	Estimates of average runoff from different landforms supplied to Dr D. Bennett, C.S.I.R.O.
RURAL ECONOMICS & MARKETING BRANCH 46. Mr P. Eckersley		c. Economic analysis of costs and returns of agricultural activities in Murray River catchment area (east of Darling Range).	Data supplied to Dr D. Bennett, C.S.I.R.O., and to Town Planning Department.
SOILS DIVISION 47. Mr J. Grasby		o. Analysis of dunes at mouth of Peel Inlet. Member of supervisory panel of project on rehabilitation of areas mined for bauxite.	Data to be supplied to Town Planning Department.
48.	SOILS DIVISION Mr J. Riches	o. Soil conservation in bauxite mining areas.	

INSTITUTION PERSONNEL	PROJECT	DATA
METROPOLITAN WATER SUPPLY SEWERAGE AND DRAINAGE BOARD 2 Havelock Street, WEST PERTH. W.A. 49. Mr H. Hunt Mr I.J. O'Hara	o. Peel Inlet Study - see W.A.I.T.-AID o. Bacteriological and chemical analyses of water samples from around effluent outlet pipes, Cockburn Sound and Perth Metropolitan beaches o. Chairman of Steering Committee on effects of bauxite mining in catchments in south-west W.A. o. Member of Steering Committee on Woodchip Industry and bauxite mining in catchments in south west W.A.	Annual samples analysed for coliforms, <i>E-coli</i>, dissolved oxygen, phosphorus, nitrogen and B.O.D. (Beaches twice weekly). Data listed under working group members.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF INDUSTRIAL DEVELOPMENT, 32 St George's Terrace, PERTH. W.A. 50. Mr B. Power	None relevant to estuaries at present	May be relevant data in departmental documents relating to coastal development proposals, particularly in North West (Nickol Bay, Exmouth Gulf).
51. Mr C.J. Poynton	o. Member of Steering Committee on Woodchip Industry in catchment areas in south west W.A.	
HARBOUR AND LIGHT DEPARTMENT, 185 High Street, FREMANTLE. W.A. 52.	No estuarine projects	Charts showing depth soundings for all W.A. coast, including inlets and embay- ments, e.g. Cambridge Gulf, Admiralty Gulf, Napier Broome Bay, Shark Bay. Catalogue of Admiralty Charts, and other hydrographic publications. "Australia Pilot".

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
FREMANTLE PORT AUTHORITY 1 Cliff Street, FREMANTLE. W.A. 53. Mr D. Robinson (Public Relations)	o. Hydrographic and engineering c. Ecological survey of Cockburn Sound.	Records of dredging, depth soundings, tide records, wind readings, bore logs, current metering held by hydrographic department. Study by Environmental Resources of Australia Pty. Ltd. Copies of reports held by F.P.A., E.R.A. (and several libraries and government departments).
STATE ELECTRICITY COMMISSION 132 Murray Street, PERTH. 54.	o. Recording water temperatures at sites of Power Stations, W.A., including Swan River, Cockburn Sound.	Water temperature.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
CONSERVATION COMMITTEES SWAN RIVER CONSERVATION BOARD, 2 Havelock Street, WEST PERTH. PERTH. W.A. 55. Mrs Roberts (Secretary)	o. Monitoring composition of treated effluent discharge into Swan River o. Chemical and bacterial analyses of Swan River water samples. o. Investigation of specific problems. See Report of Swan River Conservation Board 1959-1969.	Annual analyses of effluents submitted for renewal of permits. Also spot checks on composition of effluents. Quarterly measurement by Government Chemical Laboratory of oxygen, ammonia, phosphorus, chlorine, pH and temperature at 49 stations. (Records since about 1940). Monthly samples of <i>Salmonella</i>, coliforms and faecal <i>E. coli</i> at 40 stations (mostly swimming areas). Graphs kept by Dr R. Lugg, Public Health Department. Various. All information is filed by S.R.C.B. and is available on request (alphabetical and locality index).
PEEL INLET ADVISORY COMMITTEE 56. Mrs Roberts (Secretary)	o. Chemical sampling programme for Peel Inlet. (To be co-ordinated with WAIT-AID study). o. Preparation of recommendations on specific problems - industry, planning, pollution	Files held by Mrs Roberts at S.R.C.B.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
LESCHENAULT INLET ADVISORY COMMITTEE 57. Mrs Roberts (Secretary)	o. Preparation of recommendations on specific problems - industry, planning, pollution.	Files held by Mrs Roberts at S.R.C.B.
COCKBURN SOUND CONSERVATION COMMITTEE P.O. Box 21, KWINANA. PERTH. W.A. 6167 58. Mr R.J. Nokes (Secretary)	No research carried out; data collection only.	Development in and around Cockburn Sound. Data supplied by Department of Industrial Development, M.R.P.A., City of Fremantle, Town of Cockburn, Shire of Kwinana, Shire of Rockingham, (respective Town Planning Schemes). Data on pollution - industrial effluent outfalls - from F.P.A. and government departments, and other sources. Feedback information to Shire Councils bordering on Cockburn Sound.
59. LEEUWIN CONSERVATION GROUP	o. Study of Leeuwin Naturaliste Ridge.	See Ecological and Resource Planning Consultants.
60. VASSE CONSERVATION COMMITTEE	c. Cape Naturaliste tourism	See C. Bayley-Jones, Geography Department, University of Western Australia.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
61. WARNBRO SOUND CONSERVATION SOCIETY	c. Study of dune systems of Warnbro Sound and recommendations for recreational usage of the area	See R. Silvester, Engineering Department, University of Western Australia.
<u>INDUSTRY</u> BURMAH OIL AUSTRALIA LTD., 16 Stirling Highway, NEDLANDS. PERTH. 6009. 62. Miss M. Apthorpe	c. Study of Foraminifera of Gippsland Lakes, Victoria. f. Collection of Foraminifera in Peel Inlet, Harvey estuary (Will co-operate with WAIT-AID study).	Foraminifera of Gippsland Lakes; relationship between species and sediments. Distribution, seasonal changes and taxonomy of Foraminifera; salinity and water temperature; collections made in March and August, 1975.
WEST AUSTRALIAN PETROLEUM PTY. LTD., 12 St. George's Terrace, PERTH. W.A. 63. Dr P. Quilty	c. Foraminifera of Hardy Inlet (Blackwood Estuary Study). o. Foraminifera of Swan River Estuary	Species of Foraminifera; comparison of summer and winter faunas; distribution. Data from 1973 on, on taxonomy and distribution of Foraminifera.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
CONSULTANTS ERA ENVIRONMENTAL RESOURCES OF AUSTRALIA PTY. LTD. (No longer operating, see Meagher and Le Provost).	c. Study of the Cockburn Sound ecosystem, 1970 to 1974 for the Fremantle Port Authority and Commonwealth Department of Works.	Persistence of ecosystem in relation to constructional and industrial modifications. Data on physical features, hydrology, hydrodynamics, flora (particularly sea-grasses), fauna, industrial pollution
64. Dr T. Meagher	c. The effect of industrial waste discharge into Cockburn Sound, 1971, for Fremantle Port Authority and Commonwealth Department of Works. (Now Australian Government Department of Housing and Construction) c. The beach morphology of Cockburn Sound 1971-3, for Commonwealth Department of Works. (Now Australian Government Department of Housing and Construction) c. The hydrology of Cockburn Sound, 1971 - 1973, for the Australian Government Department of Housing and Construction c. Disposal of industrial effluent into Owen Anchorage (Cockburn Sound) 1971, for Department of Industrial Development and Chamber of Manufactures. c. An environmental appraisal of Leschenault Inlet, 1972, for United Development Corporation Pty. Ltd.	Documentation of historical decline of marine biotic community in relation to industrialisation. Fluctuations in beach profile, sediment tracking, chemical and mechanical analysis of foreshore sediment. Hydrology Topography, hydrology. constitution of industrial effluents. Hydrology, recreational use, ecology in relation to changes (dredging, dam, harbour) flora, fauna.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
ECOLOGICAL AND RESOURCE PLANNING CONSULTANTS, 30 Alderbury Street, FLOREAT PARK. PERTH. W.A. 6014	Dr J.A. Springett	o. A resource inventory of the Leeuwin-Naturaliste Ridge (coastal strip west of the Bussell Highway) for the Leeuwin Conservation Group (includes Margaret River and Hardy Inlet).	Area will be mapped (1:50 000) and list of resources and sensitivity analysis produced - a breakdown of the recreational activities particular resources can sustain. Time scale to December, 1975). (Progress report, August, 1975).
65.	MEAGHER AND LE PROVOST, ECOLOGICAL CONSULTANTS, 18 Kings Park Road, WEST PERTH. PERTH. W.A.	o. Ecological study of Cockburn Sound for the Australian Government Department of Housing and Construction and Fremantle Port Authority. o. Review of all data collected by Environmental Resources of Australia Pty. Ltd. on ecology of Cockburn Sound, for Environmental Protection Authority. o. Study of mosquito control in Canning River for the Town of Canning.	Data collected November, 1974, to April, 1975, on phosphate and nitrate levels, chlorophylls and other plant pigments, plankton, water currents and circulation, nutrient input and eutrophication. Data collected by E.R.A. Pty. Ltd.
66.	Dr T. Meagher Mr I. Le Provost	o. Ecological study of Leschenault Inlet and sea for Laporte (Titanium) Australia Ltd.	Data collected February to June 1975 on breeding cycles of mosquitoes in relation to water levels. Also documenting algae, wildfowl, benthic fauna, vegetation in relation to soil type, ground water level and salinity to provide base line data for assessment of recreational enhancement and mosquito control. Classified information - not available.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
MEAGHER AND LE PROVOST (Contd.)	Dr T. Meagher Mr I. Le Provost	o. Development of a deterrent to waterfowl landings on "Tailing ponds" belonging to Alcoa of Australia Ltd. o. Beach erosion study in Owen Anchorage, Cockburn Sound, for Town of Cockburn.	Data on swan behaviour in response to deterrent techniques Review of Air Photographic record, review of survey records. Beach profiles, summer and early winter.
67. URBAN SYSTEMS CORPORATION PTY. LTD. 56 Kings Park Road, WEST PERTH. PERTH. W.A.		o. Economic assessment of tourist establishments in Mandurah.	Data to be supplied to Town Planning Department.
68. P. & M. TOOBY, LANDSCAPE ARCHITECTS AND RECREATION PLANNERS, 46 Kings Park Road, WEST PERTH. PERTH. W.A.	Mr M. Tooby	o. Landscape analysis, Mandurah to Bunbury	Data to be supplied to Town Planning Department
69. SPELEOLOGICAL RESEARCH GROUP OF WESTERN AUSTRALIA, 35 Spencer Street, KELMSCOTT.		o. Cave surveys in the Mandurah area	Data to be supplied to Town Planning Department.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
P.A. MANAGEMENT CONSULTANTS PTY. LTD. 44 Ventnor Avenue, WEST PERTH. PERTH. W.A. 70. Mr T. White	c. Ph.D. project on population dynamics of the Tiger Prawn in the Exmouth Gulf Fishery and implications for management of the fishery.	Thesis not submitted Data held by T. White.
W.A.I.T.-AID WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY, ENVIRONMENTAL SCIENCE GROUP, Hayman Road, BENTLEY, W.A. 71. Dr R. Rippingale Mr R. Black Mr W. Cooper Dr J. Hosking Dr J. Penrose (and others as required)	o. Peel Inlet Study for Metropolitan Water Supply, Sewerage and Drainage Board. Study aimed at understanding some of the factors which control the condition of the waterways.	Hydrographic data on saline penetration, hydrodynamics, hydrology (salinity, temperature, miscellaneous chemical estimations), plankton and food chain studies, land utilization. Progress report listing data sources and deficiencies and proposed research was prepared in October, 1974. A further progress report including interpretation of field observations submitted March, 1975. (Copies held by W.A.I.T.-AID, Metropolitan Water Supply, Sewerage and Drainage Board, E.P.A.).

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
72. <u>INDIVIDUALS</u> Dr E.P. Hodgkin 6 Princes St., MOSMAN PARK, PERTH. W.A.	o. Co-ordinating Hardy Inlet Study (see Department of Environmental Protection c. Zooplankton of estuaries and associated inlets south west W.A. - Moore River, Swan River, Murray River, Collie River, Blackwood River, Deep and Frankland Rivers, Denmark and Hay Rivers, King and Kalgan Rivers. Hydrology measurements.	Data from plankton samples taken at three or four month intervals, 1971 to 1973. Also hydrological data (salinity and temperature) Data held by Dr E.P. Hodgkin and Dr R. Rippingale (W.A.I.T.) and summary of data by Dr E.P. Hodgkin (unpublished). Also data obtained by Mr. I. Le Provost on plankton in Cockburn Sound, 1971-1972.	
73.	Dr E.P. Hodgkin Dr R. Rippingale c. Study of autecology of four common species of planktonic copepods in the Swan River estuary, and inter-relations between them and the phytoplankton. Hydrology measurements.	Data on copepods, phytoplankton, hydrology (salinity and temperature) river flow and tidal movements 1969 to 1974. Sporadic data on oxygen and silica content. Also hydrological data collected by Dr B. Wilson, 1965, and Dr L. Bhuiyan 1964 to 1966.	
74.	Dr E.P. Hodgkin Mr G.W. Kendrick Mr P. Chalmer c. Benthic fauna survey of Swan River Estuary	Qualitative survey of macro-fauna in summer 1971-1972 and November, December, 1973. Unpublished reports by P. Chalmer held by Dr E.P. Hodgkin	

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
75.	Mr G. Rundle Main Roads Dept., Waterloo Crescent, EAST PERTH. PERTH. W.A.	o. Collection of data of historical interest on the Stirling Swale (Coastal strip, Bunbury to Busselton).	Maps, explorers reports, notes from early explorers diaries and other historical data. Largely collected from Department of Lands and Surveys
76.	Dr D.L. Serventy 27 Everett St., NEDLANDS. PERTH. W.A.	c. Plankton and hydrology of Matilda Bay, Swan River. o. Observations on birdlife (and other fauna and flora) of estuaries and bays between Israelite Bay and Shark Bay.	Data held by Dr D.L. Serventy Field notes of observations
<u>CLUBS</u>	W.A. NATURALIST CLUB	c. Survey of wading birds at Pelican Point, Swan River Estuary. o. Survey of fauna and flora at Yunderup delta (mouth of Murray River) and adjoining part of Peel Inlet.	Data held by Mr Max Bailey, Royal Perth Hospital. Data from 1969 held by Dr D.L. Serventy.
77.	Dr D.L. Serventy		

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
<u>UNIVERSITIES AND TECHNICAL COLLEGES</u> WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY, Hayman Road, BENTLEY. PERTH. W.A. 78. DEPARTMENT OF BIOLOGY Dr R. Rippingale	c. Zooplankton, copepods in Swan River Estuary; hydrology of Swan River. See E.P. Hodgkin o. Student projects on estuarine fauna, Peel Inlet, Harvey Estuary, Swan River Estuary. o. Peel Inlet Study - see W.A.I.T.-AID	Data on hydrology of Swan River and plankton samples 1971-1973. Predation effects on distribution of a copepod; population growth; nutritional state and salinity tolerance. Physiology, growth patterns, distribution of mussels (two species) and polychaetes (two species); patterns of fish predation; genetic isolation between separated populations of a copepod. Unpublished reports held by Dr R. Rippingale.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
UNIVERSITY OF WESTERN AUSTRALIA CRAWLEY. PERTH. W.A. DEPARTMENT OF BOTANY	c. Littoral flora	Access to all departmental theses (Honours, M.Sc., Ph.D.). Access to Herbarium - collections of marine and salt marsh-flora from south west W.A., and algae from Swan River.
80. Mr P. Collins	c. M.Sc. project under supervision of Mr G.G. Smith on algae and other aquatic vegetation of Peel Inlet	Honours Thesis, M.Sc. project commenced February 1975.
81. Mr R.A. Congdon	o. Ph.D. project under supervision of Dr A.J. McComb on flora of wetlands of south west Australia and its nutrition Blackwood Estuary Study	Aquatic flora of Hardy Inlet. Data to date presented in progress report, Blackwood Estuary Study.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
82. DEPARTMENT OF GEOLOGY	Dr B.W. Logan Mr D.E. Cebulski (Dec) Dr R.G. Brown Dr G.R. Davies Dr J.F. Read Mr G.M. Hagan Mr N. Tuppin Mr P. Woods	c. Shark Bay research project Carbonate sedimentation and diagenesis in sub-littoral and intertidal-supratidal environments in embayment. Study of environmental factors, biotic communities and Quaternary history.	Hydrographic (depth soundings, current velocity, sediment transport); hydrological (salinity, temperature, oxygen); biological (aquatic fauna, communities; aquatic plants, especially sea-grasses and algae); geological (sediment types, processes of sedimentation, stratigraphy of Holocene-Recent sequence, geology of surrounding area). Data in theses held in Geology Department Library. Additional data held by Dr B. Logan.
83.	Dr B.W. Logan Dr R.G. Brown	o. Exmouth Gulf research project. Sedimentation processes in the Gulf and marginal tidal flats. Involves studies of environmental parameters, biotic communities, sedimentation patterns and Quaternary history	Hydrographic (bathymetry, tidal currents, sediment transport); hydrological (salinity, temperature) biological (aquatic fauna, aquatic plants and algae); geological (sediment types, processes of sedimentation, stratigraphy of Holocene-Recent sequence, geology of surrounding area). Data held by Dr R.G. Brown

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF GEOLOGY (Contd.)			
84.	Dr B.W. Logan Mr L.B. Collins	c. Environment, sedimentation and sedimentary history of the Western Australian Continental Shelf and coastal zone between Fremantle and Cape Naturaliste.	Hydrographic, biological and geological data held by Mr L.B. Collins
85.	Dr B.W. Logan Dr R.G. Brown Dr D. Johnson	c. Sedimentation and stratigraphy of Gascoyne River Delta	Hydrographic, hydrological, biological and geological data in D. Johnson's thesis held in Geology Department Library.
86.	Dr V. Semenuik	o. Sedimentation in tidal flats of King Sound.	1974 on.
87.	Dr J.J. Glover	o. Sedimentation of Mooramel River Delta.	1974 on.
88.	Mr Z.A. Sas	c. Honours project under supervision of Dr B.W. Logan on sedimentology of Hardy Inlet. Blackwood Estuary Study	Data on cores taken by staff of Harbours and Rivers Branch of Public Works Department. Presented in Blackwood Estuary Study progress report and Honours Thesis.
89.	Mr R.H. Caldwell	o. Ph.D. project under the supervision of Dr B.W. Logan on evaporites of Lake Macleod.	

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF GEOLOGY (Contd.)		
90. Mr T.M. Robertson	c. M.Sc project under the supervision of Dr B.W. Logan on aspects of sedimentation, Harvey Estuary	Data (unpublished) in thesis held in Geology Department library.
91. Ms. J. Robinson	o. M.Sc project under the supervision of Dr B.W. Logan on sedimentology of Lake Clifton and Lake Preston.	
92. Mr J. Treloar	o. M.Sc project under the supervision of Dr B.W. Logan on sedimentology of Peel Inlet.	
93. Dr B.W. Logan	o. Granulometric analysis of sediments of Hardy Inlet. Blackwood Estuary Study o. Collection of surface sediment samples, Cockburn Sound. o. Sediments and stratigraphy of Peel Inlet	Data presented in Blackwood Estuary Study progress report. Samples to be analyzed for heavy metals. Data to be supplied to Town Planning Department.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
94. Dr J. Imberger DEPARTMENT OF MATHS AND MECHANICAL ENGINEERING	o. Water characteristics, dynamics and sediment transport, Hardy Inlet. Entrainment across a stationary halocline; maintenance of a salt wedge system; tidal coupling of salt wedge and surface elevation. Blackwood Estuary Study. o. Gravitational circulation in models of estuaries.	Data to date presented in Blackwood Estuary Study progress report. Papers in prep. Laboratory data
95. Mr H. Agnew	o. Ph.D. project under supervision of Dr J. Imberger on water dynamics in Blackwood River Estuary. (Blackwood Estuary Study).	Data to date presented in Blackwood Estuary Study progress report and Ph.D. thesis.
96. Mr R. Black (W.A.I.T.)	o. Ph.D. project under supervision of Dr J. Imberger and Mr R.H.B. Hebbert on gravitational circulation in Harvey Estuary and its effects on longitudinal dispersion. See Peel Inlet Study - W.A.I.T.-A.I.D.	Hydrographic and hydrodynamic data to be presented in Ph.D. thesis.
97. Dr J. Patterson	o. Numerical modelling of estuarine system	Laminar flow and density driven circulation.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF MATHS AND MECHANICAL ENGINEERING (Contd.) 98. Mr G. Ivey Mr K. Roxborough	c. Honours projects under supervision of Dr. J. Imberger on hot water discharge from the Kwinana Power Station, Cockburn Sound and its recirculation into the intakes.	Data in Mr Ivey's and Mr Roxborough's Honours theses held by Dr J. Imberger
DEPARTMENT OF CIVIL ENGINEERING 99. Mr R. Silvester	o. Hydrodynamics, siltation and coastal erosion, and methods of stabilization, Western Australian coast.	Some data presented in consultants reports, including transmission of sand across mouth of Peel Inlet (for Public Works Department) and dune systems of Warnbro Sound (for Warnbro Sound Conservation Society). Largely theoretical, little field measurement.
DEPARTMENT OF GEOGRAPHY 100. Miss C. Bayley- Jones	o. Study of holiday-making and recreational usage of estuaries and bays from Port Hedland to Esperance. Includes Greenough River, Geraldton, Lancelin, Swan River, Peel Inlet, Leschenault Inlet, Margaret River, Blackwood River, Hardy Inlet, Nornalup Inlet, Scott River, Albany. o. Aspects of tourism, Blackwood Estuary Study	Data on numbers of holidaymakers, modes of transport, activities, recreational facilities and their development. Data held by Miss C. Bayley-Jones. Some presented as consultants reports, including Geraldton - Greenough Region, Murchison River, Cape Naturaliste. Data on tourism in Peel Inlet area supplied to Town Planning Depart- ment. Data presented in progress report, Blackwood Estuary Study.

INSTITUTION	PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF GEOGRAPHY (Contd.)	Mr K. Frawley	o. Population attitudes, Blackwood Estuary Study	Data presented in report, Blackwood Estuary Study and in Honours Thesis. Geography Department, University of Western Australia.
101.			
DEPARTMENT OF SOCIAL WORK	Dr B. Wooller	o. Social and demographic characteristics, Blackwood Estuary Study.	Data not presented to date. Appendix on social characteristics of Augusta/Margaret River in Blackwood Estuary Study, progress report.
102.			
DEPARTMENT OF MICROBIOLOGY	Prof. N.R. Stanley Mr P. Liehne Mrs C. Liehne	o. The relationship between arboviruses and their vertebrate hosts, Ord River	Mosquito collections from Ord River Estuary and Dam. Also data on mosquitoes collected on Swan River Estuary, and other estuaries in W.A. (by Britten, Public Health Department).
103.			

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
DEPARTMENT OF ZOOLOGY		
104. Mr P. Smith	o. Ph.D. project under supervision of Dr E.P. Hodgkin, Dr R. Black, Dr B. Wilson on estuarine ecology of two species of Nassarid Gastropods in Swan River estuary and Hardy Inlet.	Data collection completed. Data on growth reproduction and population dynamics of molluscs, the effects of salinity on individual behaviour and population dynamics. Hydrology (salinity and temperature) of Swan River (1972-1974, monthly samples) and Hardy Inlet (1972-1974, 8-weekly samples).
105. Mr D. Bray	o. Ph.D. project under supervision of Dr E.P. Hodgkin on the biology of the shrimp <i>Palaeomonetes australis</i> in south-west Australian estuaries. Largely Swan estuary, Hardy Inlet, some samples from estuaries from Moore River to Esperance.	Data collection completed. Data on salinity tolerance, osmoregulation, life cycle and population dynamics of the shrimp; density of sea grass (<i>Ruppia</i>) in Hardy Inlet; Hydrology of Swan River and Hardy Inlet in conjunction with P. Smith.
106. Mr J. Kowarsky	c. Ph.D. project under supervision of Dr E.P. Hodgkin on the strategy and zoogeographic implications of the persistence on the estuarine catfish <i>Cnidogobius macrocephalus</i> in estuaries in south-west Western Australia. (Swan River Estuary, Peel Inlet, Oyster Harbour, Princess Royal Harbour, Cockburn Sound, Walpole Inlet, Wilson Inlet).	Data in thesis which will be held in Zoology Department Library. Data on growth, reproduction, feeding, movements in response to hydrological changes, osmoregulation, response to hypoxia and hypercapnia, thermal preferences of catfish. Comparison of estuarine and marine populations. Hydrology of Swan River estuary. (fortnightly samples, salinity, oxygen temperature).

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
MURDOCH UNIVERSITY, South Street, MURDOCH. PERTH. W.A. SCHOOL OF ENVIRONMENTAL AND LIFE SCIENCES 107. Miss T. Schwinghamme	o. M.Phil. project under the supervision of Prof. J. Loneragan on the distribution of Bryozoa on sea grasses in Cockburn Sound in relation to industrial effluent discharge.	Physiological, ecological data will be collected. To date only a preliminary survey of Bryozoa in Cockburn Sound has been made.
108. Mr P. Marks	o. Ph.D. project under supervision of Dr P. Newman on pollution of ground-water systems, and probably other water systems, in Perth area, by leaching from sanitary landfills.	Project beginning early 1975.
109. Miss C. Bayley-Jones	See University of W.A. - Geography Department	