Summary

The South African (Cape) fur seal *Arctocephalus pusillus pusillus* is the only pinniped endemic to Southern African waters, occurring mostly off the South African and the Namibian west coasts. Because of the high productivity in this region, they share these waters with a profitable fisheries industry. Since the Cape fur seal population consumes an estimated 2 million tons of food annually, with some 60% of their prey species comprising commercially valuable fish, the fisheries and the seals are generally seen as competitors for a common resource, and biological interactions (seals depriving fishermen of their livelihood) and operational interactions (seals directly interfering with fishing operations, or damaging equipment) between them are often believed to be severe. Since culling (in South Africa) has had a moratorium placed on it in 1990, and since the Cape fur seal population has been increasing at 3% annually since the seventies, numbering some 2 million individuals at present, the perception has grown that the fisheries industry will receive a substantial boost, should the fur seal population be artificially reduced, although this view is not supported by any clear evidence.

Addressing this complex management issue requires improved knowledge of specific aspects of the biology, population dynamics and interspecific interactions of the Cape fur seal. To assist with this, this study entailed an examination of the reproductive organs of 159 Cape fur seal females, collected by Marine Coastal Management (formerly the SFRI), mostly at sea during annual

cruises (n = 98) but also on land at the Kleinzee breeding colony on the South African west coast (n = 61).

A lack of standardization has meant that only 119 females had samples of their uterine horns stored with the ovaries, requiring that reproductive history at times had to be inferred from ovarian appearance alone. Samples from each ovary of 46 females were also examined histologically. Using this material, an examination of the annual ovarian size- and weight cycles were conducted. An in-depth macroscopic and microscopic examination of the follicular and luteal cycles were also conducted.

With the ages of 83 of the females having been determined to date, the information obtained from the morphological study was used to calculate a number of reproductive population characteristics. Firstly, the overall- and the age-specific pregnancy rates were calculated (pregnancy being defined as successful implantation having occurred). Pregnancy rate for the current reproductive cycle was calculated at 0.902, while birth rate for the previous cycle was estimated at 0.845. Age specific pregnancy rates were very erratic between age-classes, possibly due to small sample sizes for some age classes, but appeared to be low (0.166) at 3 years, peaked at 6 years (0.909) and remained high in the oldest (13+ years) age group.

The average age of puberty (where ovulation commences, as evidenced by mature follicles, CLs or CAs) was estimated at 4.34 years, dropping slightly to 4.31 years if second CAs are included in the calculation. The average age of sexual maturity (where reproduction first becomes possible, as evidenced by

successful implantation of a blastocyst, irrespective of whether or not the pregnancy was then carried to term) was estimated at 5.02 years.

A comparison between gravid CLs and CLs of non-pregnancy/abortion showed that no differences could be detected until implantation. Differences increased with increasing time after implantation, but with an apparent retardation in CA resorption rate at, or before, the time of implantation in the opposite uterine horn, the differences between CAs resulting from abortions and those resulting from pregnancies became smaller. At that stage, placental scars assume greater importance in distinguishing between them.

While certain errors in the study are acknowledged, the information gained has assisted in obtaining a fuller, qualitative understanding of the reproductive biology of the Cape fur seal, and has provided some quantitative information on reproductive population characteristics. This information can be used, or can be expanded upon to extend understanding of the population dynamics of the Cape fur seal for conservation and management purposes.

References

Andersen, M., Hjelset, A.M., Gjertz, I., Lyderson, C. & Gulliksen, B. 1999. Growth, age at sexual maturity and condition in bearded seals (*Erignathus barbatus*) from Svalbard, Norway. *Polar Biology* 21:179-185

Amoroso, E.C., Bourne, G.H., Harrison, R.J., Harrison-Matthews L., Rowlands I.W. & Sloper, J.C. 1965. Reproductive and endocrine organs of foetal, newborn and adult seals. *Journal of Zoology* 147:430-486.

Angot, M. 1955. Observations sur les mammiféres marins de l'archipel de Kerguelen, avec une étude detaillée de l'eléphant de mer, *Mirounga leonina* (L.). *Mammalia* 18:1-111.

Bengtson, J.L. & Siniff, D.B. 1981. Reproductive aspects of female crabeater seals (*Lobodon carcinophagus*) along the Antarctic Peninsula. *Canadian Journal of Zoology* 59:92-102.

Bester, M.N. & Kerley, G.I.H. 1983. Rearing of twin pups to weaning by subantarctic fur seal, *Arctocephalus tropicalis* female. *South African Journal of Wildlife Research* 13:86-97.

Bester, M.N. 1995. Reproduction in the female Subantarctic fur seal, *Arctocephalus tropicalis*. *Marine Mammal Science* 11:362-375.

BjØrge, A. 1992. The reproductive biology of the harbour seal *Phoca vitulina* L., in Norwegian waters. *Sarsia* 77:47-51.

Boness, D.J. & James, H. 1979. Reproductive behaviour of the grey seal (*Halichoerus grypus*) on Sable Island, Nova Scotia. *Journal of Zoology (London)* 188:477-500.

Boshier, D.P. 1981. Structural changes in the *corpus luteum* and endometrium of seals before implantation. *Journal of Reproduction and Fertility, Supplement*, 29:143-149.

Boyd, I.L. 1983. Luteal regression, follicle growth and the concentration of some plasma steroids during lactation in grey seals (*Halichoerus grypus*). *Journal of Reproduction and Fertility* 69:157-164.

Boyd, I.L. 1984. Development and regression in the Corpus Luteum in grey seal (*Halichoerus grypus*) ovaries and its use in determining fertility rates. *Canadian Journal of Zoology* 62:1095-1100.

Boyd, I.L. 1991a. Changes in plasma progesterone and prolactin concentrations during the annual cycle and the role of prolactin in the maintenance of lactation and luteal development in the Antarctic fur seal (*Arctocephalus gazella*). *Journal of Reproduction and Fertility* 91:637-647.

Boyd, I.L. 1991b. Environmental and physiological factors controlling the reproductive cycles of pinnipeds. *Canadian Journal of Zoology* 69:1135-1148.

Boyd, I.L., Croxall, J.P., Lunn, N.J. & Reid, K. 1995. Population demography of Antarctic fur seals: the costs of reproduction and implications for life-histories. *Journal of Animal Ecology* 64:505-518

Butterworth, D.S. 1992. Will more seals result in reduced fishing quotas? *South African Journal of Science* 88:414-416.

Butterworth, D.S., Duffy, D.C., Best, P.B. & Bergh, M.O. 1988. On the scientific basis for reducing the South African fur seal population. *South African Journal of Science* 84:179-188.

Butterworth, D.S., Punt, A.E., Oosthuizen, W.H. & Wickens, P.A. 1995. The effects of future consumption by the Cape fur seal on catches and catch rates of the Cape hakes. 3. Modelling the dynamics of the Cape fur seal *Arctocephalus pusillus pusillus*. *South African Journal of Marine Science* 16:161-183.

Canivenc, R. & Bonnin, M. 1981. Environmental control of delayed implantation in the European badger (*Meles meles*). *Journal of Reproduction and Fertility, Supplement* 29:25-33.

Craig, A.M. 1964. Histology of reproduction and the oestrus cycle in the female fur seal, *Callorhinus ursinus*. *Journal of the Fisheries Research Board of Canada* 21:773-811.

Coulson, J.C. 1981. A study of the factors influencing the timing of breeding in the Grey seal *Halichoerus grypus*. *Journal of Zoology (London)* 194:553-571.

Daniel, J.C. 1981. Delayed implantation in the Northern fur seal (*Callorhinus ursinus*) and other pinnipeds. *Journal of Reproduction and Fertility, Supplement* 29:35-50.

David, J.H.M. 1987a. Diet of the South African fur seal (1974-1985) and an assessment of competition with fisheries in southern Africa. *In* The Benguela and comparable ecosystems. Payne, A.I.L., Gulland, J.A. & Brink, K.H. (Eds). *South African Journal of Marine Science* 5:693-713.

David, J.H.M 1987b. South African fur seal *Arctocephalus pusillus pusillus*. *In* Status, biology and ecology of fur seals: Proceedings of an international workshop, Cambridge, England 23-27 April 1984. Croxall, J.P. & Gentry (Eds). NOAA Tech. Rep. NMFS 51:65-71.

DeMaster, D.P. 1978. Calculation of the average age of sexual maturity in marine mammals. *Journal of the Fisheries Research Board of Canada* 35:912-915.

DeMaster, D.P. 1984. Review of Techniques Used to Estimate the Average Age at Attainment of Sexual Maturity in Marine Mammals. *In* Report of the International Whaling Commission (Special Issue 6):175-179.

DeVilliers, D.J. & Roux, J-P. 1992. Mortality of newborn pups of the South African fur seal *Arctocephalus pusillus pusillus*. *South African Journal of Marine Science* 12:881-889.

DeVilliers, D.J., Oosthuizen, W.H., Roux, J-P & Kotze, P.G.H. 1997. Population structure of a non-breeding colony of the Cape fur seal *Arctocephalus pusillus pusillus* at Cape Frio, Namibia. *South African Journal of Marine Science* 18:295-298.

Enders, R.K., Pearson, O.P. & Pearson, A.K. 1946. Certain aspects of reproduction in the fur seal. *Anatomical Record* 94:218.

Fay, F.H. 1981b. Walrus, *Odobenus rosmarus*. *In* Handbook of marine mammals Vol.1. The walrus, sea lions, fur seals and sea otters, pp 1-23. (eds. Ridgway, S.H., Harrison, R.J.). Academic Press, London.

Fowler, J. & Cohen, L. 1992. Practical statistics for field biology. John Wiley & Sons, Chichester.

Hayama, S., Suzuki, M., Uno, H. & Yamashita, T. 1986. Female sexual maturity and delayed implantation period of the Kuril seal. *Scientific Reports of the Whales Research Institute* 37:173-178.

Harrison, R.J. 1969. Reproduction and reproductive organs. *In* The biology of marine mammals. Edited by H.T. Andersen. Academic Press, London. pp. 253-348.

Harrison, R.J. & Kooyman, G.L. 1968. General physiology of the pinnipedia. *In* The Behaviour and Physiology of the Pinnipeds, pp. 211-296. (Eds. Harrison, R.J., Hubbard, R.C., Peterson, R.S., Rice, C.E. & Schusterman, R.J.). Appleton, New York.

Hewer, H.R. 1964. The determination of age, sexual maturity, longevity and a life-table in the Grey seal (*Halichoerus grypus*). *Proceedings of the Zoological Society of London* 142:593-623.

Iwasa, M. & Atkinson, S. 1996. Analysis of *corpora lutea* to estimate reproductive cycles of wild Hawaiian monk seals (*Monachus schauinslandi*). *Marine Mammal Science* 12(2):182-198.

Iwasa, M. & Atkinson, S. 1997. Lipofuscin granular cells in regressing *corpora lutea* and *corpora albicantia* of ovaries from Hawaiian monk seals (*Monachus schauinslandi*). *Marine Mammal Science* 13(2):326-332.

Johanos, T.C., Becker, B.L. & Ragen, T.J. 1994. Annual reproductive cycle of the female Hawaiian monk seal (*Monachus schauinslandi*). *Marine Mammal Science* 10(1):13-30.

Kerley, G.I.H. 1983. Record for the Cape fur seal *Arctocephalus pusillus pusillus* from subantarctic Marion Island. *South African Journal of Zoology* 18:139-140.

Laws, R.M. 1956. The elephant seal (*Mirounga leonina* Linn.) III. The physiology of reproduction. Scientific Reports of the Falklands Islands Dependencies Survey No.15. 66pp.

Laws, R.M. 1984. Chapter 12: Seals. *In* Antarctic Ecology (vol. 2) (ed. R.M. Laws). Academic Press, London.

Laws, R.M. & Sinha, A.A. 1993. Chapter 13: Reproduction *In* Handbook on Antarctic seal research methods and techniques (ed. R.M. Laws). Cambridge University Press, Cambridge.

Le Boeuf, B.J. 1986. Sexual strategies of seals and walruses. *New Scientist* 16:36-39.

Lima, M. & Paez, E. 1995. Growth and reproductive patterns in the South American fur seal. *Journal of Mammalogy* 76:1249-1255.

Lima, M. & Paez, E. 1997. Demography and population dynamics of South American fur seals, *Journal of Mammalogy* 78:914-920.

Lunn, N.J., Boyd, I.L. & Croxall, J.P. 1994. Reproductive performance of female Antarctic fur seals: the influence of age, breeding experience, environmental variation and individual quality. *Journal of Animal Ecology* 63:827-840

McLaren, I.A. 1958. The biology of the ringed seal (*Phoca hispida* Schreber) in the eastern Canadian Arctic. *Bulletin of the Fisheries Research Board of Canada* No. 118. 97 pp.

McLaren, I.A. & Smith, T.G. 1985. Population ecology of seals: retrospective and prospective views. *Marine Mammal Science* 1:54-83.

Mead, R.A. 1981. Delayed implantation in mustelids, with special emphasis on the spotted skunk. *Journal of Reproduction and Fertility, Supplement* 29:11-24.

Miller, C.M., Oosthuizen, W.H. & Wickens, P.A. 1996. Cape fur seals trapped in trawling gear: age structure, sex ratio, seasonality and distribution. *South African Journal of Marine Science* 17:105-111.

Moller, O.M. 1973a. The progesterone concentrations in peripheral plasma of the mink (*Mustela vison*) during pregnancy. *Journal of Endocrinology* 56:121-132.

Mondain-Monval, M., Bonnin, M., Canivenc, R. & Scholler, R. 1980. Plasma oestrogen levels during delayed implantation in the European badger (*Meles meles* L.). *General and Comparative Endocrinology* 41:143-149.

Oosthuizen, W.H. 1991. General movements of South African (Cape) fur seals *Arctocephalus pusillus pusillus* from analysis of recoveries of tagged animals. *South African Journal of Marine Science* 11:21-29.

Oosthuizen, W.H. 1995. Age determination of South African fur seals (*Arctocephalus pusillus pusillus*). M.Sc Thesis, University of Pretoria, Pretoria.

Oosthuizen, W.H. 1997. Evaluation of an effective method to estimate age of Cape fur seals using ground tooth sections. *Marine Mammal Science* 13:683-693.

Oosthuizen, W.H. & David, J.H.M. 1988. Non-breeding colonies of the South African (Cape) fur seal *Arctocephalus pusillus pusillus* in southern Africa *Investigational Reports of the Sea Fisheries Research Institute of South Africa* 132:17pp.

Øritsland, T. 1975. The biology of the ringed seal (*Phoca hispida*) in the eastern Canadian Arctic. *Journal of the Fisheries Research Board of Canada Bulletin* 118:79-81.

Ouelette, J. & Ronald, K. 1985. Histology of reproduction in harp and grey seals during pregnancy, postparturition and oestrus. *Canadian Journal of Zoology* 63:1778-1796.

Pearson, A.K. & Enders R.K. 1951. Further observations on the reproduction of the Alaskan fur seal. *Anatomical Record* 111 (4): 695-711

Peterson, R.S. & Reeder, W.G. 1966. Multiple births in the northern fur seal. *Zeitschrift für Säugetierkunde* 31:52-56.

Pike, G.C., Spalding, D.J., MacAskie, I.B. & Craig, A.M. 1960. Report on Canadian pelagic fur seal research in 1960. Fisheries Research Board of Canada, Biol. MS Report, No. 700, 101pp.

Pimlott, D.H. & Mossman, H.W. 1949. A macroscopic ovary sectioning method. *Journal of Wildlife Management* 23:232.

Rae, B.B. 1969. Twin seals in Scotland. *Journal of Zoology (London)* 158:243-245.

Rand, R.W. 1955. Reproduction in the female Cape fur seal, *Arctocephalus pusillus* (Schreber). *Proceedings of the Zoological Society of London* 124:717-740.

Renfree, M.B. & Calaby, J.H. 1981. Background to delayed implantation and embryonic diapause. *Journal of Reproduction and Fertility, Supplement* 29:1-9.

Reijnders, P.J.H. 1990. Progesterone and oestradiol-17β concentration profile throughout the reproductive cycle in harbour seals (*Phoca vitulina*). *Journal of Reproduction and Fertility* 90:403-409.

Riedman, M. 1990. The pinnipeds: seals, sea lions and walruses. University of California Press, Berkeley.

Sandell, M. 1984. To have or not to have delayed implantation: the example of the weasel and the stoat. *Oikos* 42(1):123-126.

Shaughnessy, P.D. 1979. Cape (South African) fur seal. *In* Mammals in the Seas. Food and Agricultural Organisation Fisheries Series (vol.2). pp. 37-40.

Siniff, D.B. & Stone, S. 1985. The role of the leopard seal in the trophodynamics of the Antarctic marine ecosystem. *In* Antarctic Nutrient Cycles and Food Webs: 555-560 (Eds. Siegfried, W.R., Condy, P.R. & Laws, R.M.). Springer-Verlag, Berlin.

Sirotkin, A.V. & Schaeffer, H.J. 1997. Direct regulation of mammalian reproductive organs by serotonin and melatonin. *Journal of Endocrinology* 154:1-5.

Spotte, S. 1982. The incidence of twins in pinnipeds. *Canadian Journal of Zoology* 60:2226-2233.

Smith, E.A. 1968. Adoptive suckling in the grey seal. *Nature* 217:762-763.

Stevens, A. & Lowe, J.S. 1992. Chapter 18: Female reproductive system. *In* Histology. Mosby, St. Louis.

Stewardson, C.L., Bester, M.N. & Oosthuizen, W.H. 1998. Reproduction in the male Cape fur seal *Arctocephalus pusillus pusillus*: age at puberty and annual cycle of the testis. *Journal of Zoology (London)* 246:63-74.

Tedman, R.A. 1991. The female reproductive tract of the Australian sea lion, *Neophoca cinerea* (Peron 1816) (Carnivora: Otariidae). *Australian Journal of Zoology* 39:351-372.

Temte, J.L. 1985. Photoperiod and delayed implantation in the Northern fur seal (*Callorhinus ursinus*). *Journal of Reproduction and Fertility* 73:127-131.

Temte, J.L. 1994. Photoperiod control of birth timing in the harbour seal (*Phoca vitulina*). *Journal of Zoology (London)* 233:369-384.

Temte, J.L. & Temte, J. 1993. Photoperiod defines the phenology of birth in captive California sea lions. *Marine Mammal Science* 9:301-308

Wheater, P.R., Burkitt, H.G. & Daniels, V.G. 1995. Chapter 19: Female reproductive system. *In* Wheater's functional histology: a text and colour atlas, 3rd ed.. Churchill Livingstone, Edinburgh.

Wickens, P.A., 1993. Life expectancy of fur seals, with special reference to the South African (Cape) fur seal. *South African Journal of Wildlife Research* 23:101-106.

Wickens, P.A. 1994. Interactions between South African fur seals and the purse-seine fishery. *Marine Mammal Science* 10(4):442-457.

Wickens, P.A. 1995. Namibian sealing debacle: an environmental disaster and managerial blunder. *African Wildlife* 49(3):6-11.

Wickens, P.A., David, J.H.M., Shelton, P.A. & Field, J.G. 1991. Trends in harvests and pup numbers of the South African Fur seal: implications for management. *South African Journal of Marine Science* 11:307-326

Wickens, P.A., Japp, D.W., Shelton, P.A., Kriel, F., Goosen, P.C., Rose, B., Augustyn, C.J., Bross, C.A.R., Penney, A.J. & Krohn, R.G. 1992. Seals and fisheries in South Africa - competition and conflict. *South African Journal of Marine Science* 12:773-789.

Wickens, P.A. & York, A.E. 1997. Comparative population dynamics of fur seals. *Marine Mammal Science* 13:241-292.

York, A.E. & Hartley, J.R. 1981. Pup production following harvest of female northern fur seals. *Canadian Journal of Fisheries and Aquatic Sciences* 38:84-90.

York, A.E. & Schaeffer, V.B. 1997. Timing of implantation in the Northern fur seal, *Callorhinus ursinus*. *Journal of Mammalogy* 78(2):675-683.

Yoshida, K., Baba, N., Oya, M. & Mizue, K. 1977. On the formation and regression of *corpus luteum* in the Northern fur seal ovaries. *Scientific Reports of the Whale Research Institute* 29:121-128.

Yoshida, K., Baba, N., Oya, M. & Mizue, K. 1978. Seasonal changes in the ovary of the Northern fur seal. *Bulletin of the Far Seas Fisheries Research laboratory* 16:93-101.

Key to Appendices

Due to constraints of space, certain abbreviations were used in the appendices, which are explained further here

Appendix 1:

Abo	Abortion
Blas	A blastocyst was observed in the relevent uterine horn
NM	No sample of uterine mucosa available, accompanying relevant ovary
Non-Imp	A *corpus* of ovulation is present, but has not been followed by implantation by the blastocyst
NP	Not pregnant, but showing signs of recently having been pregnant (e.g. has a large placental scar)
RepCon	Reproductive condition of the female in the breeding season during which she was collected (referring to the CL)
RepHis	Reproductive history of the female during the previous reproductive season (referring to the 1 st CA)
ZB	Zonary band

Where reproductive failures have been deduced, relevant values are highlighted

Appendix 2:

CL/CA nr.	The number of Graafian follicles in the ovary with a CL or CA respectively (except in immature females, where the largest ovary was arbitrarily chosen as the CL ovary)
CL/CA diam	The size of the largest follicle in the ovary with a CL and CA respectively (except in immature females, where the largest ovary was arbitrarily chosen as the CL ovary).

Appendix 3 / 4:

CL/CA	The ovary containing a CL or CA respectively, except in the case of immature females, where the largest ovary was chosen arbitrarily as "CL".

Appendix 1: Sizes of CLs / CAs (mm), as well as reproductive state of female

Month	Comments	Age (yrs)	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon.	CA 1st	RepHis	CA 2nd	CA 3rd
January		8	3803	12.65		12.78	ZB		
		6	3811	11.04		13.54	ZB		
		6	3815	12.19		12.12	ZB	8.33	
	CA failure	6	3836	15.91		**5.53**	ZB – Abo		
		7	3845	10.14		14.43	ZB	6.34	
		6	3846	13.92		12.35	ZB		
		7	3849	12.38					
		6	3853	11.28		11.30	ZB		
		13+	4161	11.72		15.69	ZB	3.11	
		13+	4166	11.89		12.84	ZB	2.44	2.20
	CA failure	12	4185	15.74		**6.92**	Non-imp		
		13+	4220	11.78		13.16	ZB	6.35	
		13+	4224	13.42		14.55	ZB		
		8	4225	10.40		10.98	ZB	3.68	
		3	4226	14.67					

	DoubleCL	-	5012	11.41/10.53	2 CLs	14.23	NM	3.05	
		-	5155	11.80		12.52	NM		
		-	5156	11.82		10.33	NM		
		-	5157	10.67		12.43	NM	3.68	1.85
		-	5158	11.27		14.67	NM	2.47	

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	CA 3rd
February		10	3898	13.98		13.73	ZB	2.75	
		13+	3899	13.03		12.47	ZB	4.83	
		11	3906	11.67	Blas.	9.62	ZB	3.00	
	CA failure	6	3912	12.79		**3.72**	Non-imp.		
		9	3913	15.40		16.07	ZB	2.22	
		11	3915	10.87		13.88	ZB	5.25	

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	CA 3rd
March		7	946	17.98		11.76	ZB	7.21	
		8	950	13.56		9.71	ZB		
		13+	4411	14.49	Blas.	9.77	ZB	3.43	

		13+	4413	17.90	Blas.	14.27	ZB	7.59	
		13+	4415	14.99		12.12	ZB	1.90	
	CA failure	13+	4416	13.33		**7.27**	Non-imp.	2.03	2.87
		7	4428	15.21		10.07	ZB		
	CA failure	5	4436	14.39		**7.72**	Non-imp.		
	CA failure	10	4439	16.16		**7.39**	Non-imp.		
		10	4450	15.70	Blas.	12.09	ZB		
		14	4453	13.32		11.21	ZB	4.46	
	CA failure	4	4455	15.99		**3.58**	ZB-Abo.		
		13+	4456	14.07		8.92	ZB	4.72	
	CA failure	8	4459	15.15		**8.92**	Non-imp.	6.48	
		-	APP5	14.67		6.36	NM	3.01	3.10
	CA failure	-	APP6	16.41		**7.52**	NM		
		-	APP7	13.73		6.80	NM	1.51	
		-	APP8	12.04		8.78	NM	3.12	
		-	APP9	14.12		11.91	NM	3.15	

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	CA 3rd
April		5	3645	17.78	Implanted	13.96	ZB		
		8	3661	18.81	Implanted	17.17	ZB		
		6	3662	17.37	Implanted	9.53	ZB		
		11	3706	17.45	Implanted	13.92	ZB	3.90	2.10
	Immature	4	3910						
	CA failure	7	3958	15.05		**6.64**	Non-imp.	2.85	2.45
		4	3961	18.76		12.61	ZB		
	CA failure	13+	3968	15.97		**8.67**	Non-imp.		
	Immature	7	3971						
		11	3973	12.41		11.93	ZB	3.97	
		6	3974	17.47		12.06	ZB		
		4	3975	18.29	Implanted				
		13+	3980	15.13		11.28	ZB		2.75
	CA failure	7	3988	16.60		**9.08**	Non-imp.		
		9	3992	17.31	Implanted	11.03	ZB	2.85	
		7	3993	14.84	Implanted	10.94	ZB	2.79	
		6	3994	18.49	Implanted	10.49	ZB		

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	CA 3rd
May		8	3209	15.73	Implanted	8.42	ZB		
	CA failure	5	3224	14.74		**5.89**	Non-imp.	1.64	
		4	3226	15.47	Implanted				
		4	3228	16.48	Implanted				
		13+	3238	16.64		13.37	ZB	1.90	2.30
	CA failure	13+	3247	19.92	Implanted	**6.86**	Non-imp.		
		7	3257	15.48	Implanted	11.28	ZB		
		7	3259	17.51	Implanted	11.01	ZB		
	Immature	5	3263						
		13+	3286	21.27	Implanted	13.22	ZB	4.12	2.32
	Immature	3	3290						
	Immature	3	3291						
	CL absent	8	3293			12.03	ZB		
		5	3297	18.15	Implanted				

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	CA 3rd
June		-	5026	23.70	Pregnant				
		-	5032	22.96	Pregnant				
		-	5033	19.54	Pregnant	10.75	ZB	3.59	
		-	5039	19.95	Pregnant	10.57	ZB		
		-	5057	24.71	Pregnant				
		-	5058	24.31	Pregnant				
		-	5069	25.88	Pregnant				
		-	5087	21.50	Pregnant	10.12	ZB		
		-	5090	20.17	Pregnant				
		-	5093	20.79	Pregnant				
	CA failure	-	5095	24.82	Pregnant	**2.80**	Non-imp.		
	CL failure	-	5096	**18.60**	ZB-Abo.	8.64	ZB	1.77	1.97
		-	5097	19.49	Pregnant	10.23	ZB		
	CA failure	-	5099	18.12	Pregnant	**5.18**	ZB-Abo		
		-	5106	21.68	Pregnant	8.21	ZB		

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	CA 3 rd
July	CA absent	11	3458	17.19	Pregnant				
		13+	3483	26.70	Pregnant	11.04	ZB	3.94	
		-	5128	18.49	Pregnant	9.19	ZB		
	CL failure	-	5129	**16.35**	ZB-Abo.	11.51	ZB	2.22	
	CA failure	-	5130	13.50	Pregnant	**8.23**	Non-imp.		
		-	5131	18.51	Pregnant	10.30	ZB	2.46	
		-	5132	**15.39**	ZB-Abo	10.31	ZB		

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	CA 3rd
August		5	4051	22.26	Pregnant	8.91	ZB		
	Immature	3	4064						
	CL failure	13+	4070	**8.53**	ZB-Abo	6.54	ZB	6.50	3.63
		13+	4081	20.60	Pregnant	7.01	ZB	4.25	
		13+	4082	25.37	Pregnant	11.65	ZB		
		-	5137	25.46	Pregnant	7.99	ZB		
		-	5138	22.01	Pregnant	7.66	ZB		
		-	5139	23.90	Pregnant	10.99	ZB	3.44	

	DoubleCA	-	5140	23.60	Pregnant	14.72&7.82	ZB	2.16	4.89
		-	5141	15.00	Pregnant	9.49	ZB	2.82	

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepHis	CA 1st	RepHis	CA 2nd	New CL
October		13+	4093	26.53	Pregnant	10.46	ZB	3.34	
		13+	4095	24.43	Pregnant	10.18	ZB	4.92	
	CL failure	13+	4111	**8.77**	ZB-Abo	7.20	ZB-Abo	4.04	
		6	4127	21.03	Pregnant	7.92	ZB		
	CL failure	3	4129	**10.24**	Non-imp.				8.93
		9	4131	15.99	ZB-NP	5.20	Non-imp.		13.64
	CL failure	8	4136	**7.12**	Non-imp.	8.66	ZB		13.11
		6	4145	23.45	Pregnant	6.64	ZB		
	DoubleCA	4	4147	**9.48**	ZB-Abo				9.87
	Immature	3	4154						
		-	5010	17.05	ZB-NP				
		-	5148	19.33	Pregnant	8.97	ZB		
		-	5149	11.93	ZB-NP	**3.33**	ZB-Abo		8.17
	CL failure	-	5150	**10.64**	ZB-Abo	**3.33**	Non-imp.		

		-	5151	22.19	Pregnant	10.91	ZB		
		-	5153	12.63	ZB-NP	9.00	ZB		

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	New CL
November		-	2944	22.42					
		-	2947	15.48					
		-	2948	24.11		4.00			
	CL failure	-	2949	**8.34**		2.68		3.79	
		-	2952	15.91					
		-	2953	18.88		2.69			
		-	2954	23.20		6.95			
	CL failure	-	2956	**6.95**		2.29			
	CL failure	-	2957	**9.44**		2.27			10.39
		-	2958	10.22		8.82			
		-	3002	23.87		4.93			
		-	3007	17.87		2.54			
		-	3014	23.19		7.03			
		-	3020	13.02		4.10			

	CL failure	-	3024	10.52		4.39			
		-	3032	19.44		5.35			
		-	3033	13.85		4.16			
		-	3051	19.02		3.22			10.41
		-	3088	21.47		2.07			
		-	3108	20.21		2.95			
		-	3123	21.21					
		-	3124	18.93		9.31			
	CL failure	-	3126	**8.82**		4.80		3.45	
		-	3131	19.04		4.13		5.18	
		-	3134	21.60					
		-	3135	24.02		5.83			
		-	3138	18.23		10.48		4.26	
		-	3143	22.22		3.11			
		-	3144	13.72		8.64			
		-	5154	21.49	Pregnant				9.60

Month	Comments	Age	ID number	Size (mm) of *corpora lutea/albicantia*					
				CL	RepCon	CA 1st	RepHis	CA 2nd	New CL
December		-	4600	18.50	Pregnant	9.78	ZB		9.41

		-	4601	12.91	Pregnant				10.22
		-	5008	16.64	Pregnant	8.40	ZB	3.87	
		-	5009	17.21	Pregnant				
		-	5011	15.42	Pregnant	1.64	Abo.		10.53

Appendix 2: Numbers of follicles per ovary, and the size (mm) of the largest follicle in each

		CL nr.	CL diam	CA nr.	CA diam			CL nr.	CL diam	CA nr.	CA diam
January	3803	30	5.24	0	0.00	**February**	3898	16	3.66	0	0.00
	3811	10	2.68	0	0.00		3899	38	5.01	2	4.87
	3815	27	3.27	5	2.05		3906	20	5.93	0	0.00
	3836	10	2.75	23	3.26		3912	15	4.22	25	5.72
	3845	25	5.42	0	0.00		3913	31	4.41	7	5.01
	3846	16	2.87	4	2.57		3915	6	3.84	1	1.69
	3849	7	2.75	3	1.85						
	3853	31	4.27	5	3.83						
	4161	15	6.93	0	0.00						
	4166	4	2.15	0	0.00						
	4185	0	0.00	11	2.93						
	4220	7	4.66	0	0.00						
	4224	12	3.14	0	0.00						
	4225	55	2.87	1	2.34						
	4226	12	3.35	20	3.37						
	5012	65	4.18	3	1.85						

	5155	17	3.08	1	1.38						
	5156	18	5.07	1	1.53						
	5157	13	3.03	0	0.00						
	5158	0	0.00	0	0.00						

		CL nr.	CL diam	CA nr.	CA diam			CL nr.	CL diam	CA nr.	CA diam
March	946	32	7.87	12	4.82	**April**	3645	10	2.84	28	4.99
	950	21	7.10	9	6.60		3661	17	4.78	22	6.07
	4411	25	8.41	4	4.13		3662	13	4.08	17	4.45
	4413	28	4.42	8	3.06		3706	7	8.09	1	2.37
	4415	35	7.60	12	5.16	Immature	*3910*	*35*	*1.80*	*40*	*1.65*
	4416	0	0.00	0	0.00		3958	9	4.83	2	1.92
	4428	27	8.66	4	4.60		3961	4	3.99	16	5.10
	4436	9	4.48	29	6.89		3968	10	8.78	7	5.90
	4439	13	5.38	17	2.63	Immature	*3971*	*29*	*4.43*	*35*	*3.97*
	4450	20	9.56	6	6.70		3973	26	6.33	19	8.58
	4453	34	8.21	35	6.02		3974	19	6.27	2	3.64
	4455	14	5.06	28	4.64		3975	22	5.32	24	8.67
	4456	6	10.26	1	5.56		3980	22	5.08	2	4.20
	4459	12	6.28	23	7.16		3988	4	2.14	10	7.97

	APP5	16	3.85	18	7.21		3992	15	8.70	2	8.56
	APP6	31	9.50	15	5.85		3993	21	5.88	12	5.01
	APP7	27	6.00	12	5.61		3994	16	5.74	15	5.79
	APP8	10	10.63	2	1.36						
	APP9	55	10.77	20	3.24						

		CL nr.	CL diam	CA nr.	CA diam			CL nr.	CL diam	CA nr.	CA diam
May	3209	6	5.57	7	6.59	**June**	5026	5	1.27	13	1.56
	3224	0	0.00	1	1.79		5032	1	1.88	18	3.11
	3226	4	2.73	9	3.33		5033	4	3.43	12	5.28
	3228	4	5.27	5	3.29		5039	6	4.40	10	6.94
	3238	6	6.57	6	5.22		5057	6	3.73	24	4.55
	3247	1	4.87	5	3.90		5058	5	2.11	43	3.96
	3257	7	6.91	0	0.00		5069	0	0.00	8	1.78
	3259	9	5.35	9	5.82		5087	14	7.55	5	5.64
Immature	*3263*	*37*	*3.54*	*37*	*4.74*		5090	5	2.34	14	3.54
	3286	5	7.41	0	0.00		5093	4	3.82	23	6.01
Immature	*3290*	*19*	*3.45*	*14*	*3.28*		5095	2	2.10	12	2.53
Immature	*3291*	*16*	*2.59*	*14*	*3.38*		5096	11	6.99	16	4.96
	3293	24	4.92	18	5.29		5097	10	3.98	14	7.54

	3297	5	5.43	18	5.53		5099	6	3.95	8	4.77
							5106	13	3.07	31	4.55

		CL nr.	CL diam	CA nr.	CA diam			CL nr.	CL diam	CA nr.	CA diam
July	3458	0	0.00	0	0.00	**August**	4051	0	0.00	3	3.58
	3483	7	4.22	6	3.72	Immature	4064	0	0.00	0	0.00
	5128	19	6.30	5	4.61		4070	0	0.00	0	0.00
	5129	14	7.77	19	7.78		4081	8	2.21	34	3.04
	5130	17	5.45	11	4.60		4082	1	1.22	7	3.13
	5131	16	4.64	18	6.56		5137	1	3.28	24	4.93
	5132	19	7.55	6	3.96		5138	2	6.23	7	4.46
							5139	11	3.21	17	3.25
							5140	2	3.15	22	6.44
							5141	15	4.24	9	5.45

		CL nr.	CL diam	CA nr.	CA diam			CL nr.	CL diam	CA nr.	CA diam
October	4093	0	0.00	25	5.26	**Nov**	2944	2	1.62	19	2.02
	4095	0	0.00	22	5.85		2947	1	1.02	21	7.89
	4111	0	0.00	0	0.00		2948	0	0.00	8	8.91
	4127	9	2.58	23	3.23		2949	9	4.49	3	6.35

	4129	0	0.00	10	2.07		2952	0	0.00	3	1.22
	4131	5	3.64	10	3.72		2953	7	1.58	46	7.77
	4136	7	3.43	5	3.28		2954	0	0.00	37	3.99
	4145	0	0.00	10	1.92		2956	11	11.61	7	8.01
	4147	1	5.08	0	0.00		2957	8	5.21	19	4.30
Immature	*4154*	*13*	*7.31*	*8*	*1.65*		2958	4	3.24	21	8.21
	5010	0	0.00	19	5.42		3002	5	1.92	32	3.71
	5148	0	0.00	32	5.73		3007	7	3.08	27	5.57
	5149	0	0.00	20	7.45		3014	3	2.00	41	3.34
	5150	3	2.42	17	9.40		3020	0	0.00	8	5.50
	5151	0	0.00	18	3.30		3024	10	4.31	7	8.51
	5153	10	5.94	30	6.25						

		CL nr.	CL diam	CA nr.	CA diam			CL nr.	CL diam	CA nr.	CA diam
Nov.	3032	0	0.00	13	4.63	**Dec**	4600	0	0.00	65	4.20
(cont.)	3033	2	2.20	25	4.32		4601	2	1.95	10	4.79
	3051	1	2.39	19	5.40		5008	6	1.82	45	7.60
	3088	6	2.68	64	4.58		5009	9	1.75	19	6.65
	3108	1	1.25	47	5.57		5011	0	0.00	21	3.82
	3123	0	0.00	34	8.52						
	3124	0	0.00	14	5.18						
	3126	24	9.78	18	4.01						
	3131	2	2.06	28	4.54						
	3134	0	0.00	14	4.43						
	3135	0	0.00	22	4.42						
	3138	6	2.74	20	3.89						
	3143	0	0.00	20	10.26						
	3144	4	6.06	3	6.64						
	5154	0	0.00	49	6.61						

Appendix 3: Sizes (mm) of ovaries with *corpora lutea* and ovaries with *corpora albicantia*

		CL	CA			CL	CA			CL	CA
January	3803	24.30	23.61	**February**	3898	27.37	23.85	**March**	946	29.38	23.92
	3811	24.53	22.03		3899	28.58	27.09		950	27.36	20.94
	3815	24.93	22.75		3906	24.88	24.05		4411	25.41	21.31
	3836	25.46	24.14		3912	22.82	20.83		4413	28.72	23.78
	3845	22.92	23.08		3913	25.83	23.04		4415	25.19	22.93
	3846	22.07	21.64		3915	24.44	25.20		4416	22.05	19.36
	3849	21.01	19.86						4428	25.72	21.21
	3853	23.52	22.24						4436	25.09	23.24
	4161	24.66	25.47						4439	24.57	19.32
	4166	23.73	25.67						4450	29.02	21.82
	4185	23.55	22.45						4453	28.16	28.04
	4220	24.12	24.75						4455	24.98	22.45
	4224	27.23	26.41						4456	24.64	22.27
	4225	24.70	23.41						4459	25.79	23.76
	4226	22.32	20.57						APP5	25.78	23.96

	5012	27.97	28.91						APP6	26.42	22.70
	5155	28.53	29.65						APP7	25.10	22.96
	5156	25.49	24.76						APP8	23.32	20.33
	5157	24.94	25.62						APP9	30.35	27.27
	5158	26.09	23.67								

		CL	CA			CL	CA			CL	CA
April	3645	24.60	23.70	**May**	3209	28.53	23.71	**June**	5026	29.79	21.55
	3661	30.78	28.63		3224	19.32	17.46		5032	28.41	19.71
	3662	25.98	24.43		3226	22.35	22.49		5033	25.31	20.03
	3706	29.84	23.60		3228	20.22	16.05		5039	29.41	25.61
Immature	*3910*	*14.78*	*16.98*		3238	26.71	22.95		5057	29.12	20.16
	3958	24.01	18.57		3247	25.36	21.48		5058	28.61	26.02
	3961	26.28	21.42		3257	27.13	20.52		5069	29.10	18.61
	3968	25.54	23.10		3259	25.19	21.94		5087	28.16	22.51
Immature	*3971*	*20.00*	*20.24*	Immature	*3263*	*23.68*	*22.62*		5090	27.76	19.56
	3973	28.21	26.28		3286	29.67	28.03		5093	29.26	21.75
	3974	25.17	20.09	Immature	*3290*	*19.78*	*20.08*		5095	35.20	21.32
	3975	27.59	21.70	Immature	*3291*	*17.12*	*16.64*		5096	27.16	23.21
	3980	28.13	24.56		3293	23.91	25.54		5097	28.38	24.25

	3988	22.50	20.60		3297	26.18	22.87		5099	30.45	22.14
	3992	28.35	24.24						5106	26.02	23.07
	3993	30.83	26.22								
	3994	28.91	24.86								

		CL	CA			CL	CA			CL	CA
July	3458	22.73	19.89	**August**	4051	30.84	23.19	**October**	4093	32.96	25.81
	3483	31.75	27.97	Immature	*4064*	*15.77*	*16.20*		4095	35.63	25.66
	5128	29.91	23.52		4070	21.49	22.01		4111	22.69	21.83
	5129	29.65	26.32		4081	31.76	26.49		4127	32.08	29.64
	5130	24.63	23.79		4082	31.41	20.68		4129	23.77	27.02
	5131	30.61	27.11		5137	33.59	25.89		4131	30.68	26.28
	5132	30.88	25.46		5138	27.69	22.31		4136	28.35	27.84
					5139	33.48	26.48		4145	37.51	27.49
					5140	31.64	25.54		4147	24.04	21.99
					5141	28.82	25.69	Immature	*4154*	*23.15*	*21.84*
									5010	28.28	26.65
									5148	28.89	24.96
									5149	21.00	23.93
									5150	25.32	27.60

									5151	32.12	25.68
									5153	23.75	27.02

		CL	CA			CL	CA			CL	CA
Nov.	2944	31.11	26.55	**Nov.**	3032	27.98	21.35	**Dec.**	4600	29.68	31.04
	2947	26.18	25.02	**(cont.)**	3033	27.35	24.42		4601	23.87	26.17
	2948	26.31	19.90		3051	27.43	24.17		5008	26.89	26.73
	2949	25.03	26.02		3088	28.15	23.18		5009	26.15	29.75
	2952	24.45	22.39		3108	31.58	25.45		5011	23.73	28.24
	2953	28.49	30.56		3123	27.64	23.22				
	2954	25.64	22.99		3124	32.68	25.90				
	2956	29.32	30.74		3126	26.77	25.94				
	2957	25.31	26.76		3131	30.76	26.41				
	2958	24.21	27.13		3134	29.79	22.11				
	3002	31.87	23.75		3135	29.03	21.96				
	3007	29.20	27.26		3138	31.74	31.28				
	3014	27.63	23.17		3143	28.29	23.62				
	3020	24.53	22.41		3144	24.33	25.05				
	3024	26.94	25.60		5154	30.81	26.60				

Appendix 4: Weights (g) of ovaries with *corpora lutea* and ovaries with *corpora albicantia*

		CL	CA			CL	CA			CL	CA
January	3803	8.8	8.8	**February**	3898	11.9	9.2	**March**	946	13.2	8.4
	3811	10.7	8.4		3899	13.2	11.3		950	11.9	10.0
	3815	9.1	7.4		3906	12.8	11.5		4411	8.3	5.6
	3836	9.6	10.9		3912	7.8	6.8		4413	15.7	8.7
	3845	8.2	7.5		3913	12.7	7.9		4415	11.1	11.3
	3846	7.5	6.8		3915	10.4	11.5		4416	6.9	5.1
	3849	6.4	4.6						4428	8.1	5.6
	3853	8.5	7.0						4436	7.6	6.5
	4161	9.4	9.7						4439	9.9	4.5
	4166	11.4	14.1						4450	12.8	7.5
	4185	9.4	7.8						4453	11.7	11.1
	4220	9.8	11.9						4455	7.7	6.6
	4224	14.3	11.5						4456	8.5	9.6
	4225	8.9	7.4						4459	11.4	9.8
	4226	7.6	5.5						APP5	11.5	8.2

5012	13.5	12.5
5155	13.5	14.7
5156	9.4	8.4
5157	8.7	9.8
5158	9.8	8.7

APP6	11.6	7.6
APP7	10.5	6.9
APP8	7.9	6.5
APP9	15.1	11.1

		CL	CA
April	3645	10.1	8.4
	3661	16.7	16.0
	3662	12.1	9.3
	3706	17.0	10.8
Immature	*3910*	*4.2*	*3.3*
	3958	9.5	4.6
	3961	10.6	9.9
	3968	11.0	7.9
Immature	*3971*	*4.6*	*4.5*
	3973	13.9	10.1
	3974	9.5	5.6
	3975	13.0	8.4
	3980	12.7	8.8

		CL	CA
May	3209	14.8	9.9
	3224	5.3	4.1
	3226	8.9	6.5
	3228	7.3	3.2
	3238	12.1	10.5
	3247	12.2	8.2
	3257	15.7	7.8
	3259	11.5	6.0
Immature	*3263*	*8.5*	*7.6*
	3286	18.8	9.0
Immature	*3290*	*5.7*	*5.5*
Immature	*3291*	*3.1*	*3.0*
	3293	8.3	9.0

		CL	CA
June	5026	15.0	5.2
	5032	13.4	4.9
	5033	9.7	5.2
	5039	19.1	10.8
	5057	14.8	5.0
	5058	20.1	10.3
	5069	14.4	3.7
	5087	13.3	7.2
	5090	11.9	4.5
	5093	15.3	6.4
	5095	21.5	6.3
	5096	12.4	7.8
	5097	12.7	8.5

3988	7.0	6.9
3992	14.7	8.2
3993	13.1	12.2
3994	16.9	9.9

3297	10.5	6.6

5099	16.8	6.8
5106	10.9	6.9

		CL	CA
July	3458	7.2	4.5
	3483	25.4	13.6
	5128	12.6	8.4
	5129	14.1	12.2
	5130	8.2	6.1
	5131	16.8	10.8
	5132	16.2	9.8

		CL	CA
August	4051	16.6	9.0
Immature	*4064*	*2.8*	*2.6*
	4070	7.5	6.8
	4081	13.6	10.9
	4082	16.4	6.6
	5137	21.0	10.0
	5138	12.7	6.0
	5139	20.2	10.6
	5140	20.3	10.0
	5141	13.1	10.0

		CL	CA
October	4093	20.4	9.4
	4095	23.0	10.8
	4111	8.0	7.6
	4127	17.5	14.6
	4129	10.3	12.5
	4131	14.6	14.2
	4136	12.5	11.1
	4145	24.7	7.2
	4147	9.4	6.1
Immature	*4154*	*7.0*	*6.5*
	5010	11.6	10.5
	5148	11.1	8.2
	5149	5.5	8.5
	5150	9.5	11.6

5151	17.4	9.3
5153	7.7	8.7

		CL	CA			CL	CA			CL	CA
Nov.	2944	17.7	10.5	**Nov.**	3032	13.3	6.0	**Dec.**	4600	16.2	15.7
	2947	9.7	9.7	**(cont.)**	3033	12.3	9.1		4601	9.8	10.4
	2948	12.4	5.7		3051	15.6	8.3		5008	11.6	10.8
	2949	11.3	14.0		3088	14.8	8.3		5009	10.8	12.4
	2952	7.9	6.0		3108	18.6	9.0		5011	12.6	12.0
	2953	15.0	12.1		3123	12.6	8.0				
	2954	20.8	8.8		3124	23.0	10.5				
	2956	19.1	19.1		3126	13.6	11.9				
	2957	10.3	10.8		3131	15.9	10.4				
	2958	9.3	10.8		3134	14.5	7.3				
	3002	17.5	7.7		3135	15.5	6.5				
	3007	13.8	13.3		3138	20.9	18.1				
	3014	14.4	7.7		3143	12.9	9.1				
	3020	9.3	7.7		3144	8.5	9.9				
	3024	12.6	11.3		5154	15.9	11.2				