## Appendix 8: Costs of Control Methods and Techniques

*Harassment.* A typical 5 month harassment program at a 200 hectare farm with high DCCO pressure would cost almost $20,000 annually (Littauer et al. 1997). This would include the cost of labor, vehicle expenses, pyrotechnics, and live ammunition. If supplemented with propane exploders and scarecrows, an additional startup cost of $1,000 to $2,000 would be incurred.

An observational food habits study conducted by Stickley et al. (1992) concluded, based upon an average number of 30.5 DCCOs observed feeding on an eight hectare pond stocked at 51,000 fish per hectare, that the fish population would be halved in 30 days if this number of cormorants fed all day. They further concluded, based on the cost of bird patrol harassment on a 200 hectare aquaculture facility over a 5 month period, that costs associated with harassment of DCCOs would be exceeded in 22 days by the losses in this one 8 hectare pond. This means that harassment efforts would prove cost-effective after 22 days at this level of depredation.

The night roost dispersal program used in the Mississippi Delta to harass DCCOs from the fish producing regions during the winters of 1993-95 ranged from $16,757 to $32,302 per year to disperse birds from 30 to 40 night roosts (Mott et al.1998). Costs to disperse DCCOs from night roost sites averaged $400 to $640 per year for each participating farm. Current costs of the roost dispersal program have likely increased based upon the doubling of the wintering DCCO population (Reinhold and Sloan 1999; Glahn et al. 1999; Glahn et al. 2000) and the increase of night roosting sites to more than 65 in the Delta region (Reinhold and Sloan 1999) since the 1995 study was completed.

Adding the cost of labor and materials necessary to patrol a typical catfish farm to the cost of pyrotechnics and live ammunition, Littauer et al. (1997) estimated harassment costs at $132/day. The authors calculated that a farm with an average of 100 DCCOs feeding at any time could experience losses of $400/day (replacement costs); they concluded that there may be instances in which an aggressive harassment program would be cost effective. In a survey of 281 Mississippi catfish farmers, Stickley and Andrews (1989) reported an average of 2.6 person-hours of harassment/day for all bird species, at an annual cost of $7400; harassment during the 6 month period when cormorants were present averaged $26 per day, or approximately $4700 for the entire six months. Outside harassment zones, expenditures for harassment at individual aquaculture facilities increased an average of $845 in 1994 and $741 in 1995, suggesting that the harassment program moved DCCOs out of the harassment zone and into surrounding areas (Mott et al. 1998).

*Shooting and egg oiling.* Bédard et al. (1999) provided a "very rough estimate" for the St. Lawrence River Estuary, Québec, control program of $10/adult shot and $3/nest sprayed with oil. Without better economic estimates on the costs of DCCO impacts, the cost effectiveness of population control by any means can not be determined (Wires et al. 2001).