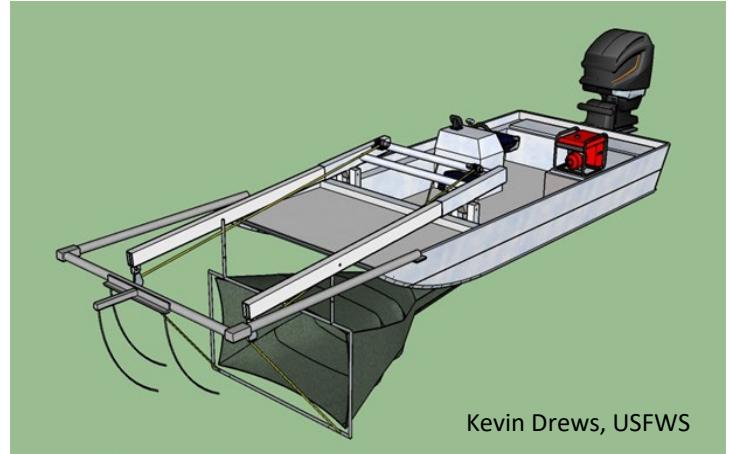




Electrified Dozer Trawl for Invasive Carp Capture

Background The Electrified Dozer Trawl was developed to address the difficulty in capturing invasive carp species. It combines conventional boat electrofishing and push trawls allowing for accurate and time-efficient assessments of Silver Carp in lentic and lotic systems in a standardized manner.

General Description The Electrified Dozer Trawl is a conventional electrofishing boat modified with an attached rigid frame. The frame is 2.13 m wide by 0.91 m high and placed at the bow of the boat. A winch attached to the frame adjusts its sampling depth. A 1.83-m long net extends beneath the boat and has 38-mm mesh at the opening reducing to a 4-mm mesh cod. Fishing depth and mesh size can be modified to meet habitat and sampling objective needs.



Gear Versatility An Electrified Dozer Trawl is capable of capturing a large size range of Silver Carp across several habitat types. Additionally, the use of push trawls reduces bias associated with dip netting and collection in turbid waters. The ability of this single gear to obtain high catch rates allows agencies to expend minimal effort while maintaining confidence in invasive carp population assessments.

Application In 2018, USFWS-Columbia collected fisheries-independent data of Silver Carp in spring (May - June) and fall (September - November) in five pools of the Illinois River. Collection sites were randomly selected and stratified across main channel borders, backwaters and side channels. Sample size of 50 five-minute transects per pool was selected based on previous catch rate data from Illinois River backwaters. Approximately 2,800 Silver Carp measuring 40–872 mm were captured. Size classes varied across pools and seasons. Summary statistics for the fall season demonstrate the efficacy of this gear as a population assessment tool (Table 1).

Table 1. Illinois River summary statistics, fall 2018. Sample size was 50 transects per pool. CPUE is mean ± standard error.

Pool	Length (miles)	# of SVCP	CPUE (SVCP/5 min)	Size range (mm)
Alton	80	455	8.97 ± 0.76	75–723
LaGrange	77	410	8.11 ± 0.79	40–725
Peoria	74	424	8.36 ± 1.41	463–626
Starved Rock	14	246	4.84 ± 1.10	537–757
Marseilles	26	71	1.40 ± 0.32	644–878



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Paupier for Invasive Carp Capture

General Description The Paupier is built around a semi-V plate boat measuring 7.3 m long by 1.8 m wide with nets attached to 1.5 X 4.0 m winch-supported frames. A 7,000 watt generator with an 82-ampere pulsator box is used to power the system. The boat is electrified using conventional electrofishing forward mounted booms affixed with three 4.76–mm stainless steel electrodes. Behind each frame is an electrified single hemisphere to prevent fish escapement from nets (Figure 1).

Electrical Field The Paupier is distinct from conventional boat electrofishing by using four quadrants of electricity. Electricity is distributed to produce the effective field and desired influence on fish within each quadrant. Generally, 60% of the total amperage is applied to the front two quadrants and 40% to the rear quadrants. Voltage gradient field-testing allows for a comprehensive calibration of the boat's electrofishing design (Figure 1).

Applied Power The electrical system is managed to maintain a consistent active field capable of transferring a constant power to fish regardless of ambient water conductivity. Target amperage increases with increasing water conductivity (Table 1). The target is achieved by manipulating voltage with the control unit.

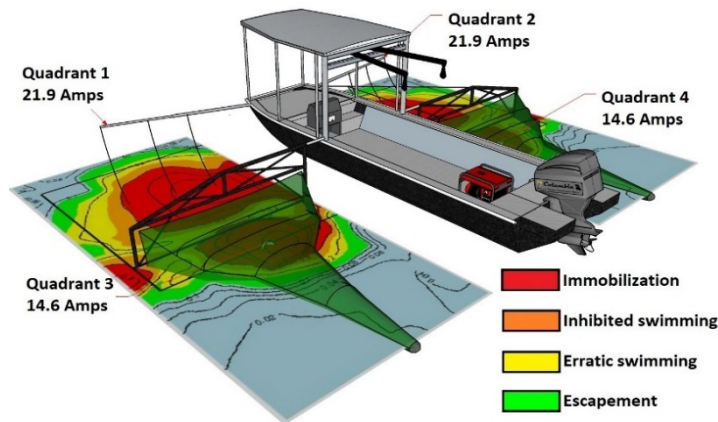


Figure 1. Paupier electric field map with identified quadrants. Amperage distribution across the quadrants is consistent with operation at 72 peak amps in water conductivity of 700 $\mu\text{S}/\text{cm}$.

Table 1. Amperage required to achieve power goals for the Paupier based on ambient conductivity.

Ambient Conductivity, $\mu\text{S}/\text{cm}$	Target Amps				Total Amps
	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	
100	5.3	5.3	3.5	3.5	17.7
200	8.1	8.1	5.4	5.4	27
300	10.8	10.8	7.2	7.2	36
400	13.6	13.6	9.1	9.1	45.3
500	16.4	16.4	10.9	10.9	54.7
600	19.2	19.2	12.8	12.8	64
700	21.9	21.9	14.6	14.6	73
800	24.7	24.7	16.5	16.5	82.3
900	27.5	27.5	18.3	18.3	91.7
1000	30.3	30.3	20.2	20.2	101

Gear Versatility The Paupier exploits the advantages of conventional boat electrofishing and push trawls while limiting the bias associated with each gear independently. By adjusting mesh size and sampling protocols, the Paupier can be used to meet a variety of objectives. To assess a Silver Carp population, the mesh size of the Paupier net is reduced to capture a broad size range of fish (Figure 2a). When capture of larger fish is desired, the mesh of the Paupier net is adjusted to target this size class (Figure 2b). Efforts are underway to increase the versatility of the gear to capture Silver Carp in deep waters of large impoundments and areas of high conductivities.

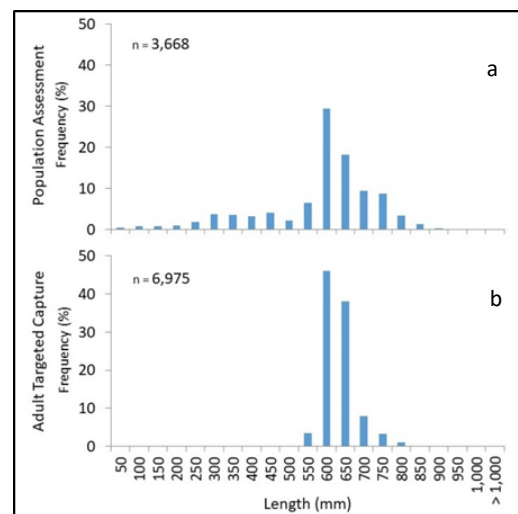


Figure 2. Length frequency distributions of fish captured for population assessment efforts (i.e. small mesh net; a) and targeted capture efforts (i.e., large mesh net; b).



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